United States Department of Agriculture

Kake to Petersburg Transmission Line Intertie Project, Tongass National Forest

Final Environmental Impact Statement

Forest Service
Alaska Region

Tongass National Forest
Petersburg Ranger District

R10-MB-765b June 2016

ACRONYMS AND ABBREVIATIONS

°F Fahrenheit

1987 Intertie Study 1987 Southeast Alaska Transmission Intertie Study

2003 Intertie Study Southeast Alaska Intertie Study prepared in 2003

2005 Feasibility Report 2005 Kake-Petersburg Transmission Intertie Study Final Report

ACFEC Alaska Commercial Fisheries Entry Commission

ACHP Advisory Council on Historic Preservation

ACS American Community Survey

ACSR aluminum cable steel reinforced

ADCCED Alaska Department of Commerce Community and Economic Development

ADEC Alaska Department of Environmental Conservation

ADF&G Alaska Department of Fish and Game

ADOT&PF Alaska Department of Transportation and Public Facilities

ADSS all-dielectric self-supporting

AEA Alaska Energy Authority

AFSC Alaska Fisheries Science Center

AHRS Alaska Heritage Resources Survey

Alaska DNR Alaska Department of Natural Resource

ANILCA Alaska National Interest Lands Conservation Act of 1980

ANKHP Alaska Natural Heritage Program

APDES Alaska Pollutant Discharge Elimination System

AP&T Alaska Power & Telephone

APE Area of Potential Effect

APLIC Avian Power Line Interaction Committee

ARD acid rock drainage

ATM Access and Travel Management

BA Biological Assessment

BE Biological Evaluation

BMP best management practice

CA Census Area

$CaCO_3$ calcium carbonate

CCHITA Central Council of the Tlingit and Haida Indian Tribes of Alaska

CEQ Council on Environmental Quality

CFR Code of Federal Regulations

cfs cubic feet per second

Corps U.S. Army Corps of Engineers

dB decibel

dBA A-weighted decibel

DBH diameter at breast height

DEC Department of Environmental Conservation

DNR Department of Natural Resources

DPS Distinct Population Segment

DOL Alaska Department of Labor

EA Environmental Assessment

EIS Environmental Impact Statement

EFH essential fish habitat

EPA U.S. Environmental Protection Agency

ESA Endangered Species Act

ESI Existing Scenic Integrity

EVC existing visual conditions

FHWA Federal Highway Administration

FLPMA Federal Land Policy and Management Act

FMP fishery management plan

FONSI Finding of No Significant Impact

Forest Plan Land and Resource Management Plan

Forest Service U.S. Department of Agriculture, Forest Service

FR Forest Road

FSH Forest Service Handbook

FSM Forest Service Manual

GIS geographic information system

GMU game management unit

GPS global positioning system

HDPE high-density polyethylene

HRA Historical Research Associates, Inc.

HSI habitat suitability index

HUC Hydrologic Unit Code

IDT Interdisciplinary Team

IPEC Inside Passage Electric Cooperative

IRA Inventoried Roadless Area

IRP Integrated Resource Plan

ISLES Island Surveys to Locate Endemic Species

kcmil one thousand circular mils

KPI Kake to Petersburg Transmission Line Intertie

kV kilovolt

kW kilowatt

kWh kilowatt hour

LiDAR Light Detection and Ranging

LTF log transfer facility

LUD Land Use Designation

MAF marine access facility

mG milligauss

MIS Management Indicator Species

ML maintenance level

MBF thousand board feet

MMBF million board feet

MMI Mass Movement Index

MOU Memorandum of Understanding

msl mean sea level

MVUM Motor Use Vehicle Map

MW megawatts

NAWS non-agricultural wage and salary

NEPA National Environmental Policy Act

NESC National Electrical Safety Code

NFMA National Forest Management Act

NFS National Forest System

NHPA National Historic Preservation Act

NIC non-interchangeable components

NMFS National Marine Fisheries Service

NOAA National Oceanic and Atmospheric Administration

NOI Notice of Intent

NPDES National Pollutant Discharge Elimination System

NPFMC North Pacific Fishery Management Council

NRCS Natural Resources Conservation Service

NRHP National Register of Historic Places

O&M operation and maintenance

OBML objective maintenance level

OGR old-growth reserve

OHV off-highway vehicle

OPML operational maintenance level

P Primitive

PCE Power Cost Equalization

PFA post-fledging area

PMPL Petersburg Municipal Power & Light

POG productive old growth

PRD Petersburg Ranger District

PWS public water supply

R10 Region 10

RARE II Roadless Area Review and Evaluation

RCS road condition survey

R Rural

RM Roaded Modified

RMA riparian management area

RN Roaded Natural

ROD Record of Decision

ROS Recreation Opportunity Spectrum

RV recreational vehicle

SAFETEA-LU Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

SATP Southeast Alaska Transportation Plan

SDM Size-Density Model

SEAPA Southeast Alaska Power Agency

SEIS Supplemental Environmental Impact Statement

SHPO State Historic Preservation Officer

SIO Scenic Integrity Objective

SMS Scenery Management System

SMU Soil Map Unit

SOPA Schedule of Proposed Actions

SPM Semi-Primitive Motorized

SPNM Semi-Primitive Non-Motorized

TES threatened and endangered species

TTRA Tongass Timber Reform Act

TUS Transportation and Utility System

USFWS U.S. Fish and Wildlife Service

USGS U.S. Geological Survey

VAC visual absorption capacity

VCU Value Comparison Unit

VMS Visual Management System

VPR visual priority route

WAA Wildlife Analysis Area

WBD Watershed Boundary Dataset

WCC watershed condition classification

United States Department of Agriculture | Forest Service | Tongass National Forest Alaska Region | 648 Mission Street Ketchikan, AK 99901 907-225-3101

File Code: 1950
Date: June 13, 2016

Dear Planning Participant:

I am pleased to announce that the Final Environmental Impact Statement (FEIS) for the Kake to Petersburg Transmission Line Intertie Project (KPI Project) on the Petersburg Ranger District, Tongass National Forest is available for review.

The FEIS describes and analyzes four alternatives, including a no action alternative. Under the no action alternative, there would be no transmission line or associated facilities constructed. The proposed action alternatives range from 51.9 miles to 60.3 miles in total length, with 82 percent to 88 percent of their total length located on NFS lands. The proposed transmission line would be built to transmit power at either 69- or 138-kilovolts and would consist of single wood pole structures with horizontal post insulators. Average span lengths between pole structures would be 350 to 400 feet, with an average above-ground height of 55 feet.

All three action alternatives follow existing NFS system roads to the extent possible, with the length along existing roads ranging from 58 percent to 72 percent of the total. The action alternatives all cross Inventoried Roadless Areas. No new roads would be built under any of the alternatives. Construction access in unroaded areas would be via temporary shovel trails and matting panels, with helicopter support, as needed. The action alternatives would all involve marine crossings.

Copies of this letter have been directly mailed or emailed to those who have expressed interest in the project through scoping, comments, consultation, or requests to be on the mailing list. The Final Environmental Impact Statement and ROD are also available for review at the Ketchikan Forest Supervisor's Office and Petersburg District Office, and online at http://www.fs.usda.gov/project/?project=31761.

For additional information, please contact Tom Parker, Petersburg Ranger District, at (907) 772-3871.

Sincerely,

for

M. EARL STEWART
Forest Supervisor, Tongass NF

Kake to Petersburg Transmission Line Intertie Project

Final Environmental Impact Statement

United States Department of Agriculture, Forest Service Alaska Region

Lead Agency:	USDA Forest Service Tongass National Forest
Responsible Official:	Earl Stewart, Forest Supervisor Tongass National Forest Federal Building Ketchikan, Alaska 99901
For Information Contact:	Tom Parker Supervisory Resource Staff Petersburg Ranger District 12 North Nordic Drive P.O. Box 1328 Petersburg, Alaska 99833-1328 (907) 772-3871

Abstract: The Southeast Alaska Power Agency (SEAPA), a joint action agency organized and existing pursuant to the laws of the State of Alaska, has proposed to build a new electric transmission line that would connect the isolated electric system presently serving the city of Kake with SEAPA's interconnected electric network, in or near Petersburg. The Forest Service proposes to authorize the construction, operation, and maintenance of the proposed Kake to Petersburg Transmission Line Intertie (KPI) across National Forest System (NFS) lands. A special use authorization would be issued to allow this use. The need for this action is established by the Forest Service's responsibility under the Federal Land Policy and Management Act (FLPMA) to respond to an application for a right-of-way (43 U.S.C. 1701). Title 36 Code of Federal Regulations (CFR) Part 251, Subpart B provides authority for reviewing and granting special use authorizations for transmission lines. Further direction is provided in Forest Service Manual 2700. The Forest Service must also consider the Tongass National Land and Resource Management Plan in the decision to issue a special use authorization for the Kake to Petersburg Intertie.

The EIS describes and analyzes four alternatives, including a no action alternative. There would be no transmission line or associated facilities constructed under the no action alternative. The city of Kake would continue to be served by an isolated electric system that depends upon high-cost, diesel generation. The proposed action alternatives range from 51.9 miles to 60.3 miles in total length, with 82 percent to 88 percent of their total length located on NFS lands. The proposed transmission line would be built to transmit power at either 69- or 138-kilovolts and would consist of single wood pole structures with horizontal post insulators. Average span lengths between pole structures would be 350 to 400 feet, with an average above-ground height of 55 feet.

All three action alternatives follow existing NFS system roads to the extent possible, with the length along existing roads ranging from 58 percent to 72 percent of the total. The action alternatives all cross Inventoried Roadless Areas. No new roads would be built under any of the alternatives. Construction access in unroaded areas would be via temporary shovel trails and matting panels, with helicopter support, as needed. The action alternatives would all involve marine crossings.

SUMMARY

Introduction

The Forest Service has prepared this Environmental Impact Statement (EIS) to address the potential effects of the Kake to Petersburg Transmission Line Intertie (KPI) Project in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations.

The KPI Project has been proposed by the Southeast Alaska Power Agency (SEAPA), a joint action agency organized and existing pursuant to the laws of the State of Alaska. SEAPA's member utilities (Ketchikan, Wrangell, and Petersburg) provide electric utility services to their respective service areas utilizing power generated by SEAPA's facilities and purchased from SEAPA under a Power Sales Agreement.

Project Area

The project area encompasses 493,806 acres on Mitkof and Kupreanof Islands, with the majority of the area located on Kupreanof Island. This total consists of 453,980 acres of National Forest System (NFS) lands, with the remaining lands (39,826 acres) owned and managed by the Alaska Department of Natural Resources (Alaska DNR), the Sealaska Corporation, Kake Tribal Corporation, the city of Kake, and Petersburg Borough.

Purpose and Need

The community of Kake is presently served by an isolated electric system that depends upon high-cost, diesel generation. This isolated system is served by a diesel plant that consists of three diesel generators originally installed in 1984 (1 unit) and 1993 (2 units). High operation and maintenance (O&M) expenses and high fuel costs make diesel generators costly to operate. In 2011, the full retail cost of power in Kake was 62 cents per kilowatt hour (kWh), more than five times the rate in the communities of Petersburg, Ketchikan, and Wrangell (Fay et al. 2012). The cost of electricity in Kake is currently subsidized for residential customers and public facilities through the State of Alaska's Power Cost Equalization (PCE) program, which is funded on an annual basis by the State legislature. Commercial customers are not eligible to participate in the PCE program and there is no comparable program for commercial customers, who pay the full retail cost for power in Kake. The high cost of electricity is not conducive to economic growth and may in fact impede economic development in Kake because the availability of reliable low-cost power strongly influences decisions to locate new commercial and industrial developments in Southeast Alaska (Alexander et al. 2010, Black & Veatch 2012, Hittle 2014). The proposed project would connect Kake to SEAPA's interconnected network and provide access to relatively low cost electricity. SEAPA's interconnected network includes the communities of Ketchikan, Wrangell, and Petersburg, the Swan Lake and Lake Tyee hydroelectric projects, and approximately 175 miles of transmission line that extend from Ketchikan to Petersburg.

The Forest Service proposes to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. A special use authorization would be issued to allow this use. The need for this action is established by the Forest Service's responsibility under the Federal Land Policy and Management Act (FLPMA) to respond to an application for a right-of-way (43 United States Code [U.S.C.] 1701). Title 36 Code of Federal Regulations (CFR) Part 251, Subpart B provides authority for reviewing and granting special use authorizations for transmission lines.

Further direction is provided in Forest Service Manual 2700. The Forest Service must also consider the Tongass National Forest Land and Resource Management Plan (Forest Plan) in the decision to issue a special use authorization for the KPI Project.

Proposed Action

The proposed action (i.e., the project proposed by the applicant) is to construct, operate, and maintain a new electric transmission line and associated facilities that would connect the city of Kake with the existing SEAPA interconnected network in Petersburg, Alaska. The proposed transmission line would be approximately 60 miles long. Built to transmit power at either 69 or 138 kilovolt (kV), the proposed line would consist of single wood-pole structures with horizontal post insulators. Average span lengths between pole structures would be 350 to 400 feet. The proposed project would also include a 24-strand fiber optic communication cable. The route followed by the proposed action across Kupreanof Island is identified as a “Potential Power Transmission Corridor” on the Forest Plan Land Use Designation (LUD) map (USDA Forest Service 2008a).

Decisions to be Made

Based on the environmental analysis in this EIS and in accordance with the Forest Plan and applicable laws, regulations, and policies, the Forest Supervisor of the Tongass National Forest will decide whether to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. The Forest Supervisor may decide to:

- Select one of the alternatives analyzed in the EIS, including the No Action alternative.
- Modify and then select one of the alternatives.

The decision will include, but is not limited to, the following items:

- The route for the proposed transmission line
- Any necessary project-specific mitigation measures and monitoring requirements.

Issues

NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail (40 CFR 1500.1(b)). Three potentially significant issues were identified through public scoping and Forest Service review of the proposed alternatives. These issues were considered potentially significant because they had the potential to drive an alternative. These issues may be summarized as follows:

- Inventoried Roadless Areas (IRAs) – All of the action alternatives cross IRAs. Road construction in IRAs, if it were to occur, would reduce roadless acres within the project area and could affect roadless values.
- Unroaded Character of the City of Kupreanof – Residents of the city of Kupreanof expressed concern that development of an electric transmission line on National Forest System (NFS) lands behind their community would affect the unroaded character of the community and have impacts on the quality of life of residents.
- Petersburg Creek – Concern was expressed about potential impacts to Petersburg Creek, an important resource for fish and wildlife, recreation and tourism, and subsistence.

Although potentially significant, these issues were addressed through the alternative development process for this project and are, therefore, no longer considered potentially significant issues. The following paragraphs summarize how each of these issues was addressed.

- IRAs – The proposed action alternatives were modified during the alternative development process and no new roads are proposed for IRAs. Construction access in unroaded areas, including IRAs, would be via temporary shovel trails and temporary matting panels, with helicopters used to support these activities. As a result, IRAs are no longer considered a key or significant issue.
- Unroaded Character of the City of Kupreanof – The initially proposed alternative that passed behind the city of Kupreanof (the Northern Alternative, Option 2) has been eliminated from further consideration. As a result, the unroaded character of the city of Kupreanof is no longer considered a key or significant issue.
- Petersburg Creek – The initially proposed alternative that crossed Petersburg Creek (the Northern Alternative, Option 2) has been eliminated from further consideration. As a result, Petersburg Creek is no longer considered a key or significant issue.

Summary of Public Concerns

No other potentially significant issues were identified. More general concerns were expressed during public scoping about potential impacts to other resources, but these concerns were resolved or addressed through one or more of the Forest Service's standard evaluation categories: potential concerns are already addressed by the Forest Plan or would be addressed through implementation of Standards and Guidelines, Best Management Practices (BMPs), or project-specific mitigation, or would be addressed during processes or impact analyses routinely conducted by the Interdisciplinary Team (IDT). The following paragraphs summarize the identified concerns by resource:

- Aquatic Resources – The proposed project could affect steelhead and salmon streams, resident fish-bearing streams, fish habitat, water quality, and marine species.
- Botany/Vegetation – The proposed project could affect old-growth habitat. The project could spread non-native species.
- Wildlife and Subsistence – The proposed project could affect wildlife and wildlife habitat. Concerns were expressed about potential impacts to the beach fringe along Frederick Sound, including deer winter range, old growth habitat, habitat fragmentation, and waterfowl flyways. Black bear, moose, Sitka deer, wolf, marten, bald eagles, and goshawks were identified as species of concern. The proposed project could affect subsistence by increasing access (off-highway vehicle [OHV]/vehicle use) and negatively affecting habitat.
- Scenery – The presence of an electric transmission line could negatively affect scenic resources. Most comments on this issue were concerned about impacts to the city of Kupreanof and Petersburg Creek.
- Recreation and Tourism – The project could affect recreation and tourism. The presence of an electric transmission line could affect the remote recreation character of the area. Dispersed recreation sites along the beaches of Frederick Sound, bear viewing and hunting at Portage Bay, and kayaking and boating in Portage Bay and Duncan Canal were identified as potential locations of concern. Concern was also expressed about potential impacts to recreation and tourism-related floatplane landing approaches and takeoff patterns. Comments also expressed general concern about potential impacts to fishing, hunting and trapping, bird and wildlife viewing, kayaking, and tourism.

- IRAs – The presence of an electric transmission line could affect the roadless character of the IRAs crossed by the proposed project.
- Cultural Resources – The proposed project could affect cultural resources. Identified areas of potential concern included a known fish trap, Tlingit portage trail, and reported fish traps and camps.
- Social and Economic Environment – The proposed project would benefit the city of Kake by providing a relatively low cost and reliable source of power to city residents, public facilities and services, local businesses, and future development. The proposed project could affect outfitter/guide businesses and tourism, as well as commercial and recreational fisheries. Concern was also expressed about the estimated cost of building and maintaining the transmission line, especially during winter.
- Air, Noise, Public Health and Safety – The proposed project could result in electromagnetic field (EMF)-related impacts to human health and other resources. The presence of an electric transmission line could create safety issues for aircraft following bush plane paths along Portage Inlet and Duncan Canal. The project could result in impacts to air quality, including emissions and dust from vehicles and equipment.

Alternatives Considered in Detail

Alternative 1 – No Action

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line would not be built. The city of Kake would continue to be served by the existing, isolated electric system, which depends upon high-cost diesel generation.

Alternative 2 – Proposed Action

Alternative 2 is 59.9 miles long. The majority of the transmission line (57.3 miles) would be above ground, with the remaining 2.6 miles located beneath Frederick Sound and the Wrangell Narrows (1.2 miles) and underground along Sandy Beach Road in Petersburg (1.4 miles). The average span length between structures would range from 350 to 400 feet and approximately 813 single-pole structures would be installed (Table S-1). Alternative 2 would also include a 24-strand fiber optic communication cable. An estimated 61 percent or 35.2 miles of the overhead portion of the proposed transmission line would follow existing roads. A total of 7.6 miles of temporary access spurs would be required for this alternative. Access for construction along the remaining 22.1 miles (39 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels (Figure S-1).

This alternative starts at the existing SEAPA substation south of Petersburg. Staying south of Petersburg the alternative follows an existing gravel road 3.5 miles east-northeast to Frederick Sound. The line would continue northwest along Sandy Beach Road to Outlook Park. The portion of the line extending along Sandy Beach Road would be placed underground. In addition, the existing distribution line along this road would also be placed underground.

From Outlook Park, the proposed transmission line crosses Frederick Sound and the mouth of the Wrangell Narrows via a horizontal directionally drilled (HDD) bore or buried submarine cable. The crossing would extend 1.2-mile, coming ashore on Kupreanof Island near Prolewy Point. The alternative then follows the Northern route “Potential Power Transmission Corridor” to Kake. The Northern route “Potential Power Transmission Corridor” follows the unroaded east shoreline of Kupreanof Island north to the mouth of Twelve Mile Creek. From there the corridor turns southwest away from the shoreline and parallels existing Forest Road 6310, south of Portage Bay. From the south side of Portage Bay, the corridor continues west to Forest Road 6030, and from there parallels Forest Roads 6030 and 6040 to Kake (Figure S-1).

Alternative 3 – Northern Route with Submarine Cable

Alternative 3 starts at the existing SEAPA substation south of Petersburg. Staying south of Petersburg, the alternative follows an existing gravel road 3.5 miles east-northeast to Frederick Sound. The transmission line would cross Frederick Sound via a 3.1-mile-long submarine cable that would come ashore near Prolewy Point on the east shore of Kupreanof Island. This proposed crossing is the only difference between Alternatives 2 and 3. This crossing would originate near Sandy Beach Park.

This alternative is 60.3 miles long. The majority of the transmission line (57.3 miles) would be above ground, with the remaining 3.1 miles located along the floor of Frederick Sound. The average span length between structures would range from 350 to 400 feet and approximately 813 single-pole structures would be installed (Table S-1). Alternative 3 would also include a 24-strand fiber optic communication cable. An estimated 61 percent or 35.2 miles of the overhead portion of the proposed transmission line would follow existing roads. A total of 7.6 miles of temporary access spurs would be required for this alternative. Access for construction along the remaining 22.1 miles (39 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels in some wetland areas (Figure S-1).

Alternative 4 – Center-South Route

Alternative 4 is 51.9 miles long. The majority of the transmission line (50.4 miles) would be above ground, with the remaining 1.5 miles located under Wrangell Narrows and Duncan Canal. The average span length between structures would range from 350 to 400 feet and approximately 748 single-pole structures would be installed (Table S-1). Alternative 4 would also include a 24-strand fiber optic communication cable. An estimated 74 percent or 37.3 miles of the overhead portion of the proposed transmission line would follow existing roads. A total of 6.2 miles of temporary access spurs would be required for this alternative. Access for construction along the remaining 13.1 miles (26 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels in some wetland areas (Figure S-2).

This alternative would connect to the existing Tyee-Wrangell-Petersburg transmission line approximately 8 miles south of Petersburg and would require a new tap or small switch yard at this location. The alternative would then cross the Wrangell Narrows and Duncan Canal via submarine cable crossings, approximately 0.6 mile and 0.9 mile in length, respectively. These marine crossings may also be completed using an HDD approach depending on geophysical survey results. From the Wrangell Narrows crossing, the Center-South route corridor follows Forest Road 6350 across the Lindenberg Peninsula to Duncan Canal. Across Duncan Canal, the corridor continues across an unroaded area to Forest Road 6314S and from there parallels existing NFS roads to Kake (Figure S-2).

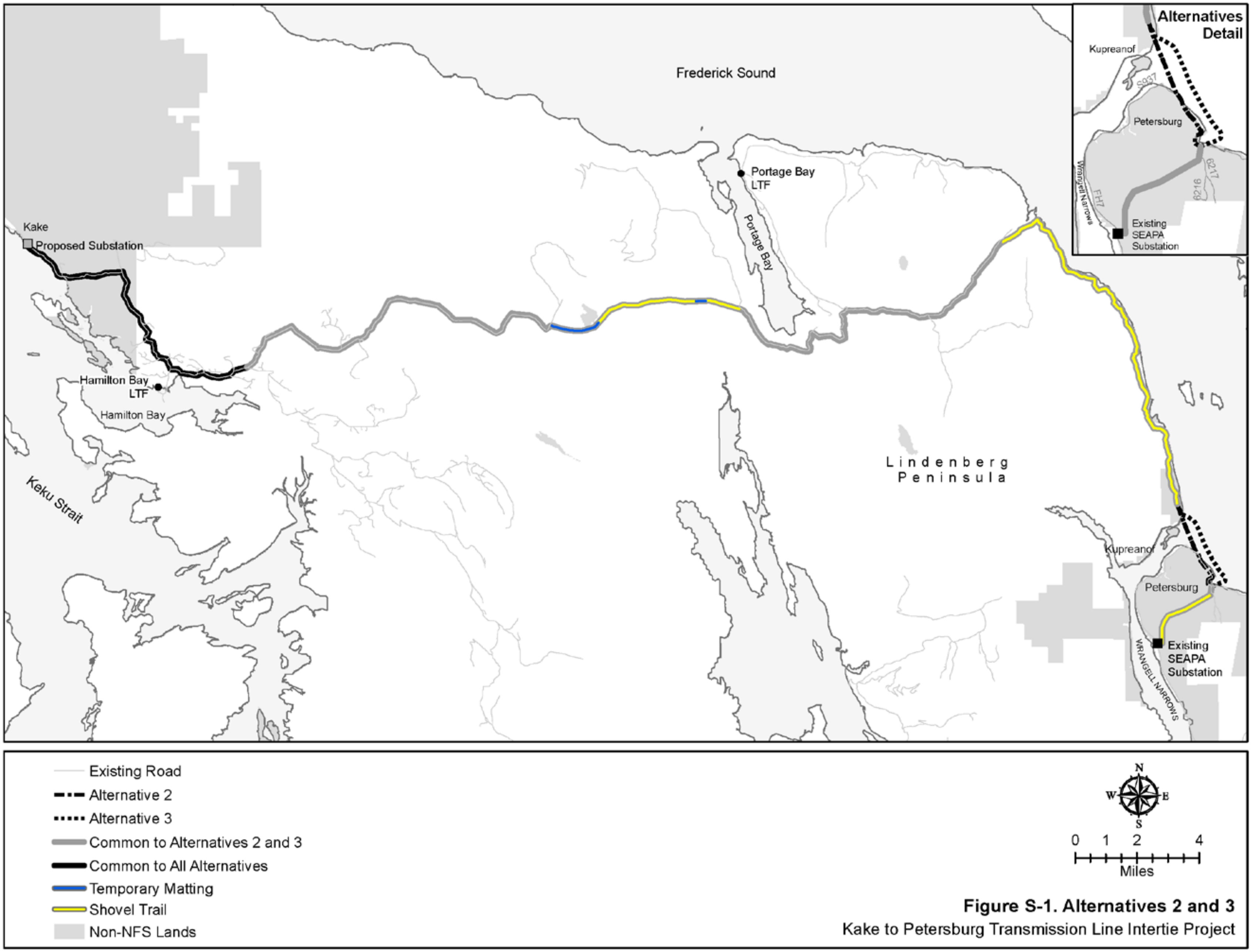


Figure S-1. Alternatives 2 and 3
Kake to Petersburg Transmission Line Intertie Project

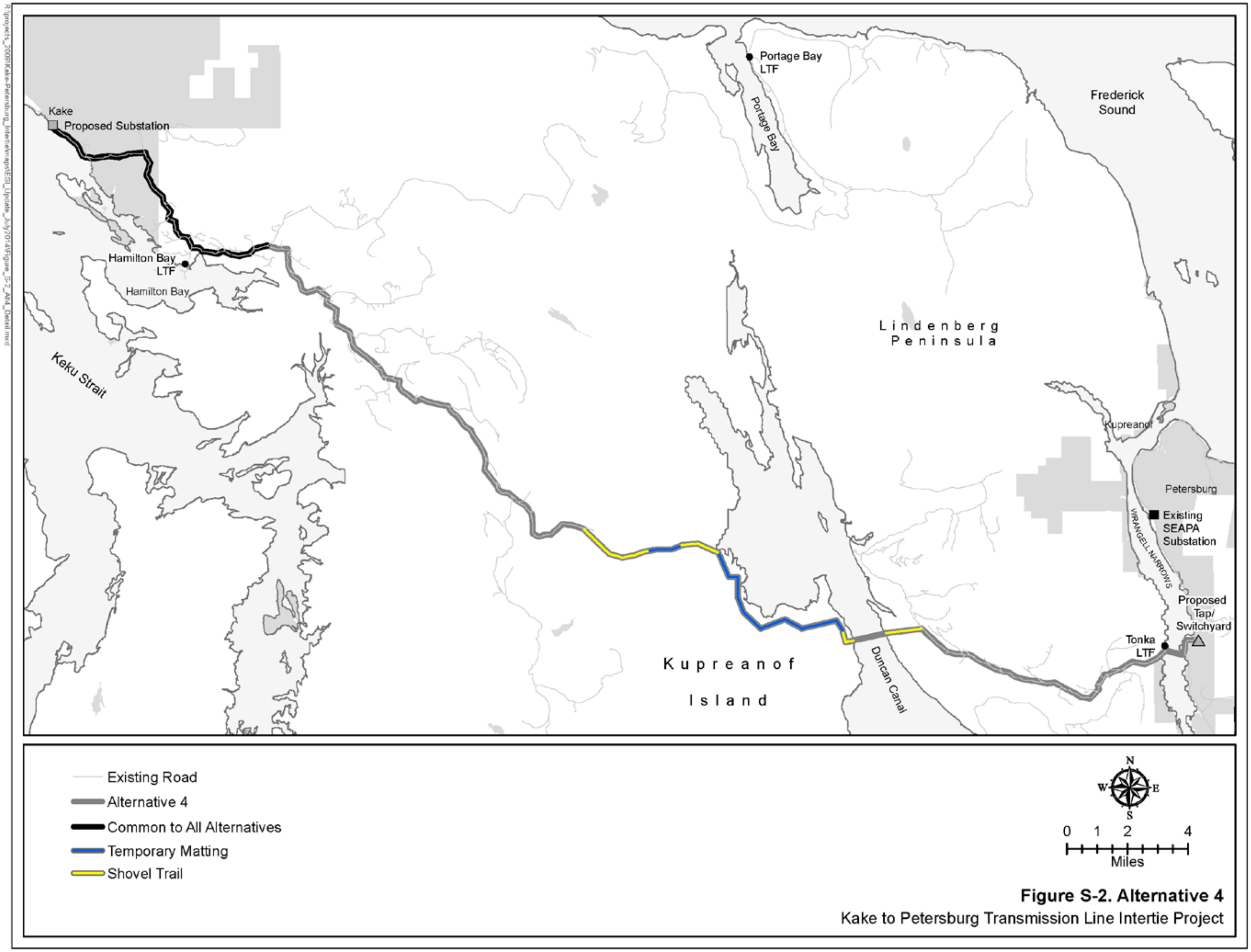


Figure S-2. Alternative 4

Kake to Petersburg Transmission Line Intertie Project

Comparison of Alternatives

Table S-1 provides a summary of the proposed alternatives and the associated environmental effects assessed in this EIS. The effects are summarized from Chapter 3, which should be consulted for a full understanding of these and other environmental consequences.

Table S-1. Comparison of Alternatives

Unit of Measure	Alternative: 1 - No Action	2 – Proposed Action	3 – Northern Route with Submarine Cable	4 – Center-South Route
Project Description				
Total Length (miles)	0	59.9	60.3	51.9
Miles on NFS Lands	0	48.9	50.6	45.9
Voltage	0	69 or 138 kV	69 or 138 kV	69 or 138 kV
Primary Structure Type	0	Single wood pole	Single wood pole	Single wood pole
Average Structure Height (feet)	0	55	55	55
Estimated Number of Structures	0	813	813	748
Average Span Length Between Structures (feet)	0	350 to 400	350 to 400	350 to 400
Overhead Length (miles)	0	57.3	57.3	50.4
- Length along Existing Roads (miles)	0	33.7	33.7	36.6
- Length along Existing Roads (%)	0	59%	59%	73%
Marine Crossings (miles)	0	1.2	3.1	1.5
- Submarine Cable (miles)[1/2/]	0	1.2	3.1	1.5
- HDD Bore (miles)[1/2/]	0	1.2	--	--
Underground Length (miles)	0	1.4	--	--
Environmental Effects				
Soils and Geology				
New Detrimental Soil Disturbance:				
- On NFS Lands (acres)	0	110	110	89
Cumulative Detrimental Soil Disturbance:				
- On NFS Lands (acres)	0	159	159	170
Aquatic Resources				
Subwatersheds with more than 20% of Basin Area Harvested Since 1984 (number)[3/]	0	0	0	0
Number of Proposed Stream Crossings by Shovel Trail/Matting Panel:				
- Class I	0	10	10	28
- Class II	0	20	20	14
- Class III	0	16	16	4
Number of Proposed Stream Crossings by Temporary Access Spur:				
- Class I	0	6	6	0
- Class II	0	5	5	6
- Class III	0	0	0	1
Timber				
Total Productive Forest Land Disturbed (acres)	0	358	358	496
Total Suitable Forest Land Disturbed (acres)[4/]	0	135	135	253
Removal of Timber from the Regional Timber Base (Net Sawlog Volume) (MBF)	0	1,524	1,524	1,693

Table S-1. Comparison of Alternatives (continued)

Unit of Measure	Alternative 1 - No Action	2 – Proposed Action	3 – Northern Route with Submarine Cable	4 – Center- South Route
Botany - Rare Plants				
Sensitive Plants with Potential to Occur (risk):[5/]				
- Large yellow lady's slipper orchid	0	Low to Moderate	Low to Moderate	Low to Moderate
- *Lobaria amplissima*	0	Low to Moderate	Low to Moderate	Low to Moderate
- Alaska rein orchid	0	Low to Moderate	Low to Moderate	Low to Moderate
- Lesser round-leaved orchid	0	Low to Moderate	Low to Moderate	Low to Moderate
Invasive Plants				
Total Acres Disturbed	0	891	873	739
Risk of Spread (Relative)[6/]	0	Highest	Second Highest	Lowest
Wetlands				
Project-Related Disturbance to Wetlands (acres):				
- Forested Wetlands	0	166	157	106
- Emergent Short-sedge Wetlands	0	4	4	4
- Moss Muskegs	0	95	93	67
- Forested Wetland/Emergent Sedge Complex	0	238	238	116
Total Wetland Disturbance (acres)[7/]	0	502	491	293
Wildlife and Subsistence				
Impacts to Total POG (acres)	0	327	324	296
Impacts to High-Volume POG (acres)	0	99	97	51
Impacts to Large-Tree POG (acres)	0	12	12	3
POG affected within Beach Fringe and Riparian Buffers (acres)	0	182	178	130
Impacts to Deep Snow Winter Range for Deer (acres)	0	15	10	7
Deer Habitat Capability as Percent of 1954 Values	0	84	83	83
Transportation				
Total Unroaded Length (miles)	0	23.6	23.6	13.8
- Length of Shovel Trails (miles)	0	21.6	21.6	6.5
- Length of Temporary Matting (miles)	0	2.0	2.0	7.3
Length of Temporary Access Spurs (miles)	0	7.6	7.6	6.2
Number of Helicopter Pads	0	83	83	47
Scenery				
Total Disturbance (acres) in:				
- Distinctive Scenic Attractiveness Class	0	0	0	0
- Foreground Distance Zone	0	325	307	132
- Areas with Very High Existing Scenic Integrity	0	309	309	222
Recreation				
Net change from SPNM, SPM, or RN ROS settings to RM (acres)	0	417	417	241
Inventoried Roadless Areas				
Total Disturbance by IRA (acres):				
- North Kupreanof (211)	0	157.3	157.3	0
- Missionary (212)	0	5.2	5.2	0
- Five Mile (213)	0	233.8	233.8	0
- South Kupreanof (214)	0	0	0	279.1
- Total IRA Disturbance	0	396.3	396.3	279.1

Table S-1. Comparison of Alternatives (continued)

Unit of Measure	Alternative: 1 - No Action	2 – Proposed Action	3 – Northern Route with Submarine Cable	4 – Center-South Route
Cultural Resources				
Effects on NRHP Eligible Cultural Resource Sites	None	None	None	None

Notes:
HDD = horizontal directionally drilled
MBF = thousand board feet
POG = Productive Old-Growth
ROS = Recreation Opportunity Spectrum; SPNM = Semi-Primitive Non-Motorized; SPM = Semi-Primitive Motorized; RN = Roaded Natural; RM = Roaded Modified
NRHP = National Register of Historic Places
1/ Alternative 2 would cross Frederick Sound and the mouth of the Wrangell Narrows via an HDD bore or buried submarine cable depending on geophysical survey results.
2/ Alternative 4 would cross Wrangell Narrows and Duncan Canal using a buried submarine cable or HDD bore depending on geophysical survey results. Different approaches could be used for each crossing depending on geophysical conditions.
3/ Estimates since 1984 include estimated disturbance by alternative.
4/ Totals include both old-growth and young-growth suitable forest land.
5/ A low to moderate rating here means that the action alternatives may adversely impact individuals, but are not likely to result in a loss of viability of these plant species in the analysis area, nor cause a trend toward federal listing. None of the alternatives would have direct or indirect effects on known populations of sensitive plant species. This rating is based on potential effects to undetected populations and potential habitat.
6/ Risk of invasive plant spread is directly related to total acres disturbed, which is reflected in the relative ranking in this table.
7/ Project disturbance totals include potential right-of way clearing. Totals may not sum due to rounding.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

List of Appendices

List of Tables

Table of Contents

List of Figures

Chapter 1
PURPOSE AND NEED

CHAPTER 1 – PURPOSE AND NEED

Introduction

The U.S. Department of Agriculture (USDA), Forest Service (Forest Service) proposes to authorize the construction, operation, and maintenance of the proposed Kake to Petersburg Transmission Line Intertie (KPI) Project across National Forest System (NFS) lands. A special use authorization would be issued to allow this use. The KPI Project consists of an electric transmission line that would extend from Petersburg on Mitkof Island to Kake on Kupreanof Island. The proposed transmission line would be built to transmit power at either 69 or 138 kilovolts (kV) and would consist of single wood-pole structures. The proposed project would include a 24-strand fiber optic communication cable. Construction access would be via existing roads, temporary shovel trails, temporary access spurs, and helicopter. The Proposed Action and action alternatives for the proposed project would all cross NFS lands on the Petersburg Ranger District of the Tongass National Forest.

The Forest Service has prepared this Final Environmental Impact Statement (EIS) to address the potential effects of permitting this request in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Final EIS identifies the purpose and need for the proposed project and discloses the direct, indirect, and cumulative environmental impacts, as well as any irreversible or irretrievable commitment of resources that would result from the Proposed Action and/or alternatives.

This Final EIS is prepared according to the format established by the White House's Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508). The Interdisciplinary Team (IDT) assembled for this proposed project used a systematic approach to analyze the environmental effects within the proposed project area using the best available science and on-the-ground surveys and observations.

Project Applicant

SEAPA, the project applicant, is a joint action agency organized and existing pursuant to the laws of the State of Alaska. SEAPA's member utilities (Ketchikan, Wrangell, and Petersburg) provide electric utility services to their respective service areas utilizing power generated by SEAPA's facilities and purchased from SEAPA under a Power Sales Agreement. These three communities—Ketchikan, Wrangell, and Petersburg—are part of SEAPA's interconnected network, which includes the Swan Lake and Lake Tyee hydroelectric projects and approximately 175 miles of transmission line that span from Ketchikan to Petersburg.

Project Area

The proposed intertie transmission line has been discussed for many years and has been the subject of a number of studies dating back to the 1970s. Over the years at least a dozen alternatives have been discussed and evaluated. The most recent of these studies identified two primary route corridors, a northern route generally located on the north end of Kupreanof Island (the "Northern" route), and a southern route that crosses the Wrangell Narrows near the Tonka log transfer facility and proceeds west across Duncan Canal (the "Center-South" route). These routes are both identified as "Potential Power Transmission Corridors" on the Forest Plan Land Use Designation (LUD) map (USDA Forest Service 2008a).

The Proposed Action and action alternatives would follow one or the other of these Potential Power Transmission Corridors. The action alternatives (including the Proposed Action [Alternative 2]) are shown on Figure 1-1. The project area comprises the Value Comparison Units (VCUs) crossed by the

Proposed Action and action alternatives, as well as the VCUs located between the two corridors. First developed for the 1979 Tongass Forest Plan, VCUs are distinct geographic areas that generally encompass a drainage basin containing one or more large stream systems. VCU boundaries typically follow easily recognizable watershed divides and provide a common set of areas used on the Tongass for resource inventory and analysis. The project area consists of a total of 18 VCUs (Figure 1-2).

The project area encompasses approximately 493,806 acres on Mitkof and Kupreanof Islands, with the majority of the area located on Kupreanof Island (Figure 1-2). This total consists of 453,980 acres of NFS lands, with the remaining lands (39,826 acres) owned and managed by the Alaska Department of Natural Resources (Alaska DNR), the Sealaska Corporation, Kake Tribal Corporation, the city of Kake, and Petersburg Borough. Non-NFS lands are identified in Figure 1-1. The term “project area” is used to refer to this area throughout the EIS. This area is synonymous with the analysis area for some resources. For other resources, a reduced or expanded boundary is used to assess impacts. The analysis area for each resource is described at the beginning of each resource-specific section in Chapter 3 of this EIS.

The Tongass National Forest, including Mitkof and Kupreanof Islands, is primarily covered by temperate rainforest consisting of Sitka spruce and western hemlock, with lesser amounts of mountain hemlock, Alaska yellow-cedar, and lodgepole pine. Red alder occupies riparian areas and other sites where bare mineral soils are exposed. The majority of the project area is occupied by old-growth forests and harvested timber areas, intermixed with muskeg, riparian plant communities, and beach habitat that are largely unaltered. Regeneration is rapid and most of the logged areas are covered by dense stands of young-growth. Topography in the project area ranges from low, flat marshes to hills and mountains ranging from 1,000 feet to 3,363 feet (Portage Mountain) above mean sea level (msl).

Frederick Sound borders Mitkof and Kupreanof Islands to the east and Kupreanof Island to the north (Figure 1-1). The Wrangell Narrows separate Mitkof and Kupreanof Islands. Duncan Canal to the south and Portage Bay to the north partially separate the Lindenberg Peninsula from the rest of Kupreanof Island. Keku Strait borders Kupreanof Island to the west.

The two route corridors cross parts of four Inventoried Roadless Areas (IRAs) (Figure 1-3). IRAs are undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for Wilderness Consideration under the Wilderness Act. The Northern route corridor crosses three IRAs: North Kupreanof (# 211), Missionary (# 212), and Five Mile (# 213). The Center-South route corridor crosses one IRA: South Kupreanof (# 214). IRAs are discussed in detail in Chapter 3 of this EIS in the *Inventoried Roadless Areas and Wilderness* section.

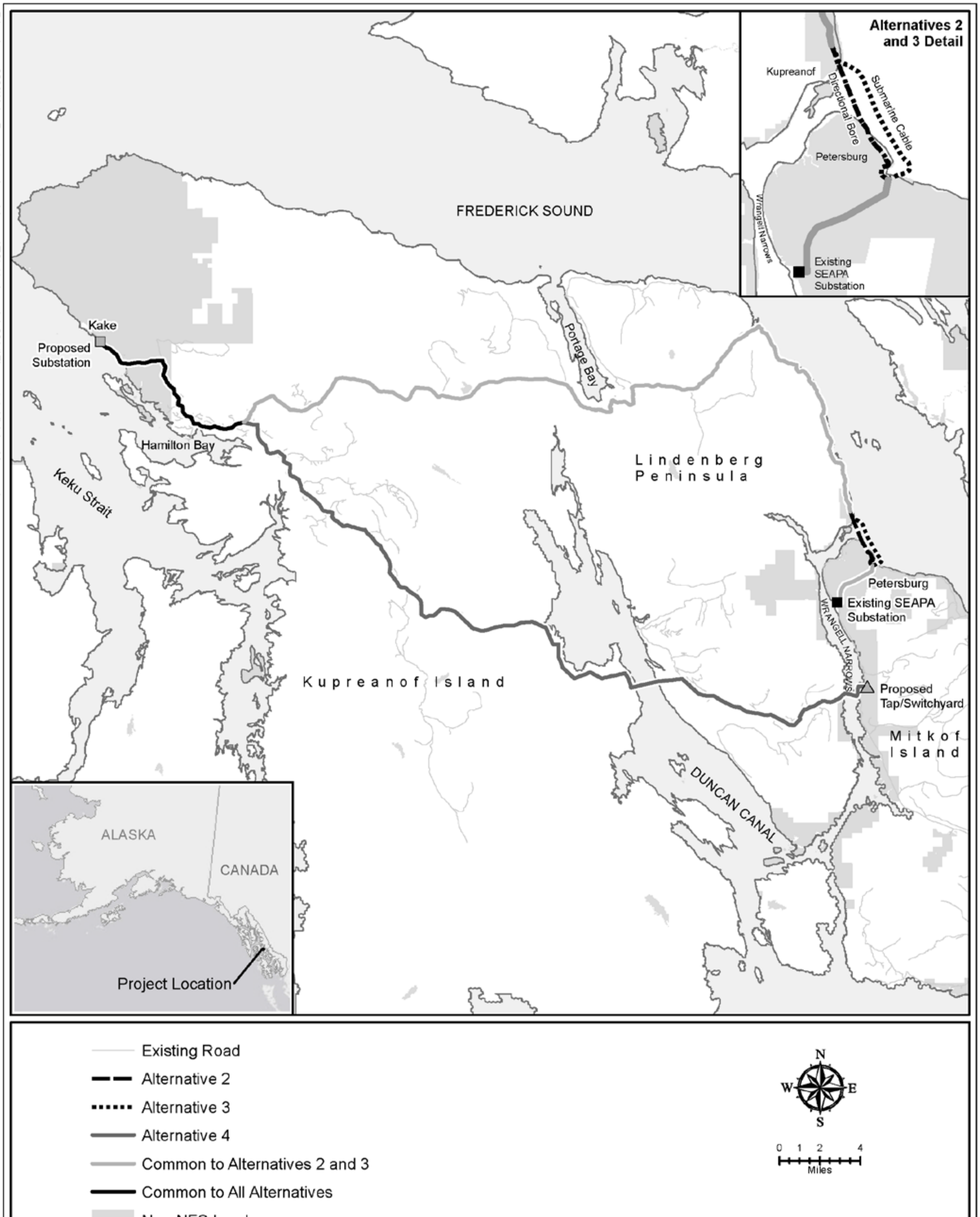


Figure 1-1. Vicinity Map

Kake to PetersburgTransmission Line Intertie Project

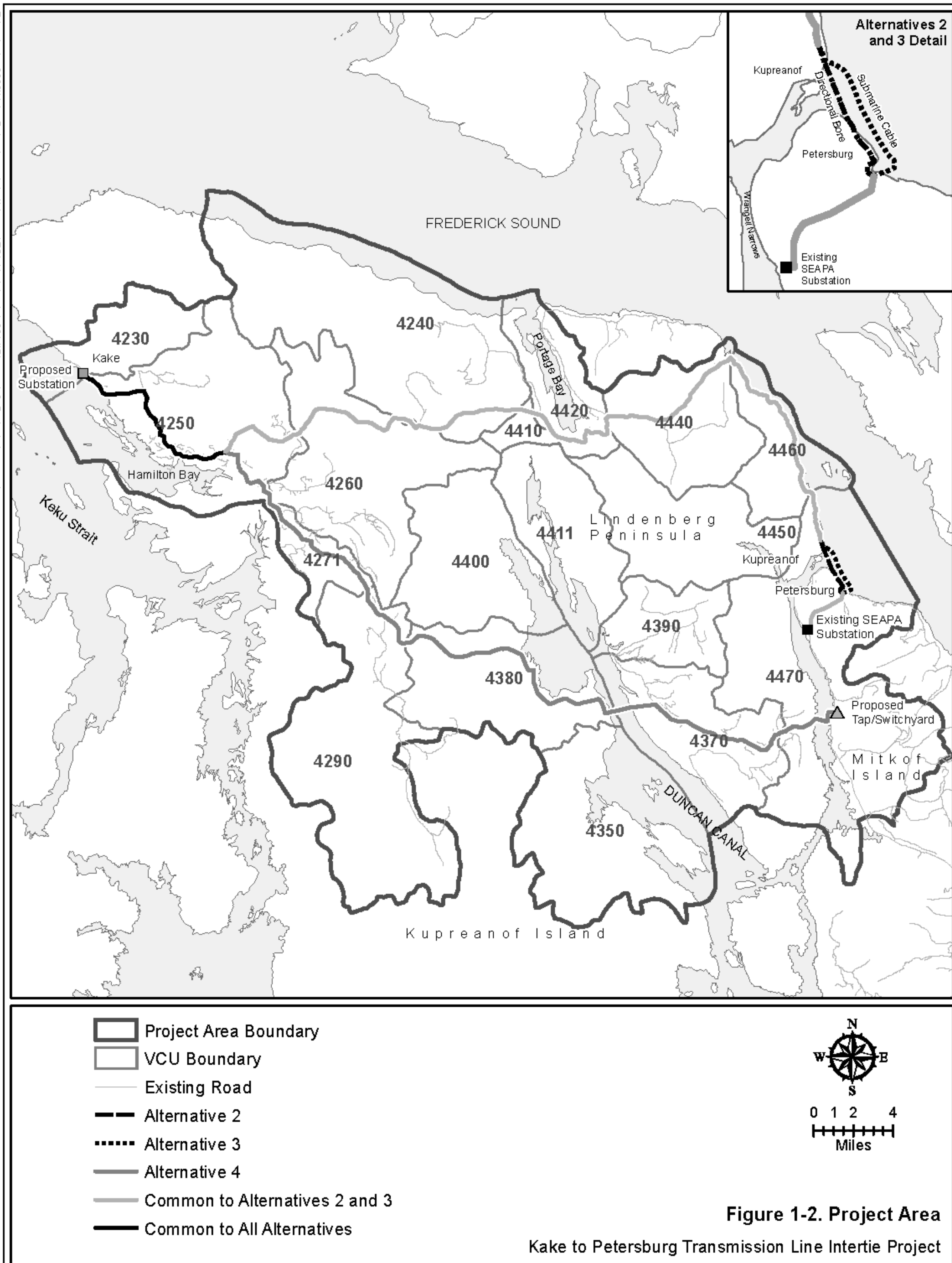


Figure 1-2. Project Area

Kake to Petersburg Transmission Line Intertie Project

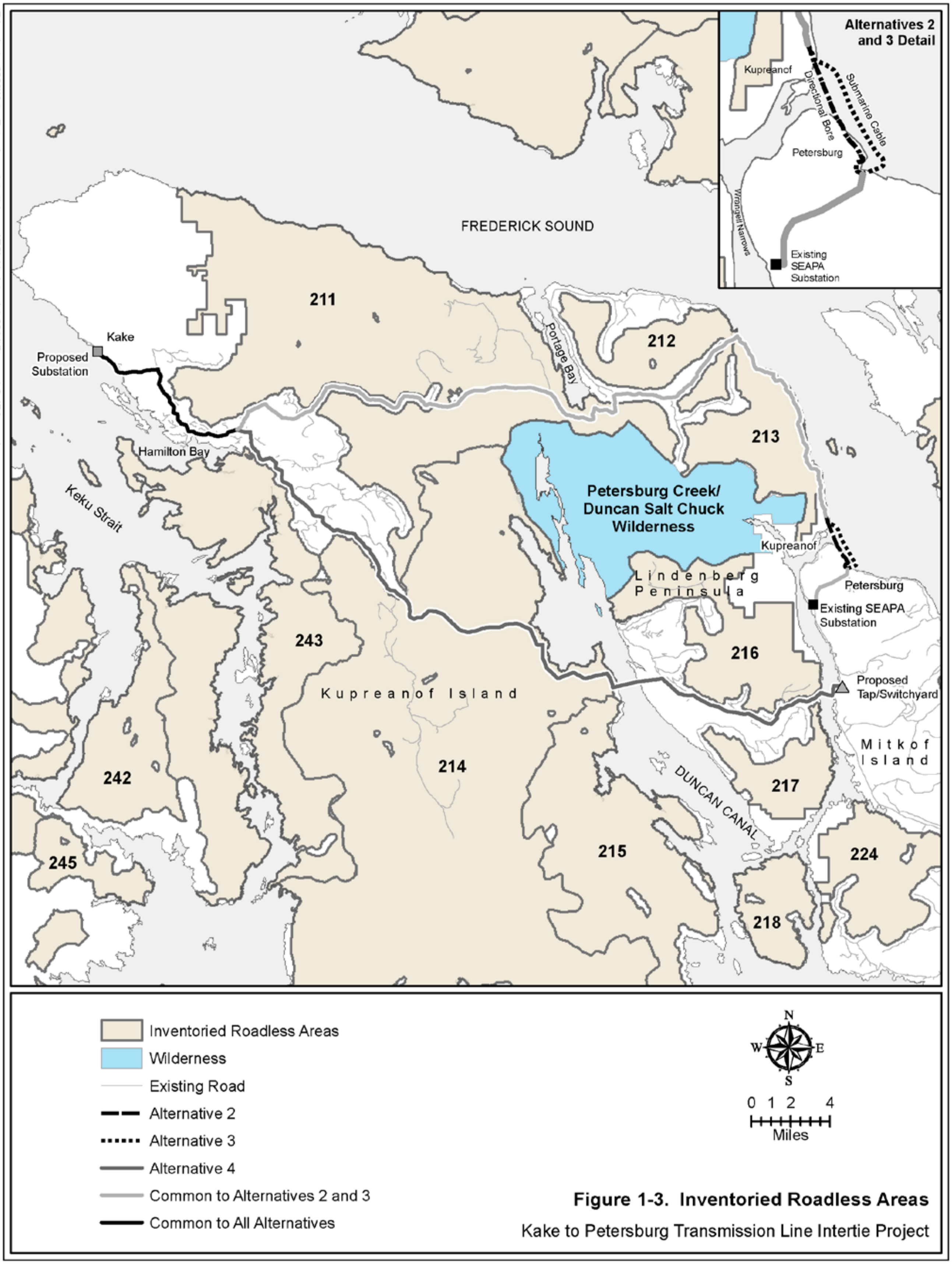


Figure 1-3. Inventoried Roadless Areas

Kake to Petersburg Transmission Line Intertie Project

1 Purpose and Need

Document Structure

This EIS document is organized as follows:

Chapter 1 – Purpose and Need: This chapter explains the purpose and need for the Proposed Action, discusses how the proposed project relates to the Tongass Land and Resource Management Plan (Forest Plan) (USDA Forest Service 2008a), describes the decision to be made, identifies the official responsible for making the decision, summarizes the public involvement conducted in support of the proposed project, and identifies the issues driving the environmental analysis.

Chapter 2 – Alternatives: This chapter describes the Proposed Action and alternatives evaluated in this EIS, discusses the alternatives considered but eliminated from detailed study, and provides a detailed summary comparison of the potential impacts of each alternative (including the Proposed Action).

Chapter 3 – Environment and Effects: This chapter discloses the potential environmental effects that would result from implementation of the Proposed Action and alternatives.

Chapter 4 – References and Lists: This chapter contains the list of preparers, the Final EIS distribution list, references, glossary, and index.

Additional documentation may be found in the project record located at the Petersburg Ranger District in Petersburg, Alaska.

Purpose and Need

Background

The community of Kake is presently served by an isolated electric system that depends upon high-cost, diesel generation. This isolated system is served by a diesel plant that consists of three diesel generators originally installed in 1984 (1 unit) and 1993 (2 units). High operation and maintenance (O&M) expenses and high fuel costs make diesel generators costly to operate. In 2011, the full retail cost of power in Kake was 62 cents per kilowatt hour (kWh)[1], more than five times the rate in the communities of Petersburg, Ketchikan, and Wrangell (Fay et al. 2012). The cost of electricity in Kake is currently subsidized for residential customers and public facilities through the State of Alaska's Power Cost Equalization (PCE) program, which is funded on an annual basis by the State legislature. Commercial customers are not eligible to participate in the PCE program and there is no comparable program for commercial customers, who pay the full retail cost for power in Kake. The high cost of electricity is not conducive to economic growth and may in fact impede economic development in Kake because the availability of reliable low-cost power strongly influences decisions to locate new commercial and industrial developments in Southeast Alaska (Alexander et al. 2010, Black & Veatch 2012, Hittle 2014). The proposed KPI Project would connect Kake to SEAPA's interconnected network and provide access to relatively low cost electricity.

Forest Service Purpose and Need

The Forest Service proposes to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. A special use authorization would be issued to allow this use. The need for this action is established by the Forest Service's responsibility under the Federal Land Policy and Management Act (FLPMA) to respond to an application for a right-of-way (43 U.S.C 1701). Title 36

---

[1] A kWh is a unit of energy equivalent to 1 kilowatt (kW) expended for one hour of time. A heater or air conditioner rated at 1,000 watts (1 kilowatt) operated for 1 hour will, for example, consume 1 kWh. Similarly, a 100 watt light bulb left on for 1 hour will consume 0.1 kWh.

CFR Part 251, Subpart B provides authority for reviewing and granting special use authorizations for transmission lines. Further direction is provided in Forest Service Manual 2700. The Forest Service must also consider the Forest Plan in the decision to issue a special use authorization for the KPI Project.

Proposed Action

The Proposed Action (the project proposed by the applicant) is to construct, operate, and maintain a new electric transmission line and associated facilities that would connect the city of Kake with the existing SEAPA interconnected network in Petersburg, Alaska. The proposed transmission line would be approximately 60 miles long. Built to transmit power at either 69 or 138 kV, the proposed line would consist of single wood-pole structures with horizontal post insulators. Average span lengths between pole structures would be 350 to 400 feet. The proposed project would also include a 24-strand fiber optic communication cable. The Proposed Action follows the Northern route corridor across Kupreanof Island. This route was identified as a Potential Power Transmission Corridor in the 2008 Forest Plan (as described below) (see Figure 1-4).

The proposed transmission line would originate at the existing SEAPA substation south of Petersburg and extend north, then northeast toward Frederick Sound. The line would continue northwest along Sandy Beach Road to Outlook Park. From Outlook Park, the transmission line would cross Frederick Sound and the mouth of the Wrangell Narrows via a horizontal directionally drilled (HDD) bore or buried submarine cable. The crossing would extend approximately 1.2 miles, coming ashore on Kupreanof Island, near Prolewy Point. From this point, the transmission line would follow the identified Potential Power Transmission Corridor north along Frederick Sound, and then west to Kake where it would terminate at a new substation located near the existing powerhouse. Existing Inside Passage Electric Cooperative’s (IPEC) distribution lines would be used to deliver power from the new substation to residential and commercial electric users in Kake.

An estimated 61 percent, or 35.2 miles, of the overhead portion of the proposed transmission line would follow existing roads. Construction access in areas where there are no existing roads would be via shovel trails supported by temporary matting panels in some wetland areas. Helicopters would be used to support construction, especially in areas without roads. Following construction, routine annual inspections would be conducted via helicopter and existing access roads, where possible. Helipad structures would be installed for use in unroaded sections.

The majority of the Proposed Action (51.6 miles) would cross NFS lands. The proposed transmission line would also cross lands owned and managed by the Alaska DNR, Sealaska Corporation, Kake Tribal Corporation, the City of Kake, and Petersburg Borough (see Figure 1-1). Detailed maps of the Proposed Action are presented in Chapter 2, which describes the Proposed Action and action alternatives in detail.

Decision Framework

Based on the environmental analysis in this EIS and in accordance with the Forest Plan and applicable laws, regulations, and policies, the Forest Supervisor of the Tongass National Forest will decide whether to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. The Forest Supervisor may decide to:

- Select one of the alternatives analyzed in the EIS, including the no action alternative.
- Modify and then select one of the alternatives.

The decision will include, but is not limited to, the following items:

- The route for the proposed transmission line and fiber optic communication cable.
- Any necessary project-specific mitigation measures and monitoring requirements.

Relationship to the Kake Access Project

The Alaska Department of Transportation and Public Facilities (ADOT&PF) identified the need for more efficient access to and from Kake in its 2004 Southeast Alaska Transportation Plan and subsequent updates. Access is currently limited to twice-weekly mainline ferry service, scheduled air taxi service to Juneau and Sitka, and chartered aircraft service to Petersburg. The nearest larger community is Petersburg, 38 flying miles away. The Western Federal Lands Highway Division of the Federal Highway Administration (FHWA**)** and ADOT&PF initiated the Kake Access Project (KAP) EIS with a Notice of Intent (NOI) published in the Federal Register on January 22, 2013 (Volume 78, Number 14).

The KAP EIS was initially intended to evaluate alternatives that provide additional public access to Kake via a new road or enhanced ferry service, with a Draft EIS expected to be published sometime in 2015. As indicated in the Draft EIS, there were initially some commonalities between the KPI Project and the KAP, with both projects evaluating the potential use of the Northern Route and Center-South Route Potential Power Transmission Corridors identified in the 2008 Forest Plan. However, as also discussed in the Draft EIS, the two projects had different purposes and while there was some overlap with potential alternatives, the KAP at that time also included other potential road locations, as well an alternative that would improve ferry service only. As a result, it was recognized that the best solution for each project may not involve action taken at the same time or in the same place, and the two projects have been pursued independently.

In the time since the Draft EIS for the KPI Project was published (November 2014), FHWA and ADOT&PF have conducted additional studies to gauge support for the KAP, solicited public input to help refine the Purpose and Need statement, and developed a revised Purpose and Need statement and range of alternatives, as well as a revised schedule for a KAP EIS (FHWA 2015). However, in February 2016, citing a lack of federal funding and the high cost of operating and maintaining a shuttle ferry service across the Wrangell Narrows, the ADOT&PF formally notified the City of Kake and other communities via letter of their decision to “close-out the Kake Access federal project in order to investigate a more cost-effective project” (Luiken 2016). FHWA subsequently published a Notice to rescind the NOI for the KAP in the Federal Register on April 7, 2016 (Volume 81, Number 71).

The February 2016 letter indicated that the ADOT&PF “proposes to initiate a new scoping effort to develop a project that provides the community of Kake improved access to forest resources.” This new scoping effort has not yet been formally proposed or initiated, but ADOT&PF has indicated that they plan to provide road access to Kake following the State’s right-of-way easement from Kake to Petersburg (ADOT&PF 2016). This easement was granted by the Forest Service to the State of Alaska, acting by and through ADOT&PF in 2006 under Section 4407 of Public Law 109-59. The Forest Service believes that a Kake road project along this easement is reasonably foreseeable for the purposes of the cumulative effects analysis for KPI. This is discussed further in Chapter 3 of this EIS. This potential road project is referred to as the Kake road project in this EIS to distinguish it from the cancelled KAP.

Relationship to the Forest Plan

Based on an extensive forest-level analysis, the Forest Plan provides land and resource management direction for the Tongass National Forest. The KPI Project is designed to be consistent with the standards and guidelines and LUDs identified in the Forest Plan (USDA Forest Service 2008a). The KPI Project Final EIS is a project-level analysis and its scope is confined to addressing the significant issues and possible environmental effects of the proposed project.

Land Use Designations

The Forest Plan uses LUDs to guide the management of NFS lands on the Tongass National Forest. Each designation provides for a unique combination of activities, practices, and uses.

The Proposed Action and action alternatives would follow one of two routes identified as Potential Power Transmission Corridors on the LUD map that accompanied the Record of Decision (ROD) for the Forest Plan (USDA Forest Service 2008b). Potential Power Transmission Corridor is one of four subcategories that comprise the Transportation and Utility System (TUS) LUD. The goal of the TUS LUD is to "provide for, and/or facilitate the development of, existing and future major public Transportation and Utility Systems, including those identified by the State of Alaska and the Alaska Energy Authority." The Forest Plan also states that prior to construction of the new systems, in this case the proposed KPI Project, the management prescriptions of the underlying LUDs remain applicable (USDA Forest Service 2008a, p. 3-128). The LUDs within the project area are identified in Table 1-1 and Figure 1-4. These totals represent existing conditions and, therefore, include the LUDs that underlie the two Potential Power Transmission Corridors.

More than half of the project area (60 percent of the NFS lands) is allocated to development LUDs: Timber Production, Modified Landscape, and Scenic Viewshed, with almost half of the total allocated to Timber Production (Table 1-1, Figure 1-4). The remaining lands within the project area (40 percent of the NFS lands) are allocated to non-development LUDs: Old-Growth Habitat, Semi-Remote Recreation, Municipal Watershed, Special Interest Area, Wilderness, and Wild River (Table 1-1, Figure 1-4). The following paragraphs provide summary information for each of the LUDs in the project area.

Table 1-1. Land Use Designations in the Project Area

LUD	Project Area Acres	Percent of Project Area Total	Percent of NFS Lands in the Project Area
Development LUDs[1/]			
Timber Production	199,221	40	44
Modified Landscape	55,378	11	12
Scenic Viewshed	18,703	4	4
Subtotal	**273,302**	**55**	**60**
Non-Development LUDs[2/]			
Old-Growth Habitat	72,590	15	16
Semi-Remote Recreation	58,825	12	13
Municipal Watershed	2,668	1	1
Special Interest Area	85	0	0
Wilderness	44,102	9	10
Wild River	2,408	0	1
Subtotal	**180,678**	**37**	**40**
TOTAL NFS	**453,980**	**92**	**100**
Non-National Forest	39,826	8	na
Total All Lands	**493,806**	**100**	**na**

Notes:
na = not applicable; totals may not sum due to rounding.
1/ Development LUDs allow timber harvest and related road construction under certain conditions.
2/ Non-development LUDs emphasize maintaining the natural setting and undeveloped character of the area and generally do not allow timber harvest, but roads linking transportation systems, particularly major state corridors may occur.

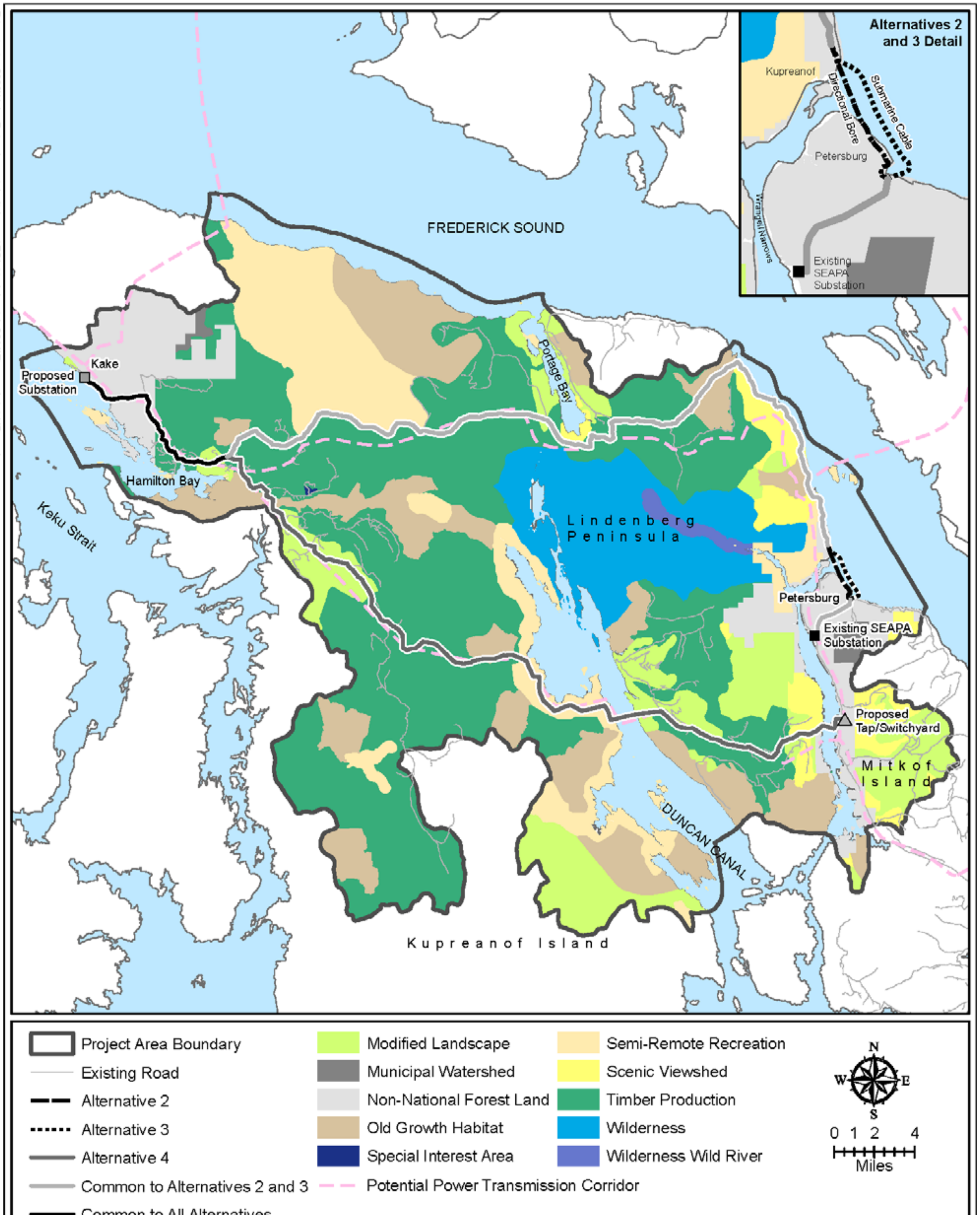


Figure 1-4. Land Use Designations

Kake to Petersburg Transmission Line Intertie Project

Timber Production: The goal of this LUD is to maintain and promote wood production from suitable forest lands (Forest Plan, page 3-116).

Modified Landscape: The goal of this LUD is to provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground distance zone (Forest Plan, page 3-109).

Scenic Viewshed: The goal of this LUD is to provide a sustained yield of timber and mix of resource activities while minimizing the visibility of developments as seen from visual priority routes and use areas (VPRs) (Forest Plan, page 3-101).

Old-Growth Habitat: The goal of this LUD is to maintain areas of old-growth forest and their natural ecological processes to provide habitat for old-growth associated resources (Forest Plan, page 3-57).

Semi-Remote Recreation: The goal of this LUD is to provide predominantly natural or natural-appearing settings for semi-primitive types of recreation and tourism, with occasional spots for concentrated facilities (Forest Plan, page 3-63).

Municipal Watershed: The goal of this LUD is to provide protection of municipal water supplies for incorporated cities and boroughs (Forest Plan, page 3-51).

Special Interest Area: The goal of this LUD is to provide for the protection of the existing characteristics and attributes of areas with unique cultural, geological, botanical, zoological, recreational, scenic, or other special features (Forest Plan, page 3-40).

Wilderness: The goal of this LUD is to maintain the enduring resource of Wilderness as directed by the Wilderness Act of 1964, subject to the special provisions and exceptions in the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) and the Tongass Timber Reform Act of 1990 (Forest Plan, page 3-7). None of the proposed alternatives would cross Wilderness (see Figure 1-3).

Wild River: The goal of this LUD is to maintain, enhance, and protect the free-flowing character and remarkable values of rivers and river segments designated as Wild Rivers and included in the National Wild and Scenic Rivers system (Forest Plan, page 3-74). None of the proposed alternatives would cross lands allocated to this LUD (see Figure 1-3).

Public Involvement

Public involvement is a key component of the NEPA process. The following paragraphs describe the public involvement activities that have occurred to date for the KPI Project.

Scoping

The CEQ defines scoping as “an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action” (40 CFR 1501.7). Among other things, the scoping process is used to invite public participation, obtain public comment, and help identify issues. Scoping begins early and is a process that continues until a decision is made.

The following is a summary of the contacts and meetings that have taken place for this proposed project to date:

- April 1, 2010: KPI Project first listed on the Schedule of Proposed Actions (SOPA) for the Petersburg Ranger District.
- April 29/30, 2010: A scoping brochure describing the purpose and need, project background, Proposed Action, preliminary issues, NEPA schedule, and the location and timing of scoping meetings was mailed to approximately 200 individuals, groups, and agencies. The 88 responses

to this mailing, plus comments received during the scoping meetings, identified a range of issues and concerns.

- April 29/30, 2010: Public notices seeking comment on the proposed project and describing the project, NEPA schedule, and the location and timing of scoping meetings were published in the Petersburg Pilot (April 29) and Ketchikan Daily News (April 30).
- May 7, 2010: A NOI to prepare an EIS for the KPI Project was published in the Federal Register (Volume 75, Number 88).
- May 12, 2010 and May 13, 2010: Open house scoping meetings were held in Kake and Petersburg.
- July 28, 2014: A corrected NOI to prepare an EIS for the KPI Project was published in the Federal Register (Volume 79, Number 144).

The Forest Service has continued to engage with the public and other interested parties regarding this project since the initial formal scoping activities described above were initiated.

Consultation with Federally Recognized Tribal Governments and Tribal Corporations

The following federally recognized tribal governments and organizations have been consulted about this proposed project:

- Organized Village of Kake
- Petersburg Indian Association

The Forest Service also corresponded with additional tribal groups that have the potential to be culturally affiliated with the project area. These groups include the Kake Tribal Corporation, Wrangell Cooperative Association, Sealaska Corporation, Sealaska Heritage, and the Central Council of the Tlingit and Haida Indian Tribes of Alaska (CCHITA). Tribal governments and organizations did not express any concerns about the KPI Project during initial consultation and discussions. Regular consultation will continue during the planning of this proposed project and beyond.

Other Agency Involvement

The Forest Service is committed to working closely with other agencies at all stages of planning and is responsible for coordinating project reviews by several other agencies. In some cases, the reviews are required because another agency has the authority to issue permits for a specific activity proposed by the Forest Service. In other cases, the reviews provide a time for dialogue with agencies responsible for ensuring that certain environmental conditions are met, such as clean water or healthy wildlife populations. This interagency communication helps provide information about area resources, used to meet laws and regulations, and to identify ways to avoid or mitigate environmental effects. Other agencies with jurisdiction over aspects of the KPI Project are identified in the following paragraphs.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) provides a general review in accordance with their responsibilities under NEPA, Section 309 of the Clean Air Act, and Section 402 of the Clean Water Act.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (Corps) is responsible for approving proposals to dredge or place fill materials in the coastal waters of the United States under Section 404 of the Clean Water Act. The Corps also has administrative authority over activities associated with wetlands.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) administers the Endangered Species Act. The Forest Service has ongoing consultation with the USFWS to determine if proposed activities will affect threatened or endangered species. In addition, if required, a permit for non-purposeful take of eagles would be applied for; this process is managed by USFWS.

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) has jurisdiction over most threatened or endangered marine life and all anadromous salmon listed under the Endangered Species Act (ESA). The Forest Service consults with NMFS concerning possible effects to these species. Under the Magnuson-Stevens Fishery Conservation and Management Act, the Forest Service is also required to consult with NMFS when an action "may adversely affect" essential fish habitat (EFH) for federally managed marine and anadromous fish species.

State of Alaska

The State of Alaska was involved in the development of the Forest Plan and entered into a Memorandum of Understanding (MOU) with the Tongass National Forest in March 2009, to promote cooperation between the Tongass and the State in implementing the Forest Plan and related environmental analyses and work associated with managing the land and resources of the Tongass. Several departments in the State of Alaska are expected to participate in review of the KPI Project. These departments include the following:

Alaska Department of Environmental Conservation

The Alaska Department of Environmental Conservation (ADEC) participates in cooperative water quality management through Section 319 of the Clean Water Act and a Memorandum of Agreement with the Forest Service.

Alaska Department of Fish and Game

The Alaska Department of Fish and Game (ADF&G) and the Forest Service have an MOU to reach concurrence prior to conducting any instream activities. Concurrence with the state's Title 16 authority for fish habitat and special area permitting must be reached before any work occurs below the ordinary high water for fish-bearing water bodies that will use, divert, obstruct, pollute, or change the natural flow or bed of water bodies. The MOU between ADF&G and the Forest Service allows cooperation on projects of mutual interest on the Tongass National Forest, which may include large-scale vegetation management, fish or wildlife habitat restoration/enhancement/management, and fish or wildlife research/monitoring. The applicant would be responsible for obtaining Fish Habitat Permits for all stream crossings requiring instream work and would consult as necessary to determine whether stream crossings may require a permit. Specific mitigation measures to ensure compliance would be outlined in a Stream Protection Plan.

Alaska Department of Natural Resources

The Alaska DNR, Division of Mining, Land, and Water issues tideland permits and the lease or easement necessary for the use of log transfer facilities (LTFs), as necessary.

Alaska Department of Transportation and Public Facilities

All of the alternatives evaluated in the DEIS follow portions of road alignments that fall into easements granted to the ADOT&PF) under Section 4407 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Where the transmission line falls within these ADOT&PF easements, a utility permit will be required from the ADOT&PF.

Alaska Office of History and Archaeology

Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies consider the effects of their actions on historic properties eligible to the National Register of Historic Places, following regulations issued by the Advisory Council on Historic Preservation (ACHP; 36 CFR 800). The Section 106 review process seeks to consider historic preservation concerns with the needs of federal actions. Review occurs through consultation with Alaska State Historic Preservation Officer (SHPO), the ACHP, Indian Tribes, and other parties with an interest in the effects of the undertaking on historic properties. The Forest Service determined there are historic properties eligible to the National Register of Historic Places within the project area (See Cultural Resources section in Chapter 3).

Alaska Office of Project Management and Permitting

The Office of Project Management and Permitting office provides overall coordination for the State's comments for large projects.

Issues

The Forest Service received 88 unique written comment letters during public scoping for this proposed project. These letters combined included more than 280 individual comments. Members of the project team reviewed and conducted content analysis for each comment letter received and used an issue identification process to analyze the individual comments. This process was used to ensure that all key or significant issues were identified, and that all other issues were meaningfully addressed in the analysis. Comments were received from individuals, organizations, state agencies, and other Federal agencies.

Evaluation Categories

Each of the comments received during scoping was considered a potential issue, and was evaluated to determine in which of the following ways the comment was resolved or addressed:

- Already addressed by the Forest Plan and Forest Plan LUDs
- Addressed through implementation of standards and guidelines or best management practices (BMPs)
- Can be resolved through project-specific mitigation
- Can be addressed during processes or impact analyses routinely conducted by the IDT
- Can be addressed through spatial modification of actions during alternative design
- Used to drive or partially drive an alternative
- Beyond the scope of the project
- Comment or opinion
- Other request

Significant Issues

NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail (40 CFR 1500.1(b)). Three potentially significant issues were identified through public scoping and Forest Service review of the proposed alternatives. These issues were considered potentially significant because they had the potential to drive an alternative. These issues may be summarized as follows:

- Inventoried Roadless Areas – All of the action alternatives cross IRAs (Figure 1-3). Road construction in IRAs, if it were to occur, would reduce roadless acres within the project area and could affect roadless values.
- Unroaded Character of the City of Kupreanof – Residents of the city of Kupreanof expressed concern that development of an electric transmission line would affect the unroaded character of their community and have impacts on the quality of life of residents.

  Public scoping for this proposed project identified two alternative routes: the Center-South and Northern Alternatives, with two options (Options 1 and 2) identified for the Northern Alternative. The Northern Alternative, Option 2 crossed Petersburg Creek and passed behind the city of Kupreanof. Many of the comments received from the public during scoping for the project were from Kupreanof residents concerned about the potential impact of the Northern Alternative, Option 2 on their community, as well as potential impacts to Petersburg Creek.[2]
- Petersburg Creek – As noted above, concern was expressed about potential impacts to Petersburg Creek, an important resource for fish and wildlife, recreation and tourism, and subsistence.

Although potentially significant, these issues were addressed through the alternative development process for this project and are, therefore, no longer considered potentially significant issues. The following paragraphs summarize how each of these issues was addressed.

- Inventoried Roadless Areas – The alternatives as initially proposed all included construction of a pioneer road along those sections of the proposed transmission line that do not follow existing roads, including locations within IRAs. The alternatives were modified during the alternative development process and pioneer roads are no longer proposed. Construction access in unroaded areas, including IRAs, would be via temporary shovel trails and temporary matting panels, with helicopters used to support these activities. As a result, IRAs are no longer considered a key or significant issue.
- Unroaded Character of the City of Kupreanof – The Northern Alternative, Option 2 has been eliminated from further consideration, as discussed in Chapter 2. None of the action alternatives considered in this EIS pass behind or near the city of Kupreanof. As a result, the unroaded character of the city of Kupreanof is no longer considered a key or significant issue.
- Petersburg Creek – As noted above, the Northern Alternative, Option 2 has been eliminated from further consideration. None of the action alternatives considered in this EIS cross Petersburg Creek. As a result, Petersburg Creek is no longer considered a key or significant issue.

Summary of Public Concerns

No other potentially significant issues were identified. More general concerns were expressed during public scoping about potential impacts to other resources, but these concerns were resolved or addressed through one or more of the evaluation categories identified above. Potential concerns are already addressed by the Forest Plan or would be addressed through implementation of Standards and Guidelines, BMPs, or project-specific mitigation, or would be addressed during processes or impact analyses

[2] Note: The Northern Alternative, Option 1 is Alternative 3 in this EIS; the Center-South Alternative is Alternative 4. The Northern Alternative, Option 2 was eliminated from detailed consideration. This is discussed in more detail in the *Alternatives Considered but Eliminated from Detailed Study* section in Chapter 2.

routinely conducted by the Interdisciplinary Team (IDT). The following paragraphs summarize the identified concerns by resource:

- Aquatic Resources – The proposed project could affect steelhead and salmon streams, including Mitchell Creek, Five Mile Creek, Twelve Mile Creek, Portage Creek, and others. The proposed project could also affect fish passage, resident fish-bearing streams, fish habitat, water quality, and marine species.
- Botany/Vegetation – The proposed project could affect old-growth habitat. The project could spread non-native species.
- Wildlife and Subsistence – The proposed project could affect wildlife and wildlife habitat. Concerns were expressed about potential impacts to the beach fringe along Frederick Sound, including deer winter range, old-growth habitat, habitat fragmentation, and waterfowl flyways. Black bear, moose, Sitka deer, wolf, marten, bald eagles, and goshawks were identified as species of concern. The proposed project could affect subsistence by increasing access (off-highway vehicle [OHV]/vehicle use) and negatively affecting habitat.
- Scenery – The presence of an electric transmission line could negatively affect scenic resources. Most comments on this issue were concerned about impacts to the city of Kupreanof and Petersburg Creek.
- Recreation and Tourism – The proposed project could affect recreation and tourism. The presence of an electric transmission line could affect the remote recreation character of the area. Dispersed recreation sites along the beaches of Frederick Sound, bear viewing and hunting at Portage Bay, and kayaking and boating in Portage Bay and Duncan Canal were identified as locations of concern. Concern was also expressed about potential impacts to recreation and tourism-related floatplane landing approaches and takeoff patterns. Comments also expressed general concern about potential impacts to fishing, hunting and trapping, bird and wildlife viewing, kayaking, and tourism.
- Inventoried Roadless Areas – The presence of an electric transmission line could affect the roadless character of the IRAs crossed by the proposed project.
- Cultural Resources – The proposed project could affect cultural resources. Identified areas of potential concern included a known fish trap, Tlingit portage trail, and reported fish traps and camps.
- Social and Economic Environment – The proposed project would benefit the city of Kake by providing a relatively low cost and reliable source of power to city residents, public facilities and services, local businesses, and future development. The proposed project could affect outfitter/guide businesses and tourism, as well as commercial and recreational fisheries. Concern was also expressed about the estimated cost of building and maintaining the transmission line, especially during winter.
- Air, Noise, Public Health and Safety – The proposed project could result in electromagnetic field –related impacts to human health and other resources. The presence of an electric transmission line could create safety issues for aircraft following bush plane paths along Portage Inlet and Duncan Canal. The project could result in impacts to air quality, including emissions and dust from vehicles and equipment.

These concerns and other potential impacts are addressed by resource in Chapter 3 of this EIS. In addition to the above, impacts are also evaluated for the following resources:

- Soils and Geology
- Marine Environment

- Timber
- Invasive Plants
- Wetlands
- Transportation
- Air Quality and Climate Change

Federal and State Permits, Licenses and Certificates

Prior to implementation of the proposed project, various permits are or may be required from other Federal and State agencies. Administrative actions on these permits would be initiated after the EIS is filed with the EPA. The agencies and their responsibilities are listed below:

- Forest Service
  - Special use permit to construct, operate, and maintain the proposed transmission line across NFS lands.
  - Temporary special use permits for use of roads and LTF/Marine Access Facilities during project construction, operation, and maintenance.
- U.S. Army Corps of Engineers
  - Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act of 1977, as amended).
  - Approval of construction or work in navigable waters of the United States, which include Frederick Sound, Wrangell Narrows and Duncan Canal, depending on the selected alternative (Section 10 of the Rivers and Harbors Act of 1899)
- USFWS
  - Federal Fish and Wildlife Permit- for non-purposeful take of eagles.
- EPA
  - Stormwater discharge permit
- U.S. Coast Guard
  - Coordination to ensure appropriate clearance for lines over water; generally handled through the Corps permitting authority.
- Federal Aviation Administration
  - Notice of proposed construction.
- Alaska DNR
  - Authorization for occupancy and use of tidelands and submerged lands
  - Right-of-way to construct the proposed transmission line
  - ANILCA 906(k) concurrence
- ADEC
  - Certificate of Reasonable Assurance.
  - Certification of compliance with Alaska Water Quality Standards (Section 401 Certification)
  - Solid Waste Disposal Permit (Section 402 of the Clean Water Act)
- ADF&G
  - Habitat protection permits addressing conditions and timing of stream crossings and maintenance of vegetation.
  - Title 16 fish habitat permit for any disturbance of anadromous fish streams. A Fish Habitat Permit is required before any action is taken to:
    - construct a hydraulic project; or

- use, divert, obstruct, pollute, or change the natural flow or bed of a specified river, lake, or stream; or
- use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed of a specified river, lake, or stream.

Applicable Laws and Executive Orders

Shown below is a partial list of Federal laws and executive orders pertaining to project-specific planning and environmental analysis on Federal lands. While most pertain to all Federal lands, some of the laws are specific to Alaska.

- Alaska Native Claims Settlement Act of 1971
- American Indian Religious Freedom Act of 1978
- Archeological Resource Protection Act of 1980
- Alaska National Interest Lands Conservation Act of 1980
- Bald and Golden Eagle Protection Act of 1940 (as amended)
- Cave Resource Protection Act of 1988
- Clean Air Act of 1970 (as amended)
- Clean Water Act of 1977 (as amended)
- Endangered Species Act of 1973 (as amended)
- Executive Order 11593 (cultural resources)
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 12898 (environmental justice)
- Executive Order 12962 (aquatic systems and recreational fisheries)
- Executive Order 13007 (Indian sacred sites)
- Executive Order 13112 (Invasive Species)
- Executive Order 13175 (government-to-government consultation)
- Federal Land Policy and Management Act of 1976 (as amended)
- Executive Order 13443 (hunting heritage and wildlife conservation)
- Magnuson-Stevens Fishery Conservation and Management Act of 1996
- Marine Mammal Protection Act of 1972
- Migratory Bird Treaty Act of 1918 (amended 1936 and 1972)
- Multiple-Use Sustained-Yield Act of 1960
- Native American Graves Protection and Repatriation Act of 1990
- National Environmental Policy Act of 1969 (as amended)
- National Forest Management Act of 1976 (as amended)
- National Historic Preservation Act of 1966 (as amended)
- National Invasive Species Act of 1996
- National Transportation Policy (2001)

- Organic Act of 1897
- Tongass Timber Reform Act of 1990
- Wild and Scenic Rivers Act of 1968, amended 1986

Availability of the Project Record

An important consideration in preparing this Final EIS is reduction of paperwork specified in 40 CFR 1500.4. This Final EIS provides sufficient site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and ways to mitigate the impacts. The project record contains supporting material that documents the NEPA process and analysis from the beginning of the proposed project through project implementation.

The project record is located at the Petersburg Ranger District office in Petersburg, Alaska, in electronic form. Reference documents, such as the Forest Plan and the Tongass Timber Reform Act (TTRA), are available for review at public libraries and Forest Service offices throughout Southeast Alaska, including the Forest Supervisor's Office in Ketchikan. The Forest Plan and the associated Final EIS are also available on CD-ROM and on the Internet (http://www.fs.usda.gov/main/tongass/landmanagement/planning/).

Map and Number Qualification

All map products in this document are reproduced from geospatial information prepared by the Forest Service. Geographic information system (GIS) data and product accuracy may vary. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information, contact the Petersburg Ranger District.

In addition, the accuracy of calculations made from GIS layers varies with the quality of the mapping itself. Numbers presented in tables in this document may not sum correctly due to rounding. Other slight anomalies due to rounding may also occur. Therefore, all numbers should be considered as approximate.

This page intentionally left blank.

Chapter 2

ALTERNATIVES

CHAPTER 2 – ALTERNATIVES

Introduction

This chapter describes the alternatives considered for the KPI Project. It includes a discussion of how the alternatives were developed, a description of each alternative considered, and a map of each alternative considered in detail. This chapter also presents the alternatives in comparative form, with the goal of identifying the differences among the alternatives and providing a clear basis for choice among options by the decision-maker and the public. For a discussion and analysis of site-specific, project-level effects, consult Chapter 3, Environment and Effects.

Alternative Development

An alternative is a set of activities designed to meet the *Purpose and Need* for action (see Chapter 1).

An intertie transmission line from Kake to Petersburg has been discussed for many years and has been the subject of a number of studies dating back to the 1970s. More recent studies include the Southeast Alaska Intertie Study prepared in 2003 and a follow-on study of the KPI Project completed in 2005 and 2010 (Hittle et al. 2005, 2010), and subsequently updated in 2014 (Hittle 2014). Over the years, at least 10 alternative routes have been discussed with six carried forward and evaluated in more detail in the 2005 KPI study. This study resulted in the identification of two primary route corridors, a northern route generally located on the north end of Kupreanof Island (the "Northern" route), and a southern route that crosses the Wrangell Narrows near the Tonka log transfer facility and proceeds west across Duncan Canal (the "Center-South" route) (Hittle et al. 2005). These routes and other alternatives across NFS lands were further evaluated by the Forest Service in the planning process for the Forest Plan and the two primary route corridors – the Northern and Center-South routes – were subsequently both identified as Potential Power Transmission Corridors in the Forest Plan. None of the other potential routes between Petersburg and Kake are designated as Potential Power Transmission Corridors in the Forest Plan. These two primary route corridors form the basis for the alternatives considered in detail in this Final EIS. The Proposed Action—the project proposed by the applicant—follows the Northern route corridor.

In April/May 2010, the Forest Service published its NOI for this EIS in the Federal Register, placed notices in local newspapers (the Petersburg Pilot and Ketchikan Daily News), and distributed a public scoping brochure to approximately 200 individuals, groups, and agencies (see Chapter 1). Based on public input and further evaluation during and after the EIS public scoping period, the proposed action and alternatives were revised. A corrected NOI published in the Federal Register in July 2014 outlined the changes and requested additional public input. These revisions are discussed in more detail in the *Alternatives Considered but Eliminated from Detailed Study* section below.

Alternatives Considered in Detail

Four alternatives are considered in detail in this Final EIS, including the no action alternative. The three action alternatives are shown in Figure 1-1. Table 2-1 summarizes the characteristics for the action alternatives. This information is based on the preliminary project design conducted to date for the proposed project. The evaluation of potential impacts to the natural and human environment in Chapter 3 of this Final EIS (and summarized later in this chapter) reflects this information. As noted in the introduction to this chapter, the following section, *Project Components Common to All Action Alternatives*, provides detail on the project components referenced in the following alternative descriptions.

Table 2-1. Summary of Characteristics by Alternative

Characteristic	Alternative 2 Proposed Action	Alternative 3 Northern Route with Submarine Cable	Alternative 4 Center- South Route
Total Length (miles)	59.9	60.3	51.9
Miles on NFS Lands	48.9	50.6	45.9
Voltage	69 or 138 kV	69 or 138 kV	69 or 138 kV
Primary Structure Type	Single wood pole	Single wood pole	Single wood pole
Average Structure Height (feet)	55	55	55
Estimated Number of Structures	813	813	748
Average Span Length Between Structures (feet)	350 to 400	350 to 400	350 to 400
Overhead Length (miles)	57.3	57.3	50.4
- Length along Existing Roads (miles)	33.7	33.7	36.6
- Length along Existing Roads (%)	59%	59%	73%
Marine Crossings (miles)	1.2	3.1	1.5
- Submarine Cable (miles)[1/]	*1.2*	3.1	*1.5*
- Horizontal Directionally Drilled (HDD) Bore (miles)[1/2/]	*1.2*	--	*1.5*
Underground Length (miles)	1.4	--	--
Total Unroaded Length (miles)	23.6	23.6	13.8
- Length of Shovel Trails (miles)	21.6	21.6	6.5
- Length of Temporary Matting (miles)	2.0	2.0	7.3
Length of Temporary Access Spurs (miles)	7.6	7.6	6.2
Number of Helicopter Pads	83	83	47

Notes:
1/ Alternative 2 would cross Frederick Sound and the mouth of the Wrangell Narrows via an HDD bore or buried submarine cable depending on geophysical survey results.
2/ Alternative 4 would cross Wrangell Narrows and Duncan Canal using a buried submarine cable or HDD bore depending on geophysical survey results. Different approaches could be used for each crossing depending on geophysical conditions.

Alternative 1 – No Action

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line would not be built. The city of Kake would continue to be served by the existing, isolated electric system, which depends upon high-cost diesel generation. In the absence of the KPI Project, future efforts to reduce the cost of electricity would be limited to small-scale renewable energy projects in the immediate vicinity and distributed power options, such as solar panels. The Alternative Energy Sources subsection below in the Alternatives Considered but Eliminated from Detailed Study section summarizes the current status of alternative energy development in the vicinity of Kake by resource.

Alternative 2 – Proposed Action

This alternative starts at the existing SEAPA substation south of Petersburg (Figure 2-1). Staying south of Petersburg the alternative follows an existing gravel road 3.5 miles east-northeast to Frederick Sound. The line would continue northwest along Sandy Beach Road to Outlook Park. The portion of the line extending along Sandy Beach Road would be placed underground (Figure 2-2). In addition, the existing distribution line along this road would also be placed underground.

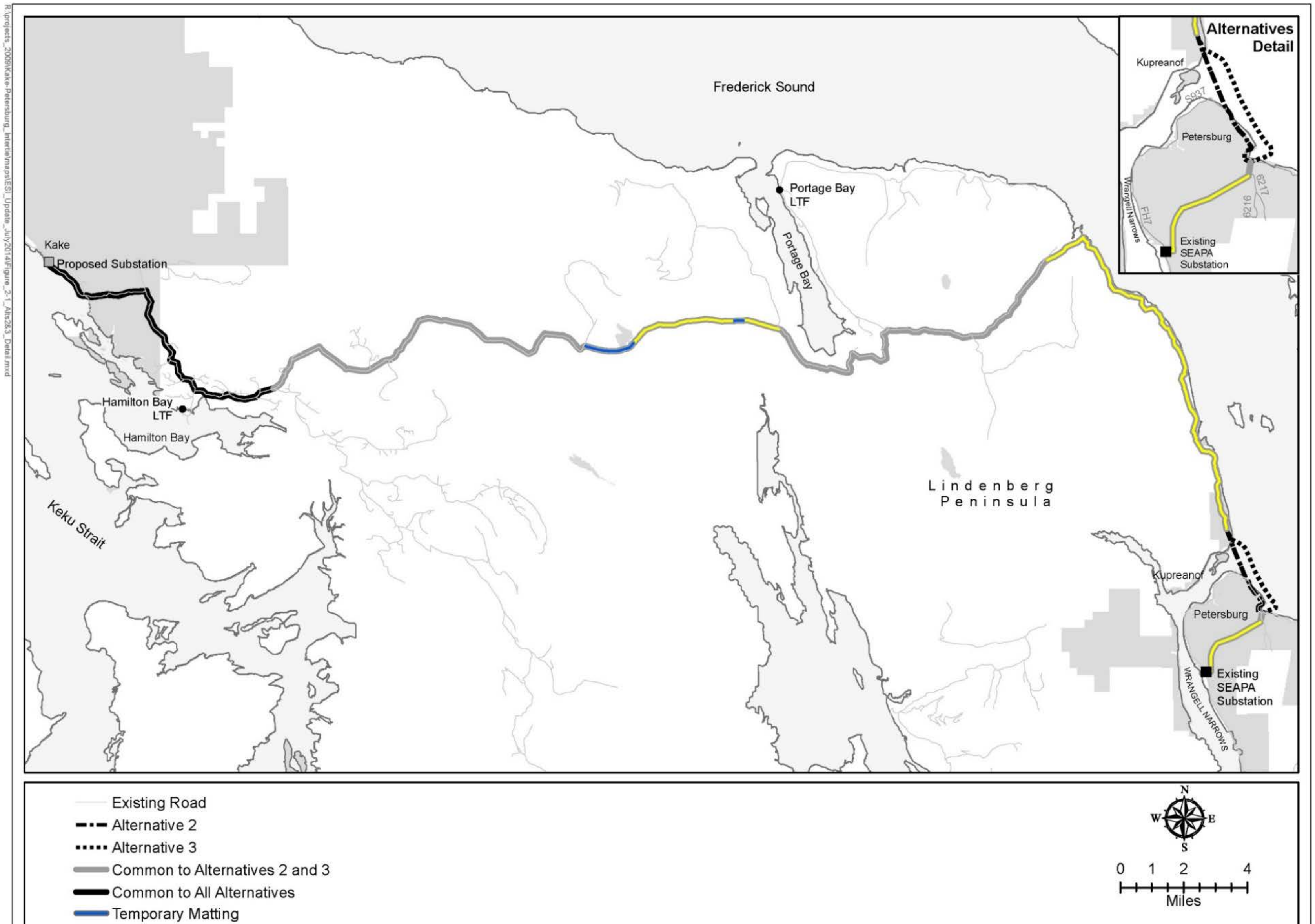


Figure 2-1. Alternatives 2 and 3
Kake to Petersburg Transmission Line Intertie Project

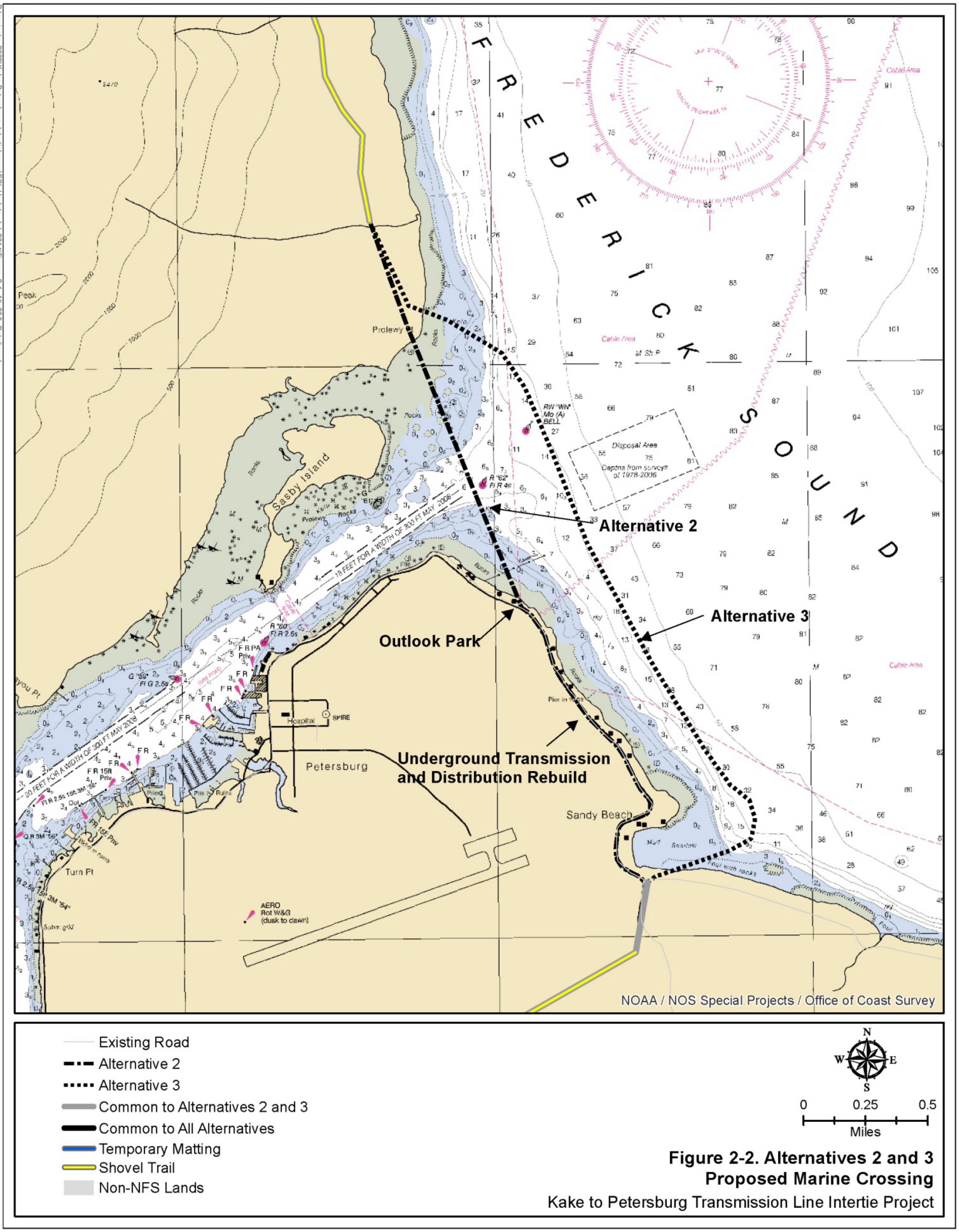


Figure 2-2. Alternatives 2 and 3 Proposed Marine Crossing

Kake to Petersburg Transmission Line Intertie Project

From Outlook Park, the transmission line would cross Frederick Sound and the mouth of the Wrangell Narrows via an HDD bore or buried submarine cable. The crossing would extend approximately 1.2 miles, coming ashore on Kupreanof Island, near Prolewy Point. From this point, this alternative follows the Northern route Potential Power Transmission Corridor to Kake. The Northern route corridor follows the unroaded east shoreline of Kupreanof Island north to the mouth of Twelve Mile Creek. From there, the corridor turns southwest away from the shoreline and parallels existing Forest Roads 6319 and 6031, south of Portage Bay. From the south side of Portage Bay, the corridor continues west across the North Kupreanof IRA (# 211) to Forest Road 6030, and from there parallels Forest Roads 6030 and 6040 to Kake.

This alternative is 59.9 miles long. The majority of the transmission line (57.3 miles) would be above ground, with the remaining 2.6 miles located either beneath Frederick Sound and the Wrangell Narrows (1.2 miles) and underground along Sandy Beach Road in Petersburg (1.4 miles). The average span length between structures would range from 350 to 400 feet and approximately 813 single-pole structures would be installed. Alternative 2 would also include a 24-strand fiber optic communication cable. An estimated 59 percent or 33.7 miles of the overhead portion of the proposed transmission line would follow existing roads. The proposed transmission line would be located adjacent to the existing NFS roads to the extent possible, but would not be in the same location in all areas due to the ruggedness of the terrain and other environmental constraints. In locations where poles would be located off the road by more than 20 feet, an access work pad would be created by extending the road fill to the site. Where the distance from the road makes this impractical, temporary matting would be used to gain access to the site during construction. These temporary spurs, consisting of access work pads and/or temporary matting, are identified as “temporary access spurs” in Table 2-1.

Access for construction along the remaining 23.6 miles (41 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels. Shovel trails would be used for an estimated 21.6 miles, with temporary matting used for 2.0 miles (Table 2-1). Figure 2-1 shows where existing roads, shovel trails, and temporary matting would be used during construction. Helicopters would be used to support construction activities, especially in areas without roads. Helicopter pads would be located along the 23.6 miles of the alternative that are not located adjacent to an existing road. These pads would be spaced approximately every 0.25 mile (see the *Helicopter Pads* section, below).

This alternative would cross parts of three IRAs: North Kupreanof (# 211), Missionary (# 212), and Five Mile (# 213).

Alternative 3 – Northern Route with Submarine Cable

This alternative starts at the existing SEAPA substation south of Petersburg. Staying south of Petersburg the alternative follows an existing gravel road 3.5 miles east-northeast to Frederick Sound. The transmission line would cross Frederick Sound via a 3.1-mile-long submarine cable that would come ashore near Prolewy Point on the east shore of Kupreanof Island. This proposed crossing, which would originate near Sandy Beach Park, is the only difference between Alternatives 2 and 3. This difference is shown in the Alternatives Detail inset on Figure 2-1 and as a separate figure (Figure 2-2). The remainder and majority of the proposed transmission line routes under Alternatives 2 and 3 are the same (see Figure 2-1).

Like Alternative 2, after coming ashore on Kupreanof Island near Prolewy Point, this alternative follows the Northern route Potential Power Transmission Corridor north along the unroaded east shoreline of Kupreanof Island north to the mouth of Twelve Mile Creek. From this point the corridor turns southwest away from the shoreline and parallels existing Forest Roads 6319 and 6031, south of Portage Bay. From the south side of Portage Bay, the corridor continues west across the North Kupreanof IRA (# 211) to Forest Road 6030, and from there parallels Forest Roads 6030 and 6040 to Kake.

This alternative is 60.3 miles long. The majority of the transmission line (57.3 miles) would be above ground, with the remaining 3.1 miles located along the floor of Frederick Sound, as noted above. The average span length between structures would range from 350 to 400 feet and approximately 813 single-pole structures would be installed. Alternative 3 would also include a 24-strand fiber optic communication cable. An estimated 59 percent or 33.7 miles of the overhead portion of the proposed transmission line would follow existing roads. A total of 7.6 miles of temporary access spurs would be required for this alternative.

Access for construction along the remaining 23.6 miles (41 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels in some wetland areas. Shovel trails would be used for an estimated 21.6 miles, with temporary matting used for 2.0 miles (Table 2-1). Figure 2-1 shows where existing roads, shovel trails, and temporary matting would be used during construction. Helicopters would be used to support construction activities, especially in areas without roads. Helicopter pads would be located along the 23.6 miles of the alternative that are not located adjacent to an existing road. These pads would be spaced approximately every 0.25 mile (see *Helicopter Pads* section, below).

This alternative would cross parts of three IRAs: North Kupreanof (# 211), Missionary (# 212), and Five Mile (# 213).

Alternative 4 – Center-South Route

This alternative starts 8 miles south of Petersburg where it would connect to the existing Tyee-Wrangell-Petersburg transmission line approximately 8 miles south of Petersburg via a new tap or small switch yard. This alternative would cross the Wrangell Narrows and Duncan Canal via submarine cable crossings, approximately 0.6 mile and 0.9 mile in length, respectively. These marine crossings may also be completed using an HDD approach depending on geophysical survey results.

From the Wrangell Narrows crossing, the Center-South route corridor follows Forest Road 6350 across the Lindenberg Peninsula to Duncan Canal. Across Duncan Canal, the corridor continues across the South Kupreanof IRA (# 214) to Forest Road 6314S and from there parallels existing NFS roads to Kake. A map showing the Center-South route (Alternative 4) is presented as Figure 2-3.

This alternative is 51.9 miles long. The majority of the transmission line (50.4 miles) would be above ground, with the remaining 1.5 miles located under Wrangell Narrows and Duncan Canal, as noted above. The average span length between structures would range from 350 to 400 feet and approximately 748 single-pole structures would be installed. Alternative 4 would also include a 24-strand fiber optic communication cable. An estimated 73 percent or 36.6 miles of the overhead portion of the proposed transmission line would follow existing roads. A total of 6.2 miles of temporary access spurs would be required for this alternative.

Access for construction along the remaining 13.8 miles (27 percent) of the overhead portion of the route would be via shovel trails supported by temporary matting panels in some wetland areas. Shovel trails would be used for an estimated 6.5 miles, with temporary matting panels used for 7.3 miles (Table 2-1). Figure 2-3 shows where existing roads, shovel trails, and temporary matting would be used during construction. Helicopters would be used to support construction activities, especially in areas without roads. Helicopter pads would be located along the 13.8 miles of the alternative that are not located adjacent to an existing road. These pads would be spaced approximately every 0.25 mile.

This alternative would cross one IRA: South Kupreanof (# 214).

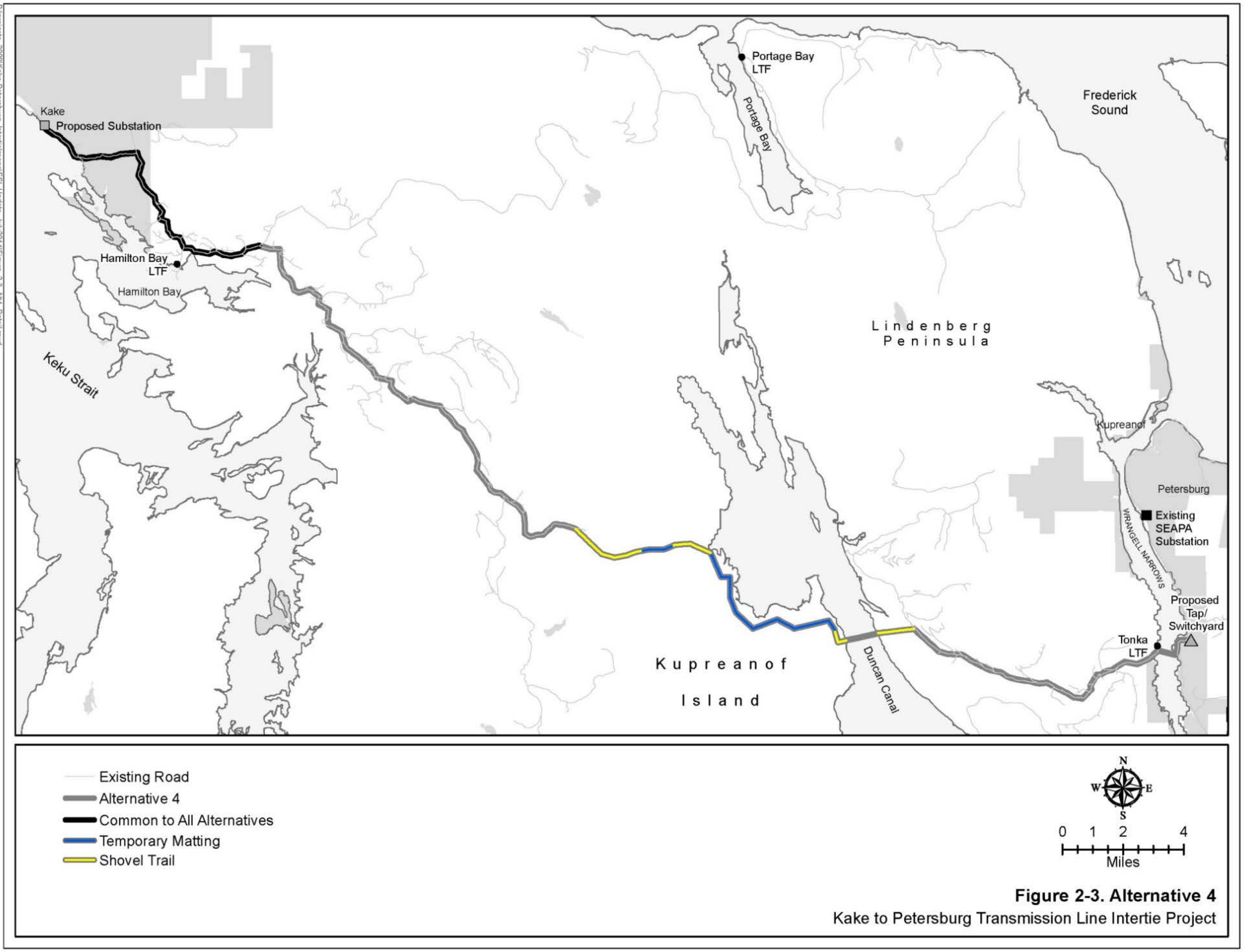


Figure 2-3. Alternative 4
Kake to Petersburg Transmission Line Intertie Project

Project Components Common to All Action Alternatives

While each of the alternatives considered in this Final EIS would differ in their routing, they would all share certain common elements. This section describes those aspects of the proposed project that would be common across all of the action alternatives.[1] Although these components are common across all alternatives, there are instances where they would differ by alternative. These differences are highlighted in the following discussion, as appropriate.

Voltage

The proposed transmission line would be built to transmit power at either 69 or 138 kV. A load flow analysis conducted as part of the KPI feasibility study considered 34.5 kV, 69 kV, and 138 kV operating voltages (Hittle 2014). The study found that a 34.5 kV operating voltage could adequately serve total loads in Kake up to about 2 megawatts (MW) and would be sufficient to accommodate the existing load, but would not provide for much commercial growth in the future. The Kake load alone, even with a reasonably high level of growth, could be reliably served by a system operating at 69 kV. Operating the system at 138 kV would be sufficient to serve Kake, assuming a reasonably high level of growth in the future, and also allow for the expansion of the existing SEAPA interconnected network, if new regional hydroelectric resources were developed in the future.

Based on this study, the proposed line is being designed to comply with 69 kV standards. Insulators and certain poles would, however, likely be designed to 138 kV standards to provide adequate conductor spacing for raptor protection. Raptor protection is discussed in more detail in Chapter 3 of this Final EIS.

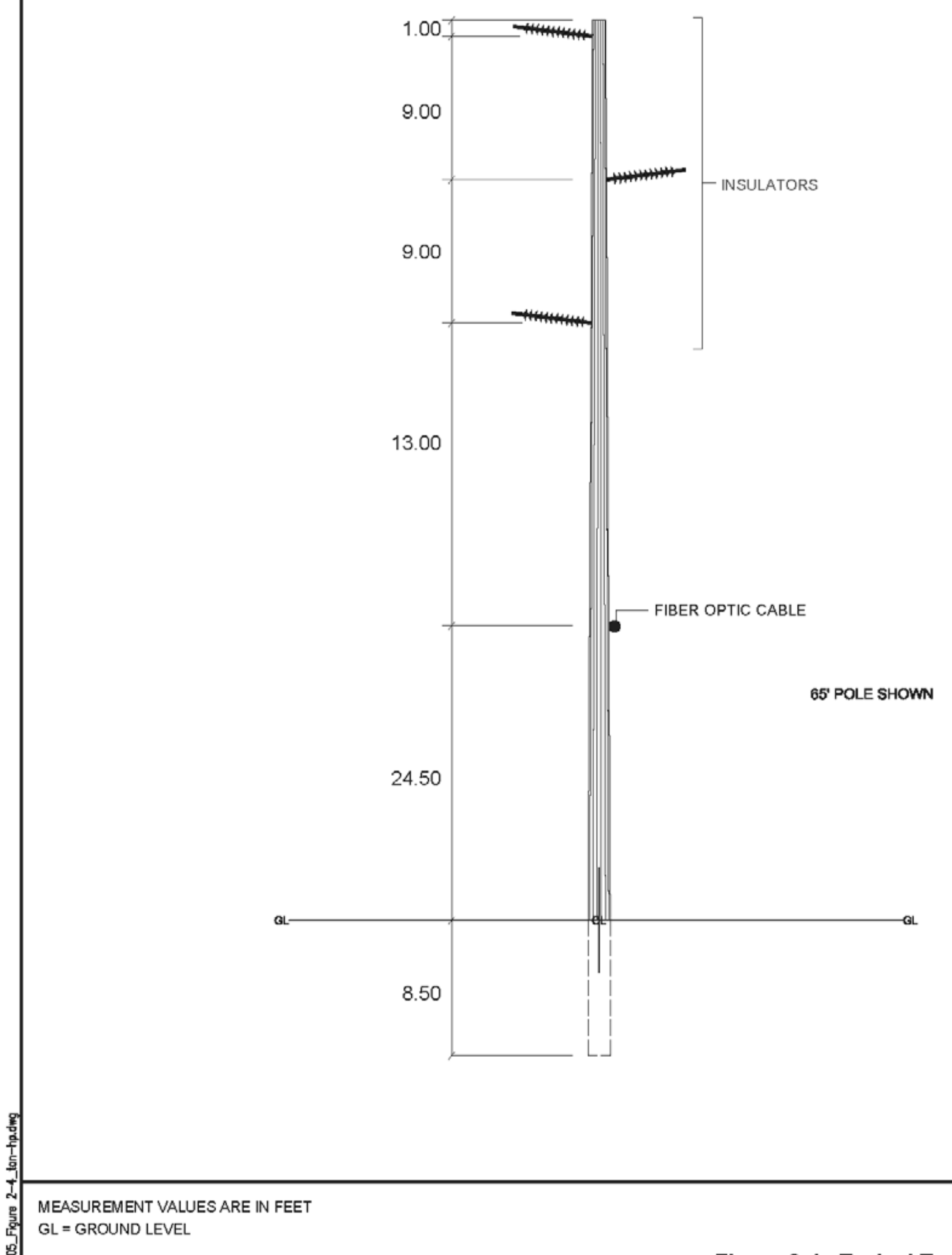
Structures

The action alternatives would consist of single wood pole structures with horizontal post insulators. The average span length between structures is estimated to be 350 to 400 feet, with an average above-ground height of 55 feet. The KPI feasibility study describes this as a short span, road-side transmission line design and notes that it has been used successfully for other transmission applications elsewhere in Alaska (Hittle et al. 2010, Hittle 2014).

The following typical structure types would be employed for all three action alternatives:

- Tangent pole structures: These structures are the type most commonly used on a transmission line and are used on relatively straight portions of the transmission line. Because the conductors are in a relatively straight line, tangent structures are designed only to handle small line angles (changes in direction) of 0 to 2 degrees. Tangent pole structures are usually characterized by horizontally attached insulators, which support and insulate the conductors and transfer wind and weight loads to the structure (Figure 2-4).
- Angle structures: These structures are used where transmission line conductors change direction. These types of structures are designed to withstand the forces placed on them by the change in direction. Angle structures may be: (1) similar to tangent structures, using horizontally mounted insulators to attach the conductors and transfer wind, weight, and line angle loads to the structure; or (2) similar to strain or dead-end structures, using insulators in series with the conductors to bring wind, weight, and line angle loads directly to the structure (Figure 2-5). Horizontal loads on angle structures are typically countered with guy wires that extend from the upper end of the pole at a nominally 45 degree angle to anchors placed opposite the conductor angle.

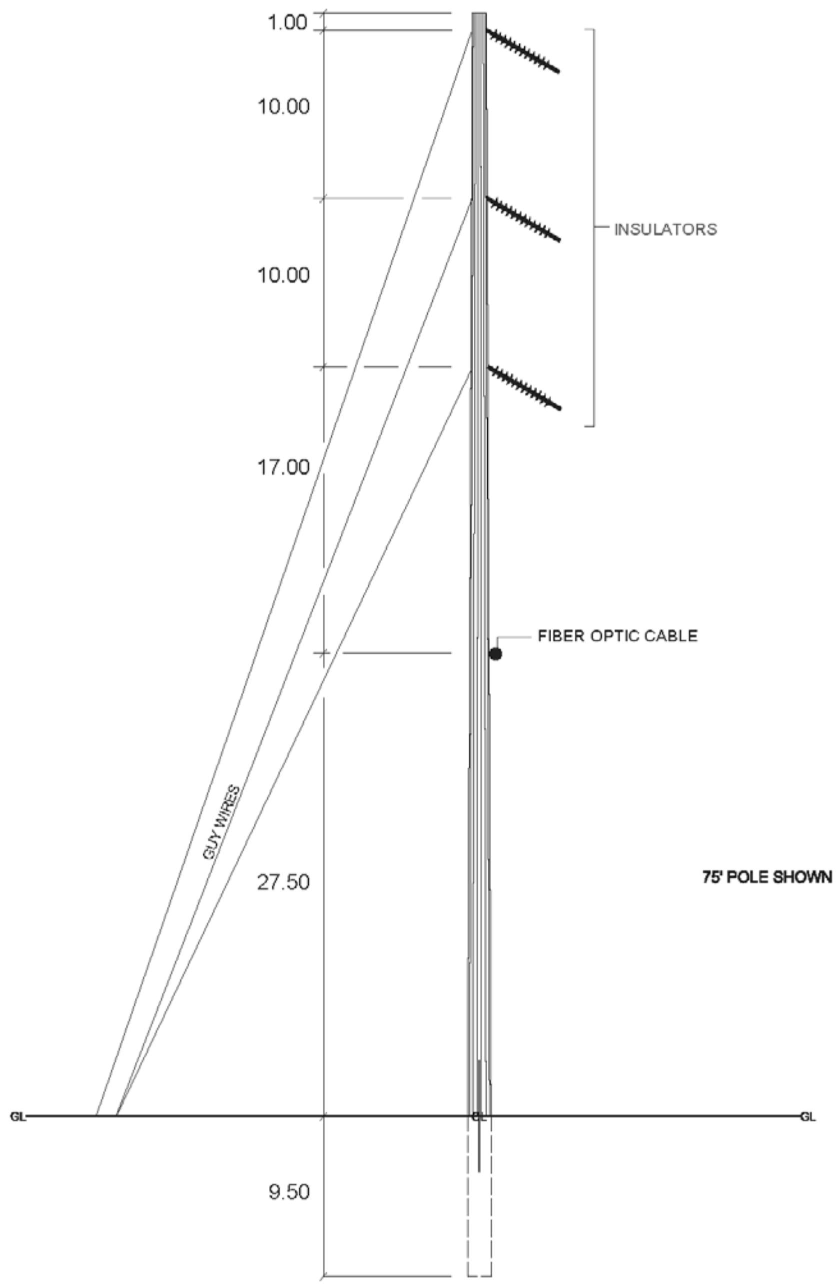
[1] One exception is the Underground Line Installation discussion below, which applies only to Alternative 2.



MEASUREMENT VALUES ARE IN FEET
GL = GROUND LEVEL

Figure 2-4. Typical Tangent Pole Structure

Kake to Petersburg Transmission Line Intertie



MEASUREMENT VALUES ARE IN FEET
GL = GROUND LEVEL

Figure 2-5. Typical Angle Structure

Kake to Petersburg Transmission Line Intertie

FILE NAME: 302005_Figure 2-6_ang-sus.dwg

- Dead-end structures: This structure type is typically used where transmission line conductors turn at a wide angle or end. Dead-end structures are designed to be stronger than tangent structures and are often larger. Typically, insulators on a dead-end structure are in series with the conductors (horizontal) to bring wind, weight, and line angle loads directly to the structure (Figure 2-6). As with angle structures, horizontal loads on these structures are typically countered with guy wires that are anchored into the ground.

As indicated in Figures 2-4 to 2-6, all structures would be set in the ground (see the *Foundation and Structure Support* section below).

Conductors

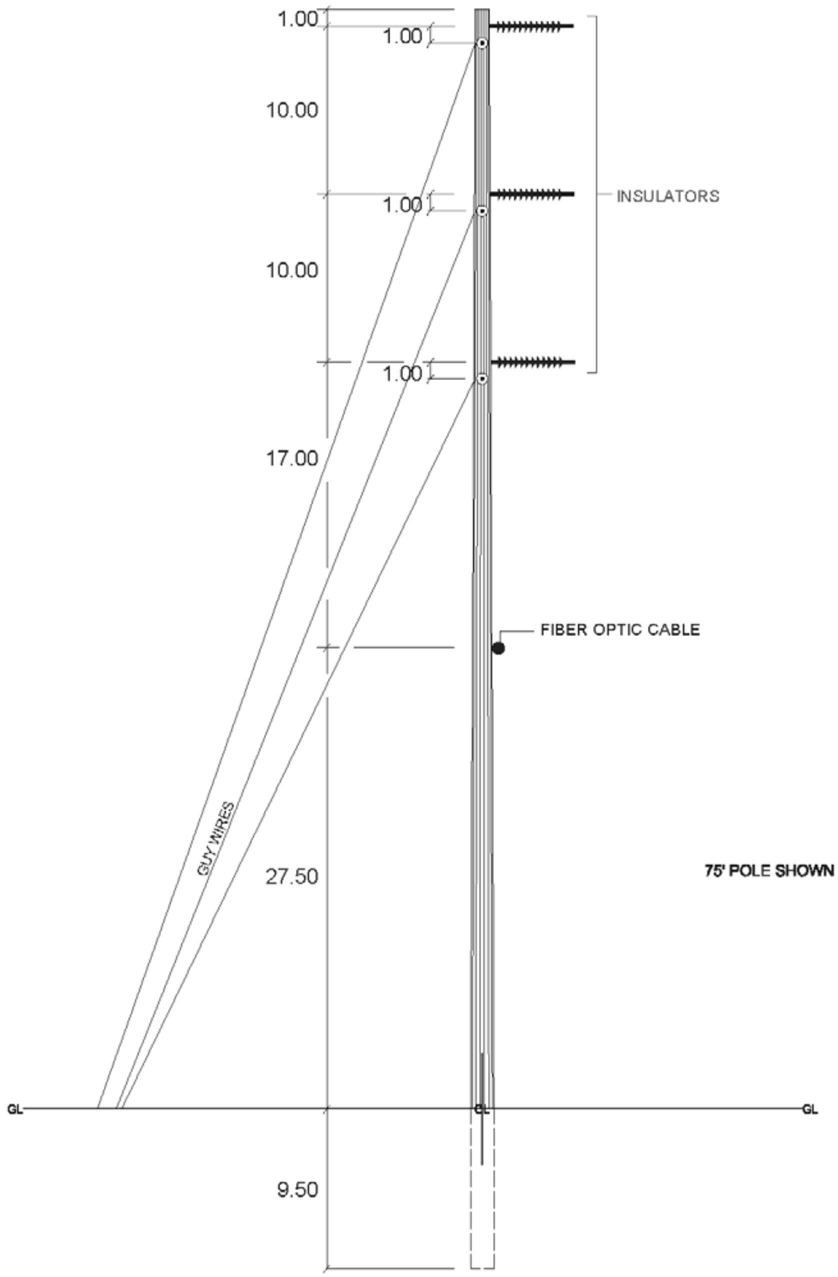
The wires that carry the electrical current on the transmission line are called conductors. The proposed transmission line would consist of three sets (called phases) of conductors. The conductor proposed for the overhead transmission line sections is 336.4 kcmil 30/7 Aluminum Cable Steel Reinforced (ACSR)/AW "Oriole/AW."[2] The selected conductors would be capable of transmitting loads larger than the current electrical loads in Kake and would also be able to support the physical loads associated with wind, snow, and ice.

Three conductor sizes were considered in the 2005 feasibility study and 2010 update: 336, 266, and 4/0 (Hittle et al. 2005, 2010). The study indicated that all three conductors would be adequate to meet the expected maximum electrical load at Kake. The larger conductor (336 ACSR) was selected because much of the terrain crossed by the proposed alternatives is rough and could be difficult to reach for timely maintenance or repair. The additional mechanical strength of the 336 ACSR conductor is expected to reduce the amount of maintenance required over the life of the proposed project. The existing Tyee-Wrangell-Petersburg transmission line uses this conductor and the two systems would be able to share a common stock of spare conductor. Non-reflective wire would be used for the overland sections of the transmission line to reduce line visibility.

The conductors would be insulated and supported through polymer type insulators of the required strength with the associated hardware making suspension, deadend, and jumper assemblies. The mechanical and electrical characteristics of the insulator will be selected to provide ample safety margin for the expected mechanical loads and assure excellent electrical performance for the operation of the line under normal conditions and abnormal voltages. The proposed horizontal post insulator configuration is shown for a tangent structure in Figure 2-4.

For safety reasons, the National Electrical Safety Code (NESC) has established minimum clearances above grade based on line voltage and land use under the line. The NESC required clearance must be maintained under two conditions: 1) the conductor sagging at its maximum operating temperature (220 degrees Fahrenheit [° F] minimum), and 2) the NESC "Heavy" loading district requirement of 0.5 inch radial ice at 30° F. The vertical clearance for 69 kV and 138 kV lines above roads and lands that can be traversed by trucks is 20.7 feet and 22.2 feet, respectively, and the vertical clearance for communication conductors (fiber optic cable) above roads and streets is 16 feet, per NESC rules 232B1, 232C1a and 232D4. The proposed line would be designed to meet or exceed these requirements under all three action alternatives.

[2] A circular mil is a unit of area, equal to the area of a circle with a diameter of one mil (one thousandth of an inch). Large wires, like transmission line conductors, may be expressed in thousands of circular mils or kcmil.



MEASUREMENT VALUES ARE IN FEET
GL = GROUND LEVEL

Figure 2-6. Typical Deadend Structure

Kake to Petersburg Transmission Line Intertie

FILE NAME: 302005_Figure 2-6_ang-sus.dwg

Underground Line Installation

Approximately 1.4 miles of Alternative 2 would be installed underground along Sandy Beach Road in Petersburg. This portion of the alternative is located on non-NFS lands (Figure 2-1). Along this stretch of the proposed alternative, it is expected that a trench approximately 4 feet deep and 3 feet wide would be dug along the length of the placement. The three phase conductors of the KPI Project would be enclosed in a single high-density polyethylene (HDPE) conduit approximately 8 inches in diameter. An appropriate backfill material would be used around the conduit for necessary thermal transfer. In areas where the KPI Project includes undergrounding of nearby Petersburg Municipal Power & Light (PMPL) distribution lines, the distribution lines will be enclosed in a separate conduit in the same trench as the KPI. Appropriate separation distances will be maintained between the KPI and PMPL lines in the trench. There may be some sections where the underground line would be placed with horizontal directional boring. These sections could potentially include placement under roads and high traffic areas.

Fiber Optic Cable

The action alternatives each include a 24-strand fiber optic communication cable. Initially, the fiber optic system would be used for control of the KPI system. Fiber optics technology uses light pulses rather than radio or electrical signals to transmit messages and can be used to gather information about the transmission line system, such as the amount of power being carried, meter readings at interchange points, and the status of equipment and alarms. The fiber optic cable also allows voice communications between power dispatchers and line maintenance crews and provides instantaneous commands that control the power system operation.

The ALCOA All-Dielectric Self-Supporting (ADSS) 24 strand aerial cable selected for the preliminary design for the KPI Project would be more than sufficient to meet the communication needs of control and data collection for operation of the new transmission line. In addition, extra fiber would be available for commercial and system voice communication in the future and the terminations of the fiber optic cable would likely be connected to local communication systems at a later date. For the overhead portions of the line, the fiber strands would be bundled within an aerial cable and located on the proposed transmission line structures (Figures 2-3 through 2-5). For the submarine crossings, the fiber-strands would be an integral part of the bundled cable design.

Pole Structure Design

Preliminary structure and support design is based on the assumption that the mix of soils along the proposed alternative routes is approximately 75/15/10 percent for upland soils, rock, and wetland (hydric) soils, respectively. However, even in the areas considered upland, the top 3 to 5 inches of material is organic and has essentially no lateral strength capability. As a result, the preliminary design for tangent structures in upland soils is based on standard embedment depths (10 percent of the pole length plus 2 feet) plus an additional 2 feet, for a total of 10 percent of pole length plus 4 feet.

Structures located in rock and guyed structures are assumed to be embedded at standard embedment depths (10 percent plus 2 feet). Pole structures located in wetlands would be stabilized by using a wood raft at ground line with side guys or through use of a foundation system. Foundation systems, where required, would either consist of driven H-piles or a culvert embedded at a depth required for lateral stability with the pole placed inside the culvert. Typical pole embedment (8.5 feet deep) is shown for the proposed single wood pole design in Figure 2-4.

Pole structures could be assembled in a remote location and transported by truck, barge, or helicopter to staging areas near the right-of-way. Pole structures would be installed using standard pole installation trucks or multi-purpose equipment, depending on the location, with helicopters used to support these activities, especially in areas without roads (see the *Pole Structure Assembly, Transportation, and*

Erection section, below). Use of pole installation trucks and multi-purpose equipment would result in some ground disturbance at the pole structures. Disturbance areas are assumed to be approximately 90 feet by 90 feet, with a radius of 50 feet from the center of each structure used for the purposes of analysis.

Substation and Switching Station Concepts

Alternatives 2 and 3 would originate at the existing SEAPA substation located on non-NFS lands south of Petersburg where the existing Tyee-Wrangell-Petersburg transmission line terminates (see Figure 2-1). For Alternative 4, a new switching station is proposed on non-NFS lands further south of Petersburg, close to the narrowest part of the Wrangell Narrows (see Figure 2-3 for the proposed location). The new switching station would tap into the existing Tyee-Wrangell-Petersburg transmission line. The new station would be constructed with a breaker for the Kake exit to ensure continued system reliability for the existing Petersburg electrical system. With the breaker in place, any circuit problems on the proposed KPI transmission line would only affect the load serving Kake. Similarly, a second breaker would be installed for the Petersburg exit at the new switching station such that circuit problems north towards Petersburg would be isolated from affecting the Kake load.

A new substation located in Kake is proposed under all three action alternatives. The proposed substation would be located on non-NFS lands approximately 4.8 miles south of the town. This new substation would connect to IPEC's existing 12.47 kV distribution system via a new distribution line. This new substation would be configured as follows:

- A single 69 kV/12.47 kV power transformer protected by a high-side fused disconnect
- A distribution class plus or minus 10 percent voltage regulator
- Two 12.47 kV feeders
- IPEC's existing generating units would be interconnected with SEAPA's system but would not generally be used at the same time that power is being delivered from the SEAPA system.

The substation site would be approximately 150 feet by 70 feet. An 8-foot-high fence consisting of 7 feet of chain link and one foot of three-strand barb wire would surround the equipment, with a minimum clearance of 10 feet from the fence to live parts. The fenced area would be approximately 140 feet by 60 feet. The substation surfacing would be crushed rock (gravel) extending 3 feet to 5 feet outside the fence along with the buried ground grid conductor which extends 3 feet outside the fence and gate areas. In addition, the site could potentially require a small parking area that would be adjacent to the substation site itself.

Right-of-Way Clearing

The transmission line right-of-way is assumed to be nominally 100 feet wide (50 feet either side of the center line) and trees within this area would be cleared. Brush would also be removed in the immediate vicinity of the transmission poles. In addition, trees located outside the right-of-way with the potential to strike the line were they to fall would also be removed. These types of trees are typically referred to as danger or hazard trees. In locations where trees are 100 feet to 150 feet tall, trees could be cleared up to 150 feet from the transmission line center line.

The average right-of-way clearing width in areas classified by the Forest Service as productive forest is, therefore, assumed for the purposes of analysis to be 300 feet wide. We have assumed this for the purposes of analysis, but not all of that width would necessarily need to be cleared, with the extent of the clearing being primarily dictated by line safety criteria and the nature of the vegetation. In order to maintain the safety of the structures and conductor, all trees that could grow up under the line or potentially fall over onto the line within 10 years of construction or during routine maintenance clearing would be cut down. Trees and brush would, however, be left whenever possible to reduce the impact on the environment, especially in visually sensitive areas, riparian zones, erosion prone areas, and sensitive wildlife habitats.

Where the line is placed near roads, the road itself would provide approximately 50 feet of cleared width on the roadside. Also, much of the area along the route of the Proposed Action and action alternatives has been subject to clear-cut (even-aged) harvest in the recent past. Areas that have been harvested, even as long as 35 years ago, have much shorter trees, often less than 40 feet in height. Fast growing scrub trees such as alder may require clearing within the right-of-way along existing roads. Typical pole placement and clearing requirements along existing NFS roads are shown in Figure 2-7. The average right-of-way clearing width along existing roads is assumed for the purposes of analysis to be 100 feet. The average clearing width in areas classified by the Forest Service as unproductive forest is also assumed to be 100 feet.

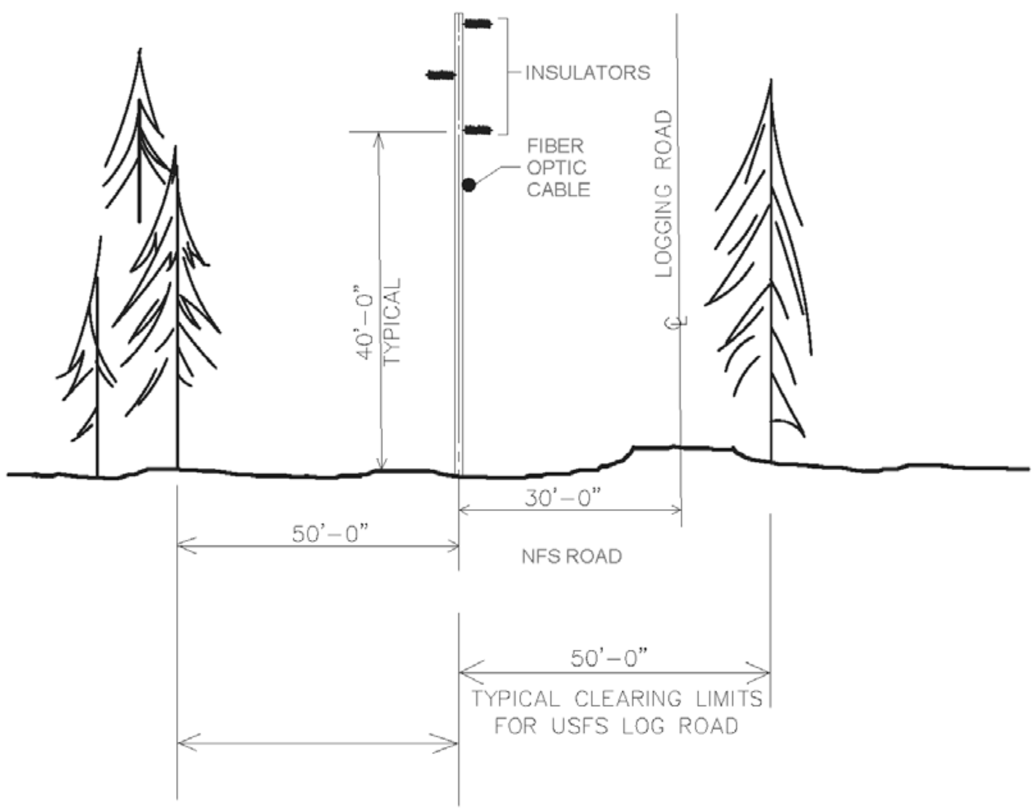
The general clearing criteria for the action alternatives may be summarized as follows:

- Cut all brush in the immediate vicinity of structures.
- Cut all trees within 50 feet from the center line. With the exception of brush within the immediate vicinity (see above), low growing brush would not be cut within this area.
- Remove all trees that could strike the line if they were to fall within 10 years of construction or during routine maintenance clearing (out to approximately 150 feet from the centerline, as needed).
- Leave trees and brush wherever possible to reduce the impact on the environment, especially in sensitive areas such as riparian zones, erosion prone areas, sensitive wildlife habitat, and visually sensitive areas.

Where the terrain permits, trees would be cut in a “feathered” or “scalloped” pattern, narrowing near the poles, where there is little sway in the conductors, and widening at mid-span, where the conductors have maximum sway. Depending on the terrain and the height of trees and brush, the outer edges of the right-of-way can be thinned of only the tallest trees, leaving the brush and smaller trees in place. Where the line passes through relatively flat or uniform terrain, the right-of-way would be cleared as described above, including danger trees. Exceptions to these general clearing guidelines may occur in the lower part of valleys and in more rugged terrain where the transmission line spans from ridge-to-ridge. In these locations, trees growing in V-notches between ridges may be left standing.

Clearing guidelines will be documented in stream protection plans and other site-specific documents to ensure their implementation.

Timber felled during right-of-way clearing would be cruised and valued and sold to the project applicant. The applicant would be required to remove trees with commercial value as timber (i.e., merchantable timber) on lands that are 0.75 mile from either saltwater or a road network that leads to a community or LTF. This would apply to all areas except those where right-of-way clearing is required in stream buffers (see the *Timber* section in Chapter 3). In accordance with the Forest Plan, timber located in a Development LUD and utilized would count towards the Forest Service’s Allowable Sale Quantity (ASQ); timber cleared in a Non-Development LUD and utilized would not count toward the ASQ (USDA Forest Service 2008a). Previously harvested stands evaluated for commercial viability and timber removed and utilized would include young growth of commercial size, as appropriate. Deck locations for timber to be removed would be coordinated with the appropriate Forest Service staff, including timber staff, engineers, and contracting officers, and decked volume would be disposed of within a reasonable timeframe.



TREES AND MEASUREMENTS NOT TO SCALE
MEASUREMENT UNITS ARE IN FEET AND INCHES

Figure 2-7. Typical Clearing Along NFS Roads

Kake to Petersburg Transmission Line Intertie

Access

Use of Existing Roads

Existing NFS roads would be used to access portions of all three action alternatives. The proposed transmission line design is a short span, road-side design that takes advantage of the existing NFS roads that would be followed by the action alternatives. Originally built to support logging operations, these roads are now used in support of multiple use activities. Many of the roads have a numbered NFS designation (e.g., Forest Road 6030). The existing NFS roads that are part of the action alternatives include several isolated road systems that do not connect with one another (see Figures 2-1 and 2-2). Trucks and other equipment would use these existing NFS roads to transport workers, materials, and machinery along the length of the line where they exist. These roads are discussed in more detail in the *Transportation* section in Chapter 3 of this EIS.

The proposed transmission line will be adjacent to the existing NFS roads to the extent possible, but will not be immediately adjacent to the roads in all locations due to the ruggedness of the terrain and other environmental constraints. Roads follow natural contours and as a result tend to wind through areas of steep terrain to control the steepness. Transmission lines are designed to follow straight lines as much as possible and minimize the number of structures and angles. Transmission lines are also able to span between ridges and across terrain where construction may be difficult, as well as across environmentally sensitive areas. In locations where poles would be located off the road by more than 20 feet, an access work pad would be created by extending the road fill to the site. Where the distance from the road makes this impractical, native materials (logs and slash) would be used as an underlayment to allow vehicle access for construction, with temporary wood and/or high density polyethylene matting used where native vegetation is not readily available. These temporary spurs, consisting of access work pads and/or temporary matting, are referred to as “temporary access spurs” in this EIS. After installation of pole structures is complete, temporary matting and any areas where existing road fill may have been used would be removed and the affected areas would be recontoured as needed.

Access to Unroaded Areas

In addition to stretches that follow existing NFS roads, all of the proposed action alternatives cross areas where there are no existing roads (see Table 2-1). Surface access in these areas would be via shovel trails supported by temporary matting panels in some wetland areas, particularly along Alternative 4 (see Table 2-1). The routes used for surface access are assumed for the purposes of analysis to follow the centerline of the proposed transmission line route.

Shovel trails would be temporary and for short-term use during proposed project construction only and would be decommissioned following construction. Shovel trails would be up to 16-feet-wide and use native materials (logs and slash) to allow the passage of vehicles. Use of rock fill is not anticipated; however, if needed, the nearest available rock source would be used and coordinated with Forest Service staff. Alternatives 2 and 3 would involve the development and use of 21.6 miles of shovel trail; Alternative 4 would require 6.5 miles (Table 2-1). Shovel trails would be used in wetland areas in locations where native materials (logs and slash) removed during right-of-way clearing are available for use as an underlayment to allow for the passage of wide tracked equipment.

Temporary matting panels would be installed in wetland areas where sufficient native materials are not available. Alternatives 2 and 3 would require the use of an estimated 2 linear miles of temporary matting panels; Alternative 4 would require 7.3 miles (Table 2-1). Temporary matting panels would be primarily used in wetland areas with relatively flat terrain. Smaller streams may be able to be crossed using temporary matting panels; however, most crossings would require some bridging (see the *Aquatic Resources* section in Chapter 3 for additional detail on stream crossings and types of crossings).

Helicopters could also be used to transport and install structures in some of these areas as discussed below in the *Helicopter Use* section.

The proposed temporary matting panels would likely be similar to the high density polyethylene mats shown in Figure 2-8. These mats are 8 feet by 14 feet wide, weigh approximately 1,050 pounds each, and can be configured to form a 7-foot-wide or 13-foot-wide useable surface. Based on past experience, the vendor for the mats shown in Figure 2-8 estimates that about 115 panels can be laid a day, approximately 1,500 or 750 linear feet of travel way, depending upon the configuration (8-foot-wide or 14-foot-wide surface).

Figure 2-8. Temporary Matting Panels

An estimated 1,500 separate panels (assuming a 14-foot-wide trail), would be required for access for Alternatives 2 and 3. Alternative 4 would require an estimated total of 5,200 separate panels for a 14-foot-wide trail. Using the assumption that up to 115 panels can be laid a day, 13 days would be spent laying panels for Alternatives 2 and 3, with 45 days required to lay panels for Alternative 4. Prior to installing the mats, a geo-fabric may be laid down that aids in mat removal and cleaning. Mat installation would require the use of an excavator and larger loader. The most efficient installation approach would be to have the loader deliver the mats to the area. An excavator with a specialized bucket would then pick up and place the mats, and a two-person crew would adjust the placement, as necessary, and lock the connection pins. All temporary matting panels would be removed following construction. The vegetation of areas covered by temporary mats would be expected to recover to the point where impacts are not likely noticeable within 3 to 6 months of mat removal. All mats would be weed free prior to use.

Stream Crossings

All alternatives would require the use of temporary stream crossings. Alternatives 2 and 3 would involve a total of 118 new stream crossings by either temporary shovel trails or temporary matting panels and 14 new crossings by temporary access spurs (see Chapter 3, Aquatics for additional detail). A total of 16 new temporary Class I stream crossings are proposed under these alternatives, 10 by temporary shovel trails or matting panels and 6 by temporary access spurs. Properly placed and maintained crossings would affect only local channel segments and have individually minor effects.

In the unroaded sections of Alternatives 2 and 3, a total of 10 Class I and 20 Class II streams would be crossed. An estimated 18 of these crossings would likely require the use of an embedded pipe arch, with the remaining 12 requiring bridges. With one exception, the bankfull widths of the fish-bearing streams that would likely require bridging are 6 feet wide or less. The exception, located in the Frederick Sound area, is approximately 110 feet wide.

An estimated 88 non-fish-bearing stream crossings would be required for Alternatives 2 and 3. More than half this total (57 percent; 50 of 88) would likely be crossed using a circular pipe, with the remaining 38 crossings likely requiring the use of either a modular bridge (3 crossings) or stringer bridge (35 crossings). The majority of bridges required to span non-fish-bearing streams would span widths of 10 feet or less; the exceptions would range up to 16 feet wide (bankfull width).

Alternative 4 would involve an estimated total of 70 new stream crossings by temporary shovel trails or matting panels, and 14 new crossings by temporary access spurs. A total of 28 new temporary Class I stream crossings are proposed under this alternative.

Within the unroaded sections of Alternative 4, an estimated total of 28 Class I and 14 Class II would be crossed. An estimated 28 of these crossings would likely require the use of an embedded pipe arch, with the remaining 14 requiring bridges. Thirteen of the 14 fish-bearing streams that would likely require bridging are located west of Duncan Canal; bankfull widths range from 3 feet to 100 feet wide, with an average width of 39 feet.

An estimated 28 non-fish-bearing stream crossings would be required for this route. Twenty of these streams would likely be crossed using a circular pipe, with the remaining 8 crossings likely requiring the use of either a modular bridge (3 crossings) or stringer bridge (5 crossings). The bridges required to span non-fish-bearing streams along this route would all span widths of 6 feet or less.

All stream crossings would follow Forest Plan Standards and Guidelines, Region 10 (R10) best management practices (BMPs), and National Core BMPs, as appropriate.

Helicopter Use

Construction access would be via existing roads, with temporary access spurs in some locations. In areas without roads, access would be via shovel trails supported by temporary matting panels in some wetland areas. Helicopters would be used to support these activities, especially in areas without roads. Project construction activities potentially facilitated by helicopters may include delivery of construction laborers, equipment, and materials to intermittent material drop locations or specific pole sites; structure placement; hardware installation; and wire stringing operations.

Construction in unroaded areas is expected to be primarily ground-based with helicopter support, and this likely scenario is evaluated for each alternative in this EIS (see Table 2-1). However, to allow the construction contractor some flexibility, the construction specification will be written to allow the contractor the option of using ground-based or helicopter construction methods or a combination of the two. Use of a helicopter for pole installation may be driven by various factors, including access to the structure locations, construction schedule, and/or construction economics.

Helicopter Pads

Helicopters would be used to support construction along portions of all three action alternatives. Use of helicopters would require the installation of temporary helicopter pads along the proposed right-of-way for the selected alternative with pads likely constructed using logs. Upon completion, these pads would, over time be replaced with permanent helipads. These helipads would be up to 16 feet by 16 feet in size and made of aluminum, with a 4- to 6-leg foundation support system. The pads would be located within the proposed right-of-way, which would be cleared. The 4- to 6-leg support system would be the only parts of the pad in direct contact with the ground. Disturbance associated with these legs would be approximately 54 square feet or 0.01 acre per pad. Pads would be installed approximately every 0.25 mile along the portions of the alternatives where there are no existing roads. An estimated total of 83 pads would be required for Alternatives 2 and 3, with 47 pads expected to be required for Alternative 4 (Table 2-1). Permanent helipad structures would meet Forest Service visual requirements to blend with the natural environment.

Staging Areas

Two or three staging areas would be required to construct the proposed transmission line. The exact locations of these areas have not been identified at this point, but they are expected to be located in already disturbed areas to the extent possible. One staging area would be located in an existing commercial area near Petersburg and another would be located in or near Kake. These areas would not be located on NFS lands. A third staging area could be potentially located on NFS lands near the end of the existing forest road system on Kupreanof Island, depending on the alternative selected. The exact locations will be identified by the construction contractor prior to construction. The applicant would complete any required site-specific environmental review of the staging areas once the locations are determined.

Each staging area would be approximately 2 acres in size. Construction equipment and materials such as poles, cable reels, insulators, drill rigs, and compressors would be temporarily stored in these areas during construction, as would fuel. Helicopter landing areas would also be located at these facilities.

As distances from the end of the existing roads increase, it is expected that the poles and other construction materials, including temporary matting panels, may be delivered by truck or loader. However, helicopter support to intermittent material drop locations or to specific pole locations may also be needed. Where used, intermittent material drop locations would be areas up to 100 feet by 100 feet situated on upland areas, located approximately every 0.5 mile along and within the proposed transmission line right-of-way corridor. To limit the distance of helicopter travel, materials would most likely be placed on barges and transported to locations just offshore and in the vicinity of the transmission line route.

Marine Access and Log Transfer Facilities

Trees and brush would be cleared as described above (see *Right-of-Way Clearing*). Three existing LTFs—the Portage Bay, Little Hamilton Bay, and Tonka LTFs—could be used to transport logs cleared from the right-of-way and transport construction personnel, equipment, and materials, as well as serve as temporary staging. These LTFs may be summarized as follows:

- The Portage Bay LTF is located on Portage Bay on the north side of Kupreanof Island and could be used by Alternatives 2 and 3. This LTF is accessed by an existing isolated NFS road system that does not connect to any community (Figure 2-1).
- The Little Hamilton Bay LTF is located on Little Hamilton Island, which is connected to Kupreanof Island by a land bridge road. Little Hamilton Island is located in Hamilton Bay on the

west side of Kupreanof Island (Figures 2-1 and 2-3). Logs could be hauled to the Little Hamilton Bay LTF for transportation by barge or raft under all three action alternatives.

- The Tonka LTF is located on Forest Service road 6350 (Forest Road [FR] 6350) on Kupreanof Island (see Figure 2-3). Originally constructed as an A-frame in 1977, modifications have been made to this LTF through the years, including a low angle ramp installation in 1990, drainage improvements in 2008, and various small boat float maintenance/modification tasks. The Tonka LTF was made larger and improved in 2013 and a new dock was added. This LTF could be used by Alternative 4 (Figure 2-3).

If any of these LTFs are used, the applicant will be issued a special use permit that will comply with the terms and conditions of the Forest Service's existing Alaska Pollutant Discharge Elimination System (APDES) permit.

Marine Crossings

All three action alternatives would require marine crossings and coordination and approval by the Alaska DNR, ADEC, and National Oceanic and Atmospheric Administration (NOAA) Fisheries. These crossings may be summarized by alternative as follows:

- Alternative 2: This alternative includes a 1.2-mile HDD bore beneath or buried submarine cable crossing of the mouth of Wrangell Narrows (Figure 2-1).
- Alternative 3: This alternative includes a 3.1-mile submarine cable crossing of Frederick Sound (Figure 2-1).
- Alternative 4: This alternative includes two water crossings: 1) a 0.6-mile submarine cable crossing of, or HDD bore beneath, the Wrangell Narrows, and 2) a 0.9-mile submarine cable crossing of, or HDD bore beneath, Duncan Canal (Figure 2-3).

Horizontal Directionally Drilled Bore

Alternative 2 potentially includes an HDD bore, as noted above. The length of the proposed boring between Petersburg and Prolewy Point is such that drilling rigs may need to be placed on both sides of the crossing. Neither of these locations are on NFS lands. The crossings proposed under Alternative 4 may also be completed using an HDD approach depending on geophysical survey results. With the exception of the initial Wrangell Narrows crossing site located on Mitkof Island, all other drill site locations would be on NFS lands under Alternative 4.

Directional bores are commonly used in the utility industry for placing pipes and conduits beneath rivers and other bodies of water. The HDD process involves a bore pit that would be installed a limited distance from the shoreline and an adjacent area of 40 feet by 60 feet for the drilling rig, other equipment, and materials. The directional boring process uses a drilling rig that pumps a drilling fluid to remove loosened materials and allows the material to be collected at the bore pit. The drilling fluid would be selected to be environmentally benign and not harm terrestrial and aquatic life. The drilling fluid pressure will be monitored during the drilling process to insure that a "blow-out" does not happen or if it does happen that the drilling is immediately stopped. This would reduce the potential for harm to aquatic life. Drilling fluids and materials would be hauled off-site to an approved disposal area.

The proposed HDD process would require up to a 10-inch-diameter bore be made below the channel and a HDPE pipe or steel conduit be installed in the boring. After an initial geotechnical study verifies the location and feasibility, the drilling process would begin with a pilot bore drilled from a launch pit at one end of the planned installation, along a predetermined route, to an exit pit at the other end of the installation route. The drill head contains a transmitting device which allows the position, depth, pitch and roll of drill head to be monitored and adjusted as needed to achieve the planned bore profile. After the pilot bore is complete, the drill head is removed from the drill string and replaced with an appropriate hole opening device which is then rotated and pulled back through the bore to increase the hole diameter (back reaming). When the bore is of sufficient size, the steel conduit pipe is attached by means of a swivel and towing head, and installed as the drill string is retracted to complete the installation. Conductors and fiber optic cable would then be pulled through the pipe.

It is estimated that approximately 500 feet can be drilled per day using one drilling rig for each of the processes described above. Additional equipment would be needed to support the drilling operation including a drilling mud recycling system, shale shaker, mud cleaner, centrifugal pump, mud tanks, etc. requiring approximately a 200-foot x 200-foot work area. Based on the above drill rate per day including set-up time, it would take approximately one month to complete the directional bore proposed under Alternative 2. If a directional bore is feasible under Alternative 4, it is estimated to take approximately 2 weeks and 3 weeks of drilling activity at the Wrangell Narrows and Duncan Canal crossings, respectively.

Noise from the drilling activities would be mitigated (sound panels/screening) as necessary to maintain daytime and nighttime levels required by City and Borough Ordinances. Vibration from the HDD process cannot be accurately predicted as there is no standard empirical methodology available to calculate this and there are no data on measured vibration levels from a drill. Although there is currently no established guidance or prediction methodology available to calculate vibration from HDD techniques, it is unlikely vibration disturbance will be noticeable. Effects from noise or vibration would be considered temporary and minor.

Submarine Cables

The proposed submarine cable that would be used for Alternatives 3 and 4, and potentially used for Alternative 2, would be a single-armored, 69 kV, 3-phase, 500 kcmil copper conductor, dielectric submarine cable with bundled fiber optic communication lines. The bundled cable would be about 6.5 inches in diameter (7.9 inches for 138-kV cable) (Figure 2-9). The three larger components shown in this figure are the conductors; the smaller cable represents the bundled fiber optic lines. Cables used for the proposed submarine crossings would be similar to the submarine cable crossing between Douglas Island and Young Bay that was installed during the summer of 2005.

Cable design – FXBTV 3x500 kcmil, 69 kV

Figure 2-9. Representative Submarine Cable Design

Submarine Cable Installation

In all cases, the submarine cable would be laid directly on the bottom of the bay or canal being crossed. Cable embedment or protection is not expected to be necessary except in areas of ship anchoring or fish trawling. A cable-laying vessel would be used to lay the cable, as well as transport the cable from its point of manufacture. Cable-laying vessels are specifically designed to lay underwater cables and are equipped with sophisticated navigational instrumentation and directional propulsion to permit accurate cable laying along a pre-plotted surveyed route.

A detailed geophysical investigation and bathymetric survey of each crossing location will be required to identify bottom conditions, obstacles, and tidal currents. A subsequent geotechnical investigation that includes a coring and drilling program may also be needed, depending on the results of the geophysical surveys. Obstacles such as boulders and rock outcrops need to be avoided to prevent suspension of the cable. Excessive bending due to suspension or cable swing caused by strong currents can lead to mechanical failure of the cable over time. Strong currents may require anchoring of the cable along the route to prevent it from moving. In addition, movement of boulders due to currents may further require rock armor for cable protection.

At the shorelines, the cable would be installed in a trench. Trenches would be cut under water using on-barge equipment and use of a water jet or plough. Trenches on land would be dug using a backhoe or rock saw, depending upon conditions. An access road/working easement would be required along the land portion of the trench to allow trenching and cable installation activity, and provide access to the submarine cable termination yards.

The work activities associated with installation of submarine cables and construction of the associated termination yards would take place over two work seasons. The first season would be used for clearing and site preparation of the cable land trench, termination yards, and work roads. The land and any underwater trenches would be excavated in the second season, the termination yards would be constructed, and the cable would be installed and terminated. Based on the results of geophysical surveys, the cable would be laid directly on the seabed or buried in a narrow (<1 meter wide) trench cut by a water jet or plough where by a wedge of sediment is ploughed out so that the cable can be inserted below. Based on other armored submarine cable installation projects, cable laying speed is estimated to be about 0.1 mile/hour (0.2 km/hr).

Barge and/or helicopter would be used to transport personnel, equipment, and materials to the termination yard locations. The termination yard equipment would be erected by helicopters. Pre-assembly of certain materials such as insulator strings would be performed in a staging area before transportation to the site for installation.

Submarine Cable Termination Yards

At the termination points of the submarine cable, a small facility would be located on land to provide the interconnection of the submarine cable and the overhead line. The facility would include switching, protection and monitoring equipment and would include a pole with a riser. The total amount of space needed for the facility is estimated to be about 30 feet by 30 feet. They would generally be located near the shoreline but behind the existing tree lines to limit visibility from the water. The termination yards would contain lightning arrestors and risers that connect the overhead system to the submarine cable and include structures up to 50 feet in height. Disconnect switches would also be installed to allow for the electrical isolation of the cable for maintenance and testing. A typical submarine cable yard is shown in Figure 2-10.

Figure 2-10. Typical Submarine Cable Termination Facility

Alternatives 2, 3 and 4

Under Alternative 2, the proposed transmission line would cross the mouth of the Wrangell Narrows via an HDD bore or buried submarine cable. The HDD bore that could occur under this alternative is discussed above in the Buried Cable Underwater Crossing (Directional Bore) section. Like the HDD bore, the potential buried submarine cable for Alternative 2 would originate at Outlook Park on Mitkof Island and extend 1.2 miles across the mouth of the Wrangell Narrows, coming ashore on Kupreanof Island, near Prolewy Point.

Alternative 3 includes one submarine crossing, approximately 3.1 miles in length, that would originate to the southeast of Sandy Beach Park in Petersburg on borough-owned land (Figure 2-1). The cable would initially extend from the beach to a depth of approximately 180 feet and then turn northwest towards Kupreanof Island. Generally, the depth of placement would be in the range of 150 to 200 feet. The cable would need to be placed sufficiently north of the entrance to Wrangell Narrows to avoid the dredging area but to the south of an underwater disposal area north of Petersburg. The cable would terminate on Kupreanof Island in the general vicinity of Prolewy Point.

Two separate submarine cable crossings are proposed for Alternative 4 (Figure 2-3). The first crosses Wrangell Narrows about 8 miles south of downtown Petersburg and is about 0.6 mile in length. Tide movements are indicated to be very limited at this location and the waters are generally calm. Review of NOAA charts suggests that the water depth at the Wrangell Narrows crossing increases uniformly from 0 feet at the shoreline to 110 feet near the center of the channel (Hittle et al. 2010).

The second crossing is about 0.9 mile in length and crosses Duncan Canal between points about 1.75 miles south of the mouth of Mitchell Slough on the east and about 2.5 miles south of Indian Point on the west side of Duncan Canal (Figure 2-3). The water depth at the location of the Duncan Canal crossing is approximately 100 feet at maximum. The marine crossings proposed for Alternative 4 may also be completed using an HDD approach depending on geophysical survey results.

If one of the action Alternatives is the selected alternative, a thorough submarine topographical survey and subsurface profile will be completed to determine the best routes for the submarine cables for the selected alternative, as well as associated terminal locations. The submarine topographical survey will identify areas to be avoided, such as shipwrecks, large rocks, and rock outcroppings, that could cause suspensions and damage to the cable. If the selected alternative is Alternative 2 or Alternative 4, the survey will also be used to inform the decision about the type or types of crossing that will be employed: HDD boring or buried submarine cable.

Operation and Maintenance

The proposed transmission line would require limited maintenance. Routine annual inspections would be conducted via helicopter and along existing roads to ensure that the transmission line is in fully operational condition and that no damage has occurred to the conductors, insulators, pole structures, guying, or safety systems. If damage is evident, repair work would depend on the extent of the damage and the type of equipment required to make the repairs. Helicopters would be needed to support substantial repairs, such as pole replacements, along unroaded portions of the transmission line.

The right-of-way would require regular maintenance clearing. This clearing would occur at 10-year intervals and would be expected to restore the original clearing boundaries. Removal of any additional danger trees would also occur during this maintenance or earlier if they are identified as potential problems during the annual flight inspections of the line.

Final Design and Construction

Prior to actual construction of the proposed transmission line, final design work would be completed for the selected alternative to determine the precise location of all KPI Project components. Exact structure locations would be determined using terrain data primarily collected using Light Detection and Ranging (LiDAR), augmented as necessary by other terrain data collection methods such as photogrammetry, high resolution aerial photography, and survey crews working on the ground. Structures would be positioned during final design to provide adequate conductor clearances above ground and other obstacles while minimizing potential impacts to other resources. This terrain data would also be used to locate the proposed shovel trails and temporary matting panel locations.

Construction of the proposed transmission line under all three action alternatives would involve the following major phases:

- Right-of-way clearing, log removal, and temporary access
- Prepare site and dig holes
- Pole structure assembly, transportation, and installation
- Wire stringing and clipping

Right-of-Way Clearing, Log Removal, and Temporary Access

Right-of-way clearing would involve the use of both mechanized heavy equipment and chain saws. Actual equipment selection and logistics would be the responsibility of the construction contractor.

Along much of the unroaded areas, wide-tracked, multi-purpose equipment is expected to be used to limit the number of equipment passes that are needed. The Linetrac 830G is an example of the type of equipment that might be used for this purpose (see Figure 2-11). Approximately 10 feet wide and 20 feet long, this equipment incorporates a bulldozer, an auger, and a pole-lifting crane, with 30-inch-wide tracks and less than 8.0 pounds per square inch ground pressure.

Figure 2-11. Construction Equipment for Use in Unroaded Areas

In unroaded areas, an excavator would initially be used to pioneer in the trail and place culverts and temporary bridges, where needed. In some forested areas, a feller buncher (a type of vehicle used for logging) would be used to cut and remove trees, and lay slash matting ahead of the excavator. Feller bunchers are most effectively used in young growth stands where tree diameter at breast height (DBH) is less than 24 inches. R10 BMP 13.9 has a slope restriction of 20 percent; however, in well-drained soils harvesting equipment may be able to work on slopes up to 35 percent. Shovel harvesting would likely be employed in those areas with larger trees (DBH greater than 24 inches). In wetland areas requiring limited clearing and without an adequate supply of natural underlayment material, temporary matting panels would be laid. With respect to work on hydric soils, R10 BMP 13.9 has a slope restriction of 25 percent.

To facilitate movement along the selected route, temporary matting panels would likely be delivered by helicopter or truck to intermittent material staging locations, which would be areas of approximately 200 feet by 200 feet situated on upland areas, approximately every 0.5 mile along the proposed transmission line route in unroaded areas. Intermittent material staging locations within unroaded sections would be located within the cleared right-of-way; specific locations would be identified as part of the final design planning and approved by the Forest Service in advance. Approximately 13 days would be required to lay an estimated 2 linear miles (1,500 panels) of temporary matting panels for Alternatives 2 and 3. Approximately 1.5 months (45 days) would likely be required to lay 7.3 linear miles (5,200 panels) of temporary matting panels for Alternative 4.

Culverts would be plastic pipe, galvanized steel pipe, or approved log culverts. Temporary bridges would also be required to cross certain streams. Bridges would be placed with tracked vehicles or airlifted into location. Some of the bridges could potentially be moved to other locations along the route as construction progresses along the length of the line.

Trees and brush would be cleared as described above (see *Right-of-Way Clearing*). To minimize slash build up, areas of heavy slash would be piled and/or openings would be created through slash at regular intervals (every 100 yards and/or at identified game trail crossings), unless specifically waived by the Forest Service.

Approximately 15 to 25 workers would be involved in right-of-way clearing activities for one season. Right-of-way clearing and timber removal would be conducted in accordance with Forest-wide standards and guidelines, BMPs, and Forest Service R10 Soil Quality Standards.

Pole Site Preparation

Pole site preparation and hole digging would follow progressively behind right-of-way clearing. Review of soils in the project area indicates that soil types range from moss muskeg to rock. The preliminary design for the KPI Project is based on standard embedment depths plus an additional 4 feet (10 percent of pole length plus 4 feet) for tangent structures. Structures located in rock and guyed structures are assumed to be embedded at standard embedment depths (10 percent plus 2 feet). Pole structures located in wetlands would be stabilized by using a wood raft at ground line with side guys or by construction of a foundation system. The foundation system could consist of either driven H-piles or a culvert embedded at a depth required for lateral stability with the pole placed inside the culvert.

Holes can be dug by auger, excavator, backhoe, or hand, depending on the location. Factors determining how the hole would be dug include access and ground conditions. Hand crews would likely be limited to those areas where pole structures are installed by helicopter.

As noted with respect to right-of-way clearing and log removal, actual equipment selection and logistics would be the responsibility of the construction contractor, but the selected construction equipment is expected to be relatively small and compact because of the need to transport it by helicopter in certain areas. Approximately 20 personnel would be involved in foundation and pole setting work, which is expected to extend over two seasons.

Site-specific blasting plans, including contingency plans for overshot and resource damage would be prepared before any blasting associated with foundation placement occurred.

Pole Structure Assembly, Transportation, and Erection

Pole structures could be assembled in a remote location and transported by truck, barge, or helicopter to staging areas near the right-of-way. This process is designed to minimize the handling of materials and increase the efficiency of the work by avoiding having the framing crews work in rough terrain and adverse field conditions. For sections of the proposed alternatives that follow existing NFS roads, most pole structures are expected to be delivered and installed with standard pole installation trucks. In unroaded areas, wide-tracked, multi-purpose equipment, similar to the Linetrac 830G shown in Figure 2-11, is expected to be used. The use of this multi-purpose equipment would reduce the number of equipment passes needed, and would be used along shovel trails and areas with temporary matting panels.

The holes used to place the poles would be backfilled as part of installation. This would be generally accomplished through the use of the same native material removed from the hole; however, some rock fill and/or cement may be needed. Backfilled material would be compacted with an attachment on the auger or backhoe or with a hand-operated tamper, and the earth mounded around the structure to take into account the settling that may occur during the first year following construction. Pole structures located in wetland areas would be stabilized through the use of a guyed system, as described above.

In some cases, helicopters could be used to deliver and install pole structures. In these cases, the assembled structure at the staging area would be flown directly to the site of installation, and the hand crew would receive the structure, stabilize it, and backfill immediately after delivery.

Twenty personnel would be involved in pole structure assembly, transportation, and erection, which is expected to extend over two seasons.

Wire Stringing and Clipping

Bucket trucks or helicopters would generally be used to string the pilot line, and the wire would be pulled by cable pullers. Approximately 15 personnel would be present on the right-of-way during the wire stringing and clipping operation, connecting wires to each other and clamping them to insulators. Equipment required during stringing and clipping operations would include bull wheel pullers, drum pullers, reel winders, and pilot line winders.

Construction Schedule

Construction of the proposed project is expected to extend for two or three construction seasons. A generalized schedule for a 3-year project is shown below. It is possible this schedule could be compressed into two years, but this would not be determined until an alternative is selected and final design is either complete or near completion.

The major activities to be undertaken in each year are as follows:

Year 1

- Survey the centerline and identify areas for right-of-way and danger tree clearing
- Identify and prepare laydown and staging areas, with the intent of locating all staging areas in previously disturbed areas (e.g., existing roads, marine access facilities [MAFs], landings, or within the cleared right-of-way)
- Mobilize equipment to staging areas
- Clear the right-of-way and remove logs, where required
- Construct shovel trails
- Install temporary culverts and bridges along shovel trails, as needed

- Prepare needed helicopter pads immediately following and/or concurrent with right-of-way clearing
- Where existing roads are present, completion of the following would be done:
  - Clear the alignment
  - Construct temporary access spurs, as required
  - Construct other key components, as appropriate
- Order materials

Year 2

- Lay temporary matting panels where needed in unroaded areas
- Assemble, deliver, and install poles and construct the transmission line

Year 3

- Complete transmission line construction:
  - Install submarine cables and water crossing equipment
  - Construct the proposed substations and switchyards, as appropriate
  - Remove temporary culverts and bridges
  - Demobilize equipment and materials

Alternatives Considered but Eliminated from Detailed Study

The applicant proposes to construct the KPI Project, a new electric transmission line that would extend from Petersburg on Mitkof Island to Kake on Kupreanof Island. The proposed transmission line would provide a reliable and relatively low-cost source of power to Kake by connecting the community to SEAPA's interconnected network. This section describes alternatives not considered in detail in this EIS, including alternative routes for the proposed transmission line, and other projects that might substitute for the proposed project.

Alternative Intertie Routes

Past Studies through 2003

An intertie transmission line from Kake to Petersburg has been discussed for many years and has been the subject of a number of studies dating back to the 1970s. Past studies have included the 1987 Southeast Alaska Transmission Intertie Study (the "1987 Intertie Study") for the Alaska Power Authority, the "1996 Feasibility Study" prepared for the State of Alaska, Department of Community Affairs, Division of Energy, and the Southeast Alaska Intertie Study prepared in 2003 (the "2003 Intertie Study"). The 2003 Intertie Study provided an overview of a complete electrical transmission system in Southeast Alaska with emphasis on two initial transmission interconnection segments between: (1) Kake and Petersburg, and (2) Juneau, the Greens Creek Mine on Admiralty Island, and Hoonah.

The 1987 Intertie Study, the 1996 Feasibility Study, and the 2003 Intertie Study all identified two primary routes for the KPI Project, a northern route generally located on the north end of Kupreanof Island and a southern route that crosses the Wrangell Narrows near the Tonka LTF and proceeds west across Duncan Canal (Hittle et al. 2005). The northern route goes to the north of the Petersburg Creek – Duncan Salt Chuck Wilderness Area, while the other route is located to the south of the Wilderness Area. Both routes were expected to follow existing NFS roads for the majority of their lengths.

2005 Feasibility Report

In July 2004, the Southeast Conference received a grant from the Denali Commission to conduct a planning study for the proposed KPI Project. A Steering Committee was formed to oversee and guide the planning study. The Steering Committee included representatives from Kake and Petersburg, IPEC, the Thomas Bay Power Authority, and the Four Dam Pool Power Agency (now known as SEAPA). One principle goal of the study was to identify and analyze the various route alternatives for the transmission line between Petersburg and Kake. The Steering Committee met several times during the study period to review and 'screen-out' various route alternatives. This planning study is documented in the 2005 Kake-Petersburg Transmission Intertie Study Final Report (the "2005 Feasibility Report") (Hittle et al. 2005) and summarized in the following paragraphs. The 2005 Feasibility Report was subsequently updated in 2010 (Hittle et al. 2010).

As part of the 2005 Feasibility Report, several meetings were held in Kake with the Kake Village leaders, merchants, and utility personnel from IPEC. Time was also spent in Petersburg meeting with Forest Service personnel, Petersburg community leaders and officials, and the Superintendent of Petersburg Municipal Power & Light. Consulting engineers conducted a detailed field reconnaissance of the area between Petersburg and Kake. The reconnaissance included driving existing NFS roads out of Kake and roads accessible from Petersburg, as well as flying potential corridors by helicopter and fixed-wing plane. General locations for alternative routes were identified based on past studies, topography, and other physical constraints, with more specific criteria, including the following, used to refine the potential route locations:

- Generally parallel existing roads where possible
- Consider route locations where new service roads could be constructed
- Avoid disruption to known fisheries, aviation, and marine traffic
- Provide for submarine cable crossings that avoid dredging areas, commercial fishing areas, and major rock outcrops, and are accessible to shore terminals
- Maintain a minimum distance of 330 feet from known nesting areas of eagles
- Avoid and minimize impacts on scenic viewsheds
- Avoid and minimize, where possible, known muskeg or other wetland areas
- Maximize ground accessibility for maintenance purposes

In addition to the factors that had influenced past studies, the 2004/2005 planning study also considered potential intertie routes that could facilitate power deliveries to a major mining operation on Woewodski Island, were one to develop. The study also considered the possibility of a route through the west side of the Petersburg Creek-Duncan Salt Chuck Wilderness parallel to Duncan Canal. This route was considered because of the generally easy topography that would simplify construction of a transmission line.

The following 10 alternative routes were identified as part of this planning study:

1. Northern Alternative
2. Center–South Alternative
3. Center–North Alternative
4. Center–Center Alternative
5. Center–Woewodski Tap Alternative
6. Southern–Woewodski Alternative

7. Upper Duncan Canal Alternative
8. Petersburg to Kake (Submarine Cable) Alternative
9. Petersburg Creek Alternative
10. Southern–Woewodski Tap (Submarine Cable) Alternative

The 10 alternative routes were presented to the KPI Steering Committee in a meeting on January 12, 2005, for consideration. Two of these routes, Alternative 8 and Alternative 10, involved extensive lengths of submarine cable and were removed from further consideration due to expected higher costs. Alternative 9, along Petersburg Creek on Kupreanof Island, was considered impractical due to the sensitive environment in this area. Alternative 7 was also removed from consideration because it would involve a lengthy submarine cable in the northern region of Duncan Canal. The removal of these alternatives from consideration left the following six alternatives, which were evaluated in detail as part of the 2004/2005 planning study. As indicated below, the Center-Woewodski Tap Alternative would be an extension of the Center-South, Center-North, or Center-Center routes to serve the potential Woewodski mine and is not a standalone alternative.

- *Northern Alternative* (66.0 miles total length, one 3.1-mile marine crossing). Generally located at the north end of Kupreanof Island, previously defined as the Northern Alternative in the 2003 Intertie Study. For the most part, this route follows the route of a permanent road between Kake and Petersburg as defined in the Southeast Alaska Transportation Plan (SATP) dated August 2004.
- *Center-South Alternative* (51.7 miles total length, two marine crossings totaling 1.6 miles). Similar to Center-Center route but crosses Duncan Canal at a point farther south on the canal. This route was defined in previous studies as the Southern Alternative and is also referred to as the Tonka-Duncan Canal route.
- *Center-North Alternative* (59.0 miles total length, one 0.6-mile-long marine crossing). Connects to the existing Tyee transmission line south of Petersburg, crosses Wrangell Narrows, proceeds west across and then north on the Lindenberg Peninsula through the Petersburg Creek-Duncan Salt Chuck Wilderness where it intersects with the route of the Northern Alternative. The Center-North Alternative was also referred to as the Wilderness Route.
- *Center-Center Alternative* (51.4 miles total length, two marine crossings totaling 5.5 miles). Originates at the same location near Petersburg as the Center-North route but continues northwest toward Kake across Duncan Canal rather than passing through the Wilderness area.
- *Center-Woewodski Tap Alternative* (13.6 miles total length, one 0.9-mile-long marine crossing). This alternative is an extension of the Center-South/Center/North route that proceeds from a point just west of Wrangell Narrows south on the Lindenberg Peninsula where it crosses to Woewodski Island. The Woewodski Tap would be constructed at a later time only if a mining facility were to be developed. The cost estimate for the Woewodski Tap Alternative included in this report is based on the assumption that one of the Center routes is constructed first to establish the connection to the TWP transmission line and cross Wrangell Narrows. With the Northern Alternative, additional cost would be incurred to extend the Woewodski Tap to the TWP interconnection point.
- *Southern Woewodski Alternative* (75.7 miles total length, two marine crossings totaling 1.5 miles). Connects to the existing Tyee transmission line near the south end of Mitkof Island, proceeds west along the south end of Mitkof Island, crosses Wrangell Narrows to Woewodski Island and continues west across Woewodski Island, crosses Duncan Canal to south Kupreanof Island and then proceeds northwest up the length of Kupreanof Island to Kake. Along much of its route on Kupreanof Island, the Southern Woewodski Alternative follows existing NFS roads.

The SATP also identifies a permanent road between Kake and south Kupreanof Island along this corridor.

Based on screening level cost estimates prepared by Hittle et al., the Steering Committee decided at a February 25, 2005, meeting that the relatively high cost Center-Center and South Woewodski Alternatives would be removed from further consideration. The Northern Alternative was noted to be significantly more costly than the other remaining alternatives but the Committee indicated that further cost evaluation of the Northern Route should be conducted because this route follows the route of the potential year-round road between Kake and Petersburg, as identified in the State's SATP.

As a result of the discussions during the February 25, 2005, meeting, the following route alternatives were identified for more detailed evaluation in the 2005 Feasibility Report:

- Northern Alternative
- Center–South Alternative
- Center–North Alternative (Wilderness Route)

The Center-Woewodski Tap Alternative was also included in this list of alternatives in the 2005 Feasibility Report (Hittle et al. 2005), but, as noted above, this is not a standalone alternative, rather it is a potential connection that would be viable in the event that one of the south routes of the KPI Project was built and a large-scale mining operation was established on Woewodski Island.

Following completion of the 2005 Feasibility Report, the Center-South route was selected as the preferred route by the KPI Steering Committee (Hittle et al. 2005). The Center-North Alternative was primarily eliminated because it crossed the Petersburg Creek-Duncan Salt Chuck Wilderness. The screening level cost analysis also indicated that it would be more expensive to construct than the Center-South Alternative.

The seven alternative intertie routes considered as part of the 2004/2005 planning that were eliminated from further consideration are identified in Table 2-2, which also identifies the primary reason each route was eliminated.

Table 2-2. Alternative Intertie Routes Considered, but Eliminated from Detailed Study

Alternative	Reason for Elimination
Center-North (Wilderness Route)	Crosses the Petersburg Creek-Duncan Salt Chuck Wilderness; Relatively high cost compared to the Center-South Alternative
Center-Center	Relatively high cost with similar environmental impacts to the Center-South Alternative
Southern–Woewodski	Relatively high cost due mainly to its length, at least 10 miles longer than the other alternatives
Upper Duncan Canal	Extensive length of submarine cable and associated high costs
Petersburg to Kake (Submarine Cable)	Extensive length of submarine cable and associated high costs
Petersburg Creek	Parallels Petersburg Creek, an environmentally sensitive area
Southern–Woewodski Tap (Submarine Cable)	Extensive length of submarine cable and associated high costs

2010 and 2014 Feasibility Report Updates

The 2010 Feasibility Report update prepared by Hittle et al. (2010) re-examined the construction and operating and maintenance costs for the Northern alternative and updated the cost for the Center-South route. The update also evaluated the likely options for the location of the KPI Project in the immediate vicinity of Petersburg more closely. As a result of this evaluation, two options were identified for the initial portion of the line extending from the Petersburg area to Kupreanof Island. The Feasibility Report was updated again in 2014 (Hittle 2014) based on the changes to the Northern Alternative described below and changes to the proposed construction approach. Estimated costs were also revised as part of the 2014 update.

EIS Public Scoping

The Forest Service initiated public scoping for the KPI Project in April/May 2010. The scoping materials identified two alternative routes: the Center-South and Northern Alternatives, with two options (Options 1 and 2) identified for the Northern Alternative. The Northern Alternative, Option 1 included a 3.1-mile-long submarine cable across the mouth of the Wrangell Narrows. This option is included in the EIS as Alternative 3. The Center-South Alternative is included in the EIS as Alternative 4.

The Northern Alternative, Option 2 was eliminated from further consideration based on public input and further evaluation during and after the EIS public scoping period. Option 2 originated at the existing SEAPA substation south of Petersburg and crossed the Wrangell Narrows at close to its narrowest point (approximately 1,400 feet) via an HDD bore or buried cable. The option then continued north, crossing Petersburg Creek and passing behind the city of Kupreanof, before joining the Northern route Potential Power Transmission Corridor and continuing on to Kake. Many of the comments received from the public during scoping for the proposed project were from Kupreanof residents concerned about the potential impact of the Northern Alternative, Option 2 on their community, as well as potential impacts to Petersburg Creek. On May 6, 2013, the Petersburg Borough Assembly passed Resolution 2013-15, a "resolution that Petersburg Creek be protected from encroachment by an electrical corridor or electrical power lines."

Working with the Borough of Petersburg, the Mayor of Kupreanof, and others, the applicant along with the current KPI Steering Committee identified a third Northern Alternative option. This option addresses potential concerns related to the 3.1-mile-long submarine cable proposed as part of the Northern Alternative, Option 1 without crossing Petersburg Creek or passing behind the city of Kupreanof. This option has been identified as the Proposed Action and is evaluated in this EIS as Alternative 2. The Northern Alternative, Option 2 was subsequently eliminated from further consideration. A corrected NOI published in the Federal Register in July 2014 outlined the above changes and requested additional public input.

Alternative Energy Sources

Comments received during public scoping requested that the EIS evaluate the development of alternative sources of energy near Kake rather than the Proposed Action or as an alternative to the Proposed Action. Suggested sources of local power include local hydropower, wind, geothermal, biomass, solar, and tidal generation.

The purpose of this EIS is for the Forest Service to decide whether to authorize the applicant to construct, operate, and maintain the proposed KPI Project across NFS lands. The need for this action is established by the Forest Service's responsibility under FLPMA to respond to an application for a right-of-way (as described further in Chapter 1 in the *Forest Service Purpose and Need* section). Development of a renewable energy project near Kake would not meet the purpose and need of this project. The applicant and others have indicated that the KPI Project and energy development in the vicinity of Kake are not mutually exclusive. Potential sources of renewable energy in the vicinity of Kake continue to be evaluated, as discussed below. If No Action is the selected alternative, future efforts to provide access to relatively low cost energy to Kake will be limited to alternative energy development in the vicinity of Kake.

Potential new sources of renewable energy are presently being evaluated in Southeast Alaska, including the general vicinity of Kake and the KPI Project. SEAPA issued a Request for Offers of Power and Energy in January 2013 open to all classes of generation resources, including offers based on output from thermal, geothermal, wind, tidal, hydropower, or any mixture of resource types. SEAPA is also exploring additional hydropower options to supplement its existing power sources, as well as exploring potential wind development opportunities along their existing interconnected system, as well as in the vicinity of the proposed KPI Project. If suitable projects exist in the vicinity of Kake and are developed, construction of the KPI Project would allow this new generation to serve the entire customer base in the area served by SEAPA.

The following paragraphs provide a brief overview of potential renewable energy projects in the vicinity of Kake and their current status.

Hydropower: As part of the Southeast Alaska Integrated Resource Plan (IRP), the Alaska Energy Authority (AEA) developed a comprehensive list of potential hydroelectric projects in the region, with projects identified from numerous sources. Almost 300 potential hydroelectric projects were identified, including four in the general vicinity of Kake: Goemere Creek at Washington Bay (1947); Ledge Lake near Saginaw Bay (1947); Gunnock Creek (1997; 2014); and Cathedral Falls Creek (2005). The years in parentheses represent the most recent information available on each project. The analysis conducted for the IRP identified a total of 24 potential hydroelectric projects that had the potential to be suitable to serve Southeast Alaska utility systems and communities. More than half of these projects, 14, were identified in the SEAPA Planning Region; none were located in the vicinity of Kake (Black & Veatch 2012).

The Sustainable Southeast Partnership (SSP) recently completed a reconnaissance report that takes “another look at local hydropower options to complement the work being done on the KPI.” The report considers the feasibility of developing hydropower on Gunnuk Creek in two phases: initially developing a run-of-the-river hydroelectric project (Phase 1) that could then later be augmented by a small reservoir (Phase 2). The report concludes that the results of the initial reconnaissance suggest that it may be appropriate to study this potential further with additional stream gaging and land surveys for rough design work (Christensen and Davis 2014). IPEC has subsequently applied to AEA for a grant to study this potential project further (SSP 2014). However, there are currently no formal proposals to develop this or other hydropower projects in the vicinity of Kake.

Wind: According to the Southeast Alaska IRP, there are small areas distributed throughout the region that may possess wind resources, but most utility-scale resources are in areas that are inaccessible due to terrain, in IRAs, or too far from population centers (Black & Veatch 2012). Efforts to measure wind resources in areas with potential for wind generation include data collection near Kake. Wind resources have been measured at a meteorological tower on a high headland on the northeast side of Kupreanof Island, about 12 miles by road from Kake. Based on 18 months of data collected from May 2010 through November 2011, a report prepared on behalf of SEACC indicated that the wind resource measured at this site is “very good” (V3 Energy 2012). There are currently no proposals for wind power projects in the vicinity of Kake.

Geothermal: Although Southeast Alaska has some potential opportunities for geothermal electric production, most of the area has only low to moderate temperature geothermal systems (Black & Veatch 2012). Review of the *Renewable Energy Atlas of Alaska* (Renewable Energy Alaska Project 2013) did not identify any potential geothermal resources in the vicinity of Kake. The Southeast Alaska IRP identified three potential geothermal sites that have been identified in Southeast Alaska in the past, none of which are located near Kake (Black & Veatch 2012).

Biomass: The Central Council Tlingit and Haida Indian Tribes of Alaska proposed a Kake Biomass Gasifier project and requested funds from AEA under the Renewable Energy Grant Fund, but subsequently withdrew from the project, which was not granted funds (Black & Veatch 2012). More recently the SSP prepared a preliminary assessment of the wood supply in the vicinity of Kake that could be used for biomass heat generation and concluded that sufficient wood appears to exist in the local land base to provide a renewable source of heat for commercial and residential use (Christensen 2013). There are currently no proposals for biomass projects in the vicinity of Kake.

Solar: The Southeast Alaska IRP did not identify any solar projects in Southeast Alaska and recommended that solar not be used to meet the near-term needs of Southeast Alaska, but should instead be monitored and perhaps considered in the future as costs decrease (Black & Veatch 2012). The

Organized Village of Kake installed 24 solar panels on its tribal government building in 2012 as part of a U.S. Department of Energy demonstration solar project (Shor 2014). In addition, at least one Kake resident has installed solar panels on his home (Shor 2014).

Tidal: According to the Southeast Alaska IRP, tidal energy development in Alaska is presently focused on kinetic tidal projects – underwater turbines turned by kinetic flow. The AEA has granted partial funding for two tidal power reconnaissance and feasibility studies in Southeast Alaska: the Port Frederick and Angoon tidal projects. A third project – the Gastineau Channel Tidal project – was also identified in the Southeast Alaska IRP (Black & Veatch 2012). There are currently no proposals for tidal projects in the vicinity of Kake.

Mitigation Measures

The Forest Plan (USDA Forest Service 2008a) presents management prescriptions for each land use designation and Forest-wide standards and guidelines that are to be followed in the development of mitigation measures, and also provides forest management goals and objectives. The plan does not contain project decisions. The analysis supporting this EIS discloses possible adverse impacts and measures to mitigate these impacts. Mitigation measures are guided by Forest-wide goals and objectives, applicable LUD management prescriptions, and Forest Plan Standards and Guidelines.

Specific mitigation measures, designed to avoid or minimize adverse impacts, have been evaluated and incorporated into the preliminary project design, and would be included in final design and implementation. These measures are summarized in Table 2-3 and address activities associated with structure installation, shovel trails, use of matting, temporary access spurs, helicopter pads, right-of-way clearing, and system operation and maintenance. Other Forest Plan standards and guidelines would also apply to the project and are incorporated by reference.

In addition to the mitigation measures included in the Table 2-3, all appropriate R10 BMPs, Forest Service National Core BMPs (USDA Forest Service 2012a), and State of Alaska BMPs (ADEC 2011) would apply. These BMPs are described below.

Table 2-3. Site-specific Mitigation Measures for Clearing and Construction-related Activities

Mitigation Measure	Description
General Mitigation Measures	
G1	Conduct environmental staff review of final construction drawings and specifications prior to the package being sent out to bidding contractors to ensure that the package reflects and adheres to the mitigation measures outlined in this NEPA process. This effort will include Project Engineer, Project Manager, and Forest Service or approved third-party Environmental Compliance Monitor.
G2	Prior to construction, review plans for the clearing required for the transmission line right-of-way for conformance with permits and mitigation measures outlined during the NEPA process. This effort will include Project Engineer, Project Manager, and Forest Service or approved third-party Environmental Compliance Monitor.
G3	Prior to construction, inspect areas marked for clearing to determine conformance with agreed upon plans, and the need for adjustments based on special site conditions. Any changes or potential realignments will follow additional review requirements as outlined in Mitigation Measure S1.
Soils/Aquatic Resources	
F1	Minimize clearing in areas with high or very high mass movement potential.
F2	Suspension cable logging systems or other low impact system will be required in areas with high mass movement potential or on McGilvery soils.
F3	Required split yarding and directional felling along all streams that cannot be avoided or spanned (R10 BMPs 12.6, 12.6a, and 13.16).

Table 2-3. Site-specific Mitigation Measures for Clearing and Construction-related Activities (continued)

Mitigation Measure	Description
F4	Span, without clearing, steep v-notch streams with high erosion potential.
F5	Establish timing restrictions for any instream activities in fish-bearing streams and streams with a downstream influence on fish habitat (R10 BMP 14.6 and Fish Standards and Guidelines). Locations and operating plans for heavy equipment placed in the right of way must be specified to ensure that all necessary stream crossings are specified and mitigated.
F6	Develop and implement an erosion control and sediment plan that covers all disturbed areas, including borrow, stockpile, fueling, and staging areas used during construction activities (Fac-2, USDA Forest Service 2012a). Measures will be developed to reestablish vegetation or otherwise stabilize soils (R10 BMPs 14.8 and 14.14).
F7	Remove construction slash in streams to ensure that debris generated during construction is prevented from obstructing channels or encroaching on streams. Right-of-way slash must not be left or placed below the high water mark at power line stream crossings (R10 BMP 14.19)
F8	Avoid construction in areas with high mass movement potential, when possible, by limiting the number the structures and by spanning areas of concern. Structure locations should incorporate site-specific geotechnical investigations to ensure location at stable sites
F9	To the extent practicable, implement feathering of edges where right-of-way clearing approaches within 100 feet of a temperature sensitive stream.
F10	Instream protection notwithstanding, where clearing is necessary within 100 feet of anadromous streams and their resident fish tributaries (Class I and II) leave felled trees in place but not blocking stream channel.
F11	Prepare a Stream Course Protection Plan for all Class I streams and Class II streams flowing directly into Class I streams where the power line crosses and/or parallels the stream within 100 feet (R10 BMP 13.16).
F12	If blasting is required, a blasting plan will be supported by site-specific geotechnical investigations showing blasting as a suitable and prudent practice. Blasting operations will be designed to reduce the risk of mass failure on potentially unstable or saturated soils. Use current regional specifications where mass wasting due to blast vibration is likely. Blasting plan will address corrective actions and contingencies for restoring resources damaged by overshot rock or mass wasting (R10 BMP 14.7).
F13	All ground disturbing support facilities (i.e., staging areas, barge locations, etc.); will require site-specific erosion control and restoration plans prior to construction commencement and will be addressed in any required permits. These facilities will be designed to minimize the total area disturbed, and their locations will be selected to minimize the number of required roads and landings necessary.
F14	Implement measures to minimize the use of the corridor by unauthorized vehicle use and prevent soils from being exposed to increased erosion risk.
F15	Routinely inspect disturbed areas to verify that erosion and stormwater controls are implemented and functioning as designed, and are suitably maintained.
F16	Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable. Provide breaks in grade and avoid long runs on steep slopes.
F17	Use low ground pressure equipment when practicable, particularly on equipment traveling over large portions of units with sensitive soils or site conditions. On sites having soils with low bearing strength, tracks need to be supported by logging slash, shrubs, other woody material, or pads to prevent rutting. This mattress material should be removed where necessary to restore the natural drainage pattern.
F18	Prior to final selection of submarine crossing locations and marine-associated logging operations, field verification will be undertaken to ensure avoidance of sensitive areas including estuaries, anadromous fish streams, eelgrass beds, and important fish aggregating areas.

Table 2-3. Site-specific Mitigation Measures for Clearing and Construction-related Activities (continued)

Mitigation Measure	Description
Wetlands, Floodplains, and Riparian Management Areas (R10 BMP 12.5)	
RMA 1	To the extent practicable, avoid siting transmission line structures in wetlands, floodplains, and riparian areas. Where this is not possible, BMPs and Forest Plan Standards and Guidelines will be implemented to reduce overall disturbance.
RMA 2	Construction techniques used to cross wetlands must have minimal effects on wetland hydrology, chemistry, or biology, and meet all 33 CFR BMPs. A 404 permit will be applied for in the event that the project does not fall under a nationwide permit.
Vegetation and Timber	
T1	Where practicable, locate right-of-way edges perpendicular to the prevailing winds to minimize windthrow.
T2	Use feathered right-of-way edges to minimize vegetation removal, windthrow, and visual impacts.
T3	Where feasible, merchantable timber felled during right-of-way clearing will be removed in accordance with specifications outlined in an approved Timber Settlement Agreement. The approved Timber Settlement Agreement will identify the timber required to be removed and specify how it will be removed and transported.
T4	Develop and implement a post-construction site revegetation plan. Use suitable species and establishment techniques to cover or revegetate disturbed areas in compliance with local direction and requirements per FSM 2070 and FSM 2900 for vegetation ecology, and prevention and control of invasive species.
T5	Use ground-based yarding systems only where physical site characteristics are suitable to avoid or minimize potential impacts to vegetation and soils.
T6	Proposed shovel yarding on slopes greater than 35 percent should undergo interdisciplinary review before being approved. Areas with broken, uneven topography, or an area dissected by numerous incised drainages may not be suitable for shovel yarding. Harvesting in areas with hydric soils will be limited to areas with slopes ≤ 25% (R10 BMP 13.9).
T7	Spur roads for shovel access should be minimized and/or obliterated after use. The number of turns on shovel trails should be limited, depending on soil type and vegetative cover. Wide arc turns can be used to reduce soil disturbance on shovel trails (R10 BMP 13.9).
T8	All ground-based construction equipment and temporary matting panels will be cleaned prior to implementation and mobilization to the right-of-way and before equipment is transported to another area (e.g., between Kupreanof and Mitkof islands). On NFS lands, cleaning would be done according to Tongass National Forest requirements (see Forest Service Manual 2900-Invasive Species Management [USDA Forest Service 2011]).
T9	Should rock be needed, a quarry development plan would be reviewed prior to use of existing quarries or development of new rock quarries, and reviewed and approved by resource specialists and the District Ranger. Forest Plan Standards and Guidelines and BMPs would apply to reduce risk of increasing invasive plant species.
Wildlife	
W1	Provide line markers on the transmission line to minimize the risk of bird collision at any known areas of concern.
W2	Provide for snag retention and structural diversity by leaving non-hazard snags within the cleared right-of-way. Leave non-danger trees and snags along the right-of-way boundaries. Where possible, allow the size and density of snags to be dictated by Forest Plan Standards and Guidelines for cavity-nesting species. Non-hazard snags may be retained in clumps away from conductors and in protected draws to minimize blowdown effects and conflicts with safety standards.
W3	To minimize restriction of wildlife movements, pile heavy (more than 18 inches deep) slash, or create openings through slash at regular intervals (every 100 yards and/or at identified game trail crossings), unless specifically waived by the Forest Service.

Table 2-3. Site-specific Mitigation Measures for Clearing and Construction-related Activities (continued)

Mitigation Measure	Description
W4	Maintain a 330-foot forested radius around any bald eagle nest identified within the Project Area. Between March 1 and August 31, restrict controlled blasting on all transmission line sites within a 0.5 mile radius of a bald eagle nest site, and restrict all helicopter logging and/or flight paths within one-quarter mile of a nest. These restrictions may be lifted after June 1 if the nest is found to be unoccupied. All activities will be consistent with Forest-wide standards and guidelines, National Bald Eagle Management Guidelines, and the National Bald and Golden Eagle Protection Act unless a variance is granted from the U.S. Fish and Wildlife Service.
W5	If a wolf den site is found in the right-of-way, restrict clearing construction within 0.5 mile during wolf mating, denning, and rearing periods, from February 1 to July 30. Timing restrictions may be lifted after April 30 if the den is determined to be unoccupied.
W6	Inform all construction personnel concerning laws restricting the use of aircraft, especially helicopters, for hunting and harassment of wildlife.
W7	Do not allow hunting activities by construction crews while they are using project housing, vehicles, or other project-related transportation.
W8	Follow USFWS recommendations for transmission conductor separation and height to prevent eagle electrocutions.
W9	Inform contract personnel and other persons in the area that bald eagles could potentially be present and that they are protected by law. Instruct all personnel about the proper procedures for reporting suspected sightings or signs of threatened, endangered or sensitive plant and animal species.
W10	Conduct goshawk surveys on route if not conducted previously. Follow the Tongass National Forest Project-level Goshawk Inventory Protocol (Stangl 2009), if required. If a goshawk nest is discovered, it shall be reported to the Forest Service, and current Forest Plan direction will be followed to ensure protection of the nest and surrounding area.
W11	The timing of geophysical surveys and the installation of a cable either through an HDD bore or buried cable approach would be conducted during the winter months (late October through March) when humpback whales are less likely to be in the area.
W12	Limit project-related boat traffic and aircraft flights if humpback whales or Steller sea lions are observed migrating through or near the Project Area. Humpback whales will not be approached within 100 yards by boats less than 100 feet in length or within 0.25 mile by boats over 100 feet in length. As safety allows, avoid aircraft flights below 1,000 feet above sea level within 0.3 mile of a whale. Hauled out marine mammals will not be approached by boat within 100 yards. Sightings of humpback whales or Steller sea lions will be recorded and submitted to the Forest Service.
W13	All onsite vessel operations along the cable alignment will be conducted at speeds of 10 knots or less.
W14	Dynamic Positioning (DP) will not be used during cable installation if other methods are possible to reduce noise propagation in the marine environment. If the use of DP cannot be avoided, the applicant shall reduce the DP thruster to 50 percent power or less as feasible during cable-laying operations.
W15	A 500-meter marine mammal exclusion zone will be established if bubble pulser and airgun operation cannot be avoided. If bubble pulser or airgun operation occurs, the ramp-up, power down, and shutdown procedures identified in NOAA Fisheries' January 4, 2016 concurrence letter will be followed. If bubble pulser or airgun operation occurs, a trained marine mammal observer will be present on the vessel during related in-water activities to ensure the ramp-up, power down, and shutdown procedures are followed and record all marine mammal sightings within the exclusion zone.
W16	Noise from any above ground drilling activities would be mitigated (sound panels/screening) as necessary to maintain daytime and nighttime levels required by City and Borough Ordinances.

Table 2-3. Site-specific Mitigation Measures for Clearing and Construction-related Activities (continued)

Mitigation Measure	Description
Visual Resources	
V1	Use non-reflective and non-refractive insulators if glass is not required for safety and reliability; and use non-specular conductors.
V2	At the time of delivery, inspect all line construction materials (poles and other structure elements, insulators, and conductors) for conformance with specifications related to color and reflectivity.
V3	In key viewshed areas, to the extent possible, feather visible right-of-way cuts by leaving the smaller vegetation and narrow the right-of-way near the structures.
V4	Develop and apply measures to restore and revegetate LTF sites and staging areas if using areas that are not already disturbed.
V5	Helipads and other structures will be painted to blend in with the surrounding environment. Paint colors will be approved by the Forest Service.
Recreation	
R1	Keep all permitted outfitters/guides in the area informed of construction schedule. Provide advance notice to allow outfitters/guides to plan trips around construction activities.
Cultural Resources	
C1	Avoid right-of-way clearing and construction of transmission line structures at known cultural sites where practicable. If avoidance of cultural sites is not feasible or practicable, project applicant's cultural resource contractor will develop a data recovery plan to mitigate the effects on those sites in accordance with Forest Service guidelines and involve the State of Alaska and the appropriate Native tribes.
C2	Exposure of previously unknown cultural properties during construction will be reported by the project environmental compliance monitor to the project applicant's cultural resource contractor and the Forest Service. The cultural resource contractor in consultation with the Forest Service archaeologist will determine if it is appropriate for the unknown properties to be recorded and evaluated for National Register eligibility.
Site-Specific Rerouting Considerations	
S1	During final design, field check locations that have specific resource concerns and make minor adjustments to routes or structure placement where practicable if it would result in a reduction of environmental impacts.

Best Management Practices

The following BMPs would be employed to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during the construction and maintenance of powerlines and transmission facilities (Fac-9, USDA Forest Service 2012a):

- Limit corridor disturbance, particularly in or near riparian areas, surface waters, shallow groundwater, unstable areas, hydric soils, or wetlands.
- Consider temporary road location and standards for shovel trail and access spurs, type of construction equipment (wheeled, tracked, and helicopter), size and location of footings and guy anchors, and revegetation requirements during project design.
- Use applicable R10 and National Core BMPs for Mechanical Vegetation Management Activities when using mechanical treatments to remove or manage vegetation from the project corridor.
- Aggressively address unauthorized uses of the corridor, such as motorized vehicle use, that are exposing soils, increasing erosion, or damaging the facilities.

Apply measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments (Veg-2, USDA Forest Service 2012a):

- Establish designated areas for equipment staging, stockpiling materials, and parking to minimize the area of ground disturbance (Fac-2, USDA Forest Service 2012a).
- Locate landings, skid trails, and slash piles in suitable sites to avoid, minimize, or mitigate potential for erosion and sediment delivery to nearby waterbodies.
- Develop an erosion control and sediment plan that covers all areas disturbed during transmission line construction
- Apply soil protective cover on disturbed areas where natural revegetation is inadequate to prevent accelerated erosion before the next growing season.
- Divert surface runoff around bare areas with appropriate energy dissipation and sediment filters.
- Use suitable species and establishment techniques to cover or revegetate disturbed areas in compliance with local direction and requirements per FSM 2070 and FSM 2900 for vegetation ecology and prevention and control of invasive species
- Install sediment and stormwater controls before initiating surface-disturbing activities to the extent practicable.
- Operate equipment when soil compaction, displacement, erosion, and sediment runoff would be minimized.
- Avoid ground equipment operations on unstable, wet, or easily compacted soils and on steep slopes unless operation can be conducted without causing excessive rutting, soil puddling, or runoff of sediments directly into waterbodies.
- Routinely inspect disturbed areas to verify that erosion and stormwater controls are implemented and functioning as designed and are suitably maintained.
- Maintain erosion and stormwater controls as necessary to ensure proper and effective functioning.
- Implement mechanical treatments on the contour of sloping ground to avoid or minimize water concentration and subsequent accelerated erosion.

Apply applicable measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies (Veg-3, USDA Forest Service 2012a):

- Use ground-based yarding systems only where physical site characteristics are suitable to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.
- Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable. Provide breaks in grade and avoid long runs on steep slopes concentrating runoff.
- Use suitable measures during felling and skidding operations to avoid or minimize disturbance to soils and waterbodies to the extent practicable.
- Perform skidding or yarding operations when soil conditions are such that soil compaction, displacement, and erosion would be minimized.
- Directionally fell trees to facilitate efficient removal along predetermined yarding patterns with the least number of passes and least amount of disturbed area (e.g., felling-to-the-lead).
- Use low ground pressure equipment when practicable, particularly on equipment traveling over large portions of units with sensitive soils or site conditions.
- Use suitable measures to stabilize and restore skid trails after use and promote rapid revegetation.

- Use cable or aerial yarding systems on steep slopes where ground-based equipment cannot operate without causing unacceptable ground disturbance (Veg-5, USDA Forest Service 2012a).
- Locate cable corridors to efficiently yard materials with the least soil damage (Veg-5, USDA Forest Service 2012a).
- Use suitable measures to minimize soil disturbance when yarding over breaks in slope (Veg-5, USDA Forest Service 2012a).
- Locate landings to minimize the number of required skid roads and minimize the size and number of landings as practicable to accommodate safe, economical, and efficient operations (Veg-6, USDA Forest Service 2012a).
- Establish and maintain construction area limits to the minimum area necessary for completing the project and confine disturbance to within this area (Fac-2, USDA Forest Service 2012a).
- Develop and implement an erosion control and sediment plan that covers all disturbed areas, including borrow, stockpile, fueling, and staging areas used during construction activities (Fac-2, USDA Forest Service 2012a).
- Apply soil protective cover on disturbed areas where natural revegetation is inadequate to prevent accelerated erosion during construction or before the next growing season. (Fac-2, Veg-2; USDA Forest Service 2012a).
- Develop and implement a post-construction site vegetation plan using suitable species and establishment techniques to revegetate the site (Fac-2, USDA Forest Service 2012a).
- Install sediment and stormwater controls before initiating surface-disturbing activities to the extent practicable (Fac-2, USDA Forest Service 2012a).
- Limit the amount of exposed or disturbed soil at any one time to the minimum necessary to complete construction operations (Fac-2, USDA Forest Service 2012a).
- Limit operation of equipment when ground conditions could result in excessive rutting, soil puddling, or runoff of sediments directly into waterbodies (Fac-2, USDA Forest Service 2012a).
- Proposed shovel yarding on slopes greater than 35 percent should undergo interdisciplinary review before being approved. Areas with broken, uneven topography, or an area dissected by numerous incised drainages may not be suitable for shovel yarding. Harvesting in areas with hydric soils will be limited to areas with slopes *less than* 25 percent (R10 BMP 13.9, USDA Forest Service 2006).
- Areas with broken, uneven topography, or an area dissected by numerous incised drainages may not be suitable for shovel yarding (R10 BMP 13.9, USDA Forest Service 2006).
- On sites having soils with low bearing strength, tracks need to be supported by logging slash, shrubs, other woody material, or pads to prevent rutting. This mattress material should be removed where necessary to restore the natural drainage pattern (R10 BMP 13.9, USDA Forest Service 2006).
- Live streams will not be crossed without the use of a temporary structure, such as a log mat (R10 BMP 13.9, USDA Forest Service 2006).
- Temporary spur roads for shovel access should be minimized and/or obliterated after use (R10 BMP 13.9, USDA Forest Service 2006).
- The number of turns on shovel trails should be limited, depending on soil type and vegetative cover. Wide arc turns can reduce soil disturbance on shovel trails (R10 BMP 13.9, USDA Forest Service 2006).
- Minimize clearing in areas with high or very high mass movement potential.

- Required split yarding and directional felling along all streams that cannot be avoided or spanned (R10 BMPs 12.7 and 13.16, USDA Forest Service 2006).
- Span, without clearing, steep v-notch streams with high erosion potential.

Monitoring

Implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. The Forest Service preparation of the special use permit for this project will incorporate an interdisciplinary review to ensure that all mitigation measures are included in the permit. Periodic interdisciplinary review of design plans and documents will also ensure that mitigation is implemented as intended on a site-specific basis. Forest Service permit administration, including field inspections and inspection documents, will ensure that mitigation is applied as intended during right of way clearing, powerline construction, operation, and maintenance activities.

The Forest Service will work with the project applicant to develop a clearing and construction plan; part of that plan will include implementation monitoring. The project administrators ensure that mitigation measures are incorporated into permit documents and then monitor performance relative to permit requirements. The project applicant will be required to have a third-party Environmental Monitor on-site during the clearing and construction period. The Environmental Monitor will be approved by the Forest Service. The Environmental Monitor will ensure that the terms and conditions in the permit are followed during clearing and construction-related activities. One of the Environmental Monitor's duties will be to train and work with the construction contractor's personnel (both management and labor) to ensure that they understand and follow the environmental requirements.

Comparison of Alternatives

This section compares outputs and environmental effects of the alternatives for the resources analyzed. The effects are summarized from Chapter 3, which should be consulted for a full understanding of these and other environmental consequences. Table 2-4 provides a comparison of alternatives relative to the issues and resources analyzed.

Table 2-4. Comparison of Environmental Effects by Alternatives

	Alternative			
Unit of Measure	**1 - No Action**	**2 – Proposed Action**	**3 – Northern Route with Submarine Cable**	**4 – Center-South Route**
Soils and Geology				
New Detrimental Soil Disturbance:				
On NFS Lands (acres)	0	110	110	89
Cumulative Detrimental Soil Disturbance (acres)				
On NFS Lands (acres)	0	159	159	170
Aquatic Resources				
Subwatersheds with more than 20% of Basin Area Harvested Since 1984 (number)[1/]	0	0	0	0
Number of Proposed Stream Crossings by Shovel Trail/Matting Panel:				
- Class I	0	10	10	28
- Class II	0	20	20	14
- Class III	0	16	16	4

Table 2-4. Comparison of Environmental Effects by Alternatives (continued)

	Alternative			
Unit of Measure	**1 - No Action**	**2 – Proposed Action**	**3 – Northern Route with Submarine Cable**	**4 – Center-South Route**
Number of Proposed Stream Crossings by Temporary Access Spur:				
- Class I	0	6	6	0
- Class II	0	5	5	6
- Class III	0	0	0	1
Timber				
Total Productive Forest Land Disturbed (acres)	0	358	358	496
Total Suitable Forest Land Disturbed (acres)[2/]	0	135	135	253
Removal of Timber from the Regional Timber Base (Net Sawlog Volume) (MBF)	0	1,524	1,524	1,693
Botany - Rare Plants				
Sensitive Plants with Potential to Occur (risk): [3/]				
- Large yellow lady's slipper orchid	0	Low to Moderate	Low to Moderate	Low to Moderate
- *Lobaria amplissima*	0	Low to Moderate	Low to Moderate	Low to Moderate
- Alaska rein orchid[/]	0	Low to Moderate	Low to Moderate	Low to Moderate
- Lesser round-leaved orchid	0	Low to Moderate	Low to Moderate	Low to Moderate
Invasive Plants				
Total Acres Disturbed	0	891	873	739
Risk of Spread (Relative)[4/]	0	Highest	Second Highest	Lowest
Wetlands				
Project-Related Disturbance to Wetlands (acres):				
- Forested Wetlands	0	166	157	106
- Emergent Short-sedge Wetlands	0	4	4	4
- Moss Muskegs	0	95	93	67
- Forested Wetland/Emergent Sedge Complex	0	238	238	116
Total Wetland Disturbance (acres)[5/]	0	502	491	293
Wildlife and Subsistence				
Impacts to Total POG (acres)	0	327	324	296
Impacts to High-Volume POG (acres)	0	99	97	51
Impacts to Large-Tree POG (acres)	0	12	12	3
POG affected within Beach Fringe and Riparian Buffers (acres)	0	182	178	130
Impacts to Deep Snow Winter Range for Deer (acres)	0	15	10	7
Deer Habitat Capability as Percent of 1954 Values	0	84	83	83
Transportation				
Total Unroaded Length (miles)	0	23.6	23.6	13.8
- Length of Shovel Trails (miles)	0	21.6	21.6	6.5
- Length of Temporary Matting (miles)	0	2.0	2.0	7.3
Length of Temporary Access Spurs (miles)	0	7.6	7.6	6.2
Number of Helicopter Pads	0	83	83	47
Scenery				
Total Disturbance (acres) in:				
- Distinctive Scenic Attractiveness Class	0	0	0	0
- Foreground Distance Zone	0	325	307	132

Table 2-4. Comparison of Environmental Effects by Alternatives (continued)

Unit of Measure	Alternative: 1 - No Action	2 – Proposed Action	3 – Northern Route with Submarine Cable	4 – Center-South Route
- Areas with Very High Existing Scenic Integrity	0	309	309	222
Recreation				
Net change from SPNM, SPM, or RN ROS settings to RM (acres)	0	417	417	241
Inventoried Roadless Areas				
Total Disturbance by IRA (acres):				
- North Kupreanof (211)	0	157.3	157.3	0
- Missionary (212)	0	5.2	5.2	0
- Five Mile (213)	0	233.8	233.8	0
- South Kupreanof (214)	0	0	0	279.1
- Total IRA Disturbance	0	396.3	396.3	279.1
Cultural Resources				
Effects on NRHP Eligible Cultural Resource Sites	None	None	None	None

Notes:
MBF = thousand board feet
POG = Productive Old-Growth
ROS = Recreation Opportunity Spectrum; SPNM = Semi-Primitive Non-Motorized; SPM = Semi-Primitive Motorized; RN = Roaded Natural; RM = Roaded Modified
NRHP = National Register of Historic Places

1/ Estimates since 1984 include estimated disturbance by alternative.
2/ Totals include both old-growth and young-growth suitable forest land.
3/ A low to moderate rating here means that the action alternatives may adversely impact individuals, but are not likely to result in a loss of viability of these plant species in the analysis area, nor cause a trend toward federal listing. None of the alternatives would have direct or indirect effects on known populations of sensitive plant species. This rating is based on potential effects to undetected populations and potential habitat.
4/ Risk of invasive plant spread is directly related to total acres disturbed, which is reflected in the relative ranking in this table.
5/ Project disturbance totals include potential right-of way clearing. Totals may not sum due to rounding.

Chapter 3

ENVIRONMENT AND EFFECTS

CHAPTER 3 – ENVIRONMENT AND EFFECTS

Introduction

This chapter describes the existing environment for the KPI Project and evaluates the potential environmental effects of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. Following each resource description is a discussion of the potential environmental effects 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; qualitative discussions are also included. The means by which potential adverse effects would be reduced or mitigated are also described.

The discussions of resources and potential effects include existing information documented in the 2008 Tongass Land and Resource Management Plan (Forest Plan) Final EIS (USDA Forest Service 2008c), other project EISs, project-specific resource reports, the results of field investigations, and other sources, as indicated.

Land Divisions

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

Project Area

The KPI project area consists of 18 VCUs (see below). This area encompasses a total of 493,806 acres, including 39,826 acres of non-National Forest System (NFS) land (see Figures 1-1 and 1-2 in Chapter 1).

Value Comparison Units

VCUs are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow major watershed divides. The KPI project area includes 18 VCUs (see Figure 1-2).

Game Management Units

Game management units (GMUs) are geographical areas defined by the Alaska Department of Fish and Game (ADF&G) to manage wildlife populations. Legal hunting and trapping regulations govern each unit. There are 26 GMUs in the State of Alaska, 5 of which are in Southeast Alaska. Kupreanof and Mitkof Islands are located within GMU 3.

Wildlife Analysis Areas

ADF&G subdivides GMUs into Wildlife Analysis Areas (WAAs), which are areas used by ADF&G to manage wildlife at a finer scale than the GMU. The proposed action alternatives cross a total of nine WAAs (2007, 5130, 5131, 5132, 5133, 5135, 5136, 5137, and 5138) that encompass approximately 731,000 acres. Information compiled by WAA is used in the wildlife and subsistence analyses.

Watershed and Subwatershed

The term 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. To simplify characterization of the hydrologic systems involved, as well as the evaluation process, this section uses the drainage basin-scale definitions provided by the U.S. Geological Survey (USGS) in their National Water Inventory System (USGS 2011). This inventory system applies a hierarchical identification number termed the Hydrologic Unit Code (HUC). These codes identify specific watersheds first at the regional level (multiple, major river basins) and progressing to the smallest, local level (drainage areas less than 100 square miles). The proposed Project evaluation methods use the USGS drainage basin delineations at the sixth level (or field), and generally use the term "subwatershed" to refer to the finer level (sixth-field), which is the smallest delineation provided by the USGS HUC system. There are a total of 20 subwatersheds with at least a portion of their drainage within the project area boundary. Information compiled by subwatershed is used in the Aquatic Resources analysis.

Inventoried Roadless Areas

IRAs are undeveloped areas that typically exceed 5,000 acres, meet the minimum criteria for wilderness consideration under the Wilderness Act, and were initially inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE II) process, subsequent assessments, or Forest planning. Many IRAs have been modified since the initial RARE II inventory due to road construction and timber harvest. The inventory used for this project is the 2001 Roadless Rule inventory. The boundaries of the IRAs in this inventory are identified in the set of IRA maps contained in the Forest Service Roadless Area Conservation, Final EIS Volume 2 dated November 2000 (USDA Forest Service 2000). The KPI project area includes parts or all of four IRAs. Parts of the North Kupreanof (#211), Missionary (#212), and South Kupreanof (#214) IRAs and all of the Five Mile (#213) IRA are located within the project area (see Figure 1-3 in Chapter 1).

Biogeographic Province

The biogeographic province designation refers to 21 ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiogeographic, and biogeographic features (see the map in the Forest Plan Final EIS, USDA Forest Service 2008c, p. 3-132). 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. The KPI project area is located in the Kupreanof/Mitkof Islands Biogeographic Province.

Analyzing Effects

Each resource analysis includes an *Environmental Consequences* subsection that assesses the effects of implementing the proposed alternatives on the physical, biological, social, and economic environment. The CEQ regulations implementing NEPA include the following specific categories for use in the analysis of environmental consequences.

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 actions.

In the *Environmental Consequences* subsections, the direct and indirect effects are presented first, followed by cumulative effects. The analysis area used to assess direct and indirect effects varies by resource and is described at the beginning of each resource-specific section. For the purpose of evaluating cumulative effects, the IDT for this proposed project typically considered all lands in the project area. For some resources, a reduced or expanded boundary was evaluated. The cumulative effects analysis area for each resource is described in the appropriate section later in this chapter.

Under CEQ regulations and for the purposes of this analysis, “impacts” and “effects” are synonymous and are interchangeable.

Past, Present, and Reasonably Foreseeable Projects

Past Projects

Past projects considered in cumulative effects analysis are generally physically located on the landscape. The impacts of past projects combined with the natural environment, represent the affected environment that is described for each resource in this chapter. Past projects in the KPI project area include timber harvest (including the recently completed Tonka Timber Sale), thinning of harvested stands, recreation developments, road construction and LTF construction, housing and building development in Petersburg and Kake, and dispersed private lands; and highway construction.

Present and Reasonably Foreseeable Projects

The following actions are either presently underway or considered reasonably foreseeable, and are combined with past actions considered in the cumulative effects analysis. These actions include timber harvesting, young-growth treatments on NFS lands, road activities, including the proposed Kake road project, and ongoing or proposed restoration activities. The level of cumulative effects that may occur in the future due to these activities will depend on the rate at which new projects are implemented and the rate at which disturbances from past and present activities recover. Furthermore, if and when these reasonably foreseeable projects are implemented is heavily dependent on future levels of available funding.

Timber Harvest on NFS Lands

There are multiple timber harvest projects proposed or approved on NFS lands within the VCUs crossed by the KPI Project (USDA Forest Service 2013a). Table 3-1 lists projects identified in the Tongass National Forest Five Year Timber Sale Schedule and Contract Plan that are located in the KPI project area. These projects range in size from 0.3 and 0.5 million board feet (MMBF) for small sales to 30 MMBF for the Portage Bay Timber Sale, which is partially located in the KPI project area.

The selected alternative for the Central Kupreanof EIS would harvest 26.3 MMBF from 1,329 acres of proposed harvest units in VCUs 4260, 4271, and 4290, which are all part of the KPI project area (USDA Forest Service 2011b). These units are mostly unharvested, with one small sale harvested to date and another small sale (0.3 MMBF) scheduled to be offered for sale in 2014 (Table 3-1). The remaining volume is not included in the current Tongass National Forest Five Year Timber Sale Schedule and Contract Plan, but a portion of, or all of the timber, could be made offered for sale as market conditions change.

Two other timber sale projects not included in the current Five Year Schedule have units in the KPI Project Area: Bocephus and Scott Peak. The Bocephus units consist of approximately 352 acres in VCUs 4240, 4420, and 4430, which are all part of the KPI project area. The Bocephus units are some of the last remaining units from the Bohemia EIS. Located in the North Kupreanof IRA, these units are presently unavailable for harvest. The Scott Peak timber sale consists of 356 acres located in VCU 4440, which is part of the KPI project area. These units are currently unavailable for harvest due to litigation.

Table 3-1. Timber Harvest Projects within the VCUs Crossed by the KPI Project

Fiscal Year	Decision Document Name	Timber Sale Name	Estimated Sale Volume (MMBF)[1/]	Affected VCU in KPI Project Area	Route Corridor[2/]
2014	Portage Bay	Portage Bay[3/]	30.0	4440	Northern
2014	Mitkof EA	Mitkof Heli	10.0	4470	Northern and Center-South
2014	Lindenberg EIS	Unit 46 Small Sale	0.6	4370	Center-South
2014	Central Kupreanof EIS	Kake Small Sales	0.3	4290, 4380, 4260[4/]	Northern and Center-South
2014	Mitkof EA	Small Sales[5/]	1.0	4470	Northern and Center-South
2015	Mitkof EA	Small Sales[5/]	0.5	4470	Northern and Center-South
2016	Mitkof EA	Small Sales[5/]	0.5	4470	Northern and Center-South
2017	Mitkof EA	Small Sales[5/]	0.5	4470	Northern and Center-South
2018	Mitkof EA	Small Sales[5/]	0.5	4470	Northern and Center-South

Notes:
1/ Estimated volume consists of old-growth saw and utility logs.
2/ Alternatives 2 and 3 follow the Northern Route corridor; Alternative 4 follows the Center-South Route corridor.
3/ The Portage Bay timber sale has an estimated sale volume of 30 MMBF spread over two VCUs: 4430 and 4440. Only 4440 is part of the KPI Project Area.
4/ The selected alternative for the Central Kupreanof EIS would harvest 26.3 MMBF from 1,329 acres of proposed harvest units spread over three VCUs (USDA Forest Service 2011b). The identified small sale would be located in one of these VCUs.
5/ Includes microsales and fuelwood.
Source: USDA Forest Service 2013a

A total of 2.7 acres of the identified units within the KPI project area coincide with the proposed disturbance footprint for Alternatives 2 and 3. These units are located along FR 6319 and part of the Scott Peak timber sale, which is currently in litigation. A total of 16.9 acres of the identified units in the KPI project area coincide with the disturbance footprint for Alternative 4. This total consists of units from the Central Kupreanof project that are located along FR 6314. These units are not currently part of the Tongass National Forest Five Year Timber Sale Schedule and Contract Plan.

Free Use timber harvest is also expected to occur within the general area. Free use harvesting can be up to 10 thousand board feet (MBF) per person per year. Individuals must submit a Free Use Permit Application to the Forest Service prior to free use timber harvesting. Selected trees must also be evaluated and approved by the Forest Service prior to their removal. Free use removal is expected to have similar effects as micro-sales, although this type of removal may include more live standing trees.

Young-Growth Treatments on NFS Lands

Pre-commercial thinning of even-age young-growth stands will occur within the VCUs crossed by the KPI Project in the future (USDA Forest Service 2013b). Currently, there are three thinning projects proposed within the VCUs crossed by the KPI Project: the Kake, Portage Bay, and Tonka thinning projects. The Kake project is scheduled to be implemented in 2018 and expected to treat about 318 acres in VCUs 4250, 4271, and 4290 (all three of which are crossed by both the Northern Route and the Center-South Route corridors [Alternatives 2, 3, and 4]). The Portage Bay project, which is also scheduled to be implemented in 2018, would treat about 873 acres in VCUs 4420, 4430, and 4440; two of these VCUs (4420 and 4440) would be crossed by Alternatives 2 and 3. The Tonka thinning project is scheduled to be implemented in 2016 and would impact about 1,050 acres in VCU 4370 and 4390; VCU 4370 would be crossed by the Center-South Alternative. The Tonka project has undergone NEPA review; the Kake and Portage Bay projects have not yet undergone NEPA review.

Road Activities on NFS Lands

Ongoing road maintenance will continue throughout the VCUs crossed by the proposed KPI alternatives as funding becomes available. These activities could include road grading, drainage structure replacement, decommissioning of unauthorized roads, and other ground-disturbing activities that will cause short-term sediment increases. All road maintenance activities would be required to implement Forest Plan Standards and Guidelines, including R10 and National Core BMPs to ensure water quality standards are achieved.

The Petersburg Ranger District completed their Access and Travel Management (ATM) Plan in 2009 (USDA Forest Service 2009a, 2009b). The ATM provides direction and requirements for road storage, decommissioning, motorized trail development, and other roadwork, which would be implemented in the foreseeable future based on the availability of funding. The maintenance and reconditioning of NFS roads in the project area may occur before, during, and after the KPI Project analysis. This work is done through separate service contracts to reduce the backlog of deferred maintenance, recondition roads to comply with R10 and National Core BMPs, and maintain the existing infrastructure for National Forest Management activities.

Kake Road Project

As discussed in Chapter 1 of this EIS in the section entitled *Relationship to the Kake Access Project*, the KAP was cancelled in February 2016, with FHWA subsequently publishing a Notice to rescind the NOI for the KAP in the Federal Register on April 7, 2016 (Volume 81, Number 71). ADOT&PF has indicated that they plan to provide road access to Kake following the State's 300-foot-wide right-of-way easement from Kake to Petersburg (ADOT&PF 2016). In a letter dated May 16, 2016, ADOT&PF stated that "[u]nder the authorities of Section 4407 of Public Law 109-59 and the subsequent Memorandum of Understanding (MOU) dated September 29, 2006 between the State of Alaska and the Forest Service, the ADOT&PF has received a "D-1" planning easement from the Forest Service. This easement is for the planning and engineering of a proposed road and utility corridor connecting Kake and Petersburg. ... ADOT&PF is currently in the planning stages of designing a road alignment along this corridor. … It is anticipated that much of the final roadway will be aligned in substantial proximity to existing logging road centerlines, when available." The Forest Service believes that a Kake road project along this easement is reasonably foreseeable for the purposes of the cumulative effects analysis for KPI.

The cumulative effects analysis for the Kake road project is based on the following assumptions developed in consultation with ADOT&PF:

- A proposed road will follow the centerline of the state easement.
- The road base is assumed to be 24 feet wide, with total right-of-way clearing of 48 feet, 24 feet either side of the centerline.
- The Kake road project is currently in the planning stage. While it is reasonable to assume that rock sources would be required, the road has not been designed and ADOT&PF has not identified potential sources or possible rock pit locations. As a result, it is not possible to assess the potential cumulative impacts of rock pits for the Kake road project. However, assuming that rock pits for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, the result would be up to 50 acres of rock pit-related disturbance.
- Potential impacts outside areas surveyed as part of the KPI Project are evaluated using existing Forest Service GIS information.
- For Alternatives 2 and 3, the cumulative effects of the two projects—KPI and the Kake road project—are estimated based on the combined disturbance footprint: the KPI disturbance area

plus additional areas where the Kake road centerline deviates from the 300-foot-wide KPI corridor.

- For Alternative 4, the cumulative effects of the two projects – KPI and the Kake road project – are estimated based on the combined disturbance footprint: the KPI disturbance area for Alternative 4 plus disturbance along the state road easement where the Kake road centerline deviates from existing roads. This assumes that the roads will follow existing roads where they are available. Improvements would likely be required to some of these existing roads as part of the Kake road project, but in the absence of a road design or related analysis it is not possible to identify where this would occur. Potential impacts from improvements to existing roads are, therefore, discussed qualitatively where appropriate.

Restoration Activities in the Project Area

In addition to the road maintenance activities described above, ongoing restoration and habitat improvement projects are proposed within the vicinity of the KPI Project alternatives. These projects include wildlife habitat restoration projects (e.g., young-growth thinning projects to improve deer habitat) (USDA Forest Service 2013c).

Wildlife habitat improvement projects located within the VCUs crossed by the KPI Project include the Mitkof, Tonka, and Central Kupreanof restoration projects. The Mitkof project would restore/treat about 300 acres of young-growth forests within VCUs that would be crossed by the Northern and Center-South Alternatives (implementation is expected to occur in 2014). The Tonka project would restore/treat about 90 acres in 2015 and 284 acres in 2016 (both within VCUs that would be crossed by the Center-South Alternative). The Central Kupreanof Stewardship Implementation Wildlife Vegetation Improvement Project would restore/treat about 104 acres within VCUs that would be crossed by both Northern Alternatives.

Incomplete and Unavailable Information

Much of the Tongass National Forest resource data resides in an electronic database formatted for GIS. The Forest uses GIS software to assist in the analyses of these data. GIS data are available in tabular (numerical) and map formats. For this EIS, 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 science concerning the ecology, inventory, and management of a large forest area is complex and developing. The biology of wildlife species prompts questions about population dynamics and habitat relationships. 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

The primary social and economic area of influence for the KPI Project includes those communities located in close proximity to the project area and communities whose residents use the project area for subsistence, recreation, and other activities. The communities that fall into these categories are Kake, Petersburg, and Kupreanof. Unless otherwise noted, most of the information presented in the following community profiles is from the Alaska Department of Commerce Community and Economic Development's (ADCCED) Alaska Community Database (ADCCED 2013), the 2008 Forest Plan EIS (USDA Forest Service 2008c), and the NOAA Alaska Fisheries Science Center's (AFSC) Community Profiles for North Pacific Fisheries – Alaska (AFSC 2013).

Kake

The city of Kake is located on west Kupreanof Island, along Keku Strait, 38 air miles northwest of Petersburg. Tlingit Alaska Natives villages and fishing camps in the Kake area pre-date non-Alaska Native explorations of Southeast Alaska. Historically, Tlingit people of the Kake (Keex) Kwaan[1] claimed 2,003,000 acres of territory, including the upper halves of Kuiu, Kupreanof, and Mitkof Island, the eastern shore of Baranof Island and the southern shore of Admiralty Island. The arrival of early European explorers and traders resulted in occasional confrontations between Native Tlingits and foreigners. Escalating tensions led to the U.S. Navy shelling several Kake villages and destroying their homes, boats, and stored foods. The inhabitants of multiple villages subsequently consolidated at the current site of Kake, with further consolidation of Kake villages taking place in the 1880s. A government school and store and Society of Friends mission were established in Kake in 1891. A post office followed in 1904 and the first cannery was built near Kake in 1912. Today, Kake remains a primarily Tlingit village with a fishing, logging, and subsistence lifestyle. Traditional customs are important to the Kake people. The world's largest totem pole stands on a bluff overlooking town (AFSC 2013). Kake is a First Class City and is not located in an organized borough.

Kake had a total estimated population of 598 in 2012, approximately 112 or 16 percent fewer residents than 12 years earlier in 2000 (Alaska DOL 2013a, 2013b). More than two-thirds (68 percent) of the population in Kake identified as Alaska Native in the 2010 Census, with just 17 percent identifying as White (U.S. Census Bureau 2011a).

Kake's economy has been traditionally based on forest and fisheries resources and subsistence activities. According to a survey conducted by the AFSC in 2011, community leaders indicated that this continues to be the case with the current economy dependent on logging, fishing, ecotourism, and sport hunting and fishing. Subsistence remains an essential part of the local way of life, with deer, halibut, salmon, and black sea weed identified as the most important subsistence resources (AFSC 2013). Shellfish, bear, waterfowl, and berries are also important food sources. The city of Kake, school district, and Kake Tribal Corporation are the largest employers in the community.

In 2010, 45 Kake residents held commercial fishing permits and 36 residents held crew member licenses (Alaska Commercial Fisheries Entry Commission [ACFEC] 2011). Between 2000 and 2010, participation levels by Kake residents were highest in commercial salmon fisheries; participation levels were also relatively high in fisheries for halibut, groundfish, and crab. Community leaders indicated in a recent survey by AFSC that current challenges for Kake's fishing economy include high costs of electricity, fuel, and labor, and shipping constraints for delivering fresh products to market (AFSC 2013).

Petersburg

Petersburg is located on the northwest end of Mitkof Island, where the Wrangell Narrows meet Frederick Sound. Formerly the city of Petersburg, the community of Petersburg is now part of the larger Petersburg Borough, which includes the former city and the rest of Mitkof Island, part of Kupreanof Island, and the mainland coastline north to Endicott Arm. The city of Petersburg was dissolved in January 2013 and became part of the new home-rule Petersburg Borough at this time. Petersburg Borough is discussed further in the *Socioeconomics* section of this chapter. The following profile focuses on the community of Petersburg, rather than the larger Borough area.

[1] "Keex" in Tlingit is pronounced similar to "Kake" in English. "Kwaan" is a Tlingit socio-geographical term meaning "inhabitants of," literally a contraction of the Tlingit verb "to dwell." It is most commonly used to refer to a geographic region consisting of those areas controlled by clans or house groups residing in a single winter village or several closely situated winter villages (AFSC 2013).

Tlingit Indians from Kake historically used the north end of Mitkof Island as a summer fish camp, with some reportedly living year-round at the site. Petersburg was named after Norwegian immigrant Peter Buschmann, who arrived in the late 1890s. By 1900, he had built the Icy Strait Packing Company cannery, a sawmill, and a dock. The City incorporated in 1910, and by 1920, 600 people lived in Petersburg year-round. Alaska's first shrimp processor, Alaska Glacier Seafoods, was founded in Petersburg in 1916, and a cold storage plant was built in 1926.

Today, Petersburg is one of Alaska's major fishing communities. Petersburg has one of the largest home-based halibut fleets in Alaska, and is also well-known for shrimp, crab, salmon, herring, and other fish products. Subsistence remains an important part of the local way of life. The community maintains a mixture of Tlingit and Scandinavian history and is known as "Little Norway."

Petersburg had a total estimated population of 2,972 in 2012, approximately 252 or 8 percent fewer residents than 12 years earlier in 2000 (Alaska Department of Labor DOL 2013a, 2013b). According to the 2010 Census, the population of Petersburg was primarily White and accounted for 78 percent of the total population. Alaska Natives accounted for about 8 percent of the total population (U.S. Census Bureau 2011a).

Petersburg's economy has been historically based on commercial fishing and timber harvest. The city is one of the top-ranking ports in the U.S. based on the quality and value of fish landed. In 2010, 468 Petersburg residents held commercial fishing permits and 408 residents held crew member licenses (ACFEC 2011). Several processors operate cold storage, canneries, and custom packing services. Petersburg remains, to a lesser degree, a supply and service center for logging camps and smaller communities. Independent sportsmen and tourists utilize local charter boats, outfitter and guide trips, and lodges. There is no deep-water port to accommodate large cruise ships. Smaller cruise ships stop overnight in Petersburg. Activities pursued by cruise ship passengers include flight seeing via fixed-wing and helicopter, trips up Petersburg Creek (within the Petersburg Creek-Duncan Salt Chuck Wilderness) by boat, Norwegian dinner and dance performances, and shopping.

Kupreanof

The city of Kupreanof is located across the Wrangell Narrows from Petersburg, on the northeast shore of Kupreanof Island. Originally known as West Petersburg, the town was homesteaded around the turn of the century. In 1911, the Knudsen brothers established the first business in town, a small sawmill that produced barrels for salted fish. The Yukon Fur Farm was established in the early 1920s. The farm initially raised foxes, but soon shifted to mink and became the first mink farm in Alaska. During the 1920s, more than 100 people resided in West Petersburg, with residents operating a small store and a gaff hook factory. Businesses in the 1930s and 1940s included a small ship repair facility, an outboard motor shop, commercial logging, and a clam cannery.

Although the Knudsen Mill and Yukon Fur Farm continued to operate until the 1960s, the population fell during the 1950s, dropping from 60 in 1950 to 26 in 1960. The population has since remained stable. The community changed its name to Kupreanof when it incorporated as a second class city in 1975.

Kupreanof had a total estimated population of 34 in 2012, approximately 11 or 48 percent more residents than 12 years earlier in 2000 (Alaska DOL 2013a, 2013b). According to the 2010 Census, the population of Kupreanof was primarily White, with 24 of the 27 residents (89 percent) counted in the Census identified as White (U.S. Census Bureau 2011a).

Kupreanof is a small closely knit non-Native community. All of the homes are built on the waterfront; there are no roads. Residents use skiffs to travel to Petersburg for schooling, goods and services. The majority of Kupreanof's working residents are self-employed although some commute by boat to jobs in Petersburg. Subsistence and recreation uses of resources around Kupreanof supplement household incomes; deer, salmon, halibut, shrimp and crab are favorites. According to the ACFEC, no residents held commercial fishing permits in Kupreanof in 2010 (ACFEC 2011). Several residents in Kupreanof are believed to be commercial fishermen. However, permit counts provided by ACFEC are likely based on mailing addresses, with any Kupreanof residents holding fishing permits included in the Petersburg totals.

Although located within the boundary for the recently formed Petersburg Borough, the city of Kupreanof continues to exist as a separate municipality (Miller 2012).[2] The City has no full-time staff, few services and no public utilities.

[2] http://juneauempire.com/local/2012-12-18/petersburg-borough-approved-voters

Soils and Geology

Introduction

The soils and geology section provides an assessment of the current condition of the project area and the potential effects of implementing the proposed action and the alternatives on these resources. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the project (i.e., the no action alternative).

Analysis Area

The analysis area for direct, indirect and cumulative effects to soils and geology is the disturbance footprint for each alternative. The following affected environment discussion presents separate discussions for each analysis area. Each analysis area is identified by its alternative numbers (e.g., the analysis area for Alternative 2 is identified as Analysis Area 2).

Potential direct and indirect effects to soils include temporary construction disturbance and other long-term soil disturbance that could result from construction and operation of the proposed transmission line and associated shovel trails and temporary access spurs. The unit of measure for the soil analysis is the number of acres of soil disturbance.

The spatial boundary for cumulative effects on soil resources is the analysis area. The temporal extent of effects to soil is decades or longer due to the length of time it takes for soils to recover and regenerate vegetative cover after clearing.

Methodology

The primary source for soil data used in this analysis is the Tongass National Forest Soil Inventory (Southeast Alaska GIS Library 2010). Potential effects associated with landslides, slopes greater than 72 percent, past harvest, and temporary shovel trail, matting panel, and temporary access spur-related disturbance were analyzed using GIS spatial data maintained by the Forest Service.

Soil Disturbance

Natural soil disturbances include areas where soil erosion has resulted from overland flow, stream bank erosion, windthrow, and colluvial activity. These areas are estimated to cover about 2 percent of the somewhat poorly drained, moderately well-drained, and well drained mineral soils (drainage class 3, 4, and 5) in each analysis area.

Soil disturbance from past log yarding activities is estimated on the Tongass National Forest by assuming that 3 percent of the soils in harvest areas have been disturbed as a result of these activities. This 3 percent estimate is based on soil disturbance monitoring that was conducted in the 1990s on Prince of Wales Island and in the Ketchikan area to determine the amount of detrimental soil condition that is incurred during harvest activities (Landwehr and Nowacki 1999). This monitoring indicated that average soil disturbance in harvest areas using ground-based yarding or partial suspension is 3 percent, and average soil disturbance in harvest areas using full suspension is 2 percent. Past harvest systems used in the analysis area are unknown and, as a result, the following analysis assumes an average of 3 percent disturbance to estimate cumulative detrimental soil conditions from past harvest.

Landslides

Forest Service landslide inventories are based on multiple sets of historic air photos. For this analysis, the highest elevation of each Forest Service GIS landslide polygon was identified as the initiation point.

While it is possible that headscarps may have migrated upslope, previous investigations in forests of Southeast Alaska indicate that most initiation zones have a well-defined headwall (Johnson et al. 2000). This method of identifying the initiation point from the highest elevation is a method that has been used by the Forest Service for other studies on the Tongass National Forest (Landwehr 1998).

Affected Environment

The KPI project area and the Soils and Geology analysis area are located on the Petersburg Ranger District on north Kupreanof and Mitkof Islands in Southeast Alaska. Within the project area, elevation ranges from sea level to about 1,100 feet. Annual precipitation ranges from about 106 inches with 97 inches of snow in Petersburg to 54 inches with 44 inches of snow in Kake (ADCCED 2012a).

Ecological Subsections

The ecological subsections located within the analysis area are the Wrangell Narrows Metasediments, Duncan Canal Till Lowlands, Sumner Strait Volcanics, and Kake Volcanics. Descriptions of these ecological subsections are included in the Soils and Geology Resource Report prepared for this project (Tetra Tech 2014a).

Geology

Geology of the KPI project area primarily consists of sedimentary and volcanic rocks, and metamorphosed and deformed equivalents of these strata, with a minor amount of plutonic rocks (Gehrels and Berg 1992). Heavy Pleistocene glaciations rounded the hills and mountains of sedimentary and volcanic rocks to gentle slopes in many places and carved out broad U-shaped valleys. Compact glacial tills and glaciomarine sediments remain along coastal lowlands.

Karst

Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and landforms that develop by the action of water on soluble rock (primarily limestone and marble (carbonates) in Southeast Alaska. The dissolution of the rock results in the development of internal drainage, producing sinking streams (streams that sink into the stream bed or karst features), closed depressions, sinkholes, collapsed channels, micro-relief karst features (e.g., karren), and caves.

The geology and climate of Southeast Alaska are particularly favorable for karst development. Extensive areas of very pure carbonate (greater than 95 percent calcium carbonate [$CaCO_3$]; Maas et al. 1992), approximately 537,588 acres (840 square miles), are found within the boundaries of the Tongass National Forest. This includes carbonate bedrock on private, state, and federal lands. Because of fractures in the carbonates, high annual precipitation, and peatlands adjacent to the carbonate bedrock, karst has developed, to varying extent, within all carbonate blocks. The Tongass National Forest contains the largest known concentration of limestone dissolution caves in Alaska.

According to the Forest Service karst GIS database, 2,685 acres of karst have been identified on Kupreanof Island. Less than 5 percent of these karsts (60 acres) exist within the three analysis areas. The acres that are within the analysis areas are located along the 6040 and 6040.1 roads on the west side of Kupreanof Island, near Hamilton Bay (Figure SOIL-1). These karst areas are considered low vulnerability karsts lands. Low vulnerability karst lands are those areas where resource damage threats associated with land management activities are not likely to be appreciably greater than those posed by similar activities on non-carbonate substrate.

Figure SOIL-1. Karst Rock Locations

Kake to Petersburg Transmission Line Intertie Project

Minerals

Volcanogenic massive sulfide deposits occur along both sides of Duncan Canal on Kupreanof Island (Still et al. 2002; Berg and Grybeck 1980). Review of the U.S. Geological Survey (USGS) database of descriptions of mines, prospects, and mineral occurrences in Alaska (USGS 2008) indicates that there were lode claims in the area in the 1970s. Volcanogenic massive sulfide deposits are also suspected near the headwaters of Big John Creek, near peak 1908 (Still et al. 2002) where load claims are known to have existed in the 1980s (Causey 2007). It is unknown if there are current mineral claims in the area; however, there is no plan of operations on file with Petersburg Ranger District, as would be required for active operations beyond minor prospecting.

Other mines, prospects, and mineral occurrences identified in or near the analysis area include a very low grade sedimentary uranium deposit occurring adjacent to the karst rock near Hamilton Bay; and a borrow pit about 0.5 mile south of the head of Portage Bay that contains metalliferous minerals (Causey 2007). Neither of these sites have been or are proposed to be developed for locatable mineral extraction.

There are no proposed mining operations in the area that would coincide with the KPI Project, and the proposed alternatives would not prevent mineral areas from being developed in the future. Therefore, mineral development is not addressed further in this report.

Acid Rock Drainage

As noted above, the KPI project area is known to include volcanogenic massive sulfide deposits on Kupreanof Island. Coldwell (2002) provided a map of the volcanogenic massive sulfide belt (see Appendix A of the Soils and Geology Resource Report prepared for this project). Volcanogenic massive sulfide deposits host metal- and sulfide-bearing minerals, such as pyrite. Exposure of sulfide minerals to oxidizing conditions (available water and oxygen) can result in acidic, sulfate-rich drainage (Skousen et al. 2000). The drainage quality is dependent on the ratio of acid-producing minerals (sulfides) to acid-neutralizing minerals (alkaline carbonates) contained in the host rock. In general, sulfide-rich and carbonate-poor materials pose a risk for generation of acidic drainage, commonly referred to as acid rock drainage (ARD) (Skousen et al. 2000).

Soils

Soil Drainage and Productivity

Soil nutrients tend to be confined to the upper soil horizons as suggested by the shallow rooting of vegetation and the lack of parent material influence on nutrient status in Southeast Alaska soils (Heilman and Gass 1972). In Southeast Alaska, well-drained soils tend to support highly productive timber stands while poorly drained soils support less productive timber and can be dominated by shrubs or wetland areas (USDA Forest Service 2001a). Five classes of soil drainage are found in the three analysis areas: well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. The drainage class is listed for each SMU as well as for each soil in each SMU in Appendix B to the Soils and Geology Resource Report prepared for this project (Tetra Tech 2014a).

The Region 10 (R10) Soil Quality Standards identify soil productivity as the inherent capacity of the soil to support the growth of specified plants, plant communities, or a sequence of plant communities (FSM 2500, R-10 Supplement 2500-2006-1). Several variables play a factor in forest productivity such as soil disturbance, soil depth, bedrock geology, surficial organic layers, hydrology, and slope (Banner et al. 2005). Better drained sites exhibit higher productivity (Banner et al. 2005). Soils are churned up when trees fall due to wind (windthrow), which allows water to percolate through the soil. As a result, productive forests thrive on wind-exposed sites (USDA Forest Service 1993). The most productive sites are well drained, and there are significant differences in productivity based on slope and soil drainage (Banner et al. 2005).

Site productivity and successional trends depend on organic matter dynamics, including rates of forest humus and peat accumulation (Banner et al 2005). Natural disturbance (such as landslides, windthrow, and fluvial activity) may slow down the rate of organic matter accumulation (Banner et al. 2005). The disturbance of soil accelerates the rate of decomposition of organic materials, churns up mineral soils to the surface, and keeps the soil from forming hardpan (Bormann et al. 1995). The organic matter would continue to build up without regular disturbance, causing the tree roots to be confined to the thick organic horizon, and eventually may result in lower site productivity (Banner et al. 2005).

Well-Drained and Moderately Well-Drained Soils

Well-drained and moderately well drained soils are at higher risk for surface erosion and mass wasting than the poorly drained and very poorly drained soils due to textural composition and landscape position (USDA Forest Service 1993). Well-drained soils have intermediate water holding capacity. The well-drained soils are generally classified as Spodosols, found on slopes, and promote productivity (USDA Forest Service 1993). Moderately well-drained soils are wet close enough to the surface or long enough that planting and harvesting operations may be adversely affected unless artificial drainage is provided. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the soil profile, additions of water by seepage, or some combination of these (USDA Forest Service 1993). Moderately well-drained soils tend to have high productivity similar to well-drained soils (USDA Forest Service 1993) and are found on moderate to steep slopes. An estimated 27 percent, 28 percent, and 44 percent of Analysis Areas 2, 3, and 4 contain well-drained soils, respectively (Tetra Tech 2014a).

Somewhat Poorly Drained, Poorly Drained, and Very Poorly Drained Soils

Somewhat poorly drained soils are soils that are wet close to the surface or for a long enough period of time that optimal upland vegetation growth is restricted. Somewhat poorly drained soils commonly have a combination of a layer with low hydraulic conductivity, a wet layer high in the soil profile, and/or additions of water through seepage (USDA Forest Service 1993). Somewhat poorly drained soils have moderate productivity capable of supporting upland and some wetland vegetation species. Somewhat poorly drained soils include the Mitkof soil series. An estimated 3 percent, 8 percent, and 7 percent of Analysis Areas 2, 3, and 4 contain somewhat poorly drained soils, respectively (Tetra Tech 2014a).

Poorly drained soils are commonly wet at or near the surface during a considerable part of the year. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these (NRCS 2010; USDA Forest Service 1993). Poorly drained soils tend to have moderate to low productivity capable of supporting forested wetland vegetation and are found on moderate to steep slopes (NRCS 2010; USDA Forest Service 1993). An estimated 20 percent, 17 percent, and 15 percent of Analysis Areas 2, 3, and 4 contain poorly drained soils, respectively (Tetra Tech 2014a).

Very poorly drained soils are completely saturated to the surface throughout most of the year and often for the entire year. These soils are often organic soils found in wetlands but can also be mineral soils in complex with organic soils that are shallow to bedrock on moderate to steep slopes. The majority of very poorly drained soils comprise organic soils. These soils typically have low productivity and support forested wetlands, emergent sedge, tall sedge, moss muskeg, and alpine muskeg (NRCS 2010). An estimated 48 percent, 47 percent, and 35 percent of Analysis Areas 2, 3, and 4 contain poorly drained soils, respectively (Tetra Tech 2014a).

Soil Disturbance

Surface Erosion

R10 standards and guidelines define erosion as the detachment and transport of individual soil particles or aggregates of particles by ice, wind, water, or gravity (FSM R-10 Supplement 2500-2005-1, effective May 5, 2006). Native soils are protected from surface erosion by an organic surface horizon and roots of vegetation. Mineral soils are susceptible to erosion when exposed. Soils with thinner organic mats are more easily disturbed than soils with thicker organic mats. The rate of erosion depends primarily on the amount and intensity of rainfall, vegetative ground cover, erodibility of the soil, slope length, and steepness of slope. Windthrow activities, soil creep, colluvial activity, areas of overland flow, and stream bank failures on steep V-notches are some of the chronic erosion features that are present naturally across the KPI project area. Vegetation clearing (such as timber harvest) and the use of shovel trails and temporary access spurs may increase the erosion rate by disturbing the organic mat or exposing mineral soil. Soil disturbances from naturally occurring events, such as windthrow, and management-related activities are discussed for each analysis area in the *Existing Soil Disturbances* subsection, below.

Soil Compaction

Compaction of mineral soils across much of Southeast Alaska is often limited due to soil saturation, high concentration of course fragments, course textured soils, and the high concentrations of organic matter present in the upper mineral soil horizons. Many soils have a thick organic surface horizon, and in some cases, soils are comprised entirely of poorly drained organic matter in various stages of decomposition. The high amounts of organic material present in mineral soil horizons, and in organic surfaces overlying mineral horizons, combined with in situ roots and slash, provide an adequate buffer against compaction on most soils. The organic surfaces, roots, and slash often act like a sponge that absorbs compacting forces and rebound after the force is removed.

R10 standards and guidelines define compaction as a decrease in porosity and increase in strength and bulk density as a result of weight and vibration (FSM R-10 Supplement 2500-2005-1, effective May 5, 2006). Increasing soil bulk density more than 15 percent over undisturbed levels is considered detrimental. Forest roads compact the soil, but in this case, compaction is desirable for the stability of the road. Past logging activities have not yielded increases in soil bulk density as long as they have followed R10 and National Core BMPs.

Existing Soil Disturbance on NFS Lands

The soils on NFS lands in the three analysis areas are mostly in pristine condition. Some soils, however, have been disturbed due to forest management, landslides, and naturally occurring disturbances as identified in Table SOIL-1. Soil disturbances associated with existing road construction are based on a 40-foot wide corridor. Disturbance associated with existing NFS roads is not considered detrimental because the underlying soils are taken out of productivity (FSM R-10 Supplement 2500-2005-1 effective May 5, 2006). The area estimated to have natural soil disturbances, such as windthrow and stream bank erosion, is based on the assumption that 2 percent of the areas with well drained and moderately well drained soils have natural disturbance. Poorly drained and very poorly drained soils are not included in this estimate since these soils tend to be in depositional areas and due to the inherent erosion protection provided by their fibric material and vegetative component.

Analysis Area 2

There are approximately 710 acres of NFS lands within Analysis Area 2. Approximately 93 acres of the NFS lands in this area have been harvested in the past. Management activities on NFS lands within Analysis Area 2 have resulted in total estimated soil disturbance of 49 acres, about 7 percent of the total analysis area (Table SOIL-1). This total includes disturbance from past log yarding activities (3 acres), decommissioned/ temporary/undetermined road (43 acres), existing rock pits (3 acres), and landslides from past harvest (0.2 acre). There were no landslides due to road construction within this analysis area. Analysis Area 2 also includes 0.1 mile of existing NFS and State roads with a total estimated disturbance of 0.4 acre (assuming an average disturbance width of 40 feet) (Table SOIL-1).

Naturally occurring soil disturbances have also occurred in Analysis Area 2, with an estimated 5 acres of natural soil disturbance. No naturally occurring landslides are located within this analysis area (Table SOIL-1).

Table SOIL-1. Existing Soil Disturbances on NFS Lands within the Analysis Area by Alternative

Soil Disturbance Type (acres)	Analysis Area 2	Analysis Area 3	Analysis Area 4
Management Related Soil Disturbances			
Total NFS Acres	710	710	665
Past log yarding activities[1/]	3	3	6
Other Existing Roads[2/]	43	43	67
Existing NFS and State Road[3/]	0.4	0.4	1.8
Existing rock pits	3	3	7
Landslides from past harvest[4/]	0.2	0.2	0
Total Soil Disturbances from Management	50	50	82
Total Detrimental Soil Conditions from Management[5/]	**49**	**49**	**80**
Natural Soil Disturbances			
Naturally occurring landslides	0	0	0.6
Natural soil disturbances[6/]	5	5	7
Total Natural Soil Disturbances	5	5	7
Total Existing Soil Disturbance	**55**	**55**	**89**

Notes: Totals may not sum due to rounding.
1/ Assumes 3 percent disturbance of all past harvest areas (Landwehr and Nowacki 1999).
2/ This category includes miles of decommissioned/temporary/undetermined roads within the analysis area, assuming a 40-foot width. Other types of road in the analysis area not included in this table are those classified as "Private", "Unknown", and "Local".
3/ Estimated effects are based on miles of existing NFS and State road located within the analysis area assuming a 40-foot width.
4/ Landslides are assumed to be associated with past harvest if the initiation point of the landslide (or the highest elevation point) falls within a past harvest unit (Landwehr 1998) and the slide occurred after harvest.
5/ This total does not include NFS and State roads because the underlying soils are taken out of productivity (FSM R-10 Supplement 2500-2005-1 effective May 5, 2006).
6/ Defined as 2 percent of drainage class 3 and greater for soils on NFS lands within the analysis area.

Analysis Area 3

There are approximately 710 acres of NFS lands within Analysis Area 3. Approximately 93 acres of the NFS lands have been harvested in the past. Management activities in NFS lands within Analysis Area 3 have resulted in total estimated soil disturbance of 49 acres, about 7 percent of the total analysis area (Table SOIL-1). This total includes disturbance from past log yarding activities (3 acres), decommissioned/ temporary/undetermined road (43 acres), existing rock pits (3 acres), and landslides from past harvest (0.2 acre). There were no landslides due to road construction within this analysis area. Analysis Area 3 also includes 0.1 mile of existing NFS and State roads with a total estimated disturbance of 0.4 acre (assuming an average disturbance width of 40 feet) (Table SOIL-1). Naturally occurring soil disturbances have also occurred in Analysis Area 3, with an estimated 5 acres of natural soil disturbance. No naturally occurring landslides are located within this Analysis Area (Table SOIL-1).

Analysis Area 4

There are approximately 665 acres of NFS lands within Analysis Area 4. Approximately 208 acres of the NFS lands have been harvested in the past. Management activities in NFS lands within Analysis Area 4 have resulted in total estimated soil disturbance of 81 acres, about 12.2 percent of the total analysis area

(Table SOIL-1). This total includes disturbance from past log yarding activities (6 acres), decommissioned/ temporary/undetermined road (67 acres), and existing rock pits (7 acres). There were no landslides from past harvest or road construction in this analysis area. Analysis Area 4 also includes 0.4 mile of existing NFS and State roads with a total estimated disturbance of 1.8 acres (assuming an average disturbance width of 40 feet) (Table SOIL-1). Naturally occurring soil disturbances have also occurred in Analysis Area 4, with an estimated 0.6 acre associated with two naturally occurring landslides and an estimated 7 acres of natural soil disturbance (Table SOIL-1).

Mass Movement Index

MMI classes are used to group SMUs (Soil Map Units) that have similar properties relative to the stability of natural slopes. Slope gradient is the primary site factor determining the stability of slopes; however, soil type and soil drainage class may also play a role in specific locations. There are four MMI classes of soil: MMI 1 through MMI 4, with MMI 4 being the least stable. The majority of soils in the three analysis areas contain MM1 and MM2 soils, with an estimated 29 acres and 37 acres of Analysis Areas 2 and 3 and Analysis Area 4, respectively, containing MM3 or MM4 soils (Tetra Tech 2014a).

Landslides

Many slopes in Southeast Alaska are prone to landslides due to the steep gradient, shallow soils, and coarse texture (Swanston 1969). A landslide inventory was completed by the Forest Service on the Tongass National Forest using aerial photography. Portions of two landslides were found within Analysis Area 4 and a portion of one landslide was found within Analysis Areas 2 and 3 (Table SOIL-2). Each landslide was associated with the MMI class where it was initiated. All three landslides were debris avalanches, none of the landslides were road related; one was harvest related and the other two were initiated in productive old-growth forest (POG).

Table SOIL-2. Mapped Landslides Intersecting the Analysis Area

Landslide Number	Year of Occurrence	Type[1/]	Initiated in MMI[2/]	Analysis Area	Landslide Acres in Analysis Area	Total Landslide Acres
P0065	1990	POG[3/]	2	4	0.14	2.8
P0198	1990	Harvest	1	2,3	0.18	1.4
P0210	1960	POG[3/]	3	4	0.44	7.8

Notes:
Harvest = previously harvested area
POG = Productive Old Growth forest.
1/ Forest type where the landslide initiated.
2/ MMI Class where landslide initiated.
3/ POG is generally defined as old-growth forest capable of producing at least 20 cubic feet of wood fiber per acre per year, or having greater than 8,000 board feet per acre.

Only three landslides comprising less than 1 percent of each analysis area were identified, over 80 percent of the soils within each analysis area are low hazard class (MMI 1), and there would be no vegetation clearing on slopes greater than 72 percent. Two of the three landslides occurring within the project area initiated on steep slopes well above the corridor with their debris flow track or debris field crossing the proposed right of way. The other landslide, P0198, initiated adjacent to a quarry within the proposed corridor on more gentle slopes. Given the low occurrence of landslides within the project area, the predominantly low hazard class lands affected, and the fact that the three existing landslides in the analysis area would be spanned by the transmission line, the risk of project-related landslides in each analysis area is minimal and potential impacts to landslides are not evaluated further in this analysis.

Environmental Effects

Effects Common to All Alternatives

The construction-phase activities that would impact soil and geologic resources include clearing, excavation, trenching, grading, and heavy vehicle traffic. Disturbed surfaces, concentrated flows, and increased runoff may lead to soil erosion. The use of shovel trails and temporary access spurs would compact soils. Soil disturbance would be limited by using existing roads, where feasible, implementing erosion control plans, and restoring/revegetating temporarily disturbed areas.

Following construction, soil conditions would stabilize over time with the implementation of the mitigation measures identified below. The amount of time this would take would depend in part on the mitigation measures used on site during and following construction, as well as local environmental conditions. Following restoration, the environmental impact during the operations phase would largely be limited to soil erosion induced by occasional vehicle traffic on existing unpaved roads. This would be controlled by road maintenance and adherence to the speed limits established for these roads.

Geology

Each action alternative would require some disturbance on mapped low vulnerability karst lands located near Hamilton Bay (Figure SOIL-1). Disturbance would include temporary access spurs, structure installation, and vegetation clearing along or near existing NFS roads. Alternatives 2 and 3 each include about 51 structures on karst rocks, requiring about 13 temporary access spurs (0.25 acre disturbance). Alternative 4 includes about 72 structures on karst rocks, requiring about 25 temporary access spurs (0.54 acre disturbance). As these are low vulnerability karst lands, resource damage threats associated with land management activities are not likely to be appreciably greater than those posed by similar activities on non-carbonate substrate. No special measures are required for activities on low vulnerability karst.

All alternatives have the potential to encounter sulfide rich/low carbonate rock, especially within volcanogenic massive sulfide deposits (Tetra Tech 2014a, Appendix A). In these areas, there is a potential for acid rock drainage to develop as a result of exposing the sulfide minerals to air and water during foundation construction for the proposed transmission line structures, or where the rock is used as backfill for structures. If ARD potential rock is disturbed, a Forest Service geologist may be consulted to evaluate the risk of ARD and determine monitoring and mitigation requirements, as necessary. However, due to the small areas expected to be excavated for structure foundations, ARD is not expected to develop.

Soils

The loss of soil productivity on NFS lands is often evaluated by acres of detrimental soil conditions due to soil disturbance, displacement, and loss by alternative. For many projects, R10 Soil Quality Standards require that the total acreage of all detrimental soil conditions should not exceed 15 percent of the total acreage within the activity; however, transmission line corridors are managed as facilities and are, therefore, excluded from this standard (Landwehr 2014).

Table SOIL-3 identifies detrimental soil disturbance on NFS lands for each alternative for comparison. Detrimental soil disturbance from vegetation clearing within the project disturbance corridor is assumed to be similar to harvest by shovel yarding. Therefore, soil disturbance from vegetation clearing within the right-of-way is estimated assuming that 3 percent of the total acres disturbed would result in detrimental disturbance (Landwehr and Nowacki 1999).

The action alternatives would result in approximately 89 to 110 acres of detrimental soil disturbance on NFS lands within each respective analysis area. Except for permanent facilities (poles and helicopter pad support footings), most soil disturbance would be temporary. Periodic vegetation management and facility maintenance within the right-of-way would result in additional soil disturbance during operations.

Table SOIL-3. Estimated Acres of Soil Disturbance on NFS Lands by Analysis Area

Type of Disturbance (acres)[1/]	Alternative		
	2	**3**	**4**
Structure Installation[2/]	60.9	60.9	59.2
Shovel Trails[3/]	22.8	22.8	8.0
Temporary Matting Panels[4/]	0.0	0.0	0.0
Temporary Access Spurs[3/]	9.2	9.2	6.1
Helicopter Pads[5/]	0.4	0.4	0.3
Right-of-way Clearing[6/]	16.6	16.6	15.7
Total Acres of New Detrimental Soil Conditions	**109.8**	**109.9**	**89.2**

Notes:
1/ Disturbance estimates by type have been adjusted to avoid counting disturbance to the same area twice.
2/ These estimates assume that 50 percent of the area within a 50-foot radius from the center of each pole would be temporarily disturbed during construction.
3/ Based on an average width of 16 feet.
4/ Assumes temporary matting panels would prevent soil disturbance.
5/ Based on an average disturbance area of 16 feet by 16 feet.
6/ Based on 3 percent of the total acres cleared.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no transmission line built under this alternative and no related disturbance to soil conditions. Roads within the project boundary will continue to receive incidental use from hunters and other visitors. Landslides will continue to occur. Vegetation in harvested areas will continue to grow and add stability to soils on those sites.

Cumulative Effects

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. Cumulative effects of the proposed actions on long-term soil productivity are directly related to the amount of disturbance that occurs through time as a result of natural events, temporary and/or permanent road construction, and resource management. The No Action Alternative would not contribute to cumulative effects on soils resources because there would be no construction under this alternative.

Alternative 2 – Proposed Action

Direct and Indirect Effects

An estimated total of 110 acres of detrimental soil disturbance would occur on NFS lands under this alternative. An estimated 55 percent of this total (61 acres) would be associated with structure installation, 21 percent (23 acres) would be associated with shovel trails, and an estimated 15 percent (17 acres) associated with right-of-way vegetation clearing (Table SOIL-3).

Cumulative Effects

The estimated 110 acres of detrimental soil conditions expected to occur under this alternative would incrementally add to existing detrimental soil disturbance and that associated with other ongoing or reasonably foreseeable projects (Table SOIL-4). Existing detrimental soil conditions from management account for an estimated 49 acres within the analysis area for this alternative (Tables SOIL-1 and SOIL-4).

Table SOIL-4. Estimated Acres of Cumulative Detrimental Soil Disturbance Lands by Analysis Area

Detrimental Disturbance (acres)	Alternative		
	2	**3**	**4**
Total Existing Detrimental Soil Disturbance from Management (acres)	49	49	80
Detrimental Soil Disturbance from KPI (acres)	110	110	89
Reasonably Foreseeable Actions			
Scott Peak timber sale[1/]	0	0	0
Central Kupreanof timber sale[1/]	0	0	1
Detrimental soil disturbance from Reasonably Foreseeable Actions (acres)	**0**	**0**	**1**
Cumulative Soil Disturbance (acres)	**159**	**159**	**170**

Note:
1/ Assumes 3 percent detrimental soil disturbance.

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. One reasonably foreseeable timber sale (Scott Peak) includes units that would be located within the analysis area for this alternative. The portions of these units within the analysis area total 2.7 acres. Assuming that harvest of these lands would result in detrimental soil disturbance equivalent to 3 percent of the affected area would result in total detrimental soil disturbance of less than 0.1 acre. Estimated total cumulative soil disturbance under this alternative would be 159 acres (Table SOIL-4).

The Kake road project would result in an increase in cumulative soil disturbance above that shown in Table SOIL-4. The road base is assumed for the purposes of analysis to be 24 feet wide, with total right-of-way clearing of 48 feet, 24 feet either side of the centerline. Clearing along this 48-foot-wide corridor would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor. Based on the assumed width of 24 feet, the road base would occupy half this area (60 acres) and result in 100 percent detrimental soil disturbance. The remaining 60 acres are assumed to be clearing, with detrimental soil disturbance equivalent to 3 percent of the area. With these assumptions, the resulting total soil disturbance outside the 300-foot-wide KPI corridor would be about 62 acres. This disturbance would occur outside the analysis area for soils and geology, which is based on the disturbance footprint of the KPI alternative.

The Kake road project is currently in the planning stage. While it is reasonable to assume that rock sources would be required, the road has not been designed and ADOT&PF has not identified potential sources or possible rock pit locations. As a result, it is not possible to assess the potential cumulative impacts of rock pits for the Kake road project. However, assuming that rock pits for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, the result would be up to 50 acres of rock pit-related disturbance.

Like this alternative for the KPI Project, the Kake road project would cross low vulnerability karst lands located near Hamilton Bay (Figure SOIL-1). The Kake road project would likely coincide with existing roads in this area and, as noted with respect to the KPI Project, as these are low vulnerability karst lands, resource damage threats associated with land management activities are not likely to be appreciably greater than those posed by similar activities on non-carbonate substrate.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

An estimated total of 110 acres of soil disturbance would occur under this alternative. An estimated 55 percent of this total (61 acres) would be associated with structure installation, 21 percent (23 acres) would be associated with shovel trails, and an estimated 15 percent (17 acres) associated with right-of-way vegetation clearing (Table SOIL-3).

Cumulative Effects

The estimated 110 acres of detrimental soil conditions expected to occur under this alternative would incrementally add to existing detrimental soil disturbance and that associated with other ongoing or reasonably foreseeable projects (Table SOIL-4). Existing detrimental soil conditions from management account for an estimated 49 acres within the analysis area for this alternative (Tables SOIL-1 and SOIL-4).

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. As with Alternative 2, an estimated 2.7 acres of the reasonably foreseeable Scott Peak timber sale units are located within the analysis area for this alternative. Assuming that harvest of these lands would result in detrimental soil disturbance equivalent to 3 percent of the affected area would result in total detrimental soil disturbance of less than 0.1 acre. Estimated total cumulative soil disturbance under this alternative would be 159 acres (Table SOIL-4).

Similar to Alternative 2, construction of the Kake road project would result in an increase in cumulative soil disturbance above that shown in Table SOIL-4. This additional disturbance of approximately 62 acres would occur outside the 300-foot-wide KPI corridor and the analysis area for soils and geology. As noted with respect to Alternative 2, construction of a Kake access road would likely result in rock pit-related disturbance. While it is not possible to assess the potential cumulative impacts of rock pits for the Kake road project, rock pits could result in up to 50 acres of disturbance. Also like Alternative 2, the Kake road project would cross low vulnerability karst lands located near Hamilton Bay (Figure SOIL-1).

Alternative 4 – Center-South Route

Direct and Indirect Effects

An estimated total of 89 acres of soil disturbance would occur under this alternative. About 66 percent (59 acres) of this disturbance would be associated with structure installation and about 18 percent (16 acres) would be associated with right-of-way vegetation clearing (Table SOIL-3).

Cumulative Effects

The estimated 89 acres of detrimental soil conditions expected to occur under this alternative would incrementally add to existing detrimental soil disturbance and that associated with other ongoing or reasonably foreseeable projects. Existing detrimental soil conditions from management account for an estimated 80 acres within the analysis area for this alternative (Tables SOIL-1 and SOIL-4).

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. One reasonably foreseeable timber sale (Central Kupreanof) includes units that would be located within the analysis area for this alternative. The portions of these units within the analysis area total 16.9 acres. Assuming that harvest of these lands would result in detrimental soil disturbance equivalent to 3 percent of the affected area would result in total detrimental soil disturbance of approximately 1 acre. Estimated total cumulative soil disturbance under this alternative would be 170 acres (Table SOIL-4).

With the exception of the section of Forest Road (FR) 6040 that both Alternative 4 and the Kake road project would follow, the soils and geology analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for additional detrimental soil disturbance.

Mitigation

The effects of the project on soils and geology would be minimized through the site-specific application of mitigation measures and BMPs (see Chapter 2).

Aquatic Resources

Introduction

This section provides an assessment of the current condition of the analysis area and the potential effects of implementing the proposed alternatives on watershed conditions and fish. The analysis addresses the potential effects associated with construction and operation of the proposed electric transmission line and associated facilities at a finer subwatershed scale. The following analysis uses existing information from spatial GIS data, monitoring results, scientific literature, and other sources, as appropriate.

Direct, indirect, and cumulative effects for all affected subwatersheds are estimated using quantifiable measures for actual effects, as supported by the literature cited (for example, stream crossings are a surrogate for increased sediment). The level (magnitude and intensity) of effects is also characterized by descriptors that account for how measurable the effect would be, how widespread the effect is likely to be, and how long it is likely to last. These descriptors of effects are as follows:

- *Negligible:* Effects would be undetectable or if detected, would be considered slight, detectable only at the site, and last less than a day.
- *Minor:* Effects would be measurable, although the changes would be small, localized to the site or affected stream reach, and last less than a week.
- *Moderate:* Effects would be measurable at the stream reach or subwatershed scale, and last more than a week.
- *Major:* Effects would be readily measurable at the watershed scale and would last for years.

Exceptions to these descriptors are noted as applicable, because they are not a perfect fit for all effects. The ability to actually measure changes in streamflow, sediment, habitat features, or other aquatic parameters in response to the proposed project is extremely limited due to the lack of baseline data and the natural range of variability of these parameters in response to climate and other factors. Nonetheless, sufficient information for these subwatersheds exists to proceed with a credible comparison of the magnitude and extent of likely effects across alternatives.

Analysis Area

The analysis area for direct, indirect, and cumulative effects to aquatic resources consists of the subwatersheds that would be crossed by each of the proposed action alternatives (Figure WAT-1). A total of 20 subwatersheds corresponding to the 6th level HUC recognized by the USGS would be crossed by the alternatives. Alternatives 2 and 3 would cross 13 subwatersheds and Alternative 4 would cross 12 subwatersheds. The subwatersheds that are crossed by and comprise the analysis area for each alternative are identified in Table WAT-1.

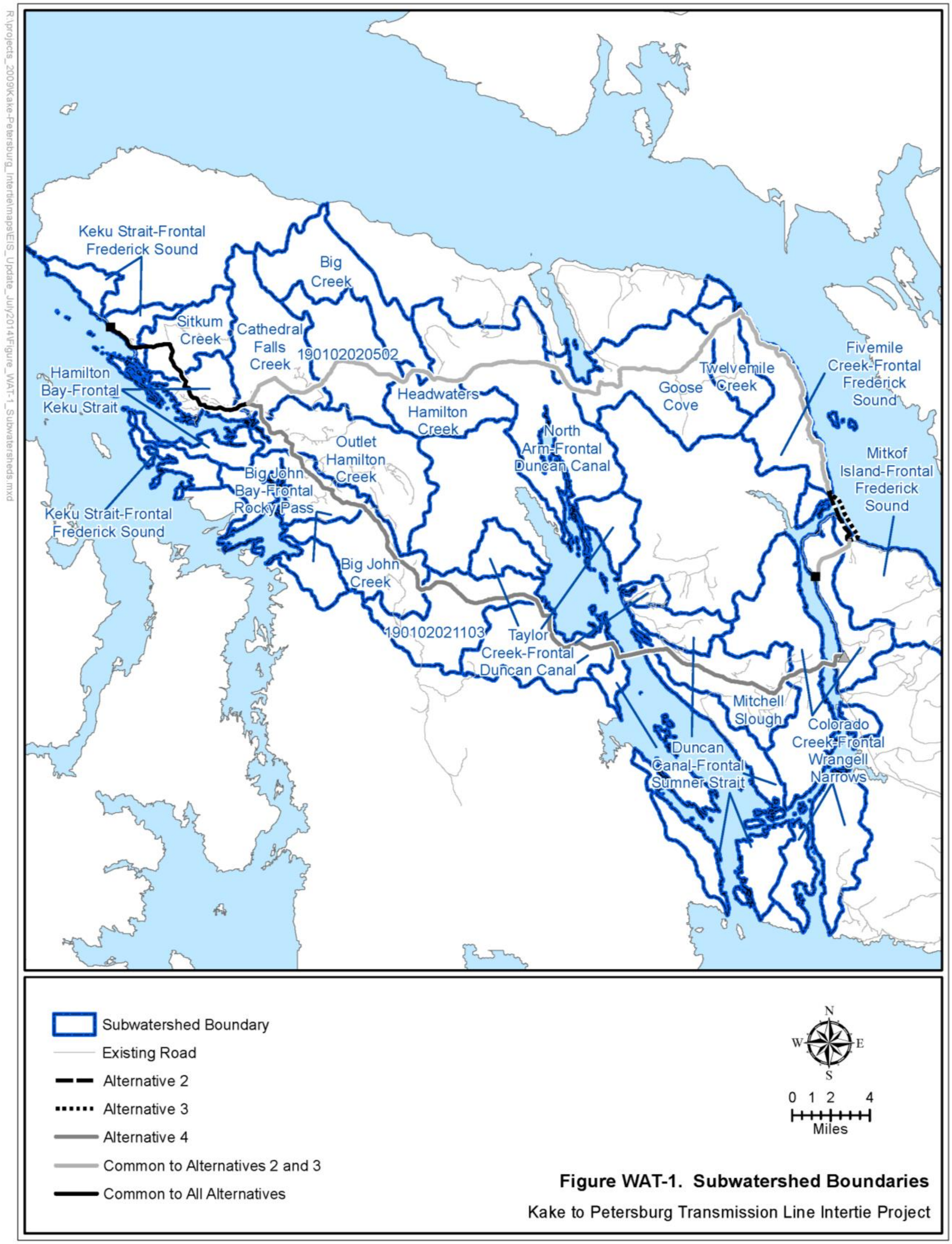


Figure WAT-1. Subwatershed Boundaries

Kake to Petersburg Transmission Line Intertie Project

Table WAT-1. Subwatersheds Crossed by Each Alternative[1/]

Subwatershed	Alternatives 2 & 3	Alternative 4
190102020502	x	
190102021103		x
Big Creek	x	
Big John Bay-Frontal Rocky Pass		x
Big John Creek		x
Cathedral Falls Creek	x	x
Colorado Creek-Frontal Wrangell Narrows	x	x
Duncan Canal-Frontal Sumner Strait		x
Fivemile Creek-Frontal Frederick Sound	x	
Goose Cove	x	
Hamilton Bay-Frontal Keku Strait	x	x
Headwaters Hamilton Creek	x	
Keku Strait-Frontal Frederick Sound	x	x
Mitchell Slough		x
Mitkof Island-Frontal Frederick Sound	x	
North Arm-Frontal Duncan Canal	x	
Outlet Hamilton Creek		x
Sitkum Creek	x	x
Taylor Creek-Frontal Duncan Canal		x
Twelvemile Creek	x	

1/ The No Action alternative assessed comparative watersheds for each Action Alternative.

Methodology

The proposed project is expected to result in disturbance from the following project-related activities: structure installation, use of temporary shovel trails and matting panels, temporary access spurs, helicopter landing pads, and right-of-way clearing. Potential direct, indirect, and cumulative effects are evaluated at the subwatershed (6th level HUC) scale using the USDA Natural Resources Conservation Service (NRCS) Watershed Boundary Dataset (NRCS 2009). The Forest Service uses the 6th level to rank watershed conditions through the watershed condition classification (USDA Forest Service 2011c), and is in the process of transitioning to this dataset for future analyses.

The affected watersheds were analyzed in detail, focusing on subwatershed size, occurrence of soils on slopes greater than 72 percent, natural and management-induced sources of disturbance, stream density, timber harvest history, road density, and percentage of basin containing roads.

Data from Forest Service resource reports on other projects within the analysis area (Whitacre and Harlan 2009; Whitacre and Lombard 2011), descriptions of roadless areas from the 2003 Tongass Forest Plan SEIS (USDA Forest Service 2003), and data from the Tongass GIS library were used to characterize analysis area subwatersheds. Field reconnaissance surveys were conducted in 2010 and 2011 and included mapping of Class I, II, III, and IV streams within a 300-foot-wide (150 feet either side of the transmission line centerline) corridor for each of the proposed action alternatives.

District-wide road condition surveys (RCS) were used in conjunction with GIS to identify the number of stream crossings, number of red fish crossings, and streams requiring additional information or field verification. Available water quality and fish distribution data were used for overall subwatershed characterizations. This included data from field surveys conducted by the Forest Service for other projects within the analysis area. These data included fish presence or absence, fish species identification, and stream class and channel type. GIS queries were used to evaluate effects and compare alternatives. The harvest and road indicator thresholds used in the following evaluation are for analysis purposes only and are not prescribed by the Forest Plan.

Stream crossing information in the RCS database included gaps in stream class and channel type classifications. Streams with either no class or channel type information are considered “unclassified” streams. None of these unclassified streams occur along the proposed alternative routes; however they are present within the subwatersheds and are accounted for in the subwatershed stream density and stream mile calculations. In most cases, classifications can be inferred from surrounding channel types and valley form.

Affected Environment

The following sections characterize the existing environment in the analysis area (see Figure WAT-1) and address climate and hydrology, streamflow, water quality, stream habitat, lake habitat, and fisheries.

Climate and Hydrology

A nearly constant procession of storms, originating from a semi-permanent low-pressure system, called the Aleutian Low, strongly influences climate in the analysis area (USDA Forest Service 2001a). Maritime air masses originate over the Pacific Ocean where heat and moisture are transferred from the warm waters to the atmosphere. This warm, moist air is transported northward into the coastal mountain ranges of the Alexander Archipelago. Heavy precipitation and strong winds result from the movement of moist air masses over topographic boundaries, and precipitation within the analysis area ranges from about 60 inches to 140 inches annually. Stream discharge within Southeast Alaska is predominantly influenced by rainfall events, with peak discharges occurring with fall and winter storms (Jones and Fahl 1994). In the winter, spring, and early summer, snowmelt augments stream runoff, especially in watersheds with terrain above 1,500 feet elevation where seasonal snowpack develops.

Streamflow

USGS stations provide the only available long term streamflow records near the project. Hydrographs display mean monthly streamflow of a particular watershed in cubic feet per second (cfs). No active gages exist within the analysis area. The nearest USGS stream gage, 15087300, is located approximately 0.5 mile east of the analysis area on Falls Creek on Mitkof Island. The Falls Creek hydrograph is, however, indicative of flows for streams within the analysis area because of similar elevations and precipitation patterns. The hydrograph shows a small snowmelt peak in the spring followed by lower flows in summer months when groundwater stores are depleted, with maximum flows occurring in conjunction with heavy rainfall in the fall and rain-on-snow events in winter months (Figure WAT-2).

Outlet Hamilton Creek subwatershed, which is part of the analysis area, has an historical USGS stream gage. This stream gage, 15087570, is located on Hamilton Creek, approximately 2.9 miles upstream from the mouth at Hamilton Bay and 9.5 miles southeast of Kake. The hydrograph for this gage shown as Figure WAT-3 presents data from October 1976 to January 1996 and shows a similar seasonal pattern of water flow to the Falls Creek hydrograph.

Vegetation clearing can affect streamflow by altering processes that control the amount and timing of water delivered to streams. The direct removal of forest canopy affects rain interception (Prussian 2010), evapotranspiration, snow storage, snow melt, and soil moisture (Jones and Grant 1996; Hubbart et al. 2007). After tree removal is completed, soil moisture and transpiration changes continue in response to uptake and use of water by remaining and regenerating vegetation. The complex relationships between these processes, how they are altered by vegetation clearing, and the net effects on streamflow have been studied extensively in the Pacific Northwest and Alaska, with varying conclusions.

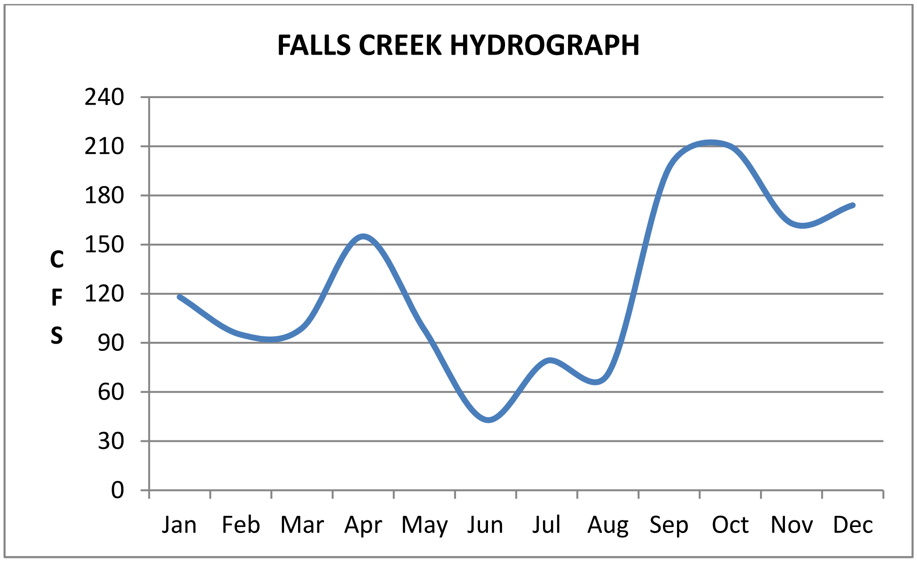


Figure WAT-2. Falls Creek Hydrograph Depicting Mean Monthly Flow

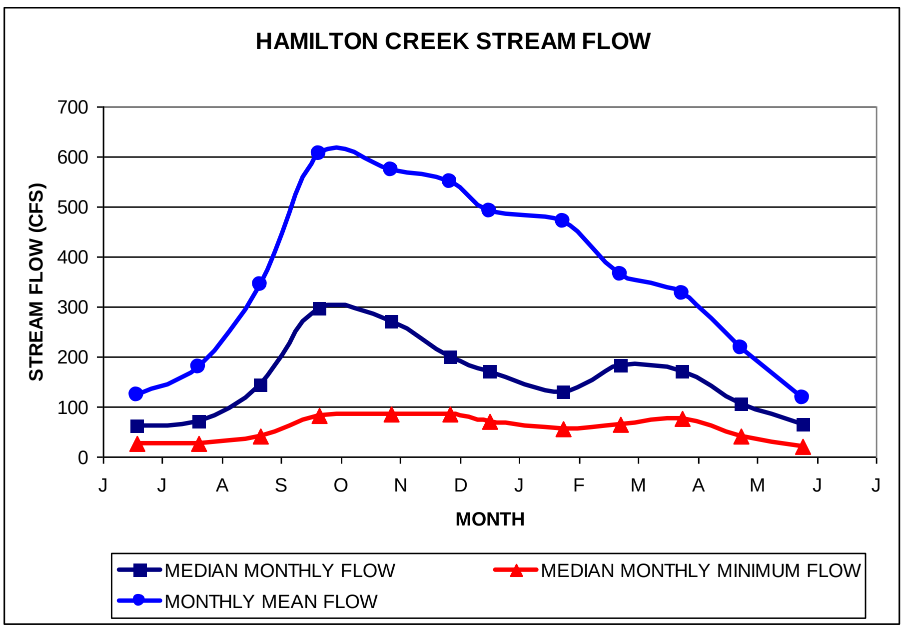


Figure WAT-3. Streamflow Characteristics of Hamilton Creek

Changes in streamflow following timber removal are commensurate with the proportion of watershed where trees have been removed (Harr 1986; Jones and Grant 1996; Jones 2000; Moore and Wondzell 2005). Bosch and Hewlett (1982) suggested a threshold effect at 20 percent of basin area harvested. Since baseline (pre-project) streamflow data are not available for all affected subwatersheds, the conservative threshold of cumulative harvest suggested by Bosch and Hewlett (1982) was used in this analysis to assess the potential for current change in streamflow resulting from past management. Specifically, subwatersheds with a cumulative harvest threshold of 20 percent of the timber in second growth less than 30 years of age (as shown in the right hand column of Table WAT-2) may have experienced potential changes in streamflow. Another more recent "state of the science report" on peak flow response to timber harvest (Grant et al. 2008) establishes a minimum, cumulative harvest/stream flow response threshold of 20 to 40 percent over a 5-year time span. Climate cycles also influence streamflow and probably confound most of these studies, which have not occurred over long enough timeframes to account for climate shifts (USGS 2000, Neal et al. 2002). The Aquatics Resource Report prepared for this project discusses other studies considered as part of this analysis (Tetra Tech 2014b).

Peak flow increases in the affected watersheds are probably more likely than low flow increases, based on most of the studies in the Pacific Northwest. Although studies have suggested forest canopy recovery occurs in 10 to 30 years (Jones and Grant 1996; Jones 2000; Prussian 2010), for this analysis, it is assumed that forest canopy recovery occurs around 30 years (Hicks et al. 1991; Jones 2000; Moore and Wondzell 2005) at which time rainfall interception recovery is assumed to occur (Prussian 2010). There are no subwatersheds within the analysis area with more than 20 percent of the timber harvested in the past 30 years (Table WAT-2). The highest percentage has occurred in Twelvemile Creek watershed, with an estimated 9.5 percent of the watershed harvested since 1984, followed by the Mitchell Slough and Keku Strait-Frontal Frederick Sound, with 8.6 percent and 7.7 percent harvested, respectively (Table WAT-2).

Table WAT-2. Summary of Timber Harvest Acres in Analysis Area Subwatersheds (not including road clearings)

Subwatershed	Subwatershed Size (Acres)	Total Harvested (Acres)	Total Harvested (% Basin Area)	Total Harvested since 1984	Total Harvested since 1984 (% Basin Area)
190102020502	15,290	43	0.3	42	0.3
190102021103	15,054	135	0.9	132	0.9
Big Creek	15,759	4	0.0	4	0.0
Big John Bay-Frontal Rocky Pass	16,239	1,018	6.3	298	1.8
Big John Creek	13,194	586	4.4	563	4.3
Cathedral Falls Creek	17,137	1,244	7.3	320	1.9
Colorado Creek-Frontal Wrangell Narrows	48,387	1,473	3.0	646	1.3
Duncan Canal-Frontal Sumner Strait	27,686	1,592	5.8	800	2.9
Fivemile Creek-Frontal Frederick Sound	13,649	17	0.1	16	0.1
Goose Cove	23,118	1,896	8.2	1,270	5.5
Hamilton Bay-Frontal Keku Strait	10,573	2,047	19.4	68	0.6
Headwaters Hamilton Creek	9,820	0	0.0	0	0.0
Keku Strait-Frontal Frederick Sound	10,747	2,172	20.2	823	7.7
Mitchell Slough	14,278	2,017	14.1	1,222	8.6
Mitkof Island-Frontal Frederick Sound	19,738	1,497	7.6	512	2.6
North Arm-Frontal Duncan Canal	30,882	428	1.4	350	1.1
Outlet Hamilton Creek	21,105	2,415	11.4	871	4.1
Sitkum Creek	8,932	2,684	30.1	78	0.9
Taylor Creek-Frontal Duncan Canal	26,121	572	2.2	258	1.0
Twelvemile Creek	7,363	746	10.1	703	9.5

Water Quality

Water quality information for streams within the analysis area is limited due to the scarcity of current or historic USGS stream gages. The primary water quality parameters likely to be affected by the proposed project are sediment, turbidity, and stream temperature. Within the affected subwatersheds, primary water quality concerns include potential effects to water bodies with beneficial uses, sedimentation and turbidity, and water temperature. 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 dive survey reports showed that the bark accumulation was 0.6 acre.

Beneficial Uses of Waters in the Analysis Area

Waters in Alaska are protected for all uses according to standards outlined in the Alaska Water Quality Standards (ADEC 2011). Numeric criteria standards are established according to protected use classes and subclasses. For stream temperature, the most stringent criterion is aquatic life, and for turbidity, it is drinking water. Existing uses of water from the subwatersheds in the analysis area include potable water supplies, aquatic life, and limited contact recreation.

There are state-classified public water supplies (PWS) in the affected subwatersheds near Kake and Petersburg: Kake Municipal Water (which gets its water from a reservoir in the Gunnuk Creek subwatershed that is not crossed by the project), and the city of Petersburg Water Utility (which treats water from Cabin Creek Dam and City Creek Dam). The Petersburg municipal watershed is split between the Colorado Creek-Frontal Wrangell Narrows and Mitkof Island-Frontal Frederick Sound subwatersheds, and the project should have no impact on either public water supplies. Both city water utilities supply potable water to area residents.

Sedimentation and Turbidity

No sedimentation or turbidity data are available for subwatersheds in the analysis area. Generally, in Southeast Alaska, suspended sediment loads in non-glacial streams in undisturbed watersheds are very low (Schmeige et al. 1974). Watershed factors such as drainage efficiency (as measured by stream density), road density, percent of basin comprised of roads, time elapsed since timber harvest, steepness of the topography, and percent of the watershed with soils on slopes greater than 72 percent contribute to determining the risk of mass movement. These factors are considered in terms of potential sediment source and deposition areas, and the efficiency of sediment transport within the watershed. Sediment is introduced into streams by channel erosion, roads, landslides and debris flows, and rain splash on bare soils.

Changes in natural flow routing and the increased rate of sediment delivery to streams and altered timing and volume of peak flows can result in bed surface fining, smoothing of stream channels, and filling of pools (Madej 1999; Wemple et al. 1996). Road building has also been implicated with losses of wetlands through the effects of filling, fragmentation, and alteration of hydrology. Long-term sediment introduction from roads is influenced by the type of structure at the road/stream crossing, road slope, age, maintenance condition, time since last graded, seasonal timing of maintenance activities, amount of traffic, rock quality, weather, hillslope length, soil depth, and cutbank depth (Croke et al. 2005; Wemple and Jones 2003; Kahklen and Hartsog 1999; Reid and Dunne 1984).

There are approximately 263 miles of roads in the analysis area subwatersheds. This estimate includes all roads, including NFS and temporary roads, ever built regardless of age. Percentage of subwatershed area consisting of roads has been used to estimate the risk of flow-related impacts to aquatic systems, including sediment introduction into streams. The percent of subwatershed area as roads and road densities are low in all analysis area subwatersheds, with the highest values occurring in the Mitchell Slough subwatershed, with roads accounting for 0.9 percent of the subwatershed and an estimated road density of 1.3 miles per square mile (Table WAT-3). Table WAT-4 lists the number of streams crossed by existing roads, by stream type.

Table WAT-3. Existing Roads in Analysis Area

Subwatershed	Size (Square Miles)	Existing Road (Miles)	Percent Subwatershed as Roads[1/]	Road Density (Miles/Square Mile)
190102020502	23.9	5.4	0.2	0.2
190102021103	23.5	6.6	0.2	0.3
Big Creek	24.6	0.9	0.0	0.0
Big John Bay-Frontal Rocky Pass	25.4	13.3	0.4	0.5
Big John Creek	20.6	14.1	0.5	0.7
Cathedral Falls Creek	26.8	15.9	0.5	0.6
Colorado Creek-Frontal Wrangell Narrows	75.6	30.1	0.3	0.4
Duncan Canal-Frontal Sumner Strait	43.3	12.6	0.2	0.3
Fivemile Creek-Frontal Frederick Sound	21.3	0.4	0.0	0.0
Goose Cove	36.1	20.4	0.4	0.6
Hamilton Bay-Frontal Keku Strait	16.5	14.3	0.7	0.9
Headwaters Hamilton Creek	15.3	1.6	0.1	0.1
Keku Strait-Frontal Frederick Sound	16.8	4.2	0.2	0.3
Mitchell Slough	22.3	27.9	0.9	1.3
Mitkof Island-Frontal Frederick Sound	30.8	26.3	0.6	0.9
North Arm-Frontal Duncan Canal	48.3	11.8	0.2	0.2
Outlet Hamilton Creek	33.0	33.2	0.8	1.0
Sitkum Creek	14.0	10.4	0.6	0.7
Taylor Creek-Frontal Duncan Canal	40.8	8.4	0.2	0.2
Twelvemile Creek	11.5	4.9	0.3	0.4

Note:

1/ ‘Percent Basin as Roads’ calculated as: [(Existing road miles * 5,280 ft/mi * 40 ft <assumed clearing width>/43,560 ft^2/acre)/ subwatershed size <acres>] * 100

Table WAT-4. Stream Crossings by Existing Roads in Analysis Area Subwatersheds

Subwatershed	Class I Streams		Class II Streams		Class III Streams		Class IV Streams	
	Outside Project Corridor	In Project Corridor	Outside Project Corridor	In Project Corridor	Outside Project Corridor	In Project Corridor	Outside Project Corridor	In Project Corridor
190102020502	0	7	0	5	0	0	1	0
190102021103	1	1	8	1	1	2	7	8
Big Creek	0	0	0	1	0	0	0	0
Big John Bay-Frontal Rocky Pass	8	1	18	14	0	2	7	23
Big John Creek	4	0	13	8	2	6	17	11
Cathedral Falls Creek	0	0	6	10	0	0	0	0
Colorado Creek-Frontal Wrangell Narrows	10	0	32	0	12	0	15	9
Duncan Canal-Frontal Sumner Strait	4	0	20	0	5	0	24	0
Fivemile Creek-Frontal Frederick Sound	0	0	0	0	0	0	0	0
Goose Cove	8	6	6	3	3	0	0	0
Hamilton Bay-Frontal Keku Strait	1	0	2	4	0	0	0	0
Headwaters Hamilton Creek	0	1	0	1	0	0	0	0
Keku Strait-Frontal Frederick Sound	1	0	1	1	0	0	0	0
Mitchell Slough	5	9	20	12	10	0	31	11
Mitkof Island-Frontal Frederick Sound	12	0	13	0	12	0	1	0
North Arm-Frontal Duncan Canal	3	0	1	0	4	0	0	0
Outlet Hamilton Creek	5	1	42	1	2	0	43	1
Sitkum Creek	4	1	4	3	0	1	0	0
Taylor Creek-Frontal Duncan Canal	0	0	6	0	3	0	1	0
Twelvemile Creek	2	0	6	1	3	0	0	0
Grand Total	**68**	**27**	**198**	**65**	**57**	**11**	**147**	**63**

Landslides resulting from disturbance can contribute significant amounts of sediment and may occur due to disturbances independent of the basin area harvested (Kreutzweiser and Capell 2001). Landslides may be an important source of wood and spawning gravels, which are building blocks for fish habitat (Burnett et al. 2007). Timber and vegetation clearing and road construction on unstable slopes may trigger landslides and debris flows. The delivery of sediment to streams from these events depends on their connection to streams (Gomi et al. 2005). Subwatersheds in the analysis area are generally characterized by low relief (steepness) of the mainstem channels. Portions of the subwatersheds have high concavity profiles where steep mountain slopes meet low-gradient valleys. Landslides and debris flows in these settings typically deliver sediment and debris in the form of large log jams and alluvial fans at confluences, resulting in patchy disturbance patterns (May 2007; Benda et al. 2004). Strictly observing Forest Plan Standards and Guidelines and R10 and National Core BMPs minimizes the risk of landslides in clearcut harvest areas and in areas with road construction. Landslide occurrence (i.e., the number of landslides) is highest in the Mitchell Slough subwatershed (Table WAT-5). The Colorado Creek-Frontal Wrangell Narrows and Fivemile Creek-Frontal Frederick Sound subwatersheds have the largest areas affected by landslides, approximately 934 acres and 896 acres, respectively (Table WAT-5).

Table WAT-5. Soils on Slopes Greater than 72 Percent and Landslide Summary for Analysis Area Subwatersheds

Subwatershed	Slopes > 72% (acres)	Percent of Subwatershed with Slopes > 72%	Number of Landslides	Landslides Area (acres)
190102020502	0.0	0.0	0	0.0
190102021103	210.9	1.4	1	201.8
Big Creek	0.0	0.0	0	0.0
Big John Bay-Frontal Rocky Pass	9.9	0.1	0	0.0
Big John Creek	159.6	1.2	6	242.5
Cathedral Falls Creek	29.6	0.2	2	73.9
Colorado Creek-Frontal Wrangell Narrows	1137.9	2.4	6	934.0
Duncan Canal-Frontal Sumner Strait	395.5	1.4	7	520.5
Fivemile Creek-Frontal Frederick Sound	1776.5	13.0	3	896.2
Goose Cove	1311.9	5.7	12	375.4
Hamilton Bay-Frontal Keku Strait	13.6	0.1	1	1.4
Headwaters Hamilton Creek	61.6	0.6	1	1.7
Keku Strait-Frontal Frederick Sound	9.5	0.1	0	0.0
Mitchell Slough	322.2	2.3	16	574.8
Mitkof Island-Frontal Frederick Sound	417.0	2.1	1	280.3
North Arm-Frontal Duncan Canal	475.5	1.5	5	778.5
Outlet Hamilton Creek	97.6	0.5	3	30.6
Sitkum Creek	48.3	0.5	2	17.5
Taylor Creek-Frontal Duncan Canal	759.9	2.9	11	590.8
Twelvemile Creek	768.4	10.4	5	258.1

The landslides identified in Table WAT-5 are for the entire subwatersheds and include landslides occurring outside of the portions of each subwatershed crossed by one or more of the proposed transmission line corridors. Project-related disturbance is expected to occur within a corridor that ranges from 100- to 300 feet-wide under all of the action alternatives. Landslides within these areas are uncommon. A review of mapped landslides on the Tongass indicated that three debris avalanches have occurred within the 300-foot-wide corridors for all of the action alternatives, affecting a total of 12 acres. Two of these landslides appear to be natural and one is assumed to be related to past timber harvest.

Temperature

Removal of riparian vegetation and the resultant increase in solar radiation can lead to increased stream temperatures (Beschta et al. 2000). The Alaska Water Quality Standards for "growth and propagation of fish" state that temperature "may not exceed 20 degrees C at any time", with additional thresholds of 15ºC for migration and rearing areas, and 13ºC for spawning areas (ADEC 2011). Recent correspondence with USGS personnel indicates the 20ºC standard is exceeded most years on approximately half of the non-glacial streams in Southeast Alaska (Solin pers. comm., 2009, as cited in USDA Forest Service 2011d). 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 (Tucker and Thompson 2010). The effects of past upland and riparian harvest on maximum stream temperatures were thought to be masked by local watershed characteristics and ambient weather conditions in the above study, suggesting the current numeric criteria for maximum stream temperature exceedance may be too stringent to reflect natural conditions in headwater basins in Southeast Alaska (Tucker and Thompson 2010). The magnitude of effects from management activities on stream temperature varies. Everest and Reeves (2007) noted that streams without riparian buffers in the Pacific Northwest may have temperature increases over 10ºC. Murphy and Milner (1997) reviewed studies in Southeast Alaska from past no buffer practices and found a wide range of temperatures in streams, most with small increases that did not approach lethal levels. In coastal British Columbia, daily maximum temperature in summer increased in streams with no buffer, while water temperature in streams with 33 and 100 feet buffers did not (Gomi et al. 2006). Hetrick et al. (1998) determined that temperature effects from vegetation removal were mitigated after flow through approximately 500 feet of canopy cover streamside; however, other studies (Poole et al. 2001; Moore and Wondzell 2005; Pollock et al. 2009) noted that while water temperature cooling occurred below timber harvest clearings, once streams entered forested areas, the level of cooling and distance to return to unharvested temperature levels was variable.

Forest Plan Standards and Guidelines protect riparian buffers on all fish-bearing and Class III streams through the designation of Riparian Management Areas (RMAs). RMAs aim to preserve riparian zone interactions among streams, floodplains, riparian wetlands and uplands (Paustian 2004). Prior to passage of the TTRA in 1990, timber harvest in RMAs occurred in all analysis area subwatersheds (Table WAT-6). Past harvest in the RMA may have increased stream temperatures on isolated stream reaches; however, sufficient vegetation regrowth has occurred since the passage of the TTRA for these riparian areas to recover.

Table WAT-6. Summary of Harvested Riparian Acres in Analysis Area Subwatersheds

Subwatershed	Total Riparian Acres[1/]	Total Riparian Harvest (acres)	Total Riparian Harvest (%)[2/]
190102020502	1,621.4	0.0	0.0
190102021103	1,716.7	3.9	0.2
Big Creek	1,633.2	0	0.0
Big John Bay-Frontal Rocky Pass	1,465.0	53.9	3.7
Big John Creek	1,593.3	18.6	1.2
Cathedral Falls Creek	1,700.5	2.6	0.2
Colorado Creek-Frontal Wrangell Narrows	3,307.7	56.6	1.7
Duncan Canal-Frontal Sumner Strait	1,537.3	66.5	4.3
Fivemile Creek-Frontal Frederick Sound	442.1	0.0	0.0
Goose Cove	2,200.6	76.4	3.5
Hamilton Bay-Frontal Keku Strait	679.2	109.6	16.1
Headwaters Hamilton Creek	930.9	0.0	0.0
Keku Strait-Frontal Frederick Sound	650.0	160.7	24.7
Mitchell Slough	1,553.1	99.7	6.0
Mitkof Island-Frontal Frederick Sound	1,109.5	107.6	9.7

Table WAT-6. Summary of Harvested Riparian Acres in Analysis Area Subwatersheds

Subwatershed	Total Riparian Acres[1/]	Total Riparian Harvest (acres)	Total Riparian Harvest (%)[2/]
North Arm-Frontal Duncan Canal	2,729.9	6.8	0.2
Outlet Hamilton Creek	2,302.0	46.4	2.0
Sitkum Creek	1,129.4	258.1	22.9
Taylor Creek-Frontal Duncan Canal	2,346.6	71.9	3.1
Twelvemile Creek	839.5	71.6	8.5

Notes:
1/ Riparian acres determined from the RMA buffer.
2/ This column identifies the percent of riparian acres in each watershed that have been harvested.

Timber harvest in upland areas has also been linked to increases in maximum daily stream temperatures. Pollock et al. (2009) observed that watersheds in the western Olympic Peninsula with 25 to 100 percent of the total area harvested had higher stream temperatures than those with little or no harvest. Potential causal mechanisms for these observations included heating of shallow soils containing groundwater sources which feed into streams; increased risk of debris flows and landslides impacting streams and the subsequent influence on alluvial exchange rates, loss of LWD, and loss of riparian vegetation through scour; increased peak flows associated with timber harvest potentially widening channels and increasing total solar radiation to streams; and microclimate effects due to forest removal such as increased air temperatures, reduced relative humidity and increased wind speed potentially extending hundreds of feet into adjacent forests (Pollock et al. 2009). In contrast to many other studies, Pollock et al. (2009) found the strongest predictor of increased stream temperatures was the percentage of total watershed harvested rather than the percentage of riparian canopy harvested; however, the authors had difficulty parsing the two effects since most of the riparian vegetation was harvested concurrent with adjacent upland harvest. Cumulative harvest levels of analysis area subwatersheds are below those identified in the above study, and would remain so with implementation of any of the action alternatives.

Stream Habitat

Stream habitat on the Tongass National Forest is determined by mapping and classifying streams according to process group and channel type. Fluvial process groups describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion and deposition processes. Fluvial process groups recognized on the Tongass National Forest are identified in Table WAT-7. Channel types further categorize streams using physical attributes such as channel gradient, channel width, channel pattern, stream bank incision and containment, and riparian plant community composition.

Table WAT-7. Fluvial Process Groups Recognized on the Tongass National Forest

Process Group	Process Group Abbreviation	Defining Characteristic of Group
Alluvial Fan	AF	Channels occurring on alluvial fan landforms
Estuarine	ES	Channels that are influenced by tides
Floodplain	FP	Low-gradient channels on broad flood plains
High-gradient Contained	HC	High-gradient channels contained by steep valley walls
Moderate Gradient Contained	MC	Moderate-gradient channels contained by steep valley walls
Moderate-gradient, Mixed-control	MM	Moderate-gradient channels with some flood plain development
Large Contained	LC	Large, low-gradient channels contained by steep valley walls
Glacial Outwash	GO	Channels associated with glaciers or recently glaciated terrain
Palustrine	PA	Very low-gradient, placid channels draining wetlands

Streams in the Tongass National Forest are further categorized into value classes from I to IV indicating levels of habitat use by fish populations and are delineated according to the criteria described in the Aquatic Habitat Management Handbook (USDA Forest Service 2001b):

> Class I: Streams and lakes with anadromous or adfluvial fish or fish habitat; or high quality resident fish waters, or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.
>
> Class II: Streams and lakes with resident fish or fish habitat and generally steep (6-25 percent or higher) gradient (can also include streams with a 0-6 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria.
>
> Class III: Streams are perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality or fish habitat capability. For streams less than 30 percent gradient, special care is needed to determine if resident fish are present.
>
> Class IV: Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have immediate influence on downstream water quality or fish habitat capability. Class IV streams do not have the characteristics of Class I, II, or III streams, and have a bankfull width of at least 1 foot.
>
> Non-streams: Rills and other watercourses, generally intermittent and less than 1 foot in bankfull width, little or no incision into the surrounding hillslope, and with little or no evidence of scour.

Streams within the analysis subwatersheds are presented by class in Table WAT-8. Fish-bearing streams (Class I and II) comprise the majority of the stream miles in most of the analysis area subwatersheds. Class I and Class II streams account from more than half of total stream miles in all but two of the analysis area subwatersheds. In these two subwatersheds they account for 43 percent (Fivemile Creek-Frontal Frederick Sound) and 49 percent (190102021103). Fish-bearing lakes and ponds are present in all the analysis area subwatersheds (Table WAT-8).

Table WAT-8. Stream Classes, Stream Density, and Lake / Pond Habitat within Project Subwatersheds

Subwatershed	Area (mi^2)	Stream Length (miles)[1/] Class I	Class II	Class III	Class IV	Stream Density[2/]	Lakes and Ponds (acres)	Number of Lakes and Ponds with Fish Habitat
190102020502	23.9	46.5	3.6	0.2	2.2	2.2	37.7	6
190102021103	23.5	18.5	18.3	25.2	13.2	3.2	138.1	5
Big Creek	24.6	19.4	39.4	0	0	2.4	77.5	14
Big John Bay-Frontal Rocky Pass	25.4	34.4	13.5	2.8	8.9	2.3	33.5	2
Big John Creek	20.6	24.7	15.7	7.8	13.4	3.0	97.6	4
Cathedral Falls Creek	26.8	1.9	42.2	5.6	0	1.9	94.4	10
Colorado Creek-Frontal Wrangell Narrows	75.6	64.5	30.7	59.9	15.3	2.3	36.4	2
Duncan Canal-Frontal Sumner Strait	43.3	27.3	14.0	15.0	17.7	1.7	249.0	9
Fivemile Creek-Frontal Frederick Sound	21.3	4.5	7.0	15.3	0	1.3	54.1	2
Goose Cove	36.1	34.2	13.3	18.5	0	1.8	96.3	2
Hamilton Bay-Frontal Keku Strait	16.5	10.5	11.8	0.2	0	1.4	4.9	3

Table WAT-8. Stream Classes, Stream Density, and Lake / Pond Habitat within Project Subwatersheds

Subwatershed	Area (mi^2)	Stream Length (miles)[1/] Class I	Class II	Class III	Class IV	Stream Density[2/]	Lakes and Ponds (acres)	Number of Lakes and Ponds with Fish Habitat
Headwaters Hamilton Creek	15.3	20.8	4.1	3.1	0	1.8	25.3	4
Keku Strait-Frontal Frederick Sound	16.8	17.9	2.7	0.6	0	1.3	21.9	1
Mitchell Slough	22.3	29.4	17.8	18.5	24.3	4.0	6.6	3
Mitkof Island-Frontal Frederick Sound	30.8	22.9	15.1	17.7	0.6	1.8	21.6	2
North Arm-Frontal Duncan Canal	48.3	64.4	9.2	22.1	0	2.0	195.7	7
Outlet Hamilton Creek	33.0	45.1	24.3	5.6	26.3	3.1	17.6	12
Sitkum Creek	14.0	17.5	12.8	7.5	0	2.7	21.7	2
Taylor Creek-Frontal Duncan Canal	40.8	30.0	33.8	22.8	6.2	2.3	150.5	17
Twelvemile Creek	11.5	10.9	2.3	10.7	0	2.1	89.3	3
Total	**570.4**	**545.3**	**331.6**	**259.1**	**128.1**	**44.6**	**1,469.7**	**110**

Notes;
1/ Stream length (miles) was estimated using the best available information from aerial photos and field reconnaissance.
2/ Stream density estimates include information from "unclassified" streams.

LWD in stream channels plays an important role in physical and biological processes by influencing channel width and meander patterns, trapping organic matter, providing storage for sediment and bedload, and forming pools used by fish and aquatic insects for cover (May and Gresswell 2003; Gomi et al. 2001; Bilby 1984; Ralph et al. 1994; Beechie and Sibley 1997). How a piece of wood functions in a stream depends on its size relative to the size of the stream. Functional wood debris is considered longer than half the channel width and with a diameter greater than half the channel depth (Montgomery et al. 2003). Large wood pieces big enough to have important geomorphic functions are called key pieces, and are typically determined in the field using minimum size criteria scaled to average channel bed width.

Stream habitat complexity depends on a continuous supply of large wood from conifer riparian forests. Harvest in riparian areas prior to 1991 resulted in young stands of alder and conifer mix forests. Alder provides shade, leaf litter, and can efficiently “fix” nitrogen to fuel primary production within streams; however, it does not provide long-lasting large wood.

Currently, adequate legacy wood exists in Class I and II streams in previously harvested riparian management areas (RMAs), but reach-level stream habitat conditions may decline in the future due to lack of LWD recruitment from the riparian forest, particularly in the Keku Strait-Frontal Frederick Sound and Sitkum Creek subwatersheds, where approximately 25 percent and 23 percent of the riparian acres have been harvested, respectively (Table WAT-6).

Lake Habitat

The primary hydrologic functions of lakes are to store water for release during low flow conditions, increase evaporation by providing a large surface area, temporarily store particulate sediment, and provide sites for chemical precipitation of dissolved materials (Dingman 2002). The shallow shoreline habitat of lakes and ponds often contain abundant populations of plants and animals, and provide important feeding and rearing areas to anadromous and resident fish populations. The Taylor Creek-Frontal Duncan Canal subwatershed has the highest number of lakes and ponds with fish habitat while the Duncan Canal-Frontal Sumner Strait subwatershed has more lake and pond surface area (Table WAT-8).

The abundant Class I and Class II habitat in the form of streams and lakes indicates high fisheries value within the analysis area (Table WAT-8).

Fisheries

The ADF&G maintains a catalog of waters important for the spawning, rearing, or migration of anadromous fish (Johnson and Blanche 2010). The catalog and field verification provide information for the fish species found within each subwatershed. A total of six anadromous and/or resident salmonid fish species are present in all of the subwatersheds in the analysis area. These species include three of the five Pacific Coast salmon, steelhead, a trout species, and one char.

- Chum salmon (*Oncorhynchus gorbuscha*)
- Coho salmon (*Oncorhynchus kisutch*)
- Pink salmon (*Oncorhynchus keta*)
- Steelhead (*Oncorhynchus mykiss*)
- Cutthroat trout (*Oncorhynchus clarki*)
- Dolly Varden char (*Salvelinus malma*)

Each subwatershed contains small and medium-sized drainages which contribute to a marine sport and commercial fishery and support a limited freshwater fishery. Both the recreational and commercial fisheries are important to the local economy of the area, and these fish populations contribute to the subsistence needs of the local communities.

Management Indicator Species

National Forest Management Act (NFMA) regulations direct the use of Management Indicator Species (MIS) in forest planning to help display the effects of forest management. MIS are species whose population changes are believed to indicate the effects of land management activities. The 2008 Tongass Forest Plan identifies pink and coho salmon, Dolly Varden char, and cutthroat trout as MIS that are representative of varied fish life history habitat uses of the Tongass stream systems.

Threatened, Endangered, and Sensitive Fish Species

Under Section 7 of the Endangered Species Act (ESA), federal agencies are required to ensure that actions are not likely to jeopardize the continued existence of a listed species. An effects analysis is required to address the direct and indirect effects of a proposed action or actions on threatened and endangered species and their critical habitat (50 CFR 402.02). This effects analysis is to comply with Section 7 of the ESA which requires all federal agencies, in consultation with the USFWS and NMFS, to ensure that their actions are not likely to jeopardize the continued existence of threatened and endangered species or adversely modify their habitat.

There are no fish species in the streams and lakes of the Tongass National Forest that are federally ESA-listed or listed under the State of Alaska ESA.

Although a number of federally listed fish have been documented in Alaskan waters, their presence near the action area appears rare; however, they have been documented in Southeast Alaska inside channels and could be present in Alaskan waters during some period of their marine life stage (McNeil and Himsworth 1980; Orsi and Jaenicke 1996; Trudel et al. 2009; Tucker et al. 2011).

The listing status of the Chinook salmon (*Oncorhynchus tshawytshca*), sockeye salmon (*O. neka*), coho salmon (*O. kisutch*), Hood Canal Summer Run Chum Salmon (*O. keta*), and steelhead (*O. mykiss*) varies depending on the Evolutionary Significant Unit (ESU) or DPS considered. The Puget Sound, Lower Columbia River, Upper Willamette River, and Snake River (spring/summer, and fall) Chinook salmon ESAs are listed as threatened. Likewise, the Upper Willamette, Middle Columbia, Lower Columbia, and Snake River Basin steelhead DPSs are also listed as threatened. However, the Snake River sockeye salmon, Upper Columbia River (spring) Chinook salmon, and Upper Columbia River steelhead ESU/DPS are listed as endangered. The Lower Columbia River Coho and Hood Canal Chum salmon are listed as threatened. No ESA critical habitat has been designated for these species within Alaskan waters. These species are addressed in detail in the wildlife Biological Evaluation (BE) prepared for the proposed project, which is included in the project record (Tetra Tech 2014c). All ESA-listed species found in Alaska are noted in Appendix A of the BE.

Marine Environment

Shorelines along all the frontal watersheds contain diverse estuarine and tidal habitats which are vital for commercially important species including Dungeness crab, king crab, and juvenile salmon. These habitats are part of a complex ecosystem comprising shrimp, flatfish, marine worms, starfish, sponges, anemones, sea cucumbers, urchins, shellfish, plankton, marine algae, and other organisms. The 2008 Forest Plan Revision identifies MAFs and raft staging areas as planned points of concentrated activity along these shoreline environments, with the remaining shoreline protected by a 1,000-foot buffer. Three existing LTFs—the Portage Bay, Little Hamilton Bay, and Tonka LTFs—could be used to transport logs cleared from the right-of-way, as well as for transport of construction personnel, equipment, and materials. These LTFs may be summarized as follows:

- The Portage Bay LTF is located on Portage Bay on the north side of Kupreanof Island and could be used by Alternatives 2 and 3. This LTF is accessed by an existing isolated NFS road system that does not connect to any community (Figure 2-1).
- The Little Hamilton Bay LTF is located on Little Hamilton Island, which is connected to Kupreanof Island by a land bridge road. Little Hamilton Island is located in Hamilton Bay on the west side of Kupreanof Island (Figures 2-1 and 2-2). Logs could be hauled to the Little Hamilton Bay LTF for transportation by barge or raft under all three action alternatives.
- The Tonka LTF is located on Forest Service road 6350 (FS 6350) on Kupreanof Island (see Figure 2-2). Originally constructed as an A-frame in 1977, modifications have been made to this LTF through the years, including a low angle ramp installation in 1990, drainage improvements in 2008, and various small boat float maintenance/modification tasks. The Tonka LTF was made larger and improved in 2013 and a new dock was added. This LTF could be used by Alternative 4 (Figure 2-2).

All three action alternatives would require marine crossings. The marine environment is discussed in more detail in the separate *Marine Environment* section of this EIS.

Fish Passage

The condition of existing roads, culverts, and drainage features in the project corridors was assessed using district-wide RCS data. Each road crossing structure in a fish stream was assessed for its ability to provide unimpeded passage (USDA Forest Service 2001b). The Tongass National Forest has developed a juvenile fish passage evaluation criteria matrix with an interagency group of professionals. The evaluation matrix stratifies culverts by type, and establishes thresholds for culvert gradient, stream channel constriction, debris blockages, and vertical barriers (or perch) at the culvert outlet. Culvert categories are:

- **Green:** conditions have a high certainty of meeting adult and juvenile fish passage requirements at all desired stream flows;

- **Gray:** conditions are such that additional analysis is required to determine juvenile fish passage ability; and
- **Red:** conditions have a high certainty of impeding juvenile fish passage at all desired stream flows

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. Review of existing data identified a total of 25 red fish crossings in six subwatersheds in the project corridors for Alternatives 2 and 3, and 24 red fish crossings distributed over six subwatersheds for Alternative 4. Additional information is provided in the Aquatics Resource Report prepared for this project (Tetra Tech 2014b).

Individual Subwatershed Descriptions

Individual subwatershed descriptions are provided for each of the 20 analysis area subwatersheds in the Aquatics Resource Report (Tetra Tech 2014b).

Environmental Effects

Effects Common to All Alternatives

Streamflow

Under all action alternatives, there may be an increase in annual water yield, increased peak flows, and altered timing of water delivery in small streams in the subwatersheds in the analysis area. Timber and vegetation clearing in watersheds may affect evapotranspiration, canopy interception, cloud-water interception, snow accumulation and melt rates, thereby changing the collection, storage, and delivery of water. Changes in streamflow following timber harvest are typically commensurate with the proportion of watershed harvested (Harr 1986; Jones and Grant 1996; Jones 2000; Moore and Wondzell 2005). A threshold of 20 percent of basin harvested, as proposed by Bosch and Hewlett (1982), provides a measure to assess potential impacts on streamflow as a result of vegetation clearing.

Timber harvest and vegetation clearing can cause temporary increases in landslide potential and water yield during certain time periods, prior to recovery to pre-harvest conditions (Swanston and Swanson 1976; Swanston and Marion 1991; May 2007). Cumulatively, there is a general trend toward recovery of slope stability and pre-harvest rates of canopy interception and evapotranspiration in the majority of the subwatersheds in the analysis area due to vegetation regrowth that has occurred since areas were harvested in the 1980s.

Harvest over the past 30 years (since 1984) has not exceeded 20 percent in any of the analysis area subwatersheds (Table WAT-9). Under the action alternatives, proposed vegetation clearing would result in minor increases in the total area harvested for less than half of the subwatersheds in the analysis area (Table WAT-9). The largest relative increase would occur in the Fivemile Creek-Frontal Frederick Sound subwatershed, with the share of the subwatershed harvested or cleared increasing from 0.1 percent harvested since 1984 to 1.3 percent under Alternatives 2 and 3. However, this is still a minor increase and all other increases in harvest for analysis area subwatersheds are below 1 percent for all alternatives (Table WAT-9).

Total vegetation clearing, including clearing of muskeg and vegetation other than productive old growth, can also impact stream flows and sedimentation. Total vegetation clearing is presented by subwatershed in Table WAT-10. Changes in streamflow are difficult to measure. Given the small percentage of vegetation clearing occurring under each action alternative, any changes are likely to be undetectable. The potential effects of the proposed alternatives on streamflow in the affected subwatersheds are, therefore, considered minor or negligible.

Table WAT-9. Change in Percent Subwatershed Harvested by Alternative and Watershed

Subwatershed	Alternative 1 (No Action)		Alternatives 2 and 3[1/]				Alternative 4			
	Total Harvested Since 1984		Estimated Vegetation Clearing		Total Harvested Since 1984 plus Estimated Clearing		Estimated Vegetation Clearing		Total Harvested Since 1984 plus Estimated Clearing	
	Acres	Percent of Watershed Area	Acres[2/]	Percent of Watershed Area	Acres	Percent of Watershed Area	Acres[2/]	Percent of Watershed Area	Acres	Percent of Watershed Area
190102020502	42	0.3	3	0.0	45	0.3	0	0.0	42	0.3
190102021103	132	0.9	0	0.0	132	0.9	111	0.7	243	1.6
Big Creek	4	0.0	4	0.0	8	0.1	0	0.0	4	0.0
Big John Bay-Frontal Rocky Pass	298	1.8	0	0.0	298	1.8	58	0.4	356	2.2
Big John Creek	563	4.3	0	0.0	563	4.3	41	0.3	604	4.6
Cathedral Falls Creek	320	1.9	23	0.1	343	2.0	20	0.1	340	2.0
Colorado Creek-Frontal Wrangell Narrows	646	1.3	41	0.1	687	1.4	36	0.1	682	1.4
Duncan Canal-Frontal Sumner Strait	800	2.9	0	0.0	800	2.9	18	0.1	818	3.0
Fivemile Creek-Frontal Frederick Sound	16	0.1	183	1.3	199	1.5	0	0.0	16	0.1
Goose Cove	1,270	5.5	75	0.3	1,345	5.8	0	0.0	1,270	5.5
Hamilton Bay-Frontal Keku Strait	68	0.6	49	0.5	117	1.1	49	0.5	117	1.1
Headwaters Hamilton Creek	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Keku Strait-Frontal Frederick Sound	823	7.7	12	0.1	835	7.8	12	0.1	835	7.8
Mitchell Slough	1,222	8.6	0	0.0	1,222	8.6	85	0.6	1,307	9.2
Mitkof Island-Frontal Frederick Sound	512	2.6	5	0.0	517	2.6	0	0.0	512	2.6
North Arm-Frontal Duncan Canal	350	1.1	25	0.1	375	1.2	0	0.0	350	1.1
Outlet Hamilton Creek	871	4.1	0	0.0	871	4.1	30	0.1	901	4.3
Sitkum Creek	78	0.9	25	0.3	103	1.2	25	0.3	103	1.2
Taylor Creek-Frontal Duncan Canal	258	1.0	0	0.0	258	1.0	55	0.2	313	1.2
Twelvemile Creek	703	9.5	18	0.2	721	9.8	0	0.0	703	9.5
Total[3/]	**8,976**		**465**		**9,441**		**540**		**9,516**	

Note:
1/ These estimates are for Alternative 2. Total clearing under Alternative 3 would affect 4 fewer acres, with a total of 461 acres affected.
2/ Estimates for all alternatives assume that all old-growth timber would be cleared in all the disturbed areas.
3/ Totals may not sum due to rounding.

Table WAT-10. Total Project Disturbance by Subwatershed by Alternative (acres)

Subwatershed	Alternative			
	1	2	3	4
190102020502	0	59.2	59.2	0.0
190102021103	0	0.0	0.0	143.5
Big Creek	0	11.3	11.3	0.0
Big John Bay-Frontal Rocky Pass	0	0.0	0.0	61.4
Big John Creek	0	0.0	0.0	70.0
Cathedral Falls Creek	0	67.1	67.1	23.6
Colorado Creek-Frontal Wrangell Narrows	0	55.3	55.3	39.4
Duncan Canal-Frontal Sumner Strait	0	0.0	0.0	33.2
Fivemile Creek-Frontal Frederick Sound	0	270.3	268.7	0.0
Goose Cove	0	139.4	139.4	0.0
Hamilton Bay-Frontal Keku Strait	0	49.1	49.1	49.1
Headwaters Hamilton Creek	0	21.6	21.6	0.0
Keku Strait-Frontal Frederick Sound	0	28.6	28.6	28.6
Mitchell Slough	0	0.0	0.0	110.2
Mitkof Island-Frontal Frederick Sound	0	25.8	9.5	0.0
North Arm-Frontal Duncan Canal	0	97.6	97.6	0.0
Outlet Hamilton Creek	0	0.0	0.0	36.6
Petersburg Creek	0	0.0	0.0	0.0
Sitkum Creek	0	40.2	40.2	40.1
Taylor Creek-Frontal Duncan Canal	0	0.0	0.0	103.7
Twelvemile Creek	0	25.5	25.5	0.0
Total	**0**	**891.0**	**873.1**	**739.4**

Water Quality

Sedimentation and Turbidity

The action alternatives would all use existing roads. The length of the aboveground portions of the proposed alternatives that follow existing roads ranges from 33.7 miles for Alternatives 2 and 3 (59 percent of the total aboveground length in each case) to 36.6 miles for Alternative 4 (73 percent of the total length). No new roads would be constructed under any of the proposed alternatives, but the three proposed action alternatives would all involve the use of temporary shovel trails, matting panels, and temporary access spurs.

The action alternatives would all cross areas where there are no existing roads (see Table 2-1). Surface access in these areas would be via shovel trails supported by temporary matting panels in some wetland areas. Alternatives 2 and 3 would involve the development and use of an estimated 21.6 miles of shovel trail and 2 linear miles of temporary matting panels; Alternative 4 would require 6.5 miles of temporary shovel trails and 7.3 miles of temporary matting panels (Table 2-1). Temporary access spurs would be constructed in locations where the proposed transmission line structures would be located off an existing road by more than 20 feet. An estimated 7.6 miles of temporary access spurs would be required for Alternatives 2 and 3; Alternative 4 would require an estimated 6.2 miles (Table 2-1).

Tongass National Forest monitoring data indicate that harvested areas are consistently within the established standard of less than 15 percent detrimental soil disturbance (USDA Forest Service 2005a). Recent BMP implementation and effectiveness monitoring of five harvest units and related roads by an interdisciplinary team on Prince of Wales Island found effective implementation of the BMPs and no sign of erosion or sedimentation into site area streams (USDA Forest Service 2010a). These findings suggest that ground disturbance during timber harvest and vegetation clearing alone is probably not a direct source of sediment. Vegetation clearing associated with the proposed transmission line is, therefore, expected to have minor direct effects on local sedimentation and turbidity within affected subwatersheds.

The numbers of estimated stream crossings are identified by alternative and stream class (Table WAT-11). Higher numbers of stream crossings typically indicate a higher potential for short term (lasting less than a week) sedimentation effects due to construction near a stream. Long-term (potentially lasting for years) effects due to drainage disruption by road prisms are not expected to occur because the proposed temporary shovel trails and temporary access spurs would be decommissioned following construction, temporary matting panels or bridging would be removed, and no new roads are proposed under any of the alternatives. Properly placed and maintained crossings only affect the local channel segment and, as a result, proposed temporary shovel trails and temporary access spurs would individually have minor effects.

Table WAT-11. Number of Proposed Stream Crossings by Action Alternative[1/]

	Alternatives 2 and 3		Alternative 4	
Stream Class	**Shovel Trail/ Matting Panels**	**Temporary Access Spur**	**Shovel Trail/ Matting Panels**	**Temporary Access Spur**
I	10	6	28	0
II	20	5	14	6
III	16	0	4	1
IV	72	3	24	7
Total	**118**	**14**	**70**	**14**

Note:
1/ This table identifies proposed stream crossings by temporary shovel trail/matting panels and temporary access spur only. It does not include streams that would be spanned by the proposed transmission line and not crossed by shovel trails or temporary access spurs.

Temperature

The action alternatives would all require the removal of some vegetation within the proposed transmission line right-of-way. Given the nature of right-of-way clearing, in most cases it would not be possible to leave tall vegetation buffers along Class I, II, and III streams spanned by the proposed transmission line. The lack of riparian buffers in these areas could result in higher stream temperatures. Based on the width of the proposed clearing, effects on stream temperature would be localized and minor. Further, although taller vegetation would need to be removed, other vegetation could potentially remain and provide some shade. Assuming no stream crossings could be spanned, an estimated 271 acres, 253 acres, and 64 acres of RMA buffers would require removal under Alternatives 2, 3 and 4, respectively. No temperature sensitive streams have been identified along either route corridor.

Stream Habitat

As noted with respect to temperature, right-of-way clearing would involve the removal of tall riparian vegetation in areas where the proposed alternatives would cross (span) Class I, II, III, and IV streams. The removal of riparian vegetation could result in direct impacts to stream habitat in affected subwatersheds. However, potential effects would be limited to the proposed rights-of-way and are expected to be minor. Timber would be left in place in these riparian corridors to provide a source of large woody debris in affected riparian areas.

Stream habitat may be indirectly affected if peak flows change as a result of the vegetation clearing proposed under the action alternatives. Increased peak flows may result in wider channels for a given drainage area (Grant and Swanson 1990; Dose and Roper 1994; Jones and Grant 1996). This could affect stream temperature and pool quantity and quality. If stream habitat was altered by increased peak flows, the effects would likely occur on discrete portions of the channel network, lasting until the channel adjusts, and would have a negligible effect at the subwatershed scale.

Lake Habitat

None of the proposed alternatives cross any lakes. Lake riparian buffers and other R10 BMPs and Forest Plan Standards and Guidelines would be implemented in locations where the proposed alternatives are located near lakes. Impacts to lake habitat are expected to be negligible under all of the action alternatives.

Fish Passage

Potential impacts to fish passage would be site-specific and primarily related to shovel trail and temporary access spur crossings. However, fish passage could also be affected if the risk of landslides were to increase as a result of vegetation clearing. Potential changes in water yield, peak flow, and timing related to project activities, such as vegetation clearing, could increase the number of red fish crossings by creating flow-related passage barriers to juvenile fish. Theoretically, higher peak flows could increase the percentage of time culverts would exceed maximum flow standards for juvenile fish; however, the low total existing harvest and proposed vegetation clearing levels and the low percentage of each basin occupied by roads indicate a negligible risk that peak flows would create additional red fish crossings. Proposed stream crossings are identified by stream class in Table WAT-11. BMPs would minimize potential impacts of the proposed new stream crossings to fish passage and these potential impacts are, as a result, considered minor.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line and related facilities would not be built. The proposed project would not result in vegetation clearing or the removal of merchantable timber.

Cumulative Effects

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other reasonably foreseeable projects in the analysis area.

Alternatives 2 and 3

Direct and Indirect Effects

Alternative 2 would result in a total estimated disturbance of 891 acres, including 465 acres of productive old-growth forest (Tables WAT-9 and WAT-10). Alternative 3 would disturb 873.1 acres, including 461 acres of productive old-growth forest. The majority of the difference between Alternatives 2 and 3 occurs in the Mitkof Island-Frontal Frederick Sound subwatershed (Table WAT-10; Figure WAT-1). Productive old growth vegetation clearing under these alternatives would not result in cumulative harvest and disturbance exceeding 20 percent in any of the affected subwatersheds (Table WAT-9).

Under Alternatives 2 and 3, old growth vegetation clearing would occur in 12 watersheds. The largest impact as a percent of total subwatershed area would occur in the Fivemile Creek-Frontal Frederick Sound subwatershed, with an estimated 183 acres of old growth expected to be cleared, an area equivalent to approximately 1.3 percent of the watershed. An estimated 0.1 percent of this watershed has been affected by past harvest. Right-of-way clearing and other disturbance associated with Alternatives 2 and 3 would increase this total to 1.5 percent (with rounding) (Table WAT-9).

Of the subwatersheds crossed by Alternatives 2 and 3, the Twelvemile Creek subwatershed has been most affected by harvest since 1984, with an estimated 9.5 percent of the subwatershed affected (Table WAT-9). Vegetation clearing associated with Alternatives 2 and 3 could potentially increase this total to 9.8 percent. Potential vegetation clearing under these alternatives and past harvest together represent less than 10 percent of the area in all the other potentially affected subwatersheds (Table WAT-9). Impacts to streamflow based on percent of subwatershed harvested or cleared would, therefore, be minor or negligible in all watersheds affected by this alternative.

A total of 0.2 acre of forest vegetation clearing would take place on soils with slopes greater than 72 percent under Alternatives 2 and 3. This area, which is located entirely in the Keku Strait-Frontal Frederick Sound subwatershed, would have minor susceptibility to landslides. Approval of the clearing of vegetation on slopes greater than 72 percent needs to be granted by the Forest Supervisor or District Ranger on a case-by-case basis (USDA Forest Service 2008c).

An estimated 21.6 miles of shovel trails, 2.0 miles of temporary matting panels, and 7.6 miles of temporary access spurs would be required for these alternatives (Table WAT-12). Viewed at a subwatershed scale, temporary shovel trails would cross just six of the affected subwatersheds, with the longest section (11.8 miles) in the Fivemile Creek-Frontal Frederick Sound subwatershed. Temporary matting panels would be primarily used in the North Arm-Frontal Duncan Canal subwatershed. Temporary access spurs would be more evenly distributed among the subwatersheds with total estimated lengths of 0.5 mile or less per watershed, with the exception of the Goose Cove watershed where an estimated total of 4.4 miles of temporary access spur would be required (Table WAT-12). Overall, the use of temporary shovel trails, temporary matting panels, and temporary access spurs is expected to have minor effects on sedimentation and aquatic habitat in all subwatersheds under these alternatives.

Table WAT-12. Estimated Disturbance under Alternatives 2 and 3 by Subwatershed

Subwatershed	Shovel Trails (miles)	Temporary Matting Panels (miles)	Temporary Access Spurs (miles)
190102020502	0	0	0.6
Big Creek	0	0	0.2
Cathedral Falls Creek	0	0	0.4
Colorado Creek-Frontal Wrangell Narrows	2.3	0	0.0
Fivemile Creek-Frontal Frederick Sound	11.8	0	0.0
Goose Cove	1.7	0	4.4
Hamilton Bay-Frontal Keku Strait	0	0	0.4
Headwaters Hamilton Creek	0	0.2	0.4
Keku Strait-Frontal Frederick Sound	0	0	0.4
Mitkof Island-Frontal Frederick Sound	0.3	0	0.1
North Arm-Frontal Duncan Canal	4.3	1.8	0.0
Sitkum Creek	0	0	0.3
Twelvemile Creek	1.2	0	0.3
Total	**21.6**	**2.0**	**7.6**

Alternatives 2 and 3 would involve a total of 118 new stream crossings by either temporary shovel trails or temporary matting panels and 14 new crossings by temporary access spurs. A total of 16 new temporary Class I stream crossings are proposed under these alternatives, 10 by temporary shovel trails or matting panels and 6 by temporary access spurs (Table WAT-11). Properly placed and maintained crossings would affect only local channel segments and have individually minor effects.

Alternatives 2 and 3 would cross a total of 10 Class I and 20 Class II streams in unroaded areas (Table WAT-13). An estimated 18 of these crossings would likely require the use of an embedded pipe arch, with the remaining 12 requiring bridges. With one exception, the bankfull widths of the fish-bearing streams that would likely require bridging are 6 feet wide or less. The exception is an approximately 110-foot-wide crossing of Five Mile Creek. Temporary bridging required to cross this stream would be flown into place via helicopter.

Table WAT-13. Estimated Stream Crossings by Stream Class and Crossing Type in Unroaded Areas along Alternatives 2 and 3

Crossing Type[1/]	Stream Class				Total
	I	II	III	IV	
Embedded Pipe Arch	9	9	0	0	**18**
Bridge	1	11	0	0	**12**
Circular Pipe	0	0	3	47	**50**
Modular Bridge	0	0	1	2	**3**
Stringer Bridge	0	0	12	23	**35**
Total	**10**	**20**	**16**	**72**	**118**

Note:
1/ Estimated crossing types are based on stream characteristics including class, bankfull width, and stream incision depth (see Tetra Tech 2014b). These potential crossing types are conceptual and provided for the purposes of analysis.

An estimated 88 non-fish-bearing stream crossings would be required for this route. More than half this total (57 percent; 50 of 88) would likely be crossed using a circular pipe, with the remaining 38 crossings likely requiring the use of either a modular bridge (3 crossings) or stringer bridge (35 crossings) (Table WAT-13). The majority of bridges required to span non-fish-bearing streams would span widths of 10 feet or less; the exceptions would range up to 16 feet wide (bankfull width).

For the portions of the right-of-way that follow existing road, it is estimated that 14 stream crossings would be needed for temporary access spurs. All but one of the 14 crossings would likely use 4-6 inch circular pipe. The remaining crossing would likely require bridging.

Disturbance associated with helicopter pad installation would be less than 0.01 acre per pad. Pads would be installed approximately every 0.25 mile along the portions of the alternative where there are no existing roads and would be situated to avoid sensitive resources. Approximately 83 pads would be required for construction and long-term maintenance along the unroaded portions of the alternative route with a combined estimated disturbance of 0.83 acre. Helicopter pads would not be placed within RMA buffers associated with fish-bearing streams and would avoid high mass movement soil types. Therefore, impacts would be negligible.

Cumulative Effects

The potential impacts of vegetation clearing and other related disturbance under this alternative are evaluated in conjunction with past disturbance since 1984 in the preceding *Direct and Indirect Effects* subsection. Reasonably foreseeable future projects on NFS lands are expected to affect an estimated total of 938 acres in 6 of the 13 subwatersheds that would be crossed by Alternatives 2 and 3, ranging from 4 acres in the Headwaters-Hamilton Creek subwatershed to 321 acres in the Colorado Creek-Frontal Wrangell Narrows subwatershed (Table WAT-14).

Reasonably foreseeable harvest when added to past harvest since 1984 and acres of estimated vegetation clearing under this alternative would not exceed 20 percent of the subwatershed area in any of the affected subwatersheds. The highest cumulative effects viewed as a percentage of subwatershed area would occur in the Twelvemile Creek subwatershed where an estimated 11.2 percent of the subwatershed would be disturbed (Table WAT-14), with Alternatives 2 and 3 contributing just 0.2 percent of this total.

The Kake road project would require the construction of new, permanent stream crossings. These would likely include some of the streams in unroaded areas that would be temporarily crossed by Alternatives 2 and 3 (see Table WAT-13). In addition, the Kake road project would cross an estimated 17 Class I streams, 10 Class II streams, and two Class III streams in areas where the Kake road centerline deviates from the 300-foot-wide KPI corridor.

Table WAT-14. Cumulative Impacts on Subwatersheds Crossed by Alternatives 2 and 3

Subwatershed	Size (Acres)	Existing Harvest (since 1984) (acres)	Reasonably Foreseeable Projects: Timber Harvest on NFS Lands (acres)	Reasonably Foreseeable Projects: Kake Road Project (acres)[1/]	Estimated Vegetation Clearing for KPI (acres)	Total Harvest and Clearing (acres)	Total as a Percent of Subwatershed Area
190102020502	15,290	42	36	0	3	81	0.5
Big Creek	15,759	4	0	0	4	8	0.1
Cathedral Falls Creek	17,137	320	0	0	23	343	2.0
Colorado Creek-Frontal Wrangell Narrows	48,387	646	310	11	41	1,008	2.1
Fivemile Creek-Frontal Frederick Sound	13,649	16	0	32	183	231	1.7
Goose Cove	23,118	1,270	281	29	75	1,655	7.2
Hamilton Bay-Frontal Keku Strait	10,573	68	0	0	49	117	1.1
Headwaters Hamilton Creek	9,820	0	0	4	22	26	0.3
Keku Strait-Frontal Frederick Sound	10,747	823	0	0	12	835	7.8
Mitkof Island-Frontal Frederick Sound	19,738	512	0	0	5	517	2.6
North Arm-Frontal Duncan Canal	30,882	350	85	33	25	493	1.6
Sitkum Creek	8,932	78	0	0	25	103	1.2
Twelvemile Creek	7,363	703	106	11	18	838	11.4
Total	**221,575**	**4,832**	**818**	**120**	**463**	**6,233**	**2.8**

Note:
1/ The cumulative effects of the two projects—KPI and the Kake road project—are estimated based on the combined disturbance footprint: the KPI disturbance area plus additional areas where the Kake road centerline deviates from the 300-foot-wide KPI corridor. The acres shown here for the Kake road project represent areas that would be disturbed outside the KPI corridor. In addition to the above acres, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit-related disturbance as part of the Kake road project.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would result in a total estimated disturbance of 739.4 acres, including 540 acres of productive old-growth forest (Tables WAT-9 and WAT-10). Productive old growth vegetation clearing under this alternative would not result in cumulative harvest and disturbance exceeding 20 percent in any of the affected subwatersheds (Table WAT-9).

Under this alternative, old growth vegetation clearing would occur in 12 subwatersheds. The largest impact as a percent of total subwatershed area would occur in the 190102021103 subwatershed, with an estimated 111 acres of old growth expected to be cleared, an area equivalent to approximately 0.7 percent of the subwatershed. An estimated 0.9 percent of this watershed has been affected by past harvest. Vegetation clearing and other disturbance under Alternative 4 would increase this total to 1.6 percent (Table WAT-9).

Of the subwatersheds crossed by Alternative 4, the Mitchell Slough subwatershed has been most affected by harvest since 1984, with an estimated 13.5 percent of the subwatershed affected (Table WAT-9). Vegetation clearing associated with Alternative 4 could potentially increase this total to 14.1 percent. Potential vegetation clearing under this alternative and past harvest together represent less than 10 percent of the area in all the other potentially affected subwatersheds (Table WAT-9). Impacts to streamflow based on percent of watershed harvested or cleared would, therefore, be minor or negligible in all subwatersheds affected by this alternative.

Approximately 6.5 miles of shovel trails, 7.3 miles of temporary matting panels, and 6.2 miles of temporary access spurs would be required for this alternative (Table WAT-15). Viewed at a subwatershed scale, temporary shovel trails would cross just three of the affected subwatersheds, with the longest section 4.6 miles) in the 190102021103 subwatershed. Temporary matting panels are expected to be required in three watersheds, with three-quarters of the total mileage expected to be used in the Taylor Creek-Frontal Duncan Canal subwatershed (Table WAT-15). Temporary access spurs would be located in more subwatersheds with total estimated lengths per watershed ranging from 0.2 mile to 1.2 miles (Table WAT-15). Overall, the use of temporary shovel trails, temporary matting panels, and temporary access spurs is expected to have minor effects on sedimentation and aquatic habitat in all subwatersheds under this alternative.

Table WAT-15. Estimated Disturbance under Alternative 4 by Subwatershed

Subwatershed	Temporary Shovel Trails (miles)	Temporary Matting Panels (miles)	Temporary Access Spurs (miles)
190102021103	4.6	1.2	0.4
Big John Bay-Frontal Rocky Pass	0	0	0.8
Big John Creek	0	0	0.8
Cathedral Falls Creek	0	0	0.2
Colorado Creek-Frontal Wrangell Narrows	0	0	1.0
Duncan Canal-Frontal Sumner Strait	1.2	0.5	0.0
Hamilton Bay-Frontal Keku Strait	0	0	0.4
Keku Strait-Frontal Frederick Sound	0	0	0.4
Mitchell Slough	0.7	0	1.2
Outlet Hamilton Creek	0	0	0.7
Sitkum Creek	0	0	0.3
Taylor Creek-Frontal Duncan Canal	0	5.6	0.0
Total	**6.5**	**7.3**	**6.2**

Alternative 4 would involve an estimated total of 70 new stream crossings by temporary access spurs or matting panels, and 14 new crossings by temporary access spurs (Table WAT-11). A total of 28 new temporary Class I stream crossings are proposed under this alternative (Table WAT-11). Properly placed and maintained crossings would affect only local channel segments and have individually minor effects.

Alternative 4 would cross an estimated total of 28 Class I and 14 Class II streams in unroaded areas (Table WAT-16). An estimated 28 of these crossings would likely require the use of an embedded pipe arch, with the remaining 14 requiring bridges. Thirteen of the 14 fish-bearing streams that would likely require bridging are located west of Duncan Canal; bankfull widths range from 3 feet to 100 feet wide, with an average width of 39 feet (Tetra Tech 2014b).

Table WAT-16. Estimated Stream Crossings by Stream Class and Crossing Type in Unroaded Areas along Alternative 4

Crossing Type[1/]	Stream Class				Total
	I	II	III	IV	
Embedded Pipe Arch	19	9	0	0	**28**
Bridge	9	5	0	0	**14**
Circular Pipe	0	0	2	18	**20**
Modular Bridge	0	0	2	1	**3**
Stringer Bridge	0	0	0	5	**5**
Total	**28**	**14**	**4**	**24**	**70**

Note:
1/ Estimated crossing types are based on stream characteristics including class, bankfull width, and steam incision depth (see Tetra Tech 2014b). These potential crossing types are conceptual and provided for the purposes of analysis.

An estimated 28 non-fish-bearing stream crossings would be required for this route. Twenty of these streams would likely be crossed using a circular pipe, with the remaining 8 crossings likely requiring the use of either a modular bridge (3 crossings) or stringer bridge (5 crossings) (Table WAT-16). The bridges required to span non-fish-bearing streams along this route would all span widths of 6 feet or less.

For the portions of the right-of-way that follow existing road, it is estimated that 14 stream crossings would be needed for temporary access spurs. All but one of the 14 crossings would likely use 4-6 inch circular pipe. The remaining crossing would likely require bridging.

Disturbance associated with helicopter pad installation would be less than 0.01 acre per pad. Pads would be installed approximately every 0.25 mile along the portions of the alternative where there are no existing roads and would be situated to avoid sensitive resources. Approximately 47 pads would be required for construction and long-term maintenance along the unroaded portions of the alternative route with a combined estimated disturbance of 0.47 acre. Helicopter pads would not be placed within RMA buffers associated with fish-bearing streams and would avoid high mass movement soil types. Therefore, impacts would be negligible.

Cumulative Effects

The potential impacts of vegetation clearing and other related disturbance under this alternative are evaluated in conjunction with past disturbance since 1984 in the preceding Direct and Indirect Effects subsection. Reasonably foreseeable future projects on NFS lands could potentially affect an estimated total of 2,996 acres in 7 of the 12 subwatersheds that would be crossed by Alternative 4, ranging from 112 acres in the Taylor Creek-Frontal Duncan subwatershed to 721 acres in the Outlet Hamilton Creek subwatershed (Table WAT-17). Reasonably foreseeable harvest, when added to past harvest since 1984 and acres of estimated vegetation clearing under this alternative, would not exceed 20 percent of the subwatershed area in any of the affected subwatersheds. The highest cumulative effects viewed as a percentage of subwatershed area would occur in the Mitchell Slough subwatershed where an estimated 13.7 percent of the subwatershed would be disturbed, with Alternative 4 contributing just 0.6 percent of this total (Table WAT-17).

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the aquatic resources analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of Forest 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for additional disturbance and new stream crossings.

Table WAT-17. Cumulative Impacts on Subwatersheds Crossed by Alternative 4

Subwatershed	Size (Acres)	Existing Harvest (since 1984) (acres)	Reasonably Foreseeable Timber Harvest on NFS Lands (acres)	Estimated Vegetation Clearing for KPI (acres)	Total Harvest and Clearing (acres)	Total as a Percent of Sub-watershed Area
190102021103	15,054	132	0	111	243	1.6
Big John Bay-Frontal Rocky Pass	16,239	298	456	58	812	5.0
Big John Creek	13,194	563	116	41	720	5.5
Cathedral Falls Creek	17,137	320	0	20	340	2.0
Colorado Creek-Frontal Wrangell Narrows	48,387	646	310	36	992	2.1
Duncan Canal-Frontal Sumner Strait	27,686	800	637	18	1,455	5.3
Hamilton Bay-Frontal Keku Strait	10,573	68	0	49	117	1.1
Keku Strait-Frontal Frederick Sound	10,747	823	0	12	835	7.8
Mitchell Slough	14,278	1,222	644	85	1,951	13.7
Outlet Hamilton Creek	21,105	871	721	30	1,622	7.7
Sitkum Creek	8,932	78	0	25	103	1.2
Taylor Creek-Frontal Duncan Canal	26,121	258	112	55	425	1.6
Total	**229,453**	**6,079**	**2,996**	**540**	**9,615**	**4.2**

Essential Fish Habitat Assessment

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act states that all federal agencies must 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 Fishery Management Council (NPFMC), managed by the NMFS, and included in a fishery management plan (FMP). These common managed species designated for the Gulf of Alaska region include: Chinook, chum, coho, pink, and sockeye salmon; walleye pollock; Pacific cod; Atka mackerel; Greenland turbot; 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 (NMFS 2005). Several common species not managed under a 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. 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.

There are four main steps in the consultation process:

1. 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.
2. An EFH Assessment is prepared by the Forest Service as a component of the NEPA document and forwarded to the NMFS to initiate formal consultation.
3. 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.
4. 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 starts when NMFS receives a copy of the Draft EIS with the EFH Assessment. Documentation of the consultation process will be included in the Final EIS.

Description of Proposed Action

The proposed action (Alternative 2) for the KPI project involves the construction of 59.9 miles of new electric transmission line from Kake to Petersburg. The proposed transmission line would follow existing roads for 33.7 miles (56 percent of its total length). In unroaded areas, construction would be via temporary shovel trails and temporary matting panels with an estimated 21.6 miles of shovel trail and 2.0 linear miles of temporary matting panels expected to be used. Temporary access spurs would be used in some locations where the proposed structures are more than 20 feet from an existing road, with a combined total of 7.6 miles of temporary access spurs expected. Temporary shovel trails and temporary access spurs would be decommissioned following construction, and matting panels and any temporary bridging would be removed. Shovel trails and temporary access spurs would cross an estimated total of 16 Class I and 25 Class II streams (Table WAT-11). Construction of the proposed transmission line and associated facilities would result in a total estimated ground disturbance of 891 acres, with approximately 271 acres of this total located within RMA buffers. Additional information on the proposed action and alternatives is provided in Chapter 2 of this EIS.

All three action alternatives would require marine crossings. These crossings may be summarized by alternative as follows:

1. Alternative 2: This alternative includes a 1.2-mile horizontal directionally drilled (HDD) bore beneath or 1.2-mile buried submarine cable crossing of the mouth of Wrangell Narrows (Figure 2-1).
2. Alternative 3: This alternative includes a 3.1-mile submarine cable crossing of Frederick Sound (Figure 2-1).
3. Alternative 4: This alternative includes two water crossings: 1) a 0.6-mile submarine cable crossing of the Wrangell Narrows, and 2) a 0.9-mile submarine cable crossing of Duncan Canal (Figure 2-2). These marine crossings may also be completed using an HDD approach depending on geophysical survey results.

Potential Adverse Effects on Freshwater EFH

An estimated total of 1,264 known miles of stream flow through the 20 subwatersheds in the analysis area (Figure WAT-1; Table WAT-8). Forty-three percent or 545 miles of this total are Class I streams and 332 miles (26 percent) are Class II streams. Chum, sockeye, pink, coho, and Chinook salmon all use the freshwater (except Chinook salmon) and marine waters of the analysis area. Steelhead, cutthroat trout, and Dolly Varden char are also present in both streams and coastal waters of the analysis area. Fish-bearing streams potentially crossed by the project include Fivemile Creek, Twelvemile Creek, Hamilton Creek, Hamilton Creek Tributary, Cathedral Falls Creek, and various unnamed tributaries to Portage Bay and Duncan Canal.

All action alternatives would result in minor effects on water quality and aquatic habitat. These potential impacts include minor changes in flow volume and timing of flow delivery, increased sediment delivery, and altered riparian vegetation. While these effects are expected to be minor, there could be adverse effects to migratory, spawning, and rearing habitat for anadromous salmonids. Potential adverse effects to freshwater EFH would be minimized by implementing BMPs to protect water quality and aquatic habitat for all freshwater streams within the analysis area. Proposed mitigation measures are summarized at the end of this section.

Potential Adverse Effects on Marine EFH

The proposed project could use three existing LTFs: the Portage Bay, Little Hamilton Bay, and Tonka LTFs (see the *Marine Environment* section, above). Depending on the alternative, these LTFs could be used for transport of construction personnel, equipment, and materials, and may also be used to transport logs cleared from the transmission line right-of-way. Additionally, depending on the selected alternative, the proposed project would involve one (Alternatives 2 and 3) or two (Alternative 4) marine crossings.

While mapping documentation at the NOAA EFH website (http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html) does not show species-specific EFH in the project marine waters other than salmon, text descriptions in the Final EFH EIS (NMFS 2005), which provides the ultimate definitions of EFH for specific species, indicates that the majority of species with identified EFH in the Gulf of Alaska Groundfish Fisheries Management Planning area have potential to occur in all project area marine waters during at least one life stage. In addition, all project area marine waters are identified EFH for all five of Pacific salmon species.

Portage Bay LTF

The existing LTF at Portage Bay on the north side of Kupreanof Island could be used by Alternatives 2 and 3. The log transfer method at this facility is a chain conveyor. Annual bark monitoring, from 2004, found that the Portage Bay LTF had a maximum bark depth of 25.4 cm and continuous bark coverage of 0.1 acre, which are below the thresholds for both measures.

Little Hamilton Bay LTF

The Little Hamilton Bay LTF, located on Little Hamilton Island and connected to Kupreanof by a land bridge road, may be used under all of the proposed action alternatives. Logs could be hauled to the Little Hamilton Bay LTF for transportation by barge or raft to mill sites. Hamilton Bay was placed on the Section 303(d) list of impaired waterbodies for bark accumulation in 1996, but was subsequently removed in 2002 (Whitacre and Harlan 2009).

The Little Hamilton Bay LTF would be maintained to comply with all permits, including tidelands permits, solid waste permits, U.S. Army Corps of Engineers 404 (fill on wetlands) and EPA 402 (NPDES) permits, and State 401 certification. Bark at the LTF would be cleaned up daily when accumulations are present to minimize water quality degradation.

Tonka LTF

The Tonka LTF located on the east side of the Lindenberg Peninsula may be used under Alternative 4. Dive surveys at the Tonka LTF in 2009 indicated 0.06 acre of continuous bark accumulation and 0.36 acre of discontinuous bark accumulation (USDA Forest Service 2012c). The substrate near this LTF is a mixture of mud and cobble with some rock and boulder. Sun stars are abundant at the LTF and sea lettuce, sand stars, hermit crabs, shipworms, anemones, sea cucumbers, benthic infauna, and sculpin are all present at the site. Marine life is healthy and diversity typical of a site with woody debris deposits on substrate (USDA Forest Service 2012c).

Potential effects on marine EFH by rafting logs include diminished habitat for managed species and their prey due to bark accumulation. Barging the logs would minimize the effect on marine species. In addition, log rafting could reduce rearing capability for juvenile salmon due to potentially reduced water quality from bark leachates and shading beneath log rafts and equipment floats. For all facilities, eliminating transportation of logs by in-water rafting would nearly eliminate any bark accumulation in the respective bay areas, thus greatly reducing potential adverse effects to marine systems associated with bark accumulation. Potential impacts are also expected to be limited based on the relatively small volume of logs expected to be removed under the action alternatives. While LTFs are in operation, dive surveys must be conducted annually and at the end of project activities to monitor bark accumulation (ADEC requirement). If accumulation exceeds EPA standards, appropriate action would be taken.

Underwater Marine Cable Routes

All three action alternatives would require marine cable crossings, as noted above. Adherence to the Forest Plan Standards and Guidelines is expected to minimize the risk of impact to fish habitat and fish populations; however, impacts related to the marine underwater crossings would occur.

Directional boring, were it to occur as part of Alternative 2 may affect nearshore EFH fish or their prey resources due to noise depending on the proximity of boring originating site to the marine waters. Adverse effects to marine EFH from the proposed submarine cable crossing (Alternatives 3 and 4, and potentially Alternative 2) could potentially include local loss of benthic organisms and impacts to eelgrass and algae from cable laying on the bottom and construction noise. Subsurface disturbance could cause short term elevation of suspended sediment and turbidity and local benthic organism mortality. This could cause some local avoidance of the area by EFH marine fish species including salmon and some local food supply reduction. Other than potential limited near-term loss of eelgrass and macrophytic algae of these areas would rapidly return to preconstruction conditions with adverse effects limited to short-term (e.g. days) impacts from the elevated turbidity and minor benthic food resource loss and potential construction noise. Vegetation loss would take longer to recover but the limited magnitude would not have substantial adverse effects on EFH habitat. The result would be short term adverse effects to marine EFH.

EFH Conclusion

Based on the known effects from forest clearing and disturbance, timber transport and processing, and submarine cable crossings, the Kake to Petersburg Intertie Project may adversely affect freshwater EFH and marine EFH. By implementing Forest Plan Standards and Guidelines, BMPs, and project-specific mitigation, effects to essential fish habitat would be minimized. Additional impacts to EFH are likely to occur only from unforeseen events such as landslides, debris blockages of culverts, and road failures. A copy of this Draft EIS will be sent to the NMFS, and the Forest Service will continue participating in the EFH consultation process.

Subsistence

Communities Traditionally Using the KPI Analysis Area

The Forest Plan EIS includes maps of community use areas for each of the 32 communities in Southeast Alaska (USDA Forest Service 2008c). These maps indicate the approximate extent of the areas commonly used by many of the residents of each community in their local day-to-day work, recreational, and subsistence activities. Other areas may also be important, but may be used less frequently than the identified community areas. The analysis area for the proposed project includes parts of the identified Petersburg community use area, which includes the city of Kupreanof (USDA Forest Service 2008c, 3-663), and parts of the Kake community use area, which includes the city of Kake (USDA Forest Service 2008c, 3-629). The Wrangell community may use the analysis area to some extent, but it is not within their identified community use area.

Petersburg

The subsistence resources most commonly used by Petersburg households are coho and Chinook salmon, halibut, deer, Dungeness crab, king crab, shrimp, berries, and wood (Betts et al. 1992). Subsistence harvest provides just over 30 percent of the meat and fish for Petersburg residents (Kruse and Muth 1990). Marine resources (fish and marine invertebrates) accounted for 59 percent of the total subsistence harvest subsistence harvest in Petersburg in 1987. Areas along the Wrangell Narrows and Duncan Canal are important for subsistence harvest of salmon, other finfish, and marine invertebrates for Petersburg households (Betts et al. 1992).

Kake

Salmon, other finfish, and marine invertebrates accounted for 52 percent of the total edible pounds of subsistence harvested by Kake households in 1987 (Betts et al. 1992, Kruse and Frazier 1988). Halibut and berries are the resources most commonly harvested by Kake households, as well as coho, Chinook, and sockeye salmon, herring roe on kelp, deer, seal, Dungeness crab, clams and cockles, chitons, seaweed and wood (Betts et al. 1992). Subsistence harvest provides 22 percent of the meat and fish for Kake households (Kruse and Muth 1990).

Wrangell

The subsistence resources most commonly harvested by Wrangell households are Chinook salmon and berries. The most commonly used resources are Chinook salmon, halibut, deer, Dungeness crab, shrimp, and berries (Betts et al. 1992). Salmon, other finfish, and marine invertebrates accounted for 63 percent of Wrangell's harvest in 1987 (Betts et al. 1992). Wrangell residents indicated that areas in the Duncan Canal and the Wrangell Narrows were used for subsistence harvest of salmon, other finfish, and marine invertebrates (Betts et al. 1992).

Fish and Marine Invertebrate Effects and Evaluation

ANILCA requires the analysis of the potential effects on subsistence uses of all actions on federal lands in Alaska. This analysis most commonly focuses on those food-related resources most likely to be affected by habitat degradation associated with land management activities. Three factors related to subsistence uses are specifically identified by ANILCA: 1) resource distribution and abundance, 2) access to resources, and 3) competition for the use of resources. These issues are discussed with respect to fish and marine invertebrate subsistence resources in the following sections.

Abundance and Distribution of Fish and Marine Invertebrates

Adherence to the Forest Plan Standards and Guidelines is expected to minimize the risk of impact to fish habitat and fish populations. Potential effects on freshwater and marine EFH are discussed in the preceding section.

Access to Fish and Marine Invertebrates

Access to shorelines is not expected to change in the analysis area as a result of the project. Drainages in the analysis area are only accessible by vehicles ferried to an existing MAF or LTF. Most active use in the area is by people who occasionally fish during hunting trips and by sport and commercial fisherman using the Wrangell Narrows and Duncan Canal. Access to historic saltwater fish and marine invertebrate areas should not be affected by the proposed project.

Competition for Fish and Marine Invertebrates

The proposed project activities are not expected to increase competition for fish and marine invertebrates under any of the action alternatives. Fishing and harvesting of marine invertebrates occurs primarily from boats, on beaches, and along estuaries. No increased activity is expected to occur on streams in the analysis area due to temporary shovel trails, matting panels, or temporary access spurs during project implementation because public motorized access will be prohibited during project operations and the trails would be decommissioned following construction.

Mitigation

The effects of the proposed project on aquatic resources would be limited through the site-specific application of Forest Plan Standards and Guidelines and R10 and National Core BMPs in all subwatersheds (see Chapter 2).

Marine Environment

Introduction

The Southeast Alaska coastline is extensive, with many islands and fjords extending the length of tidal and intertidal areas. These many intertidal niches and deep channels create highly diverse marine environments, with a diverse biota extending from large marine mammals and commercial fisheries to numerous invertebrates. This section provides an overview of the existing marine environment and assesses the potential effects of implementing the proposed action and the alternatives, including the no action alternative, on this environment. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the project (i.e., the no action alternative).

Analysis Area

The analysis area for the marine environment assessment consists of the marine areas that could be potentially affected by the proposed alternatives. The project area includes and is adjacent to marine waters that form part of the Inside Passage of Southeast Alaska. These waters reach a maximum depth of greater than 1,550 feet in Frederick Sound along the north coasts of Kupreanof and Mitkof Islands (NOAA 1998, 2013). The smaller bays and estuaries are generally more protected. The marine areas potentially affected by the proposed project include one deepwater channel, Frederick Sound; Wrangell Narrows; Duncan Canal; and two shallow bays—Portage Bay and Hamilton Bay. Marine crossings would impact Wrangell Narrows and Frederick Sound (near the mouth of Wrangell Narrows), while LTF impacts could occur within Wrangell Narrows (Alternative 4), Portage Bay (Alternatives 2 and 3), and Hamilton Bay (Alternatives 2, 3, and 4).

Methodology

The affected marine environment was primarily characterized through a review of the existing literature. Forest Service, USGS, and nautical databases were accessed to determine physical and biological factors present in the potentially affected marine waters. Project activities were assessed based on their potential impacts to human activities and marine biota.

Affected Environment

The coastline of Southeast Alaska consists of approximately 30,000 miles of tidal shoreline, roughly 60 percent of the total Alaskan coast. Marine waters in the analysis area form part of the Inside Passage of Southeast Alaska.

Deepwater Channels

Deepwater channels in the analysis area are defined as marine water channels with depths of at least 550 feet. Frederick Sound, with a maximum depth greater than 1,550 feet, is the only channel in the analysis area with a depth that is at least 550 feet. Typical of the Alaska coastline, the shoreline along Frederick Sound is often steep and rocky with shallower bays such as Portage Bay providing shallower marine environment conditions. The general bathymetry is characterized by narrow rocky sills or steep beaches that quickly drop off to much deeper water (NOAA 1998, 2013). Steep cliffs line much of the north and east coast of the Lindenberg Peninsula of Kupreanof Island, which is adjacent to Frederick Sound. More substantial areas of rocky intertidal zones exist near the mouths of bays and estuaries, as well as Wrangell Narrows.

General Characteristics

Frederick Sound has a maximum depth of approximately 792 feet, occurring in the "cable area" of Chart 17367, west of Kupreanof Island. The width of Frederick Sound varies, with greater widths occurring to the west (maximum greater than 12 miles on the west side of Kupreanof Island near Little Hamilton Bay) and narrower widths, averaging around 4 to 6 miles, near Wrangell Narrows and Portage Bay.

The inventoried estuarine and marine wetland habitat in Frederick Sound associated with Kupreanof Island is generally limited to a narrow coastal band less than one tenth of a mile wide. Wider areas of estuarine wetland occur near river mouths and the outlets for Portage Bay, Hamilton Bay, and Wrangell Narrows.

Substrate samples indicate mud, sand and clay as dominant substrate types throughout the Sound, with coarser substrate such as pebbles, shells, and gravels dominating the samples on the western end of Frederick Sound. Surveys of substrates for Frederick Sound include H10256 (NOAA 1987), H10265 (NOAA1988a), H10269 (NOAA 1988b), H10272 (NOAA 1988c), H10288 (NOAA 1988d), H10289 (NOAA 1988e), H10295 (NOAA 1989), and H09792 (NOAA 1978a). Samples in the vicinity of Wrangell Narrows describe the substrate bottom as gray mud (NOAA 1978a). Samples along the northeast coast of the Lindenberg Peninsula also indicate mud as the dominant substrate near the coast (NOAA 1988a). Near Portage Bay, samples indicate substrate composed of fine sand, broken shells, and pebbles, with mud dominating further off-shore (NOAA 1988c). Extensive kelp bed nursery areas dominate offshore areas adjacent to the Lindenberg Peninsula and provide harbor seal and waterfowl concentration areas (ADNR 2000).

Frederick Sound hosts larger marine organisms such as sea lions, humpback wales (Fisheries Center 2005), killer whales (Dahlheim and White 2010), Dall's porpoise, harbor seals, and fish such as rockfish, halibut, salmon, pollock, sablefish (Fisheries Center 2005), lingcod, and herring, as well as invertebrates such as phytoplankton, zooplankton, and krill. Benthic invertebrates include commercial species such as king crab and Tanner crab, as well as general crabs, mollusks, bivalves, including scallops, sea cucumbers, polychaets, and soft corals such as *Primnoa* sp. (red tree coral) (NMFS 2004).

Human-related activities include commercial fisheries (king crab, Tanner crab, salmon, and scallops), non-commercial fishers, heavy commercial vessel traffic, ferry traffic, and tourism activities, such as whale watching, cruise ships, and boat charters.

Bays, Estuaries, and Tidal Channels

Bays, estuaries, and tidal channels in the analysis area consist of shallow (less than 550 feet deep), protected marine waters generally characterized by mud, sand, and rock bottoms. These include Wrangell Narrows, Portage Bay, Little Hamilton Bay, and Duncan Canal. Maximum depths for these water bodies range from 144 feet in Duncan Canal to 45 feet in Portage Bay. Depths are generally greater near the mouths, decreasing inland. Greater depths are observed at the southern end of Wrangell Narrows than at the northern end.

These shallower waterbodies contain estuaries where streams enter the marine environment. Estuaries form a transition zone between fresh and marine waters, with the most productive ones generally occurring in shallow tidal areas, often located at the heads of bays and inlets. Estuaries provide rearing habitat for young fish.

Substrates range from soft mud and sand with broken shells and pebbles dominating shallow estuarine environments to mud-dominated deeper areas with some areas of rocks and pebbles.

General Characteristics

Shallow bays and estuaries in and near the analysis area (including Wrangell Narrows) contain 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. In addition, Dungeness crab is harvested commercially in Duncan Canal.

Common invertebrates in Southeast Alaska include clams, crabs (including Dungeness crab), shrimp, mussels, sea urchins, and octopus (Ratner and Turek 2009). In addition, sea lettuce (*Ulva* sp.), kelp, phytoplankton, and zooplankton occur in these areas.

Human-related activities in these shallower waters include existing Forest Service LTFs; run-off from land management activities, such as harvest and roads; developed areas including Kake and Petersburg; domestic sewer discharge; marine vessel traffic, such as commercial freighters, ferries, cruise ships, and fishing vessels; commercial, recreational, and subsistence fisheries; dispersed residences; and tourism activities.

Site-Specific Characteristics

Wrangell Narrows

The proposed transmission line under Alternative 2 would cross the mouth of Wrangell Narrows, near where it meets Frederick Sound. Under Alternative 3, the proposed transmission line would cross Frederick Sound, near the mouth of Wrangell Narrows. Wrangell Narrows is approximately 22 miles long with an average width of 0.25 to 0.5 mile and is 30 to 49 feet deep near Petersburg. Substrate samples from near the proposed crossing locations for Alternatives 2 and 3 are composed of sand, mud, pebbles, bedrock and crushed shells. The nearest bed sample to the crossing locations (Sample SD00023486.01), taken October 3, 1978, describes the bed substrate as: “Sand coarse, shells broken” (seabed descriptions from NOAA/NOS and USCGS Hydrographic Surveys, Survey H09791 - http://www.ngdc.noaa.gov/geosamples/survey.jsp).

Substrate varies throughout Wrangell Narrows; generally containing coarser substrates at the north and southern portions, with finer substrates more prevalent in the mid-portions. Substrate samples closest to the proposed crossing locations are generally coarse with the sample taken closest to the crossing resulting in a hard surface record (NOAA 1978b). Samples from Frederick Sound, near the proposed crossing locations, indicate mud and sand substrate compositions. Tideflats within the narrows provide waterfowl and shorebird concentration areas, and various estuary and tideland habitats provide rearing habitat for pink and coho salmon and herring. Bald eagles concentrate in areas near anadromous stream estuaries during salmon runs (ADNR 2000). Harbor seals concentrate in areas along the Wrangell Narrows. Runs of sockeye, pink, chum, and coho salmon, steelhead and Dolly Varden char rear and migrate through intertidal estuaries as well as starry flounder (especially noted in the Petersburg Creek estuary) (ADNR 2000). Tidelands south of the city of Petersburg include eelgrass beds with high use from shorebirds and waterfowl.

Estuarine habitat exists throughout the length of the Narrows, with the most prevalent habitat near the analysis area associated with Petersburg Creek, approximately 2 miles southwest of the closest proposed crossing, and the north shore near the mouth, surrounding Sasby Island. The National Wetland Inventory mapping for the area identifies a narrow band of estuarine wetland along the outer coastline of the islands, along Frederick Sound. This includes areas where the cable would leave and return to the shore for Alternative 3, as well as the start and endpoints for the HDD bore or buried submarine cable under Alternative 2. Out-migrating salmon from Petersburg Creek use this area extensively, and shorebirds and waterfowl (including Vancouver Canada geese) use is heavy during the fall, winter, and spring. The Petersburg Creek estuary is a community harvest area for Dungeness crab and shellfish (ADNR 2000).

Alternative 4 would cross Wrangell Narrows approximately 8.5 miles south from the crossings proposed under Alternatives 2 and 3. There are extensive mudflats near the eastern shore of this proposed crossing location. Channel depths in the vicinity of the proposed crossing range from 0 to 108 feet. The proposed crossing would pass just south of the existing Tonka LTF on the west shore of Kupreanof Island. Sediment samples near this area consist of dark gray mud (NOAA 1978c).

Human activities include commercial and personal vessel traffic, ferry traffic, tourism, fisheries, the town of Petersburg, and dispersed residential housing along the shore. A study of human activity in Southeast Alaska ranked the human activity for Wrangell Narrows with a relative index score of 10 out of 10, with a vessel traffic index greater than 1,600 vessels per square mile (Wrangell Narrows is part of the Alaska Marine Highway). Dungeness, red king, and tanner crab and salmon are harvested commercially and for community use within Wrangell Narrows. Chinook and coho salmon are also harvested for community use (ADNR 2000).

Little Hamilton Bay

The existing LTF on Little Hamilton Island on the northwest side of Kupreanof Island is proposed for use under all alternatives. Logs could be hauled from the facility by barge or raft (see effects of LTFs, below). Extensive tidal flat and areas identified as estuarine and marine wetland in the National Wetlands Inventory are present in the eastern and southern portion of Little Hamilton Bay. The Little Hamilton Bay LTF occupies approximately 0.31 acre of estuary habitat (Faris and Vaughan 1985). A 2002 dive survey found a zone of deposit for bark of 1.08 acres (0.53 acre continuous and 0.55 acre discontinuous coverage), however, with much of it covered with 0.4 to 3 inches (1 to 7.5 centimeters) of silt (Haggit 2002).

Hamilton Bay is considered a waterfowl/shorebird spring and fall concentration area (ADNR 2000). Juvenile pink, chum, and coho salmon and steelhead rear in the area and adults school before migrating up Hamilton River. Commercial and community harvest for salmon and Dungeness crab occurs within Hamilton Bay (ADNR 2000).

According to the NPFMC database (http://www.alaskafisheries.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.

Portage Bay

The existing LTF at Portage Bay on the north side of Kupreanof Island could be used by Alternatives 2 and 3. This LTF is located on the east shore at the northern end of Portage Bay, within a protected area near Frederick Sound. The Portage Bay LTF is listed in the ADEC Contaminated Sites database for petroleum contamination and transformers (ADEC 2013). The maximum depth of Portage Bay is approximately 45 feet at the mouth, with a maximum depth between 30 and 36 feet in the central bay area in Chart 17367.

The southern portion of Portage Bay, Goose Cove, is estuary habitat. The National Wetland Inventory classifies Dry Cove, Goose Cove, the shallow bay just north of Dry Cove, and a generally narrow band around the remaining coast line as estuarine and marine wetland. This includes some of the area occupied by the existing LTF. Juvenile pink, chum, and coho salmon; steelhead; Dolly Varden char; and cutthroat trout rear in the estuary. Adult salmon school in the area in the fall (ADNR 2000). A herring spawning concentration area is located directly west of the bay (ADNR 2000). Portage Bay is connected to

Frederick Sound and offers shallow waterbody and estuarine habitat. Anadromous streams containing coho, and pink salmon, as well as cutthroat, steelhead, and Dolly Varden, drain into Portage Bay.

Current human activities and impacts include the existing log transfer facility, domestic sewage discharge (Tetra Tech 2010), tourism (including a Forest Service cabin), residential use, commercial fisheries for Dungeness crab, community harvest of waterfowl, black bear, halibut, pink and coho salmon (ADNR 2000), and recreational and subsistence fisheries.

Duncan Canal

A single submarine cable crossing of or HDD bore beneath Duncan Canal is proposed under Alternative 4. This crossing would occur just south of Mitchell Slough, approximately halfway between Rookery Island and Indian Point. A small amount of beach habitat occurs on the west side of the channel near this location. Maximum depth at this crossing location is approximately 82 feet.

Substrate samples indicate that Duncan Canal is dominated by mud and sand (NOAA 1972a, 1972b, 1972c, 1974). At the site of the proposed crossing, the substrate is dominated by mud, with grass present near the western shoreline (NOAA 1972c). The waters of Duncan Canal are a harbor seal and waterfowl concentration area as well as a community harvest area for salmon (ADNR 2000).

There is extensive tidal flat and estuary habitat north of the crossing location. The National Wetland Inventory classifies Mitchell Slough, McDonald Arm, Towers Arm, and the tidal areas south of Towers Arm as estuarine and marine wetland, as well as a narrow band, generally less than 0.1 mile wide extending along much of the coastal area within the water body. Multiple named and unnamed anadromous streams flow into the Towers Arm, North Arm, and McDonald Arm, as well as the large tidal flat area west of Indian Point. These streams contain coho, steelhead, and pink salmon as well as cutthroat and Dolly Varden (ADF&G 2013a). Pink, chum, and coho salmon school and rear in the estuary, and the area is a community harvest area for halibut and king and coho salmon (ADNR 2000). Commercial Dungeness crab and shrimp fisheries (Koneman and Botelho 2000) exist in Duncan canal and additional fishing, including salmon and starry flounder harvest, and benthic invertebrates also occur. Herring have been reported spawning in Duncan Canal (Skud 1959), with gulls concentrating in the McDonald Arm during herring spawning (ADNR 2000). The estuary also provides rearing habitat for starry flounder (ADNR 2000).

Additional human activities include some residential use, tourism including hiking, waterfowl viewing and hunting, boating and fishing, as well as subsistence use.

Environmental Effects

Effects Common to All Alternatives

All of the proposed action alternatives involve a marine crossing (via cable or HDD bore), vegetation clearing near coastlines, and the use of LTFs to transport timber cleared from the transmission line right-of-way.

Marine Biota

Effects of LTFs

The effects of LTFs on marine biota are mainly a result of the accumulation of bark over the marine sediments below operations. Bark accumulation can smother marine organisms and change the substrate to less favorable conditions. Anaerobic decomposition of bark can also result in altered chemical composition of the benthic substrates and reduce oxygen availability. Guidelines established in 1985 restrict bark coverage such that there can be no more than 1 acre of continuous bark coverage 10 cm deep within the operation area of the LTF.

Little Hamilton Bay LTF

The Little Hamilton Bay LTF would be utilized under all alternatives. This LTF is an existing steel piling and dock facility with an adjacent sort yard of approximately 2.5 acres in size (USDA Forest Service 2009c). The Little Hamilton Bay LTF is located on the northeast side of Kupreanof Island. The facility is located on Little Hamilton Island in Little Hamilton Bay, located on the north side of Hamilton Bay. The island is connected to Kupreanof Island by a land bridge road. Hamilton Bay has productive estuarine habitat and anadromous streams feeding into it at the eastern end. The LTF is located in a relatively shallow area and was placed on the Section 303(d) list of impaired waters in 1996 due to bark and wood debris accumulation on the bottom of Hamilton Bay (USDA Forest Service 2009c). Dive surveys in 2002 indicated relatively continuous bark coverage with significant silt deposition, but within water quality compliance for residues (Haggit 2002) and the waterbody was removed from the 303(d) list in 2002/2003 (USDA Forest Service 2009c). Use of this facility would likely result in additional bark deposition, however standard operating guidelines would be followed and effects to marine biota would likely not increase substantially above current operating conditions.

Portage Bay LTF

The Portage Bay LTF could be used for either Alternative 2 or 3. Portage Bay has been affected by operations at the existing facility. The Portage Bay LTF and camp is currently listed on the ADEC (2013) Contaminated Sites Database for petroleum contamination and transformers. In 2007, barreled oily soil was collected from surface oil spills and removed from site for remedial treatment in Wrangell (ADEC 2013).

Tonka LTF

Tonka LTF could be used under Alternative 4. The Tonka LTF has undergone recent improvement activities, and now includes a low-angle boat ramp and new dock (added 2013). The facility was also expanded in 2013. Use of this facility for project activities would likely increase bark deposition, however, operations will be consistent with applicable LTF guidelines. The Tonka LTF is located on Kupreanof Island on the west side of Wrangell Narrows, approximately 8.5 miles from the northern mouth. Bark monitoring in 2007, 2008, and 2009 resulted in records of less than 0.1 acre of continuous bark coverage at this site (USDA Forest Service 2012c) and annual bark surveys continue while the LTF is in operation.

Effects of Log Bags

Log bags consist of storage areas where logs are transferred from helicopter yards to salt water (USDA Forest Service 1997a). The use of log bags results in deposition of bark onto the ocean bottom, primarily under the log bag. Bark is sloughed off from logs during transfer by helicopter to log bags and during agitation of logs by wind and waves while in log bags. While quantitative data on estimated areas of impact for log bags is not available, the related effects on bark accumulation would probably be less than those of the existing LTFs (USDA Forest Service 1997a). The extent of potential impacts would also vary by location. In deep water locations, away from estuary mouths, impacts are likely to be minimal as such areas provide less important foraging or reproductive habitat for shellfish, mollusks, crustaceans, or fish. Shorter operational times (less than 90 days) can also reduce any impacts from shading to algal communities (USDA Forest Service 1997a). In areas of existing commercial activity and marine traffic, the short-term operation of log bags is likely to result in minimal disturbance to marine mammals or birds due to their relatively small size (less than 1 acre), short duration, and similarity to existing activities and vessel traffic.

Effects of Log Processing Barges

At log processing barges, logs are unhooked from helicopter yards, “cleaned up,” and either bundled and banded and put into the water to form a log raft or the logs are loaded onto a transport barge. The limbs, bark, and other log debris from the processing barge would occasionally be loaded into a cargo net and returned to the logging site for disposal. Log processing barges, if used, would be moored to buoy anchors and/or the shoreline.

Effects of operation of log processing barges on marine biota would be similar to those occurring from operation of LTFs. These effects are primarily due to bark deposition on the seafloor during log transfer activities. It is expected that while similar, these effects would be less than for LTFs (EPA 1997). Log processing barges would have greater effects when operated in protected shallower waters than when operated in deeper areas with good tidal flushing. In addition, many of the shallower marine areas in the project area are estuaries with fish rearing habitat and include habitats that support important marine biota resources such as shellfish fisheries, Dungeness crab, fish spawning and rearing, and eelgrass and mudflat habitats.

Effects of Submarine Crossings

Submarine Cable Crossing

A 1.2-mile-long buried submarine crossing is one option for crossing the mouth of Wrangell Narrows being considered under Alternative 2. A 3.1-mile-long submarine crossing of Frederick Sound, near the mouth of the Wrangell Narrows, is proposed under Alternative 3. Two submarine crossings are proposed under Alternative 4: Wrangell Narrows (0.6 mile) and Duncan Canal (0.9 mile). One of both of the Alternative 4 crossings could also be accomplished by HDD bore depending on geophysical survey results.

Benthic marine organisms would be disturbed where the cable sits along the bottom of the bay or channel. The cable would displace organisms needing clear substrate to bore into; however it would provide additional hard anchoring substrate for other organisms. More extensive disturbance would occur where the cable is installed into a trench at the shorelines. The submarine cable crossings proposed under Alternative 3 and potentially under Alternatives 2 and 4 would cross in areas where substantial tidal area is present on at least one of the shorelines. Trenching in these areas would disturb the local hydrology of the area and permanently alter the tidal area where the trench is excavated. These locations are also rearing habitat for salmonids, herring, and flounder, and areas where a variety of benthic invertebrates, including those of commercial and community harvest importance, occur. Clearing of shallow tidal areas would alter rearing habitat and may impact small amounts of eel grass.

Temporary disturbance during installation could impact rearing or migrating salmonids (depending on time of year), herring, halibut, crab, and other benthic organisms, as well as seabirds, waterfowl, eagles, and harbor seals. Wrangell Narrows, near the north end especially, has high concentrations of sea birds; with thousands gathering in the nearshore and intertidal areas from October through March (ADNR 2000). Cable-laying activities could impact seabird activities, bald eagle foraging (especially during spring and summer), and overwintering Vancouver Canada geese.

Directional Boring Cable Crossing

Directional boring should have minimal effect on benthic marine life as the bore is intended to penetrate beneath this zone and would not affect animals inhabiting the surface of the substrate. Temporary impacts however, may include disturbance due to vibrations and noise from drilling operations. These disturbances may impact all marine organisms in the area for the duration of boring operations. As noted above, Wrangell Narrows, particularly near the mouth of the Narrows, and in Duncan Canal have high concentrations of seabirds and waterfowl and overwintering populations of Vancouver Canada geese, which may be temporally disturbed by such activities. Based on a daily drill, including set-up time, it would take approximately one month to complete the HDD bore proposed under Alternative 2 if Alternative 2 and HDD boring were the selected alternative and crossing approach, respectively. If HDD bores are feasible for one or both of the Alternative 4 crossings, it is estimated to take approximately 2 weeks and 3 weeks of drilling activity at the Wrangell Narrows and Duncan Canal crossings, respectively.

Human-Related Activities

Temporary disturbance to recreational users could occur during active use of LTF facilities and barging operations. This is a result of increased noise and marine traffic during operations. Other potential direct effects on human activities include temporary disruption of commercial fisheries and transportation during installation of submarine cable crossings. However, these effects would be limited to the period of installation in localized areas.

Indirect effects of Alternative 3, and potentially Alternatives 2 and 4, include the potential hazard associated with boat or ship anchors or fishing gear getting tangled in submarine cables. The risk of this occurring, however, is low due to techniques of installation, which include encasing the cable in a trench with rocks in nearshore areas. This risk is reduced in mid-channel areas because these areas are generally unsuitable for anchorages due to tidal action and/or the presence in major shipping/transportation routes. Further, due to the large amount of boat traffic through Wrangell Narrows, burial for the entire length is recommended (Hittle 2014).

ADF&G indicates that there is a commercial beam trawl fishery in Duncan Canal, in the vicinity of the 0.9-mile-long crossing proposed as part of Alternative 4, which has the potential to damage an exposed cable and/or fishing gear. In addition, there is also a commercial Dungeness crab fishery in Duncan Canal. No commercial fisheries would be disrupted, including the commercial Dungeness crab fishery provided installation of the submarine cable occurs outside of the annual fishery dates. Based on geophysical studies that would need to be conducted for this crossing, the Project would determine whether this area could be HDD bored which would eliminate the possibility of damage from commercial fishery activities. Other options would include trenching and signage indicating the location of the submarine cable crossing.

No long-term adverse consequences on commercial, recreational, or subsistence fishing, or recreational boating, are anticipated as a result of operation of LTFs, log processing barges, or log bags, particularly given the short-term (less than 2-month) operating periods associated with project-related use of these facilities. No significant indirect effects on availability of fishing resources (e.g., shellfish, crab, salmon) are expected.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct or indirect effects with the no action alternative as there would be no project action. The no action alternative would result in continuation of current power generation and consumption such as diesel power generation.

Cumulative Effects

The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other reasonably foreseeable projects in the analysis area.

Alternative 2

Direct and Indirect Effects

Direct effects of Alternative 2 on marine resources include impacts from HDD boring activities or placement of a submarine cable, depending on the selected crossing approach, as well as from operation of LTF facilities. Shoreline disturbance due to boring and construction activities at either end of the bore could disturb shorebirds, which can occur in large numbers near the mouth of Wrangell Narrows. Vibrations and sounds resulting from boring activities could temporarily displace fish, marine mammals, and benthic organisms in the vicinity of the boring activities. If a buried submarine cable crossing was used as part of this alternative, direct affects to the seafloor from ploughing in the cable is estimated to be less than 0.5 acres. Effects associated with cable laying would be similar to those described below for the submarine cable crossing proposed as part of Alternative 3.

Indirect impacts to marine resources include increased sedimentation due to right-of-way clearing and disturbance due to project operations. Use of BMPs and limiting disturbance near streams flowing directly into marine waters would minimize sediment impacts from project activities.

LTF activities could occur at both Portage Bay LTF and Little Hamilton Bay LTF. Both LTF facilities are located in sheltered bays where bark accumulation can occur. Dive surveys are ongoing at active LTFs. The Transportation System monitoring for the 2012 Tongass Monitoring and Evaluation Report (USDA Forest Service 2012d) states that no LTFs in operation exceeded the criteria of 0.9 acres of continuous bark coverage. Operation of the LTF for the proposed project is likely to increase the bark coverage above what it would be without project activities.

Cumulative Effects

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. These projects could potentially affect the marine environment through use of LTFs, log bags, and log processing barges. Potential road building and other disturbance near shorelines and streams would also have the potential to affect marine conditions. It is, however, expected that these projects would comply with all applicable regulations and guidelines designed to minimize impacts. Further, the incremental addition of potential impacts to the marine environment under the KPI Project would not be expected to substantially affect the cumulative impact of past, present, or reasonably foreseeable projects on the marine environment.

Alternative 3

Direct and Indirect Effects

Direct effects of Alternative 3 to marine resources include impacts of submarine cable placement, LTF facility usage, and cable-laying vessels. The proposed cable crossing would occur at the mouth of Wrangell Narrows, which is a known seabird concentration area and contains productive kelp beds. Herring and salmon are present and seasonal krill deposits result in the area being a key feeding area for sea birds (ADNR 2000). The shallow intertidal areas provide habitat for many benthic marine organisms which would be displaced during trenching operations. The localized area and short time period of trenching operations, however, results in fairly low disturbance impacts to benthic organisms, which are quick to recolonize. Kelp and eelgrass beds may be slower to recolonize and may have longer recovery periods. Trenching activities could directly impact migrating salmon (both adults and juveniles) and overwintering herring by direct displacement, or indirectly through noise disturbance or water quality issues associated with increased turbidity.

LTF activities could occur at both the Portage Bay LTF and Little Hamilton Bay LTF. Both LTF facilities are located in sheltered bays where bark accumulation can occur. Dive surveys are ongoing at active LTFs. The transportation system monitoring for the 2012 Tongass Monitoring and Evaluation Report (USDA Forest Service 2012d) states that no LTFs in operation exceeded the criteria of 0.9 acre of continuous bark coverage. Operation of the LTF for the proposed project is likely to increase the bark coverage above what it would be without project activities.

Cumulative Effects

The incremental addition of potential impacts to the marine environment under the KPI Project would not be expected to substantially affect the cumulative impact of past, present, or reasonably foreseeable projects on the marine environment and would be the same as Alternative 2.

Alternative 4

Direct and Indirect Effects

Direct effects of Alternative 4 to marine resources include impacts of submarine cable placement and LTF facility usage. Two cable crossings are proposed under this alternative. The proposed cable crossing of Wrangell Narrows would occur approximately 7 miles south from the mouth of Wrangell Narrows. While not as rich in estuarine and intertidal habitat as the mouth of the Narrows, the crossing location is adjacent to a small estuarine area on the east shore and would require trenching across a shallow bench. The west shore is fairly steep and would likely require less disturbance to shallow-water habitats. The shallow intertidal areas provide habitat for benthic marine organisms which would be displaced during trenching operations. The localized area and short time period of trenching operations, however, results in fairly low disturbance impacts to benthic organisms, which are quick to recolonize. Trenching activities could directly impact migrating salmon (both adults and juveniles) and overwintering herring by direct displacement, or indirectly through noise disturbance or water quality issues.

The proposed cable crossing of Duncan Canal would occur approximately 1 mile south of Mitchell Slough and just over 2 miles south of Indian Point. This crossing would occur at the mouth of a large estuary/tidal flats area to the north of the project crossing and Castle Creek estuary areas to the south of the crossing. The channel is not very deep at this crossing and the substrate consists of soft sediments. While trenching for cable-laying activities would be similar in Duncan Canal as for the Wrangell Narrows crossing, the extent of shallower water habitats could result in greater impacts due to more trenching being needed and the impacts of sediment deposition on estuarine environments during operation. As estuarine environments are present both north and south of the Project area, sedimentation impacts are possible during most tidal conditions. Impacts could include burying of benthic organisms, avoidance by fish species, and indirect effects on fish, birds, and mammals due to loss of benthic food sources and degradation of habitat. As discussed above and in Chapter 2, the use of an HDD bore may also be considered for one or both of these marine crossings proposed under this alternative depending on geophysical survey results. Impacts would be similar to those described under Alternative 2.

LTF activities could occur at both Tonka LTF and Little Hamilton Bay LTF. The Little Hamilton Bay LTF is located in a relatively sheltered shallow bay where bark accumulation can occur. This LTF was listed for excessive bark accumulation in 1996, but removed from the listing in 2002/2003, when 2002 surveys showed continuous coverage greater than 4 inches (10 centimeters) of less than one acre. Project activities would likely increase bark deposition at this LTF. The Tonka LTF has had recent enhancements due to use with other projects. Recent bark surveys indicate less than 0.1 acre of continuous bark coverage (USDA Forest Service 2012c). Project activities are likely to increase bark deposition, however location of this LTF in Wrangell Narrows along a relatively steep-sided channel reduces opportunities for accumulation under LTF operations.

Cumulative Effects

The incremental addition of potential impacts to the marine environment under the KPI Project would not be expected to substantially affect the cumulative impact of past, present, or reasonably foreseeable projects on the marine environment and would be similar to Alternative 2.

Mitigation

Appropriate mitigation measures would be implemented as possible to mitigate potential impacts of the selected alternative on the marine environment (Chapter 2). Mitigation would primarily involve following guidelines and acquiring permits for proposed marine-related logging activities and installation of submarine cable crossings, and locating facilities and features away from sensitive resources. Beach and Estuary Fringe Forest-wide standards and guidelines would apply. In addition, general mitigation would include the following measures:

- F18–Prior to final selection of submarine crossing locations and marine-associated logging operations, field verification will be undertaken to ensure avoidance of sensitive areas including estuaries, anadromous fish streams, eelgrass beds, and important fish aggregating areas.
- Implement surface erosion control at facilities such as creation and maintenance of drainage diversions to collection areas rather than draining directly to the waterbody and following BMPs such as R10 BMPs 14.8 and 14.14).
- Log processing barges and log bags will be located away from anadromous fish streams.

Underwater blasting potentially associated with construction of submarine cable trenches will not be conducted near marine mammals or sensitive terrestrial resources (e.g., active bald eagle nests, known marine mammal haul-out sites). Minimum distances from these sensitive resources would be determined in consultation with NMFS and the USFWS.

Timber

Introduction

The timber section provides an assessment of the current condition of the project area and the potential effects of implementing the proposed action and the alternatives on these resources. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the project (i.e., the no action alternative).

Analysis Area

The analysis area for direct, indirect, and cumulative effects to timber is the estimated disturbance footprint for the proposed action alternatives. This area was selected as the analysis area because all project-related disturbance and vegetation clearing is expected to occur within this area. Baseline information is also presented for timber resources in the VCUs crossed by one of more of the action alternatives.

Methodology

The analysis of the existing environment for timber is primarily based on existing GIS databases maintained by the Tongass National Forest, which provide summary information related to forest land classification and volume strata. Impacts to these categories are assessed based on the estimated disturbance footprint associated with each alternative and are quantified in terms of acres. Removal of timber from the regional timber base is estimated using existing ratios of mean board feet per acre. Removal of merchantable timber (i.e., trees with commercial value as timber) from the proposed right-of-way is discussed qualitatively, as is potential wind disturbance.

Affected Environment

The analysis area is located on the Petersburg Ranger District on north Kupreanof and Mitkof Islands in Southeast Alaska. The Tongass National Forest, including Mitkof and Kupreanof Islands, is covered primarily by temperate rainforest consisting of Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*), with lesser amounts of mountain hemlock (*Tsuga mertensiana*), Alaska yellow-cedar (*Callitropsis* [*Cupressus*] *nootkatensis*), and lodgepole pine (*Pinus contorta*). Red alder (*Alnus rubra*) occupies riparian areas and other sites where bare mineral soils are exposed. The majority of the area in the vicinity of the proposed project is occupied by old growth forests and harvested timber areas, intermixed with muskeg, riparian plant communities and beach habitat that are largely unaltered. On Kupreanof Island, extensive forest areas have been logged and plant communities in these areas have changed to early successional types that differ in character to old growth forests. Regeneration is rapid and most of the logged areas are covered by dense stands of young growth. The proposed project would primarily affect forested and muskeg vegetation types present in the analysis area.

Forest Land Classification

NFS lands are defined by vegetative cover, soil type, and administratively designated land use. This classification scheme is intended to show the amount of land covered by forested vegetation with further divisions to show the amount land capable of timber production. The land classifications for the 398,239 acres of NFS land in the VCUs crossed by the proposed alternatives are shown in Figure TBR-1.

Non-forest Land

About 7 percent (28,431 acres) of the NFS land in the VCUs crossed by the proposed alternatives is classified as non-forest (Figure TBR-1). Non-forest land is land that is biologically unable to support at least a 10 percent tree cover. This land classification includes muskegs, rock outcrops, talus slopes, alpine vegetation, and river systems, among others.

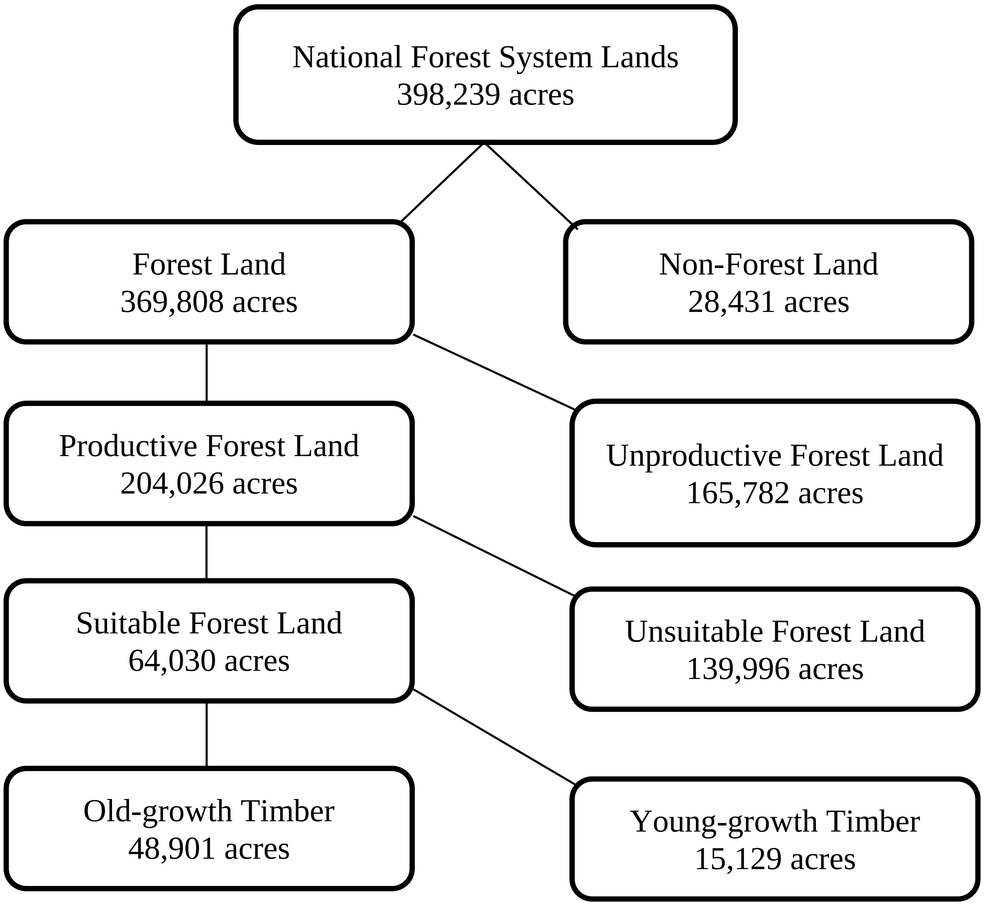


Figure TBR-1. Forest Land Classifications in the VCUs Crossed by the Proposed Alternatives

Forest Land

About 93 percent (369,808 acres) of the NFS land in the VCUs crossed by the proposed alternatives is classified as forest land (Figure TBR-1). Forest land has at least 10 percent tree cover of any size, or formerly had such tree cover and is not currently developed for non-forest use (36 CFR 219.3). Forest land is divided into productive and unproductive forest land.

Productive Forest Land

About 51 percent (204,026 acres) of the NFS land in the VCUs crossed by the proposed alternatives (55 percent of forest land) is classified as productive forest land. These lands have timber volumes of at least 8 MBF per 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 per acre, per year of tree growth. Productive forest land includes young-growth stands that have regenerated with conifer species after natural or human disturbance. Productive forest lands are further classified as either suitable or unsuitable for timber production.

Suitable Forest Land / Suitable and Available Forest Land

The Forest Plan assigned LUDs that allow timber harvest in areas that were determined to be suitable for timber production. Some land was removed from the suitable timber base due to Forest Plan Standards and Guidelines within those areas. Appendix A of the Forest Plan describes the process that was used to identify suitable forest land. Less than one-third (31 percent) (64,030 acres) of the productive forest land in the VCUs crossed by the proposed alternatives is classified as tentatively suitable for timber production. Approximately 76 percent of the suitable forest land (48,901 acres) is old-growth forest; the remaining 24 percent (15,129 acres) is young growth (Figure TBR-1).

Unsuitable Forest Land

Unsuitable forest lands are lands that have resource concerns that preclude timber harvest or are in LUDs that preclude timber harvest. Areas with slopes greater than 72 percent that have unstable soils, high vulnerability karst lands, areas within riparian, beach and estuary buffers, and OGRs are examples of forest land classified as unsuitable for timber production. More than two-thirds (69 percent) (139,996 acres) of the productive forest land in the VCUs crossed by the proposed alternatives is classified as unsuitable for timber production (Figure TBR-1).

Species Composition

Plant associations are a type of vegetation classification system based on the climax plant community. Stands within a specified plant association are comprised of vegetation with similar species composition and abundance. Most of the suitable forest land in the VCUs crossed by the proposed alternatives is a mosaic of two or more plant association series. Western hemlock, western hemlock–Alaska yellow-cedar, and mixed conifer are the three major series, with Sitka spruce, western hemlock–western redcedar, and mountain hemlock series represented on a much smaller scale. 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.

Volume Strata

The 2008 Forest Plan FEIS established three volume strata (high, medium, and low) for mean board feet per acre for productive old growth forest using existing inventories and additional information on soils and slope. These strata may be described as follows (additional information is provided in the *Wildlife and Subsistence* section of this EIS):

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

Strata characteristics, including trees per acre and gross and net volumes per acre are presented in Table TBR-1 for the South Island geographic area, which includes Kupreanof and Mitkof Islands (USDA Forest Service 2008c). Average gross volume per acre ranges from 20.9 MBF/acre for the low volume strata to 41.7 MBF/acre for the high volume strata.

Table TBR-1. Productive Old-Growth Forest Volume Strata Characteristics

Volume Strata	Trees per Acre	Gross Volume (MBF/acre)	Net Sawlog Volume (MBF/acre)	Net Utility Volume (MBF/acre)	Total Net Sawlog and Utility Volume (MBF/acre)
Low	151	20.9	13.7	2.0	15.7
Medium	100	30.3	20.7	2.9	23.6
High	97	41.7	29.3	5.1	34.4

Note:
1/ Data are presented for the South Island geographic area, which includes Kupreanof, Mitkof, Kuiu, Prince of Wales, and associated islands. Kupreanof Island generally has lower volumes than Kuiu and Prince of Wales Islands.
Source: USDA Forest Service 2008c (Table 3.13-5, p. 3-327)

Table TBR-2 identifies the distribution of productive forest land in the VCUs crossed by the proposed alternatives by Volume Strata and further subdivides these acres based on whether the lands are classified as suitable or unsuitable for timber production. The share of each classification identified as "Other" ranges from about one-quarter for suitable forest land to one-half for unsuitable forest land. The remaining lands (i.e., those mapped as low, medium, or high) are fairly evenly distributed across the three categories, with lands mapped as high volume strata accounting for 32 percent of suitable forest land and the productive forest land total (15,835 acres and 37,565 acres, respectively) and 31 percent (21,730 acres) for unsuitable forest land (Table TBR-2).

Table TBR-2. Volume Strata for Productive Forest Land, Suitable Forest Land, and Unsuitable Forest Land in the VCUs crossed by the Proposed Alternatives (acres)

Forest Land Classification	Volume Strata[1/]				Total
	Low	Medium	High	Other	
Productive Forest Land	40,878	40,453	37,565	85,131	204,026
Suitable Forest Land	14,698	18,359	15,835	15,129	64,021
Unsuitable Forest Land	26,180	22,094	21,730	70,001	140,005

Note:
1/ Characteristics for the low, medium, and high volume strata are presented in the preceding table. The Other category includes water and previously harvested areas, as well as unmapped areas. The majority of the Other category consists of unmapped areas.

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. Timber harvest and vegetation clearing have 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, including 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).

The Tongass National Forest monitors the incidence and characteristics of windthrow in riparian buffers of Class I, II, and III streams that are associated with timber sales. According to the 2012 Tongass Monitoring and Evaluation Report, 262 stream buffers associated with harvest from 2000 through 2007 and distributed across five ranger districts are currently monitored (USDA Forest Service 2012d). The amount of windthrow is measured as the cumulative number of windthrown trees as a percentage of the total number of originally standing trees in the buffer. Post-harvest windthrow was present in 55 percent of the buffers. Windthrow percentages in these buffers ranged from zero to 85 percent. However, the mean amount of windthrow present in the buffers was 6.7 percent, with a median of 0.8 percent. The vast majority of the buffers (97 percent) of the buffers had less than 50 percent windthrow, and 83 percent of the buffers had less than 10 percent windthrow (USDA Forest Service 2012d).

Buffers with the highest percentage of windthrow were found on unprotected southwest facing slopes and, in general, slopes with southern aspects had more windthrow than slopes with other aspects. Based on these findings, areas where clearing would occur along unprotected southwest facing slopes would generally be rated high for windthrow hazard. Clearing in areas with unprotected southern exposures other than southwest would be rated moderate, and clearing in areas with exposures other than southern or with protective topographic features would be rated low.

Environmental Effects

Effects Common to All Alternatives

Forest Land Classification

Forest land classifications for the Tongass National Forest are described in the preceding *Affected Environment* subsection and shown schematically in Figure TBR-1. The classifications for the total acres that would be disturbed are presented by alternative in Table TBR-3.

Table TBR-3. Forest Land Classifications for Acres Disturbed by Alternative

	Alternative 2		Alternative 3		Alternative 4	
Forest Land Classification[1/]	**Acres**	**Percent of Total**	**Acres**	**Percent of Total**	**Acres**	**Percent of Total**
Total Disturbed	**891**	**100%**	**873**	**100%**	**739**	**100%**
Non-National Forest Lands	181	20%	163	19%	74	10%
National Forest System Lands	710	80%	710	81%	665	90%
Non-Forest Land	33	4%	33	4%	35	5%
Forest Land	677	76%	677	78%	630	85%
Unproductive Forest Land	319	36%	319	37%	134	18%
Productive Forest Land	358	40%	358	41%	496	67%
Unsuitable Forest Land	223	25%	223	26%	243	33%
Suitable Forest Land	135	15%	135	15%	253	34%
Old-growth Timber	70	8%	70	8%	87	12%
Young-growth Timber	65	7%	65	7%	166	22%

Note:
1/ See Figure TBR-1 for a schematic showing the relationship between the different forest land classifications. As shown in the schematic and table:

Total Disturbed = Non-NFS Lands + NFS Lands
NFS Lands = Non-Forest Land + Forest Land
Forest Land = Unproductive + Productive Forest Land
Productive Forest Land = Unsuitable + Suitable
Suitable = Old-growth Timber + Young-growth Timber

Volume Strata and Removal of Timber

Clearing by Volume Strata

The 2008 Forest Plan FEIS established three volume strata (high, medium, and low) for mean board feet per acre for productive old growth forest using existing inventories and additional information on soils and slope. Table TBR-4 identifies the distribution of productive forest land by Volume Strata for the action alternatives and further subdivides these acres based on whether the lands are classified as suitable or unsuitable for timber production.

Table TBR-4. Volume Strata for Productive Forest Land, Suitable Forest Land, and Unsuitable Forest Land by Alternative (acres)

Forest Land Classification[1/]	Volume Strata				Total
	Low	Medium	High	Other	
Alternatives 2 and 3					
Suitable Forest Land	24	15	30	65	**135**
Unsuitable Forest Land	66	67	62	28	**223**
Productive Forest Land[2/]	**90**	**83**	**92**	**93**	**358**
Alternative 4					
Suitable Forest Land	33	38	15	166	**253**
Unsuitable Forest Land	108	58	36	42	**244**
Productive Forest Land[2/]	**141**	**96**	**51**	**208**	**496**

Note:
1/ Characteristics for the low, medium, and high volume strata are presented in the *Affected Environment* subsection. The Other category includes water and previously harvested areas.
2/ Productive forest land is divided into suitable and unsuitable forest land.

Removal of Timber from the Regional Timber Base

The estimated number of trees, gross volume, and net sawlog volume that would be cleared are summarized for suitable forest land by alternative in Table TBR-5. These estimates are based on the average numbers for the South Island geographic area developed for the 2008 Forest Plan EIS (see Table TBR-1). As a result, these are very general estimates suitable mainly for the comparison of alternatives. The majority of these trees and estimated volumes would be permanently removed from the regional timber base. The associated economic implications for the forest products industry are discussed below in the *Socioeconomics* section.

Table TBR-5. Estimated Trees, Gross Volume, and Net Sawlog Volume Cleared by Alternative

Volume Strata	Suitable Acres	Trees	Gross Volume (MBF)	Net Sawlog Volume (MBF)
Alternatives 2 and 3				
Low	24	3,639	504	330
Medium	15	1,543	468	319
High	30	2,894	1,244	874
Total	**69**	**8,077**	**2,216**	**1,524**
Alternative 4				
Low	33	5,040	698	457
Medium	38	3,793	1,149	785
High	15	1,492	641	451
Total	**87**	**10,325**	**2,488**	**1,693**

Removal of Merchantable Timber from the Right-of-Way

Suitable timber land on the Tongass is partitioned into two non-interchangeable components (NIC) based on operability. Lands with normal operability are designated NIC I; all other land is NIC II. Normal operability includes those systems most frequently used on the Tongass: tractor, shovel, standard cable, and helicopter with yarding distances up to 0.75 mile (USDA Forest Service 2008a, p. 7-24). The applicant would be required to remove trees with commercial value as timber (i.e., merchantable timber) on lands that are either 0.75 mile from saltwater or a road network that leads to a community or LTF. This would apply to all areas except those where right-of-way clearing is required in stream buffers. Clearing would only occur in stream buffers in locations where there is insufficient topography to allow spanning. In stream buffer areas, all timber within 100 feet of fish-bearing streams would be directionally felled and left in the right-of-way to reduce negative impacts to streams and provide some long-term large woody debris. However, some streams may benefit from increasing large woody debris at the time of clearing. Any efforts to provide for fish habitat improvements would be coordinated with Forest Service staff.

Wind Disturbance

Forest stand degradation could potentially occur in local areas along the proposed right-of-way where the route is exposed to strong winds, especially where it runs perpendicular to the prevailing wind direction. However, despite this potential, windthrow has not historically been a serious problem along other transmission line rights-of-way in Southeast Alaska (USDA Forest Service 1997a).

In stands with trees of variable heights, the right-of-way would be cleared with feathered edges, with the height of the vegetation increasing as one gets closer to the edge of the right-of-way. This approach provides a gradual vegetation height transition between the ground and forest canopy and minimizes the potential for windthrow along the edges of the right-of-way. In areas where trees are uniform in height, the entire right-of-way would be cleared. In areas where the proposed transmission line spans a valley, trees and other vegetation below the line may not need to be completely cleared. Another technique that may be employed to minimize effects on vegetation is limited sculpting, with vegetation allowed to grow closer and taller near the structures than near the conductors between the structures. These approaches would also minimize the potential for windthrow along the right-of-way boundary.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line and related facilities would not be built. The proposed project would not result in vegetation clearing or the removal of merchantable timber.

Cumulative Effects

The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other reasonably foreseeable projects in the analysis area.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Alternative 2 would disturb an estimated total of 891 acres. This total includes both NFS and non-NFS lands, which account for 80 percent and 20 percent of the total respectively. The majority of the NFS lands are classified as forest land (677 acres; 76 percent of the overall total), with 135 acres (15 percent) classified as suitable forest land (Table TBR-3).

Almost half (49 percent; 65 acres) of the suitable forest land that would be disturbed under this alternative is classified as other from a volume strata perspective. “Other” in this case primarily refers to previously harvested areas. Approximately 43 percent (30 acres) of the remaining suitable acres are mapped as high volume strata, with the remaining 22 percent (15 acres) and 35 percent (24 acres) mapped as medium and low volume strata (Table TBR-4).

An estimated 69 acres of suitable lands mapped with a volume strata of low, medium, or high would be cleared under this alternative. Estimates developed using average ratios developed for the 2008 Forest

Plan EIS indicate that this would involve the removal of 8,077 trees with gross and net sawlog volumes of approximately 2,216 MBF and 1,524 MBF, respectively (Table TBR-5). As noted above, these are very general estimates suitable mainly for the comparison of alternatives. The majority of these trees and estimated volumes would be permanently removed from the regional timber base. These estimates are the same for Alternatives 2 and 3 and lower than under Alternative 4.

Cumulative Effects

Timber harvest has occurred in the analysis area in the past. An estimated 10,734 acres of the NFS lands within the VCUs crossed by proposed alternatives, about 3 percent of the total NFS lands in this area, have been harvested since 1984. An estimated 45 acres or 6 percent of the total NFS lands that would be disturbed by this alternative have been harvested since 1984. There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. One reasonably foreseeable timber sale (Scott Peak) includes units that would be located within the analysis area for this alternative. The portions of these units within the analysis area total 2.7 acres. The Kake road project would disturb an estimated 114 acres of NFS land outside the 300-foot-wide KPI corridor. The majority of this land (108 acres) is classified as forest land, with an estimated 20.1 acres classified as suitable forest land. The majority of these trees would likely be permanently removed from the regional timber base.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Alternative 3 would disturb an estimated total of 873 acres. This total includes both NFS and non-NFS lands, which account for 81 percent and 19 percent of the total respectively. The majority of the NFS lands are classified as forest land (677 acres; 78 percent of the overall total), with 135 acres (15 percent) classified as suitable forest land (Table TBR-3). Total acres disturbed are lower under Alternative 3 than Alternative 2 (873 acres versus 891 acres) because it is shorter and would require less right-of-way clearing.

Almost half (49 percent; 65 acres) of the suitable forest land that would be disturbed under this alternative is classified as other from a volume strata perspective. "Other" in this case primarily refers to previously harvested areas. Approximately 43 percent (30 acres) of the remaining suitable acres are mapped as high volume strata, with the remaining 22 percent (15 acres) and 35 percent (24 acres) mapped as medium and low volume strata (Table TBR-4).

An estimated 69 acres of suitable lands mapped with a volume strata of low, medium, or high would be cleared under this alternative. Estimates developed using average ratios developed for the 2008 Forest Plan EIS indicate that this would involve the removal of 8,077 trees with gross and net sawlog volumes of approximately 2,216 MBF and 1,524 MBF, respectively (Table TBR-5). As noted above, these are very general estimates suitable mainly for the comparison of alternatives. The majority of these trees and estimated volumes would be permanently removed from the regional timber base. These estimates are the same for Alternatives 2 and 3 and lower than under Alternative 4.

Cumulative Effects

Timber harvest has occurred in the analysis area in the past. An estimated 10,734 acres of the NFS lands within the VCUs crossed by proposed alternatives, about 3 percent of the total NFS lands in this area, have been harvested since 1984. An estimated 45 acres or 6 percent of the total NFS lands that would be disturbed by this alternative have been harvested since 1984. There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. As with Alternative 2, an estimated 2.7 acres of the reasonably foreseeable Scott Peak timber sale units are located within the analysis area for this alternative. Similar to Alternative 2, the Kake road project would disturb 108 acres of NFS forest land outside the 300-foot-wide KPI corridor, including 20.1 acres classified as suitable forest land. The majority of these trees would likely be permanently removed from the regional timber base.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would disturb an estimated total of 739 acres. This total includes both NFS and non-NFS lands, which account for 90 percent and 10 percent of the total respectively. The majority of the NFS lands are classified as forest land (630 acres; 85 percent of the overall total), with 253 acres (34 percent) classified as suitable forest land (Table TBR-3). Almost twice as many suitable acres would be disturbed under this alternative than under Alternatives 2 and 3, 253 acres versus 135 acres. Much of this difference consists of young-growth timber, with an estimated 166 acres disturbed under this alternative compared to 65 acres under Alternatives 2 and 3 (Table TBR-3).

Approximately two-thirds (66 percent; 166 acres) of the suitable forest land that would be disturbed under this alternative is classified as other from a volume strata perspective. “Other” in this case primarily refers to previously harvested areas. Approximately 18 percent (15 acres) of the remaining suitable acres are mapped as high volume strata, with the remaining 44 percent (38 acres) and 39 percent (33 acres) mapped as medium and low volume strata (Table TBR-4).

An estimated 87 acres of suitable lands mapped with a volume strata of low, medium, or high would be cleared under this alternative. Estimates developed using average ratios developed for the 2008 Forest Plan EIS indicate that this would involve the removal of 10,325 trees with gross and net sawlog volumes of approximately 2,488 MBF and 1,693 MBF, respectively (Table TBR-5). The majority of these trees and estimated volumes would be permanently removed from the regional timber base.

Cumulative Effects

Timber harvest has occurred in the analysis area in the past. An estimated 10,734 acres of the NFS lands within the VCUs crossed by proposed alternatives, about 3 percent of the total NFS lands in this area, have been harvested since 1984. An estimated 81 acres or 12 percent of the total NFS lands that would be disturbed by this alternative have been harvested since 1984. There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. One reasonably foreseeable timber sale (Central Kupreanof) includes units that would be located within the analysis area for this alternative. The portions of these units within the analysis area total 16.9 acres.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the timber analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for the removal of additional trees and harvest volume from the regional timber base.

Mitigation

The effects of the KPI Project on timber resources would be limited through the site-specific application of Forest Plan Standards and Guidelines and R10 BMPs (see Chapter 2).

Botany

Introduction

This section provides an overview of the existing conditions of botanical resources and assesses the potential direct, indirect, and cumulative effects of the proposed project on these resources, including sensitive and rare plants. Sensitive plants are those found on the Alaska Region Sensitive Plant List. Rare plants are found on the Alaska Natural Heritage Program's (ANKHP's) Rare Vascular Plant List.

Only one species, Aleutian holly fern (*Polystichum aleuticum* C. Chris.), is listed as endangered in Alaska, and its known range is restricted to Adak Island in the Aleutian Islands. No proposed or federally listed plant species are known on the Tongass National Forest. A more detailed discussion of botanical resources can be found in the Botany Resource Report (Tetra Tech 2014d) and the Biological Evaluation for Plants (Tetra Tech 2014e).

Analysis Area

The analysis area for direct, indirect, and cumulative effects to vegetation is the estimated disturbance footprint for the action alternatives. This area was selected as the analysis area because all project-related disturbances are expected to occur within this area. Cumulative effects to sensitive and rare plants are assessed for the analysis area as well as the broader area of Kupreanof and northern Mitkof Islands as many of the sensitive and rare plants have ranges that extend beyond the analysis area and species viability must take other populations into consideration.

The three action alternatives follow one of two primary route corridors: the Northern route (Alternatives 2 and 3) and the Center-South route (Alternative 4) corridors. These terms (i.e., the Northern route and Center-South route corridors) are used in this section when discussing the analysis areas applicable to the different alternatives.

Methodology

Field surveys were conducted for sensitive and rare plants within the analysis area from July 19-30, 2011. Prior to conducting these surveys, a pre-field review of the analysis area was completed (Tetra Tech 2011). Habitat information in the analysis area was assessed based on information obtained from GIS, reviews of aerial photographs, and discussions with Forest Service resource specialists. This review indicated that no species on the Alaska Region Sensitive Plant List had been previously documented on the Petersburg Ranger District or within the analysis area and only one species on the list, a lichen (*Lobaria amplissima*), had previously been documented on the District. General habitat types occurring within the analysis area include forest edge, coniferous forest, rocky areas, rock outcrops, gravel, seeps, wet areas, riparian areas, streambanks, ponds, shallow freshwater marshes, muskeg, fens, and sandy areas. Based on the pre-field review and the variety of habitats present, it was determined that four of the sensitive species on the Alaska Region Sensitive Plant List have a reasonable potential to occur in the analysis area (Table BOT-1).

Focused intuitive controlled surveys for sensitive and rare plants were conducted for the project. This survey type involves identifying suitable habitat for targeted species and then focusing the survey effort within those identified habitats. The field surveys for this project were conducted in July 2011, which is an appropriate time of year to identify target species. Field surveys included the two primary route corridors (i.e., the Northern Route and Center-South route corridors). Surveys were dispersed throughout the analysis areas in a variety of habitat types, elevations and aspects, and covered approximately 35 percent of the total combined analysis area (i.e., the analysis areas for all three alternatives). Populations of sensitive plant species were not identified in the analysis areas during these field surveys; however, populations of four rare plant species were identified as a result of field surveys. The location of each population was mapped and digitized, and a plant count or estimate was made for each population.

Table BOT-1. Known or Suspected Sensitive Plants in the Petersburg Ranger District with the Potential to Occur within the Analysis Area

Scientific Name	Common Name	Presence1/	Habitat
Cypripedium parviflorum var. *pubescens*	Large yellow lady's slipper orchid	Suspected	Peatlands, occasionally on limestone substrates, open forested habitats
Lobaria amplissima	None	Known	Coastal areas on the forest fringe, often on the water-side of tree boles and large limbs
Piperia unalascensis	Alaska rein orchid	Suspected	Forested areas, roadsides and frequently on edges between forest and muskeg
Platanthera orbiculata	Lesser round-leaved orchid	Suspected	A variety of habitats, most commonly in forested habitats and along the forested muskeg edge. Found in both old and young growth.

1/ Known = known to occur in the Petersburg Ranger District
Suspected = suspected to occur in the Petersburg Ranger District

Plant Survey Field Forms and R10 Threatened and Endangered Species (TES) Plant Element Occurrence field forms were completed according to protocol for the Alaska Region (and can be found in the project record). A detailed map showing the exact routes that the botanists travelled on the ground is also in the project record. A spreadsheet identifying all plant species observed in the analysis area, their general habitats, and the alternative route they occurred along was also prepared and included in the project record.

Information on general vegetation in the analysis area was primarily developed using existing GIS data for the area. Potential impacts were assessed based on the estimated disturbance footprint for the proposed action alternatives.

Affected Environment

The analysis area is located on the Petersburg Ranger District on north Kupreanof and Mitkof Islands in Southeast Alaska. The Tongass National Forest, including Mitkof and Kupreanof Islands, is covered primarily by temperate rainforest consisting of Sitka spruce and western hemlock, with lesser amounts of mountain hemlock, Alaska yellow-cedar, and lodgepole pine. Red alder occupies riparian areas and other sites where bare mineral soils are exposed. The majority of the analysis area is occupied by old-growth forests and harvested timber areas, intermixed with muskeg, riparian plant communities, and beach habitat that are largely unaltered. Logging has occurred in forested areas on Kupreanof Island and plant communities in these areas have changed to early successional types that differ in character to old-growth forests. Regeneration is rapid and most of the logged areas are covered by dense stands of young-growth forests. The proposed project would primarily affect forested and muskeg vegetation types present in the analysis area.

Sensitive Plants

A total of 18 plant species, including one lichen, have been designated as Sensitive on the Alaska Regional Forester's list; 16 of these are known or suspected to occur on the Tongass National Forest. One of these species, *Lobaria amplissima*, has been documented on the Petersburg Ranger District. The Petersburg Ranger District is also within the potential range of an additional 8 species; however, only 3 of these species are likely to occur in habitats found within the analysis area. Table BOT-1 summarizes the general habitat requirements of the 4 sensitive plant species that are either known to occur or suspected to occur on the Petersburg Ranger District and have the potential to occur in the analysis area. No populations of sensitive species were located during surveys of the analysis area.

Large Yellow Lady's Slipper (Cypripedium parviflorum var. pubescens)

Large yellow lady's slipper orchid grows in peatlands and open forested areas, occassionally on limestone substrates (USDA Forest Service 2009d). This species is suspected to occur on the Petersburg Ranger District, but was not observed during the botanical field surveys conducted for this project.

Lobaria Amplissima

Lobaria amplissima grows on the trunks and large branches of living trees and has been found on several different tree species (USDA Forest Service 2009d). Typical habitat for *Lobaria amplissima* is exposed, windswept coastal areas on the forested fringe, often on the water side of living tree boles and large limbs of several different tree species (USDA Forest Service 2009d). Although *Lobaria amplissima* has been documented on the Petersburg Ranger District, it was not observed during field surveys of potential habitat (i.e., coastal areas crossed by the action alternatives) conducted for the proposed project.

Alaska Rein Orchid (Piperia unalascensis)

Alaska rein orchid grows in dry, open sites, under tall shrubs in riparian zones, mesic meadows and drier areas in coniferous and mixed evergreen forests from low elevation to subalpine (USDA Forest Service 2009d). This species is often found at the edge of muskeg and old-growth forest, although it has also been observed in the interior of forested areas and along road edges. Alaska rein orchid is suspected on the Petersburg Ranger District. Although it was not observed during field surveys conducted for the proposed project, potential habitat is present within the analysis area.

Lesser Round-leaved Orchid (Platanthera orbiculata)

Lesser round-leaved orchid may be found in a variety of habitats, including low elevation forested wetlands, medium to high volume old-growth hemlock forests, forest edges or near gaps in otherwise shady forests, and next to open water or boggy areas (USDA Forest Service 2009d). It is most commonly found in forested habitats and along the forested muskeg edge on the Tongass National Forest, and has been found in both old and young-growth forests. The lesser round-leaved orchid is suspected to occur in the Petersburg Ranger District but has not been documented. This plant was not observed during field surveys, although potential habitat is present in the analysis area.

Rare Plants

Rare plant species with known or suspected occurrences on the Tongass National Forest are evaluated based on the ANKHP's 2012 Rare Vascular Plant List (AKNHP 2012). The list includes species with a State Ranking of S1, S2, or occasionally S3, excluding species that are already listed as Sensitive on the Tongass National Forest. The list may change with plants added or dropped as additional information on plant viability, distribution, and taxonomy is learned.

Four rare plant species were found during surveys within the analysis area: rattlesnake fern (*Botrychium virginianum*), Bebb's sedge (*Carex bebbii*), sawbeak sedge (*Carex stipata* var. *stipata*), and bog clubmoss (*Lycopodiella inundata*). Summary information is presented for these species in Table BOT-2, which also identifies the approximate location where each species was observed in the analysis area.

Table BOT-2. Rare Plants Observed within the Analysis Area

Scientific Name	Common Name	Global Rank/ State Rank	Typical Habitat	Population Number and Estimated Population Size	Location in the Analysis Area	Habitat and Estimated Distance from Existing Road
Botrychium virginianum	Rattlesnake fern	G5 / S3	Moist woods, thickets, meadows	#1 (30)	Along the Northern route corridor; near Kake	All plants on disturbed road prism
				#2 (20)	Near Kake where the action alternatives all share the same alignment	Undisturbed diverse wet meadow, approximately 50 - 100 feet from road edge.
				#3 (20)	South of Hamilton Bay along the Center-South route corridor	Undisturbed diverse wet meadow, approximately 50 feet from road edge.
Carex bebbii	Bebb's sedge	G5 / S1S2[1]	Wet meadows, streambanks, roadside ditches	#1 (<5)	Just south of Portage Bay near Fish Creek within the Northern route corridor	Within 50 feet of road edge in previously disturbed muskeg.
Carex stipata var. *stipata*	Sawbeak sedge	G5 / S2[1]	Marshes, thicket edges, wet habitats	#1 (<5)	Just south of Portage Bay near Fish Creek within the Northern route corridor	Within 50 feet of road edge in previously disturbed muskeg.
				#2 (7)	Along the Northern route corridor; near Kake	Undisturbed diverse wet meadow approximately 50 feet from road edge.
Lycopodiella inundata	Bog clubmoss	G5/ S3[1]	Sphagnum bogs, wet shores in lowlands	#1 (2x2 foot mat)	Between Portage Bay and Hamilton Bay along the Northern route corridor	Undisturbed muskeg habitat, approximately 75 feet from road edge.

Note:

1/ Indicates that the rank is preliminary (AKNHP 2012)

Sources: Hitchcock and Cronquist 1973; Hulten 1968; Wilson et al. 2008

Rattlesnake Fern

Rattlesnake fern is a distinctive, perennial fern species that is widely distributed across North America and that typically grows in moist woods, thickets, and meadows. It is known to occur in at least 20 locations in Alaska (AKNHP 2012), including 12 locations on the Tongass National Forest, none of which are on the Petersburg Ranger District. Rattlesnake fern has been assigned a rank of S3 in Alaska, indicating that within the State of Alaska this plant is rare or uncommon (AKNHP 2012).

Three small rattlesnake fern populations, with an estimated total of 70 plants, were observed southeast of Kake during the field surveys conducted for this project (Table BOT-2; Figure BOT-1). Two populations were observed within the analysis area for the Northern route corridor (Alternatives 2 and 3) and one population was observed within the analysis area for the Center-South route corridor (Alternative 4). Two of these populations -- one along the Northern route corridor and one along the Center-South route corridor – were observed within undisturbed, highly diverse wet meadow habitat. The third population (observed along the Northern route corridor) was located within disturbed habitat of an existing road prism.

Bebb's Sedge

Bebb's sedge, a cespitose perennial sedge species with crowded roundish red-brown spikes, typically grows in wet meadows, stream banks, roadside ditches, in low elevation areas, and in the mountains (Wilson et al. 2008). Its distribution is widespread across North America. Bebb's sedge is known from three locations in Alaska (AKNHP 2012), none of which are on the Tongass National Forest. Bebb's sedge has been assigned a preliminary rank of S1S2 in Alaska, indicating that within the State of Alaska this plant is between critically imperiled (S1) and imperiled (S2) (AKNHP 2012). One small population (approximately five plants) of Bebb's sedge was located in previously disturbed muskeg habitat along an existing road south of Portage Bay near Fish Creek along the Northern route corridor (Table BOT-2; Figure BOT-1).

Sawbeak Sedge

Sawbeak sedge, a densely cespitose sedge species with large spikey inflorescence, typically grows in marshes, thicket edges, and other wet spots with still water, usually in full sun, at low to moderate elevations (Wilson et al. 2008). Except for some southeastern states, it is widespread across North America. Sawbeak sedge is known from five locations in Alaska (AKNHP 2012), including one location on the Tongass National Forest in the Petersburg District at the south end of Mitkof Island. Sawbeak sedge has been assigned a preliminary rank of S2 in Alaska, indicating that within the State of Alaska this plant is imperiled because of rarity (AKNHP 2012). Two small populations (with an estimated total of approximately 10 plants) of sawbeak sedge were observed during surveys of the analysis area; one south of Portage Bay near Fish Creek and the other southeast of Kake (Table BOT-2; Figure BOT-1). Both populations were observed along the Northern route corridor. One population was located in a previously disturbed muskeg habitat near a gravel road, and the other was in a previously undisturbed diverse wet meadow.

Bog Clubmoss

Bog clubmoss is a creeping perennial, nonflowering plant that grows low to the ground, and typically grows in muskegs, wetlands, and swampy ground (Washington Natural Heritage Program 2012). This species is widespread across northern North America and is known from 14 locations in Alaska (AKNHP 2012), including five locations on the Tongass National Forest. Bog clubmoss has been assigned a preliminary rank of S3 in Alaska, indicating that within the State of Alaska this plant is rare or uncommon (AKNHP 2012). One small population (covering an area of approximately 4 square-feet) of bog clubmoss was observed in undisturbed muskeg habitat between Portage Bay and Hamilton Bay along the Northern route corridor (Table BOT-2; Figure BOT-1).

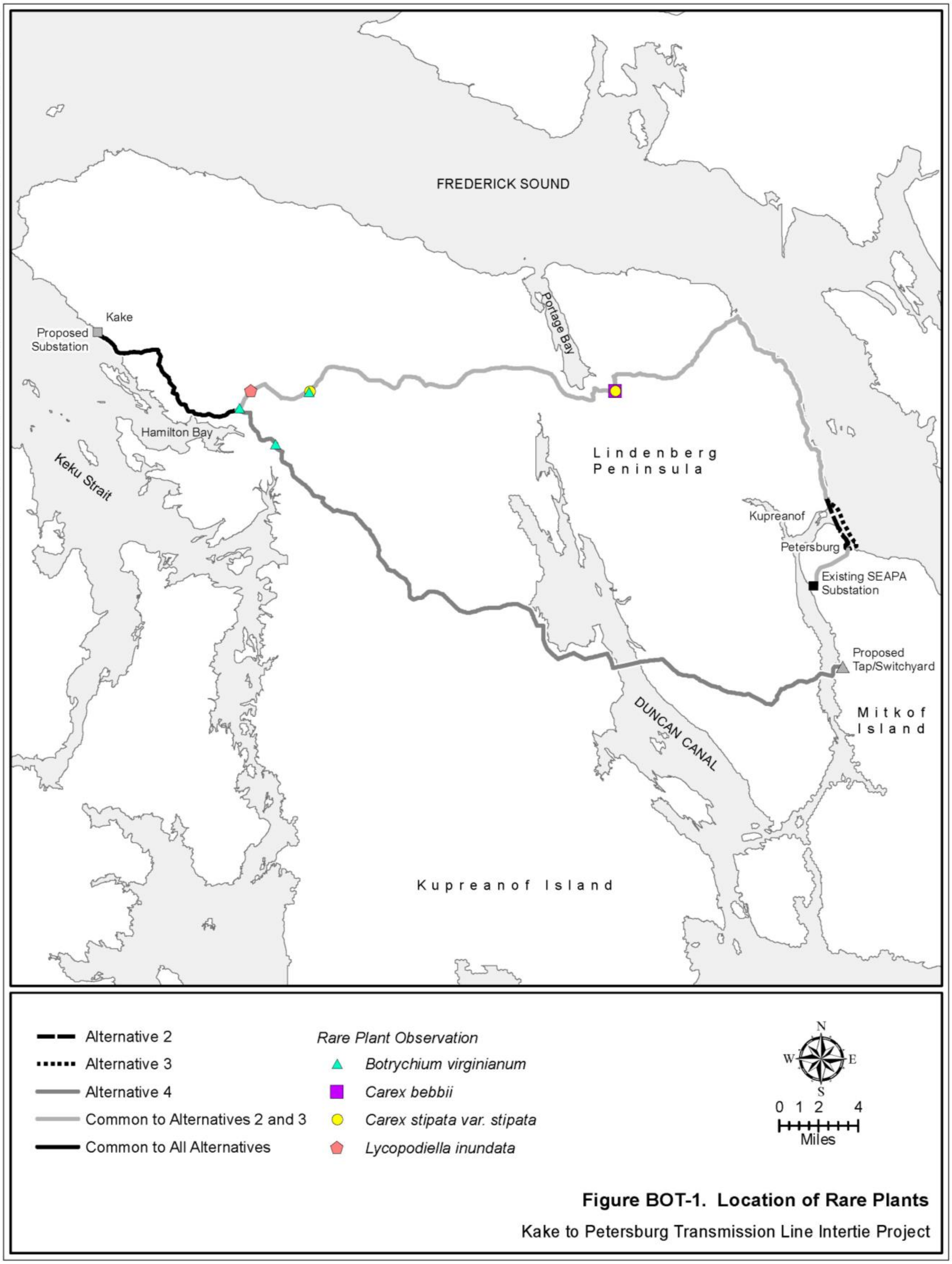


Figure BOT-1. Location of Rare Plants

Kake to Petersburg Transmission Line Intertie Project

General Vegetation Types

Three primary general vegetation types are present in the analysis area: old-growth, young-growth and non-forested areas (Table BOT-3). Old-growth forests are divided into productive and non-productive old-growth categories. Only productive old-growth contains high volume timber resources. However, both productive and non-productive old-growth take a long time to develop structurally, and may contain unique botantical resources, including sensitive and rare plants. Additional details regarding productive old-growth and non-productive old-growth are included in the *Timber* and *Wildlife and Subsistence Use* sections of this EIS. Old-growth forests, as a share of the area that would be disturbed by each alternative (i.e., the analysis area for each alternative), ranges from 36.7 percent for Alternative 2 to 40.1 percent for Alternative 4 (Table BOT-3).

Young-growth in the analysis area is generally the result of even-aged harvesting methods, although a small amount (about 1 percent) is the result of natural disturbances such as landslides and blowdown. Young-growth characteristics vary with age, with the youngest stands typically densely vegateted with a mix of young saplings and a dense shrub layer. As these stands progress in age, they develop a canopy that is predominantly closed and consequently has limited understory vegetation. Timber harvest on Kupreanof Island generally began in the 1960s, with peak harvests occuring in the 1980s. Age classes of young-growth in the analysis area range from recently harvested to about 50 years old. Young-growth forest as a share of the area that would be disturbed by each alternative ranges from 15.4 percent for Alternative 2 to 33 percent for Alternative 4 (Table BOT-3).

The majority of non-forested vegetation in the analysis area is non-forested wetland types, with small amounts of water, rock, and urban areas. The non-forested wetland types include a diverse array of vegetation types. Botanical resources in these areas vary widely by landscape position, hydrological regime, and soil type. Additional information on wetlands is provided in the *Wetlands* section of this EIS. Non-forested land as a share of the area that would be disturbed by each alternative ranges from 26.9 percent for Alternative 4 to 47.9 percent for Alternative 2 (Table BOT-3).

Table BOT-3. General Vegetation Types in the Analysis Area

	Alternative 2		Alternative 3		Alternative 4	
Vegetation Type	**Acres**	**Percent of Total**	**Acres**	**Percent of Total**	**Acres**	**Percent of Total**
Old-growth	327.1	36.7	323.6	37.1	296.4	40.1
Young-growth (Past Harvest)	137.5	15.4	137.5	15.7	244.2	33.0
Non-Forested	426.5	47.9	412.0	47.2	198.8	26.9
Total	**891.0**	**100**	**873.1**	**100**	**739.4**	**100**

Note:
1/ Totals may not sum due to rounding.

Environmental Effects

Effects Common to All Alternatives

Direct and Indirect Effects

The project has the potential to have direct, indirect, and cumulative effects on vegetation, including sensitive and rare plant species. The direct, indirect, and cumulative effects of the project are used to determine the risk the project poses to botanical resources that may potentially be affected. This is conducted through a risk assessment, which is included in the Biological Evaluation for Plants prepared for this project (Tetra Tech 2014e).

Direct effects are those that would occur immediately or soon after the implementation of the action (Dillman et al. 2009). Direct effects of the proposed project may include the following:

- *Physical Damage* – Individual plants, entire populations, or habitat may be destroyed or damaged through crushing by logging equipment and other activities associated with transmission line construction. Use of existing roads could bury or remove plants located in the road bed or along the perimeter of the road. This could also be the case with the shovel trails and temporary access trails that would be used for access during construction.

Indirect effects are those effects that are reasonably likely to occur at a later point in time after the project has been implemented (such as changes in hydrology or intensified or decreased of solar radiation) (Dillman et al. 2009). Indirect effects of the proposed project may include the following:

- *Hydrology* – Roads can alter the hydrology, as surface and ground water may be redirected and channelized by roadside ditches, altering the hydrologic regime. Increased water levels may result in the death or decline in vigor of plants not adapted to a high water table. Conversely, plants adapted to wetland conditions may become dessicated by a decrease in water availabilty. Additionally, removal of tree or shrub cover can result in changes in light, temperature, and soil moisture (Heithecker and Halpern 2007), potentially beyond the tolerance levels of some species. No new roads are proposed under any of the alternatives.
- *Light Levels* – Partial or complete removal of the tree canopy results in an increase in the light levels in the understory, potentially resulting in light levels beyond the tolerance for some shade dependent species (Heithecker and Halpern 2007). Once the stand regenerates, light levels will decrease with increasing canopy cover due to high density of small conifers. This may also alter light requirements for many species, including sensitive and rare plants.
- *Invasive Plants* – Increased light levels associated with right-of-way clearing or other ground disturbing activities associated with construction and maintenance of the transmission line could result in the introduction or spread of invasive plant species. Invasive species can outcompete native species and colonize preferred habitat. The direct and indirect effects of invasive plants are further described in the *Invasive Plants* section of this EIS.

Sensitive Plant Species

None of the alternatives would have direct or indirect effects on known populations of sensitive plant species. Although large yellow lady’s slipper, lesser round-leaved orchid, and Alaska rein orchid are not known on the Petersburg Ranger District and were not observed during field surveys of the analysis areas, transmission line construction and associated activities could affect undetected populations and potential habitat for these species. Direct effects could occur through damage by machinery and movement of native material during construction of temporary shovel trails and temporary access spurs, structure placement, or vegetation clearing activities. Indirect effects are also possible, potentially occurring as a result of light level changes, and soil moisture or hydrology changes as a result of disturbances to soils and/or canopy closures.

Both Alaska rein orchid and lesser round-leaved orchid grow in a variety of habitats, thus, much of the proposed disturbance that would result from the action alternatives has the potential to disturb potential habitat and undetected individuals of these species. In the analysis area, peatlands, which provide potential habitat for large yellow lady’s slipper, are generally categorized as moss muskeg wetlands. Impacts to moss muskeg habitat from each of the action alternatives is discussed below for each alternative. Further discussion of impacts to moss muskeg habitat can be found in the *Wetlands* section of this EIS.

The overall risk to large yellow lady's slipper, Alaska rein orchid, and lesser round-leaved orchid under the action alternatives is low to moderate since not all habitat within the analysis area was surveyed and undectected individuals could potentially be impacted by construction of the project. The action alternatives may adversely impact individuals, but are not likely to result in a loss of viability of these plant species in the analysis area, nor cause a trend toward federal listing (Tetra Tech 2014e).

Unlike the three sensitive species discussed above, *Lobaria amplissima* is known to occur on the Petersburg Ranger District. Potential habitat within the analysis area (i.e., marine crossings) was surveyed for *Lobaria amplissima*, and this lichen was not observed during these surveys. Other potential habitat exists within the 1,000 foot buffer of the beach fringe. Since not all areas of potential habitat were surveyed, the overall risk is considered low to moderate similar to that described above for the large yellow lady's slipper, Alaska rein orchid, and lesser round-leaved orchid.

Rare Plants

Four rare plants are known to occur within the analysis area. Each of the action alternatives could have impacts on rattlesnake fern, as this species as well as its suitable habitat were observed near existing roads that would be used during construction of the project. Alternatives 2 and 3 could have impacts on Bebb's sedge, sawbeak sedge, and bog clubmoss, as these three rare plants were observed within the Northern route corridor's analysis area (near existing roads).

Direct effects to rare plants could occur through damage by machinery and movement of native material during construction. Indirect effects are also possible, potentially occurring as a result of light level changes or soil moisture changes resulting from project activities. In addition, transmission line construction activities under the proposed action alternatives could affect potential habitat for these species and thus potentially affect undetected populations.

General Vegetation

Direct impacts to old-growth, young-growth, and non-forested vegetation communities would result from structure installation, use of temporary shovel trails and temporary access spurs, helicopter pads, and right-of-way clearing (see Table BOT-4). Forested areas that are cleared for structures, permanent helicopter pads, or right-of-way clearing would be permanently maintained as an early successional vegetation type (either very young-growth or scrub-shrub vegetation). Vegetation clearing would have minimal impacts to non-forested vegetation communities, including forested muskeg. The majority of the trees in this vegetation type are small and stunted, which suggests that project-related clearing would have minimal impacts in these areas. However, it is possible that scattered tall trees present in forested muskeg or infrequently in other predominantly non-forested areas may be cleared in the right-of-way. Temporary access spurs outside the proposed rights-of-way would eventually be revegetated and become young-growth forest. However, these impacts would change the structural and species composition of old-growth forest, resulting in a shift towards early successional species and the loss of shade-dependent, late seral plants.

Indirect effects on old-growth and young-growth forest could occur through blow down of adjacent stands as a result of clearing in the analysis area. Indirect effects could also result from invasive plant spread. Due to the lack of a forested canopy, disturbance, and high light levels, non-forested areas would be at a higher risk for invasive plant establishment than forested areas. Impacts to general vegetation in the analysis area are further discussed, by alternative, in the sections below.

Table BOT-4. General Vegetation Impacts by Action Alternative (acres)

Impact Type (acres)	Old Growth			Young Growth			Non-Forested			Total		
	Alternative											
	2	3	4	2	3	4	2	3	4	2	3	4
Structure Installation	34.8	34.9	40.4	27.7	27.7	51.0	83.3	83.4	42.8	145.8	146.0	134.2
Shovel Trails	9.5	9.5	4.1	0.8	0.8	0.6	18.0	18.0	3.4	28.3	28.3	8.1
Temporary Matting Panels	0.0	0.0	2.2	0.0	0.0		2.5	2.5	6.8	2.5	2.5	9.0
Temporary Access Spurs	3.0	3.0	2.8	2.4	2.4	2.9	4.8	4.8	2.3	10.2	10.2	7.9
Helicopter Pads	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.3	0.1	0.4	0.4	0.2
Right-of-Way Clearing	279.7	276.1	246.7	106.6	106.6	189.7	317.4	303.0	143.5	703.7	685.7	579.9
Total	**327.1**	**323.6**	**296.4**	**137.5**	**137.5**	**244.2**	**426.4**	**412.0**	**198.8**	**891.0**	**873.1**	**739.4**

Note:
1/ Numbers may not sum due to rounding.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line and related facilities would not be built. The proposed project would have no effect on botanical resources, including rare and sensitive plant species.

Cumulative Effects

The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other reasonably foreseeable projects in the analysis area.

Alternatives 2 and 3

Direct and Indirect Effects

Sensitive Plant Species

Potential direct and indirect effects to sensitive plant species are as described above in the *Effects Common to All Alternatives* subsection, with the exception of potential impacts to habitat for large yellow lady's slipper. Potential impacts to large yellow lady's slipper habitat that could occur under Alternatives 2 and 3 are discussed here. Approximately 102 and 100 acres of habitat for large yellow lady's slipper (i.e., moss muskeg) could be impacted by structure installation, use of temporary shovel trails and temporary access spurs, helicopter pads, and right-of-way clearing under Alternatives 2 and 3 respectively. However, these estimates likely overstate the acres that would be affected because they assume that all moss muskeg in the rights-of-way would be cleared (81 acres and 79 acres for Alternatives 2 and 3, respectively; see Table WET-2). Structure installation, use of temporary shovel trails and temporary access spurs, and helicopter pads would result in some impacts to moss muskeg. However, this habitat type mainly consists of low-lying vegetation with scattered tall trees and much of the remaining right-of-way in moss muskeg would not need to be cleared. Alternatives 2 and 3 would both affect more acres of moss muskeg habitat than Alternative 4.

Rare Plant Species

Alternatives 2 and 3 would have direct effects to one known population of rattlesnake fern (Population #1) because this population was located within the road prism of an existing NFS road that would be used under these two alternatives (Table BOT-2). Direct effects could occur through trampling and crushing by construction vehicles and personnel traveling along the road prism. Alternatives 2 and 3 could also result in direct and/or indirect effects to one of the other populations of this species observed during surveys within the analysis area (Population #2) depending on final placement of transmission poles as well as temporary shovel trails and temporary access spurs.

Alternatives 2 and 3 could also result in direct and/or indirect effects to known populations of Bebb's sedge (Population #1), sawbeak sedge (Populations #1 and #2), and bog clubmoss (Population #1) depending on the final placement of transmission poles and temporary shovel trails and temporary access spurs (Table BOT-2). Direct effects to populations of Bebb's sedge, sawbeak sedge, and bog clubmoss could occur through damage by construction machinery and personnel, as well as through movement of native material during structure installation and construction of temporary shovel trails and temporary access spurs.

Indirect effects to rattlesnake fern, Bebb's sedge, sawbeak sedge, and bog clubmoss are also possible, potentially occurring as a result of light level or soil moisture changes, as well as the potential introduction of invasive plant species resulting from project activities.

In addition to direct and indirect effects to known populations, the project could directly or indirectly affect potential habitat for rattlesnake fern, Bebb's sedge, sawbeak sedge, and bog clubmoss, and, thus, potentially affect undetected populations of these species.

General Vegetation

Direct and indirect effects to old-growth, young-growth, and non-forested vegetation types under Alternatives 2 and 3 are as described under Effects Common to All Action Alternatives. Alternatives 2 and 3 would affect very similar amounts of old-growth and young-growth forest, as indicated in Table BOT-4. These alternatives would affect more old-growth and non-forested areas than Alternative 4 and fewer young-growth forest areas.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Sensitive Plant Species

Direct and indirect effects to sensitive plant species are as described above in the *Effects Common to All Alternatives* subsection with the exception of potential impacts to habitat for large yellow lady's slipper. Potential impacts to large yellow lady's slipper habitat that could occur under Alternative 4 are discussed here. Approximately 67 acres of habitat for large yellow lady's slipper (i.e., moss muskeg) would potentially be impacted by structure installation, use of temporary shovel trails and temporary access spurs, helicopter pads, and right-of-way clearing under Alternative 4. However, this estimate likely overstates the acres that would be affected because it assumes that all moss muskeg in the right-of-way would be cleared (55 acres; see Table WET-2). Structure installation, use of temporary shovel trails and temporary access spurs, and helicopter pads would result in some impacts to moss muskeg. However, this habitat type mainly consists of low-lying vegetation with scattered tall trees and much of the remaining right-of-way in moss muskeg would not need to be cleared. Alternative 4 would affect fewer acres of moss muskeg habitat than Alternatives 2 and 3.

Rare Plant Species

Alternative 4 could result in direct and/or indirect effects to one known population of rattlesnake fern observed during surveys within the analysis area (Population #2) depending on final placement of transmission poles as well as temporary shovel trails and temporary access spurs (Table BOT-4). No direct or indirect impacts to known populations of Bebb's sedge, sawbeak sedge, or bog clubmoss would result from Alternative 4 as these species were not detected in this area during surveys; however, habitat for these species is present along this alternative and could be impacted. Project construction activities under Alternative 4 could directly affect potential habitat for sensitive species, and thus, potentially affect undetected populations.

Indirect effects to rattlesnake fern, Bebb's sedge, sawbeak sedge, and bog clubmoss are also possible, potentially occurring as a result of light level or soil moisture changes or introduction of invasive plant species resulting from project activities.

General Vegetation

Direct and indirect effects to old-growth, young-growth, and non-forested vegetation types under this alternative are as described under Effects Common to All Action Alternatives. Alternative 4 would impact approximately 297 acres of old-growth forests, 244 acres of young-growth forests, and 199 acres of non-forested areas (Table BOT-4). Alternative 4 would impact more young-growth forest areas than Alternatives 2 and 3 and fewer old-growth and non-forested areas.

Alternatives 2, 3, and 4

Cumulative Effects

Sensitive Plant Species

Not all suitable habitat for large yellow lady's slipper orchid, Alaska rein orchid, and lesser round-leaved orchid within the analysis areas has been surveyed to date; as a result, impacts to these species are possible. Cumulative effects to these sensitive plant species due to past, present, and reasonably foreseeable projects are also possible. Past projects may have impacted undetected or unknown individuals or habitat of these three sensitive species in the analysis area. Similarly, current or future projects that involve habitat disturbance could affect undetected individuals or habitat within the analysis area. The overall risk to these sensitive plant species on the Tongass National Forest as a result of any of the action alternatives, viewed in conjunction with other past, present, and reasonably foreseeable projects, is moderate due to possible adverse effects to habitat or unknown populations of sensitive plant species.

Potential habitat within the analysis area (i.e., marine crossings) was surveyed for *Lobaria amplissima* and this species was not detected during these surveys. Other potential habitat exists within the 1,000 foot buffer of the beach fringe. Since not all areas of potential habitat were surveyed, the overall risk, viewed in conjunction with other past, present, and reasonably foreseeable projects, is considered moderate similar to that described above for the large yellow lady's slipper, Alaska rein orchid, and lesser round-leaved orchid.

Rare Plant Species

Cumulative effects to the rare plant species, including rattlesnake fern, Bebb's sedge, sawbeak sedge, and bog clubmoss, due to past, present, and reasonably foreseeable projects are possible. Past projects may have affected undetected individuals or habitat in the analysis area. Similarly, current or future projects that involve habitat disturbance could affect undetected individuals or habitat. If direct or indirect impacts were to occur to these species under one of the action alternatives, these impacts would incrementally contribute to other past, existing, or reasonably foreseeable projects affecting individuals or habitat for these species.

General Vegetation

Cumulative effects to old-growth, young-growth, and non-forested vegetation would occur as a result of past, present, and future projects. Reasonably foreseeable projects within the analysis area for Alternatives 2 and 3 include the Scott Peak timber sale, which is currently in litigation. A total of 2.7 acres of Scott Peak harvest units coincide with the proposed disturbance footprint for Alternatives 2 and 3. The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor for Alternatives 2 and 3, including 114 acres of NFS lands. An estimated 38 acres of the disturbed area is classified as old-growth forest, with a further 11.4 acres classified as young-growth.

A total of 16.9 acres of harvest associated with the Central Kupreanof timber sale coincide with the analysis area for Alternative 4. With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the botany analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for related vegetation disturbance.

The KPI Project would incrementally add to these past, present, and reasonably foreseeable future projects. As the exact extent of reasonably foreseeable future projects that could overlap with the KPI project is unknown at this time, the exact extent and magnitude of these cumulative effects is also unknown. However, the extent of these cumulative effects would be minimized by the standards and guidelines established in the Forest Plan to manage this area.

Mitigation

The effects of the KPI Project on botany would be limited through the site-specific application of Forest Plan Standards and Guidelines and project-specific mitigation measures (see Chapter 2). Mitigation would also include the following measures to reduce the risks to rare species in the analysis area.

- Direct effects to all of these populations except to the rattlesnake fern Population 1 (which was located within an existing road prism) could be avoided or minimized by locating transmission line structures and other project activities away from rare plant populations.
- Avoid project-related road maintenance in the area of the road prism adjacent to Population #1 of rattlesnake fern.
- If any previously undiscovered rare or sensitive plants are encountered at any time prior to or during implementation of this proposed project, the Forest Service botanist/ecologist shall be notified. Following review of the population, avoidance measures or mitigation measures will be applied.

Invasive Plants

Introduction

This section provides an overview of the current condition related to invasive plants in the project area and summarizes the potential direct, indirect, and cumulative effects to invasive plants as a result of project activities.

An invasive plant is an alien plant whose introduction causes or is likely to cause economic or environmental harm, or harm to human health (Executive Order 13112). Invasive plants are capable of successfully expanding their populations into new ecosystems beyond their natural range.

In 2011, the Tongass National Forest adopted new guidelines for invasive plant management in Forest Service Manual (FSM) 2900, which includes development of a risk assessment as part of an environmental analysis for ground-disturbing activities. This section of the EIS follows the Tongass National Forest process for an invasive plant risk assessment (Krosse and Stensvold 2014). The 2008 Forest Plan (USDA Forest Service 2008a) contains direction on invasive species, which includes the overall context of desired conditions (see Biodiversity goals and objectives), as well as standards and guidelines for invasive species. This direction is based on a number of laws, but most directly on Executive Order 13112, which directs all Federal agencies to address the impacts that their actions may have on invasive species.

The Tongass National Forest High-Priority Invasive Plant Species List (see Appendix A of the Invasive Plant Risk Assessment prepared for this project [Opolka 2012a]) is a list of target plants for which the Forest is most concerned. This list uses the Alaska Natural Heritage Program's (ANHP's) Weed Ranking Project results to rank the invasiveness of each species.[3] This ranking process takes into account the following characteristics for each plant: potential ecological impact, biological characteristics, dispersal ability, current distribution, and the feasibility of control. Plants are then ranked on a scale of 0 to 100, with 100 having the highest invasiveness rank. Those species known to occur on the Forest, as well as several species that have not been documented on the Forest to date, with a ranking higher than 60 are highlighted for management concerns. In addition to the target list of high priority species, the Tongass is also concerned about other species not on this list, depending on their abundance, location, and threats to ecosystem functions and/or biodiversity.

Analysis Area

The analysis area for direct, indirect, and cumulative effects related to invasive plants is the estimated disturbance footprint for the action alternatives. This area was selected as the analysis area because all project-related disturbances are expected to occur within this area. Although this approach results in three separate analysis areas, one for each action alternative, these three areas are referred to collectively as the analysis area in the following section. The level of cumulative effects that may occur in the future due to these activities will depend on the rate at which new projects are implemented and the success rate in reducing or eliminating known populations of invasive plants and implementing BMPs to reduce the potential introduction of invasive plant species associated with existing and new projects.

[3] See http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm

Methodology

Field Surveys

Invasive plant surveys were conducted under contract in 2006 on the road system from Kake for all Maintenance Level (ML) 3 and 4 roads. Surveys were conducted every 0.25 mile along each road, as well as at each intersection and rock quarry encountered. Surveys were done at the appropriate time of year to identify the broadest range possible of non-native and invasive plant species.

In addition to the contract invasive plant surveys conducted in 2006, surveys were conducted for the proposed project in 2011 in conjunction with botanical surveys. Surveys were conducted along portions of the analysis areas for the Proposed Action (Alternative 2) and other action alternatives (Alternatives 3 and 4). Surveys were dispersed throughout the analysis areas in a variety of habitat types, elevations and aspects, and covered a total of 38 miles, approximately 35 percent of the total combined analysis area (i.e., the analysis areas for all three alternatives). The surveys included roadways and a variety of natural habitats, including muskegs, young-growth and old-growth forests, and riparian areas. Infestations of invasive plants of interest observed during these surveys were documented using a global positioning system (GPS) unit.

Invasive Plant Risk Assessment

An invasive plant risk assessment was conducted for the proposed project in accordance with Tongass National Forest protocols, which require an invasive plant risk assessment for ground-disturbing activities. The risk assessment evaluates the locations of known invasive plants, existing habitat vulnerability, and the potential response of invasive plants as a result of project actions that could result in habitat alteration and increased vectors. Additional details regarding the basis of the risk assessment are included below in the *Environmental Consequences* subsection. The invasive plant risk assessment (Opolka 2012a) can be found in the project record.

Affected Environment

Known Invasive Plants

A total of 42 non-native plant species are known to occur within the analysis area, 6 of which are classified as high priority invasive plants. Of these 6 plants, 1 plant (tansy ragwort) was not observed on NFS lands during field surveys of the analysis area. An additional species of *Hieracium* was observed on NFS lands during field surveys and is noted below (Table INV-1). This plant was not identified to species; however, since it may be invasive and a plant of interest to control, it is noted below. Table INV-1 summarizes the occurrences and invasiveness rank of high priority invasive plant species identified during the project-related surveys. Invasive plant distribution maps for the high priority species are available in the project record.

Table INV-1. High Priority Invasive Plant Species found in the Analysis Area

Scientific Name	Common Name	Invasiveness Rank (0-100)[1/]	Number of Occurrences and Location[2/]
Hieracium aurantiacum	orange hawkweed	79	1 occurrence near proposed Structure 730 along Alternative 4; additional occurrences on Mitkof Island (not on NFS lands)
Hieracium spp.[3/]	unknown hawkweed	n/a	2 occurrences near proposed structures 728-729 and 686 along Alternative 4.
Hieracium caespitosum	meadow hawkweed	n/a	4 occurrences on Mitkof Island along the Alternative 4 (not on NFS lands)

Table INV-1. High Priority Invasive Plant Species found in the Analysis Area (continued)

Scientific Name	Common Name	Invasiveness Rank (0-100)[1/]	Number of Occurrences and Location[2/]
Senecio jacobaea	tansy ragwort	63	2 occurrences, far western analysis area near beach (not on NFS lands) [4/]
Leucanthemum vulgare	oxeye daisy	61	About 50 occurrences, common along existing roadways in the analysis area
Phalaris arundicacea	reed canarygrass	83	About 165 occurrences, common along existing roadways in the analysis area
Polygonum cuspidatum	Japanese knotweed	87	4 occurrences, far western analysis area near beach[4/]

Notes:
1/ Numerical rankings are assigned according to the ANHP's Weed Ranking Project on a scale of 0-100, with 100 having the highest invasiveness risk.
2/ Maps of high priority invasive plant occurrences observed in the analysis area are available in the project record.
3/ Unknown non-native species of *Hieracium* that was not identified to species.
4/ These occurrences were observed in a portion of analysis area shared by all three action alternatives.

Habitat Vulnerability

Multiple factors can affect a habitat's vulnerability to invasion by non-native plants. Factors that can increase vulnerability to invasion include: 1) increased sunlight, 2) exposed soils, and 3) adjacency to existing infestation such as roadsides and/or communities.

Areas with low vulnerability may include a variety of undisturbed habitats in which the ground surface is densely vegetated. Areas with higher vulnerability may include habitats that are subjected to soil disturbance combined with high light levels such as recently logged areas with soil disturbance, landslide areas, and riparian areas with regular soil disturbance such as alluvial fans and floodplains. Tidally influenced wetlands and wetlands with water flow-through have higher risk of soil disturbance and have higher habitat vulnerability. Wetlands in hydrologically isolated landscape positions without water flow-through have a lower risk of habitat vulnerability due to limited invasive plant introduction via water flow and low rates of soil disturbance (Zedler and Kercher 2004). The presence of existing invasive plant infestations adjacent to vulnerable habitats further increases habitat vulnerability.

The majority of the analysis area is forested by either young- or old-growth forests. Forested areas with a closed canopy have low habitat vulnerability. Non-forested areas, primarily wetland areas, are less common, covering between 9 percent and 16 percent of the analysis area (depending on alternative). In the analysis area, dense and rapid vegetation growth results in few areas with exposed soils. Soil disturbance, both natural and human caused, usually revegetates quickly. Invasive plant distribution in the analysis area is primarily located along roadways. Areas with disturbed soils (natural or human caused) that have adjacent invasive plant infestations have the highest vulnerability to invasive plant infestations. Table INV-2 identifies common vegetation types in the analysis area and their relative vulnerability to light and exposed soil.

Table INV-2. Existing Vegetation Types and Corresponding Vulnerability in the Analysis Area

Vegetation Type		Habitat Vulnerability due to Light	Habitat Vulnerability due to Exposed Soil
Undisturbed Forest		Low	Low
Young-Growth	Sapling to Pole size classes	High	Low
	Stem exclusion stage	Low	Low
	Stem reinitiation stage	Low	Low
Wetlands[1/]	Isolated marshes and muskegs	High	Low
	Estuaries, riparian wetlands	High	High
Riparian Areas (floodplains, alluvial fans)		Moderate	High
Alpine		High	Low

Note:
1/ Wetlands separated based on hydrologic isolation (absence of water flow-though).

Non-Project-related Vectors

There are multiple existing vectors that can contribute to the spread of invasive plant species within the analysis area that are independent of project implementation. These include existing roads, human vehicle and foot traffic, wildlife use, and wind and drainage patterns. The analysis area includes parts of four separate NFS road systems (see Figure TRAN-1 in the *Transportation* section) and various hiking trails. Use of these networks by people and animals provides a source of invasive plant dispersal. Animals may spread invasive plant species through ingesting their seeds or transporting seeds on their fur. People may spread invasive plants along roads and trails by transporting seeds on their shoes, clothing, and vehicles. Road maintenance including vegetation mowing may also disperse invasive plants along the road system. Many of the existing invasive plants present along the road network may also spread through wind and water dispersal. All of these vectors contribute to invasive plant dispersal along the road system and it is difficult to determine which vector has the greatest impact.

The Tonka LTF provides the main access to the existing Tonka road system. The Tonka road system presently receives low to moderate use. The Portage road system is also isolated and receives relatively low use compared to the road systems accessed directly from Kake and Petersburg. Invasive plant vectors are more common near the communities of Kake and Petersburg and on the Kake and Mitkof NFS road systems that are accessed directly from these communities. The combination of these vectors results in a moderate risk of spread of invasive plants along these roadways and a low risk of spread outside of roadways due to non-project related weed vectors.

Environmental Effects

Implementation of all of the action alternatives would result in some risk to the spread of invasive plants in the analysis area, and the current moderate risk of spread would continue under the no action alternative due to existing invasive plants and traffic along the existing road system.

Effects Common to All Action Alternatives

Direct and Indirect Effects

Effects of Roads

The proposed transmission line's design is a short span, road-side design that takes advantage of the existing NFS roads that would be followed by the action alternatives. Existing NFS roads would be used to access portions of all three action alternatives. Use of these existing access roads to construct the project would increase the risk of invasive species spread and/or establishment. Vehicles, other construction equipment, and temporary matting panels could transport invasive plants along the existing road network. Invasive plant species found along these existing road networks could also be spread to the areas that would be disturbed during project construction, thereby potentially creating new infestations in previously undisturbed areas. Vectors associated with the use of existing roads would result in a high risk of invasive plant spread.

Habitat Alteration Expected as a Result of the Project

All of the action alternatives would result in an increase in the risk of invasive species spread or establishment as a result of habitat alteration. Habitat alterations that would increase risk include temporary clearing and ground disturbance for structure installation, construction of temporary shovel trails and temporary access spurs, installation of temporary matting panels, construction of helicopter pads, and right-of-way clearing. These activities would result in increased sunlight due to removal of overstory vegetation and varying levels of ground disturbance resulting in soil exposure.

Although existing roads would be used where feasible, all of the proposed action alternatives cross areas where there are no existing roads (see Table 2-1 in Chapter 2). To access these areas, the proposed project would use a combination of temporary shovel trails and temporary matting panels, with helicopter support. All proposed shovel trails would be temporary and for short-term use during project construction only. Shovel trails would be up to 16-feet-wide and would use native materials where available. Temporary mats would be laid down to move the shovel rig along, where needed. Temporary matting panels would also be installed in some locations where they would provide a 14-foot-wide trail. In addition, temporary access spurs would be constructed where a proposed project structure is located more than 20 feet from an existing road. These activities would result in both vegetation removal and ground disturbance.

Construction of temporary shovel trails and temporary access spurs and the use of temporary matting panels would result in a short-term opportunity for invasive plant spread, as movement of construction vehicles and personnel in these areas would allow for dispersal of invasive plants along these corridors. However, these alterations and the associated risk would be temporary. Temporary shovel trails and access spurs would be decommissioned and revegetated following construction, and temporary matting panels would be removed. The risk associated with these activities is low to moderate.

Clearing of the right-of-way would involve removal of young- and old-growth trees. Risk associated with this type of clearing would result from the removal of the tree canopy and high light levels. Some ground disturbance is expected, although it is likely to be minimal and would vary slightly depending on the logging system. Although vegetation would be maintained in the right-of-way, the native understory vegetation would not be continuously disturbed and is anticipated to regenerate quickly and densely, thereby helping prevent the establishment of invasive plants. The risk associated with right-of-way clearing is low.

Estimated disturbance is presented by action alternative and disturbance type in Table INV-3. Risk by alternative is described in the sections below.

Table INV-3. Summary of Project Disturbance by Alternative

Type of Disturbance (acres)1/	Alternative		
	2 (Proposed Action)	**3**	**4**
Structure Installation2/	145.8	146.0	134.2
Shovel Trails3/	28.3	28.3	8.0
Temporary Matting Panels4/	2.5	2.5	9.0
Temporary Access Spurs5/	10.2	10.2	7.9
Helicopter Pads6/	0.4	0.4	0.3
Right-of-Way Clearing7/	703.8	685.7	580.0
Total7/	**891.0**	**873.1**	**739.4**

Notes:
1/ Disturbance estimates have been adjusted to avoid counting disturbance to the same area twice.
2/ These disturbance estimates assume that an area with a radius of approximately 50 feet from the center of each proposed single wood pole structure would be temporarily disturbed during construction.
3/ Temporary shovel trails are one approach that would be used to set structures in areas where the proposed alternative does not follow existing roads. Shovel trails would be used in wetland areas in locations where native materials (logs and slash) removed during right-of-way clearing are available for use as an underlayment to allow for the passage of wide tracked equipment. For the purposes of analysis, shovel trails are assumed to be up to 16 feet wide, and would follow the centerline of the proposed transmission line. All shovel trails would be decommissioned following use.
4/ Temporary matting panels would be installed in wetland areas where sufficient native materials are not available. Temporary matting panels would be 14 feet wide and are assumed to follow the centerline of the proposed transmission line.
5/ The proposed transmission line would be located adjacent to the existing NFS roads to the extent possible, but would not be immediately adjacent in all areas due to the ruggedness of the terrain and other environmental constraints. In locations where poles would be located off the road by more than 20 feet, an access work pad (temporary access spur) would be created by extending the road fill to the site and/or temporary matting. Temporary access roads are also assumed to be up 16 feet wide.
6/ Helicopters would be used to support construction along portions of all three action alternatives and would require the installation of temporary helicopter pads along the proposed right-of-way. Upon completion, these pads would, over time be replaced with permanent helipads that would be up to 16 feet wide by 16 feet wide.
7/ The average right-of-way clearing width in areas classified by the Forest Service as productive forest is assumed for the purposes of analysis to be 300 feet wide. The average right-of-way clearing width along existing roads and in areas classified by the Forest Service as unproductive forest is assumed to be 100 feet.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. The proposed project would not be built under this alternative; therefore, there would be no increased risk of invasive plant spread as a result of the proposed project. However, as described above, even this alternative would have a moderate risk of spread due to existing invasive plants and traffic along the existing road system.

Cumulative Effects

The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other past, present, or reasonably foreseeable projects in the analysis area.

Alternative 2 – Proposed Action

Direct and Indirect Effects

This alternative would involve approximately 891 acres of ground disturbance for structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, helicopter pads, and right-of-way clearing (Table INV-3). Effects of these actions are discussed under the preceding *Effects Common* *to All Action Alternatives* subsection. This alternative would result in the largest acreage of ground disturbance of the action alternatives (see Table INV-3) and would, therefore, have the highest direct risk for the spread or establishment of invasive plant species compared to the other action alternatives.

Cumulative Effects

Past, present, and future projects that result in soil disturbance and/or removal of vegetation would cumulatively affect the extent of invasive plant species within the analysis area. Reasonably foreseeable projects within the analysis area for this alternative include the Scott Peak timber sale, which is currently in litigation. A total of 2.7 acres of Scott Peak harvest units coincide with the proposed disturbance footprint for Alternative 2. These acres would either be harvested as part of the timber sale or cleared during construction if Alternative 2 was the selected alternative for the KPI Project.

The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. Road construction would result in an increased risk of invasive species spread or establishment as a result of habitat alteration and the presence of the road itself. In addition to the above acres, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit-related disturbance as part of the Kake road project.

The KPI Project would incrementally add to these past, present, and reasonably foreseeable future projects. The extent of these cumulative effects would be minimized by the standards and guidelines established in the Forest Plan to manage invasive plants within this area.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

This alternative would involve approximately 873.1 acres of ground disturbance for structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, helicopter pads, and right-of-way clearing (Table INV-3). Effects of these actions are discussed under the preceding *Effects Common to All Action Alternatives* subsection. This alternative has the second highest acreage of ground disturbance of the action alternatives (Table INV-3) and would, therefore, have the second highest direct risk for the spread or establishment of invasive plant species compared to the other action alternatives.

Cumulative Effects

Past, present, and future projects that result in soil disturbance and/or removal of vegetation would cumulatively affect the extent of invasive plant species within the analysis area. Reasonably foreseeable projects within the analysis area for this alternative include the Scott Peak timber sale, which is currently in litigation. A total of 2.7 acres of Scott Peak harvest units coincide with the proposed disturbance footprint for Alternative 3. These acres would either be harvested as part of the timber sale or cleared during construction if Alternative 3 was the selected alternative for the KPI Project.

Similar to Alternative 2, construction of the Kake road project would affect an additional 114 acres of NFS lands and increase the cumulative risk of invasive species spread and/or establishment in the analysis area for Alternative 3.

The KPI Project would incrementally add to these past, present, and reasonably foreseeable future projects. The extent of these cumulative effects would be minimized by the standards and guidelines established in the Forest Plan to manage invasive plants within this area.

Alternative 4 – Center-South Route

Direct and Indirect Effects

This alternative would involve approximately 739.4 acres of ground disturbance for structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, helicopter pads, and right-of-way clearing (Table INV-3). Effects of these actions are discussed in detail under the preceding *Effects Common to All Action Alternatives* subsection. This alternative has the lowest acreage of ground disturbance of all the action alternatives (Table INV-3) and would, therefore, have the lowest direct risk for the spread or establishment of invasive plant species compared to the other action alternatives.

Cumulative Effects

Past, present, and future projects that result in soil disturbance and/or removal of vegetation would cumulatively affect the extent of invasive plant species within the analysis area. One reasonably foreseeable timber sale (Central Kupreanof) includes units that would be located within the analysis area for this alternative. The portions of these units within the analysis area total 16.9 acres. Although NEPA-cleared, unless market conditions change, the Central Kupreanof units are not expected to be offered for sale over the next 5 years.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the invasive plants analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for vegetation disturbance and changes in the cumulative risk of invasive species spread and/or establishment in the analysis area for Alternative 4.

The KPI Project would incrementally add to these past, present, and reasonably foreseeable future projects. The extent of these cumulative effects would be minimized by the standards and guidelines established in the Forest Plan to manage invasive plants within this area.

Mitigation

The invasive plant management goals and strategies for this project would follow the guidance contained in the 2008 Forest Plan and FSM 2900 (see Chapter 2). The primary goal for this project relative to invasive plants is prevention measures designed to minimize the spread and continued establishment of invasive plants in the analysis area.

Wetlands

Introduction

This section provides an overview of existing wetland resources in the analysis area and summarizes the potential direct, indirect, and cumulative effects on these resources from implementation of the proposed project. Wetlands are defined by the Tongass Forest Plan, U.S. Army Corps of Engineers, and the EPA as "those areas that are inundated or saturated by surface water or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (40 CFR 230.41 [a][1]). Wetlands are valued for their physical, chemical and biological functions. Wetlands moderate flooding, reduce runoff and sedimentation, provide wildlife and plant habitat, and may help sustain stream flow during dry periods. Physical functions may include flood conveyance, surface and ground water regulation, sediment retention, and temperature moderation. Chemical functions may include nutrient storage, pH moderation, and carbon storage. Biological functions include habitat for terrestrial, aquatic, and marine plants and animals. In addition, forested wetlands are an important component of the forest land base.

Management activities on NFS lands are required to comply with the relevant standards and guidelines in the Tongass Forest Plan (USDA Forest Service 2008a). The Forest Service is also required by Executive Order 11990 and Section 404 of the Clean Water Act to preserve and enhance the natural and beneficial values of wetlands wherever practicable when carrying out management activities on NFS lands.

Due to the extensive nature of wetlands in the KPI analysis area, complete avoidance of all wetlands during project implementation and construction is not feasible. Where a wetland cannot be avoided, the impacts are to be minimized. R10 BMP 12.5 (from the FSH 2509.22) provides guidance for wetland information, evaluation, and protection.

Analysis Area

The analysis area for direct, indirect, and cumulative effects to wetlands is the estimated disturbance footprint for the action alternatives. This area was selected as the analysis area because all project-related disturbances are expected to occur within this area. Although this approach results in three separate analysis areas, one for each action alternative, these three areas are referred to collectively as the analysis area in the following section. The three action alternatives follow one of two primary corridors: the Northern Route (Alternatives 2 and 3) and the Center-South Route (Alternative 4). These terms—the Northern route and Center-South route corridors—are also used in this section when discussing the analysis areas applicable to the different alternatives.

Methodology

Wetland type and extent in the analysis area was estimated based on the Tongass Wetland Mapping layer. The Tongass National Forest roads mapping layer was used to estimate acres of wetland fill from existing roads. This analysis included all existing open roads, ML 1 roads (roads in storage), decommissioned, and temporary roads. Decommissioning measures have generally included allowing the roads to revegetate, culvert removal, and/or the creation of obstructions that prevent vehicular use. However, with the exception of road bed removal associated with the removal of drainage structures, the majority of the road prisms in wetlands, including those from former temporary roads, remain as permanent wetland impacts.

Wetland impacts are estimated for the proposed alternatives based on acres disturbed by proposed project components, including structure installation, temporary shovel trails and access spurs, helicopter pads, and right-of-way clearing. The area of wetland impact for existing roads was estimated based on an average road width of 40 feet. This number is used to represent existing roads based on the results of a monitoring study completed by the Forest Service that documented wetland impacts from road construction (Landwehr 2008). The average road surface measured in this study was 15.1 feet, the width of the road fill ranged from 23 to 29 feet, and the width of soil disturbance ranged from 39 to 47 feet.

No new roads are proposed under any of the action alternatives, but the three proposed action alternatives would all involve the use of temporary shovel trails and temporary access spurs. Shovel trails would be up to 16 feet wide and use native materials where available. Temporary access spurs would be necessary in locations where the proposed transmission line structures are located more than 20 feet from an existing road. These spurs would be created by extending the road fill to the structure location and are also assumed to be 16 feet wide for the purposes of analysis. Where the distance from the road makes this impractical, temporary matting would be used to gain access to the structure location during construction. Shovel trails and temporary access spurs are discussed in more detail in Chapter 2 of this EIS.

Additional information regarding the regulatory framework, methodology, and analysis of wetlands in the analysis area can be found in the Wetland Resource Report prepared for this project (Opolka 2012b).

Affected Environment

Different wetland types are found interspersed throughout the analysis area, although some wetland types tend to be more common in some portions of the analysis area. The various wetland types and their distribution within the analysis area are described in the following sections.

Wetland Types

Forested Wetlands

Forested wetlands are wetlands dominated by vegetation greater than 20 feet in height. In the analysis area, species composition of the overstory is varied and may contain the following species: western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), shore pine (*Pinus contorta*), and Alaska yellow-cedar (*Chamaecyparis nootkatensis*). The understory is often dominated by skunk cabbage (*Lysichitum americanum*) and deer cabbage (*Nephrophyllidium crista-galli*). Forested wetlands occur on poorly or very poorly drained hydric mineral and organic soils. Forested wetlands are most common on broad glacial valley bottoms, gently sloping hill slopes or benches, but are also commonly found on steep terrain in areas overlaying volcanic geology. These wetlands provide important functions including wildlife habitat, water quality improvement, peak flow reduction and erosion control, organic matter production and export, and nutrient and carbon cycling (Cooke 2005). Forested wetlands may support the transfer of water to downslope resources, function as recharge areas for groundwater and streams, and provide depositional areas for sediment and nutrients.

Approximately 216 acres or 24 percent of the analysis area for Alternative 2 is forested wetland. Forested wetland accounts for approximately 201 acres or 23 percent of the analysis area for Alternative 3, and approximately 161 acres or 22 percent of the analysis area for Alternative 4 (Table WET-1).

Forested Wetland/Emergent Sedge Complex

The forested wetland/emergent short sedge complex is less than 50 percent forested. Forested wetland/emergent short sedge complexes share characteristics of both forested wetland and emergent short sedge types. These complexes are a mosaic of forested wetland emergent short sedge types that cannot be mapped separately at the scale used for the Tongass National Forest wetland map. Sphagnum mosses (*Sphagnum* spp.), sedges (*Carex* spp.), and skunk cabbage dominate these wetlands with low volume class hemlock, cedar, and pine. Soils are very poorly drained hydric organic soils, with

Table WET-1. Existing Roads and Past Harvest on Wetlands in the Analysis Area

Alternative/ Wetland Type	Total Acres in Analysis Area	Percent of Analysis Area[1/]	Roads			Past Harvest		Total	
			Miles of Road	Acres Affected	Percent of Analysis Area	Acres Affected	Percent of Analysis Area	Acres Affected	Percent of Analysis Area
Alternative 2									
Forested Wetland	216	24	3	16	2	35	4	51	6
Emergent Short-sedge Wetlands	5	1	0	1	0	0	0	1	0
Moss muskeg	102	11	1	7	1	0	0	7	1
FW/FES Complex	254	29	3	15	2	2	0	17	2
Total Wetland Acres[2/]	**577**	**65**	**7**	**39**	**5**	**37**	**4**	**76**	**9**
Alternative 3									
Forested Wetland	201	23	2	10	1	35	4	45	5
Emergent Short-sedge Wetlands	5	1	0	1	0	0	0	1	0
Moss muskeg	100	11	1	7	1	0	0	7	1
FW/FES Complex	254	29	3	15	2	2	0	17	2
Total Wetland Acres[2/]	**560**	**64**	**6**	**33**	**4**	**37**	**4**	**70**	**8**
Alternative 4									
Forested Wetland	161	22	4	17	2	39	5	56	8
Emergent Short-sedge Wetlands	4	1	0	1	0	0	0	1	0
Moss muskeg	67	9	0	0	0	0	0	0	0
FW/FES Complex	132	18	3	12	2	4	1	16	2
Total Wetland Acres[2/]	**364**	**49**	**7**	**30**	**4**	**50**	**6**	**73**	**10**

Notes:
FW/FES Complex -- Forested Wetland/Emergent Sedge Complex

1/ Existing wetlands are shown as a percent of the total analysis area for each alternative. These areas are 891 acres, 873 acres, and 740 acres for Alternatives 2, 3 and 4, respectively.
2/ Totals may not sum due to rounding.

occasional hydric mineral soils in small pockets of forested wetland. These complexes are commonly found in riparian areas and occur in gently sloping hill slopes and benches, glacial valley bottoms, lower foot slopes, and on broad ridge tops. Both complexes contribute to the transfer of water downslope, groundwater and stream recharge, and carbon and nutrient cycling. These complexes provide terrestrial and aquatic habitat for wildlife species, such as black bear, deer, and mink.

Alternatives 2 and 3 both include approximately 254 acres of forested wetland/emergent sedge complexes, which accounts for 29 percent of their respective analysis areas. Alternative 4 includes approximately 132 acres of forested wetland/emergent sedge complexes, which accounts for 49 percent of the analysis area (Table WET-1).

Emergent Short-sedge Wetlands

Emergent short-sedge wetlands contain organic soils that are very poorly drained, moderately deep, and dominated by short sedges and mosses, although there are often patchy areas of shrubs and shore pine. These wetlands may include poor fens and rich bogs, and there is typically some water flow through. Emergent short-sedge wetlands are often found on lower foot slopes, in valleys, and on broad ridge tops. These wetlands provide habitat for unique plants and animals, and contribute water to downslope resources, provide carbon and nutrient cycling benefits for watershed function, and provide water storage for flood and erosion control (EPA 2011).

Alternatives 2 and 3 include approximately 5 acres of emergent short-sedge wetlands (1 percent of their respective analysis areas). Alternative 4 includes approximately 4 acres of emergent short-sedge wetlands, about 1 percent of the analysis area (Table WET-1).

Moss Muskegs

Moss muskegs are characterized by nutrient limiting acid peat bogs and dominated by sphagnum moss and peat deposits. Muskeg wetlands support a distinctive flora which are adapted to life in these acidic, wet, low-nutrient environments (EPA 2011). Common plants include ericaceous shrubs such as cranberry (*Vaccinium oxycoccos*) and blueberry (*Vaccinium* spp.), cottongrass (*Eriophyllum* spp.), Labrador tea (*Ledum grandifolium*), and sundews (*Drosera* spp.). Occasional stunted trees (particularly shore pine) may also be present. Soils are typically organic peat deposits and accumulate over unconsolidated glacial till or impermeable glacial silts, typically on gentle or nearly level slopes. Moss muskegs often have no significant inflow or outflow of water other than precipitation, thus ponded areas (a result of a high water table) occur within the wetland. These wetlands function as areas of surplus water and peat accumulation creating a stable microclimate and habitat for waterfowl and wildlife, including cranes, black bear, amphibians, mink, and deer.

Approximately 102 acres or 11 percent of the analysis area for Alternative 2 is moss muskeg. Moss muskeg accounts for approximately 100 acres or 11 percent of the analysis area for Alternative 3, and approximately 67 acres or 9 percent of the analysis area for Alternative 4 (Table WET-1).

Existing Wetland Disturbances

Wetlands comprise approximately 65 percent of the analysis area for Alternative 2, 64 percent of the Alternative 3 analysis area, and 49 percent of the Alternative 4 analysis area (Table WET-1). As a result, total avoidance of wetlands is not possible under any of the proposed action alternatives. Many of the wetlands in the analysis area are undisturbed and intact; however, there are existing wetland impacts that have occurred as a result of historic logging and road construction (Table WET-1).

Road Construction

Roads across sloping wetlands may affect hydrologic connectivity across the wetland due to road ditches or road fills. Roads crossing slope wetlands have a higher chance of disrupting the down-gradient flow of water, as water is intercepted by roadside ditches and potentially blocked by the road bed. However, the high precipitation rates and soil moisture in Southeast Alaska appears to minimize the impacts of water that is intercepted by roadside ditches.

Implementation of adequate road drainage minimizes the impacts to hydrologic connectivity of wetlands. Based on research regarding the effect of road construction on adjacent wetlands in Southeast Alaska (Glaser 1999; Kahklen and Moll 1999; McGee 2000), effects to wetland hydrology and vegetation adjacent to existing roads are expected to be limited to within a few feet of the road, most likely due to the high water-holding capacity of the soil and abundant local precipitation. Table WET-1 displays the existing acreages and miles of wetlands impacted by existing roads. R10 Wetland BMP Monitoring would continue to occur annually on a representative basis across the forest as part of Forest Plan monitoring and may occur in the KPI analysis area (see the *Mitigation* subsection, below).

An estimated total of 39 acres of wetland have been replaced (i.e., filled) by roads in the analysis area for Alternative 2 and 33 acres for Alternative 3 (Table WET-1). Road building in wetlands has occurred primarily on forested wetland/emergent sedge complex wetlands (15 acres for both alternatives), forested wetland (16 acres for Alternative 2 and 10 acres for Alternative 3), and moss muskeg wetland (7 acres for both alternatives). About 1 acre of fill for roads has occurred on emergent short-sedge wetland in the analysis areas for Alternatives 2 and 3. The total acres affected by past road building represents about 5 percent and 4 percent of wetlands in the analysis areas for Alternatives 2 and 3, respectively (Table WET-1).

An estimated total of 30 acres of wetland have been replaced by roads in the analysis area for Alternative 4 (Table WET-1). Road building in wetlands has occurred primarily on forested wetland (about 17 acres) and forested wetland/emergent sedge complex wetlands (12 acres). About 1 acre and less than one acre of road fill have occurred on emergent short-sedge wetlands and moss muskeg, respectively. Total acres affected by past road building represents about 4 percent of wetlands in the analysis area for Alternative 4.

Past Harvest

Past timber harvest has occurred in the analysis areas for all three action alternatives (Table WET-1). Timber harvest in wetlands has temporary effects on wetland hydrology. Rainfall interception studies indicate that the amount of rainfall hitting the soil surface increases following clear cutting (Patric 1966; Beaudry and Sagar 1995; Banner et. al. 2005). Soils within harvested sites tend to gain higher moisture levels resulting in slower growth in the seedling and sapling stage. Soil moisture conditions remain elevated until evapotranspiration surfaces in the canopy of a young stand become equivalent to pre-harvest conditions. Depending on the soil moisture status of the wetland, this effect can range from negligible to lasting more than 20 years. In partially harvested stands, retention of a portion of the canopy cover helps minimize the effect of timber harvest on soil moisture.

Past harvest in the analysis areas for Alternatives 2 and 3 has occurred on 35 acres of forested wetland, approximately 4 percent of this wetland type in each area (Table WET-1). In addition, an estimated 2 acres of forested wetland/emergent sedge complex have been affected by past harvest. Total past harvest has affected about 4 percent of the total wetland acreage in the analysis areas for Alternatives 2 and 3 (Table WET-1).

Past harvest in the analysis area for Alternative 4 has occurred on 39 acres of forested wetland, approximately 5 percent of this wetland type in the area (Table WET-1). Past harvest has also occurred on 4 acres of forested wetland/emergent sedge complex, approximately 1 percent of this wetland type. Total past harvest has affected about 6 percent of the total wetland acreage in the analysis area for Alternative 4 (Table WET-1).

Wetland Avoidance

Past road construction activities (mostly related to timber harvests) have avoided wetlands where practicable; however, wetland impacts have occurred as a result of the extensive, interspersed wetland coverage in the analysis area and the location of harvestable timber. Wetland impacts from road construction have occurred to access timber, which may be located on forested wetland or on upland areas separated by wetland. Wetland impacts have also occurred when steep slopes are avoided for construction; often construction of a road in a wetland is the environmentally preferred alternative to construction on a steep slope. Within the context of past project objectives, including economics and minimizing environmental harm, past road construction is believed to have avoided wetlands to the extent practicable in the analysis area.

Environmental Effects

Effects Common to All Alternatives

Structure installation, the use of temporary shovel trails, temporary matting panels, temporary access spurs, and helicopter pads would occur under all of the action alternatives, as would right-of-way clearing. Potential impacts to wetlands are assessed for each action alternative based on the following measures:

- Acres of wetland affected by structure installation,
- Acres wetland affected by shovel trail construction and use,
- Acres of wetland affected by temporary access spurs,
- Acres of wetland affected by helicopter pads,
- Acres of wetland affected by right-of-way clearing, and
- Cumulative acres of wetland filled for road construction and clearing as a result of past, present, and reasonably foreseeable projects.

Direct impacts include the acres of wetland affected through these activities, either through permanent fill, temporary fill, or vegetation clearing. Right-of-way clearing could, but may not necessarily, result in ground disturbance and is, therefore, presented separately from the other potential ground-disturbing activities (i.e., structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, and helicopter pads). Permanent impacts are likely to be limited to the footprints of the transmission line structures and helicopter pads, which would be placed permanently on the landscape. Impacts related to the other project components (shovel trails, temporary access spurs, and temporary matting panels) would be temporary. Impacts associated with right-of-way clearing would also generally be temporary.

Indirect impacts include potential changes to hydrology that could result from these activities. These effects are briefly described in the following paragraphs and summarized by alternative in Tables WET-2 and WET-3.

Structure Installation

Single wood-pole structures are proposed for most of the alternative routes. Disturbance estimates for these structures assume that an area with a radius of approximately 50 feet from the center of each pole would be temporarily disturbed during construction. This disturbance area could involve wetland fill as well as vegetation removal and soil disturbance. Efforts to avoid and minimize impacts to wetlands during construction and future operation and maintenance activities would be implemented to minimize the amount of disturbance and permanent wetland fill (see the *Mitigation* subsection, below).

Table WET-2. Estimated Impacts by Alternative, Type of Disturbance, and Wetland Type

Alternative/ Wetland Type[1/]	Type of Disturbance (acres)[2/]					Total Affected Acres[2/]	Percent of Total Analysis Area[4/]
	Structure Installation	Shovel Trails	Temporary Access Spurs	Temporary Matting Panels	Helicopter Pads [3/]		
Alternative 2							
Forested Wetlands	21	6	1	0	0	29	3
Emergent Short-sedge Wetlands	1	0	0	0	0	1	0
Moss muskeg	18	4	0	2	0	24	3
FW/FES Complex	46	10	3	1	0	61	7
Total	**86**	**21**	**4**	**3**	**0**	**114**	**13**
Alternative 3							
Forested Wetlands	21	6	1	0	0	29	3
Emergent Short-sedge Wetlands	1	0	0	0	0	1	0
Moss muskeg	18	4	0	2	0	24	3
FW/FES Complex	46	10	3	1	0	61	7
Total	**86**	**21**	**4**	**3**	**0**	**114**	**13**
Alternative 4							
Forested Wetlands	19	1	2	1	0	23	3
Emergent Short-sedge Wetlands	1	0	0	0	0	1	0
Moss muskeg	11	1	0	4	0	17	2
FW/FES Complex	20	3	1	3	0	27	4
Total	**51**	**4**	**3**	**9**	**0**	**67**	**9**

Notes:
FW/FES Complex – Forested Wetland/Emergent Sedge Complex
1/ Totals may not sum due to rounding.
2/ Disturbance estimates by type have been adjusted to avoid counting disturbance to the same area twice.
3/ Disturbance from helipad placement is estimated to be less than 1 acre under any alternative. For Alts 2/3, 62 of the estimated 83 indicative helipads are at least partially in wetlands (0.62 acres); an estimated 32 of 47 indicative helipads are at least partially in wetlands (0.32 acres) under Alternative 4.
4/ Percent of Total Analysis Area represents the combined total disturbance as a share of the analysis area. The analysis areas are 891 acres, 873 acres, and 740 acres for Alternatives 2, 3 and 4, respectively

Table WET-3. Estimated Right-of-Way Clearing and Total Disturbance by Alternative and Wetland Type

Alternative/ Wetland Type[1/]	Right-of-Way Clearing[2/]		Total Clearing	
	Affected Acres	Percent of Total Analysis Area[3/]	Total Affected Acres[4/]	Percent of Total Analysis Area[3/]
Alternative 2				
Forested Wetlands	137	15	166	19
Emergent Short-sedge Wetlands	3	0	4	0
Moss muskeg	71	8	95	11
FW/FES Complex	177	20	238	27
Total[1/]	**388**	**44**	**502**	**56**
Alternative 3				
Forested Wetlands	128	15	157	18
Emergent Short-sedge Wetlands	3	0	4	0

Table WET-3. Estimated Right-of-Way Clearing and Total Disturbance by Alternative and Wetland Type (continued)

	Right-of-Way Clearing[2/]		Total Clearing	
Alternative/ Wetland Type[1/]	**Affected Acres**	**Percent of Total Analysis Area[3/]**	**Total Affected Acres[4/]**	**Percent of Total Analysis Area[3/]**
Moss muskeg	69	8	93	11
FW/FES Complex	177	20	238	27
Total[1/]	**377**	**43**	**491**	**56**
Alternative 4				
Forested Wetlands	83	11	106	14
Emergent Short-sedge Wetlands	3	0	4	1
Moss muskeg	50	7	67	9
FW/FES Complex	89	12	116	16
Total[1/]	**226**	**31**	**293**	**40**

Notes:
FW/FES Complex – Forested Wetland/Emergent Sedge Complex
1/ Totals may not sum due to rounding.
2/ Right-of-way clearing could, but may not necessarily, result in ground disturbance and is, therefore, presented separately from the other potential ground-disturbing activities (see Table WET-2). Disturbance estimates by type have been adjusted to avoid counting disturbance to the same area twice.
3/ Percent of Total Analysis Area represents estimated right-of-way clearing as a share of the analysis area. The total analysis areas are 891 acres, 873 acres, and 740 acres for Alternatives 2, 3 and 4, respectively.
4/ Total affected acres consists of right-of-way clearing plus disturbance associated with structure installation, shovel trails, temporary access spurs, temporary matting panels, and helicopter pads.

Shovel Trails, Temporary Matting Panels, and Temporary Access Spurs

The effects of temporary shovel trails and temporary access spurs on wetlands may vary based on the substrate (soil type) and the landscape position of the wetland. Shovel trails would be used in wetland areas in locations where native materials (logs and slash) removed during right-of-way clearing are available for use as an underlayment to allow for the passage of wide tracked equipment. Temporary matting panels would be installed in wetland areas where sufficient native materials are not available. Disturbed areas would be restored and revegetated after construction following applicable BMPs including R10 BMP 12.5, and summarized under the *Mitigation Measures* subsection in Chapter 2, specifically RMA 1 and RMA 2.

The indirect potential effects of temporary shovel trail and access spur use on adjacent wetlands would likely vary based on wetland type and the landscape position of the wetland. Although not directly comparable, research regarding the effect on adjacent wetlands from road construction in Southeast Alaska (Glaser 1999; Kahlklen and Moll 1999; McGee 2000) have indicated that effects to wetland hydrology and vegetation adjacent to these roads are expected to be limited to within a few feet of the road (see the *Existing Wetland Disturbances* subsection, above),

Helicopter Pads

Helicopters would be used for construction along portions of all three action alternatives (see Table 2-1 and Figures 2-1 and 2-2). Use of helicopters would require the installation of temporary helicopter pads along the proposed right-of-way, which would be replaced later with permanent pads. Although it is anticipated that helipads will be placed on upland soils where possible, there are sections of the unroaded areas where this is not likely possible. Disturbance from helipad placement is estimated to be 0.6 acre and 0.3 acre under Alternatives 2/3 and Alternative 4, respectively. For Alternatives 2 and 3, 62 of the estimated 83 indicative helipads are at least partially in wetlands, and 32 of 47 indicative helipads are at least partially in wetlands under Alternative 4.

Right-of-Way Clearing

Right-of-way clearing for the proposed action alternatives would primarily affect wetlands with a forested vegetation class. Right-of-way clearing could, but may not necessarily, result in ground disturbance and is, therefore, presented separately from the other potential ground-disturbing activities. The effects of right-of-way clearing would be similar to effects resulting from timber harvesting as described above (see the *Past Harvest* subsection, above), although future maintenance would prevent trees from growing to maturity in these areas. Where removed, shrubs and trees would be expected to quickly revegetate the right-of-way of the selected alternative, and soil moisture levels may partially return to normal. However, since long term right-of-way maintenance would prevent a mature forest in the right-of-way, soil moisture may remain elevated in some wetlands.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and there would be no direct or indirect effects on wetland areas because there would be no transmission line construction or associated activities. Vegetation on forested wetlands harvested in the past would continue to grow toward maturity. Wetlands impacted by past road construction would receive minimal use. Vegetation would occupy ditch lines and, in the case of closed roads, the roadbed may be occupied by species such as red alder. The road prism would remain in an upland condition. Road ditches, where present, 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 1999).

Cumulative Effects

The no action alternative would not contribute to cumulative effects on wetland areas because there would be no transmission line construction or associated activities under this alternative. The effects of past road building and timber harvest on wetlands are described in the *Affected Environment* subsection and summarized in Table WET-1. Reasonably foreseeable projects in the analysis areas crossed by the proposed KPI alternatives are summarized at the beginning of Chapter 3 of this EIS.

On wetlands where timber has been harvested, vegetation will continue to grow toward hydrologic maturity, and overall soil moisture levels will return to pre-harvest conditions. Vegetation on the oldest harvest areas would be more than 30 years old and consists of generally vigorous young-growth stands, and soil moisture conditions should be returning to near pre-harvest conditions. Open, drivable roads in the analysis area would continue to receive use for recreation and subsistence, as well as future timber harvest activities. Vegetation will grow in ditch lines on all roads, and on closed roads vegetation will likely colonize the road surfaces.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Structure installation and the use of temporary shovel trails, temporary matting panels, temporary access spurs, and helicopter pads would disturb an estimated total of 29 acres of forested wetland, 24 acres of moss muskeg, and 61 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 114 acres or 13 percent of the analysis area (Table WET-2). These estimates are adjusted to avoid double counting areas that would be disturbed more than once and also exclude areas that have already been disturbed (Table WET-1).

Areas of the proposed 100- or 300-foot-wide right-of-way not disturbed by the project components identified in Table WET-2 may also be cleared depending on the existing vegetation. Assuming that all of the remaining right-of-way would be cleared would result in disturbance to an estimated 137 acres of forested wetland, 71 acres of moss muskeg, and 177 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 388 acres or 44 percent of the analysis area (Table WET-3). However, these estimates likely overstate the acres in moss muskeg and emergent short-sedge wetlands that would be affected because they assume that all acres of these vegetation types in the right-of-way would be cleared. These wetland types mainly consist of low-lying vegetation with scattered tall trees and much of these areas in the right-of-way would not need to be cleared.

Overall, this alternative would affect more acres of wetlands than the other action alternatives, with a total of 502 acres of impacts to wetlands from structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, and right-of way clearing. This alternative would also have the largest acreage of impact to forested wetlands (Table WET-3). Permanent impacts associated with this and the other action alternatives are likely to be limited to the footprints of the transmission line structures and helicopter pads, which would be placed permanently on the landscape.

Cumulative Effects

Estimates of existing wetland disturbance within the analysis area for this alternative are presented by disturbance type (past road construction and timber harvest) and wetland type in Table WET-1. This table indicates that past road construction and timber harvest has affected an estimated total of approximately 76 acres (9 percent) of wetlands in the analysis area for this alternative. This estimated total includes approximately 37 acres of cleared or previously harvested wetland with a forested vegetation class and approximately 39 acres of wetlands impacted by road construction.

Reasonably foreseeable projects within the analysis area for this alternative include the Scott Peak timber sale, which is currently in litigation. A total of 2.7 acres of Scott Peak harvest units coincide with the proposed disturbance footprint for Alternative 2. These acres would either be harvested as part of the timber sale or cleared during construction if Alternative 2 was the selected alternative for the KPI Project.

The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. This estimated disturbance would affect an estimated 75 acres of additional wetlands, consisting of 13 acres of forested wetlands, 43 acres of forested wetland/emergent sedge complex, and 19 acres of moss muskeg. The majority of these impacts would be permanent.

The incremental addition of estimated wetland disturbance under Alternative 2 to existing wetland disturbance in the analysis area would result in total cumulative impacts to approximately 652 acres of wetland, including approximately 229 acres of forested wetlands, 297 acres of forested wetland/emergent sedge complex, 121 acres of moss muskeg, and 5 acres of emergent short-sedge wetlands. Impacts would vary by project with higher levels of permanent impact associated with the potential Kake road project.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Structure installation and the use of temporary shovel trails, temporary matting panels, temporary access spurs, and helicopter pads would disturb an estimated total of 29 acres of forested wetland, 24 acres of moss muskeg, and 61 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 114 acres or 13 percent of the analysis area (Table WET-2). These estimates are adjusted to avoid double counting areas that would be disturbed more than once and also exclude areas that have already been disturbed (Table WET-1).

Areas of the proposed 100-foot or 300-foot-wide right-of-way not disturbed by the project components identified in Table WET-2 may also be cleared depending on the existing vegetation. Assuming that all of the remaining right-of-way would be cleared would result in disturbance to an estimated 128 acres of forested wetland, 69 acres of moss muskeg, and 177 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 377 acres or 43 percent of the analysis area (Table WET-3). However, these estimates likely overstate the acres in moss muskeg and emergent short-sedge wetlands that would be affected because they assume that all acres of these vegetation types in the right-of-way would be cleared. These wetland types mainly consist of low-lying vegetation with scattered tall trees and much of these areas in the right-of-way would not need to be cleared.

Overall, this alternative would have the second largest impact to wetlands compared to the other action alternatives, with a total of 491 acres of impacts to wetlands from structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, and right-of way clearing. This alternative would have the second largest acreage of impact to forested wetlands (Table WET-2). Permanent impacts associated with this and the other action alternatives are likely to be limited to the footprints of the transmission line structures and helicopter pads, which would be placed permanently on the landscape.

Cumulative Effects

Estimates of existing wetland disturbance within the analysis area for this alternative are presented by disturbance type (past road construction and timber harvest) and wetland type in Table WET-1. This table indicates that past road construction and timber harvest has affected an estimated total of approximately 70 acres (8 percent) of wetlands in the analysis area for this alternative. This estimated total includes approximately 37 acres of cleared or previously harvested wetland with a forested vegetation class and approximately 33 acres of wetlands impacted by road construction.

Reasonably foreseeable projects within the analysis area for this alternative include the Scott Peak timber sale, which is currently in litigation. A total of 2.7 acres of Scott Peak harvest units coincide with the proposed disturbance footprint for Alternative 3. These acres would either be harvested as part of the timber sale or cleared during construction if Alternative 3 was the selected alternative for the KPI Project.

The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. This estimated disturbance would affect an estimated 75 acres of additional wetlands, consisting of 13 acres of forested wetlands, 43 acres of forested wetland/emergent sedge complex, and 19 acres of moss muskeg. The majority of these impacts would be permanent.

The incremental addition of estimated wetland disturbance under Alternative 3 to existing wetland disturbance in the analysis area would result in total cumulative impacts to approximately 635 acres of wetland, including approximately 214 acres of forested wetlands, 297 acres of forested wetland/emergent sedge complex, 119 acres of moss muskeg, and 5 acres of emergent short-sedge wetlands. Impacts would vary by project with higher levels of permanent impact associated with the potential Kake road project.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 is about 8 miles shorter than the other two action alternatives. This alternative also crosses fewer unroaded miles, 13.8 miles versus 23.6 miles under Alternatives 2 and 3 both, with an estimated

6.5 miles of shovel trail versus 21.6 miles for the other two alternatives, and 1.4 miles less of estimated temporary access spur. This alternative would, however, require the use of more temporary matting panels, with an estimated total of 7.3 miles expected to be required to cross the unroaded area west of Duncan Canal compared to just 2.0 miles for Alternatives 2 and 3 (Table 2-1).

Structure installation and the use of temporary shovel trails, temporary matting panels, temporary access spurs, and helicopter pads would disturb an estimated total of 23 acres of forested wetland, 17 acres of moss muskeg, and 27 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 67 acres or 9 percent of the analysis area (Table WET-2). These estimates are adjusted to avoid double counting areas that would be disturbed more than once and also exclude areas that have already been disturbed (Table WET-1).

Areas of the proposed 100- or 300-foot-wide right-of-way not disturbed by the project components identified in Table WET-2 may also be cleared depending on the existing vegetation. Assuming that all of the remaining right-of-way would be cleared would result in disturbance to an estimated 83 acres of forested wetland, 50 acres of moss muskeg, and 89 acres of forested wetland/emergent sedge complex, with a combined total disturbance of 226 acres or 31 percent of the analysis area (Table WET-3). However, these estimates likely overstate the acres in moss muskeg and emergent short-sedge wetlands that would be affected because they assume that all acres of these vegetation types in the right-of-way would be cleared. These wetland types mainly consist of low-lying vegetation with scattered tall trees and much of these areas in the right-of-way would not need to be cleared.

Overall, this alternative would affect fewer acres of wetlands than the other action alternatives, with a total of 293 acres of impacts to wetlands from structure installation, temporary shovel trails, temporary matting panels, access spurs, and right-of way clearing. This alternative would also affect fewer acres of forested wetlands (Table WET-2). Permanent impacts associated with this and the other action alternatives are likely to be limited to the footprints of the transmission line structures and helicopter pads, which would be placed permanently on the landscape.

Cumulative Effects

Estimates of existing wetland disturbance within the analysis area for this alternative are presented by disturbance type (road construction and past timber harvest) and wetland type in Table WET-1. This table indicates that past road construction and timber harvest has affected an estimated total of approximately 73 acres (10 percent) of wetlands in the analysis area for this alternative. This estimated total includes approximately 50 acres of cleared or previously harvested wetland with a forested vegetation class and approximately 30 acres of wetlands impacted by road construction.

Reasonably foreseeable projects within the analysis area for this alternative include the Central Kupreanof timber sale project. A total of 16.9 acres of identified harvest units for this project coincide with the disturbance footprint for Alternative 4. Although NEPA-cleared, unless market conditions change, the Central Kupreanof units are not expected to be offered for sale over the next 5 years.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the wetlands analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for additional wetland disturbance.

The incremental addition of estimated wetland disturbance under Alternative 4 to existing wetland disturbance in the analysis area would result in total cumulative impacts to approximately 364 acres of wetland, including approximately 161 acres of forested wetlands, 132 acres of forested wetland/emergent sedge complex, 67 acres of moss muskeg, and 4 acres of emergent short-sedge wetlands.

Mitigation

Section 313 of the Clean Water Act and Executive Order 12088 require that BMPs that 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.

Where temporary shovel trails and temporary access spurs are located in wetland habitat, the Forest Plan Standards and Guidelines direct avoidance of wetlands where possible. Additionally, the standards and guidelines protect riparian areas from direct impact. The effects of the project on wetlands would be limited through the site-specific application of Forest Plan Standards and Guidelines as well as National, Federal, and State BMPs for all action alternatives (see Chapter 2). Forest-wide BMP implementation monitoring has consistently reported a high level of compliance (Landwehr 2008).

Due to the preponderance of wetlands and the interspersed nature of wetlands with uplands on the analysis area, complete avoidance of wetlands from project activities is not feasible. Final project design for the selected alternative would avoid and minimize wetland impacts, as practicable.

Wildlife and Subsistence

Introduction

This section evaluates impacts to wildlife and subsistence resources. The following subsections address wildlife habitat, including the old-growth forest ecosystem and old-growth reserves; Forest Service Management Indicator Species; threatened, endangered, and sensitive species; migratory birds; endemic species; and subsistence.

Analysis Area

The analysis area for direct and indirect effects to wildlife and subsistence consists of several scales, including the VCUs and Wildlife Analysis Areas (WAAs). VCUs are NFS land divisions that approximate watersheds. The analysis area for wildlife and subsistence consists of the VCUs that would be crossed by the proposed alternatives. WAAs, which encompass multiple VCUs, are geographic subdivisions of GMUs within which ADF&G manages wildlife populations. The KPI Project is located within GMU 3, which encompasses Coronation, Kuiu, Kupreanof, Mitkof, Zarembo, Kashevarof, Woronkofski, Etolin, Wrangell, and Deer Islands. Analysis areas for wildlife and subsistence are defined as follows and unless otherwise noted include all land ownerships within the identified boundaries:

- Habitat impacts (old-growth and landscape connectivity) were assessed at the scale of the individual VCUs which collectively comprise the analysis area to capture localized effects to the old-growth forest ecosystem associated with habitat loss and fragmentation and for the project area as whole. Minimum acreage requirements for small old-growth reserves, which are crossed by the project, are also established at the VCU scale.
- For cavity nesting species, red squirrels, migratory birds, and endemic species impacts were assessed at the VCU scale.
- For wider-ranging species such as the black-tailed deer, wolves, marten, and black bears, and for subsistence resources, impacts were assessed at the WAA or multiple WAA scale which extend beyond the project area boundary.

These scales of analysis are commensurate for the project because they provide a consistent approach for analyzing impacts based on the Forest Plan. For the analysis of cumulative effects, unless otherwise noted, the analysis areas are the same as those described above for direct and indirect effects because these areas already extend beyond the project-related effects (i.e., beyond the areas disturbed by each alternative).

Methodology

Sources of information used in the preparation of this analysis include field reconnaissance, aerial photo interpretation, existing Forest Service GIS data, peer-reviewed literature (cited as appropriate below), prior NEPA analyses in the vicinity of the KPI Project, and information from knowledgeable individuals. This section describes field surveys conducted for the project and the methodology for classifying wildlife habitat and for conducting analysis using the interagency deer habitat capability model. The *Analyzing Effects* section at the beginning of this chapter describes general methods for cumulative effects and provides a list of ongoing and foreseeable projects.

Field Surveys

Surveys for the Queen Charlotte goshawk (*Accipiter gentilis laingi*) were conducted within the analysis area in June and July of 2011 according to the Tongass National Forest Project-level Goshawk Inventory Protocol (Stangle 2009). During these surveys, observations of MIS and other species of interest were recorded. See the Wildlife and Subsistence Use Resource Report and the BE prepared for this project for additional information on survey effort and other wildlife observations (Tetra Tech 2014f; Tetra Tech 2014c).

Supplemental information on the presence of endemic mammals in the vicinity of the KPI Project was obtained from small mammal trapping conducted in association with the Island Surveys to Locate Endemic Species (ISLES) program (http://www.msb.unm.edu/mammals/ISLES_ website_final_20091028/ isles_home.html). In compliance with the Forest Plan, field surveys for endemic mammals were not conducted in the analysis area because Kupreanof and Mitkof Islands both exceed 50,000 acres and because there is a relatively low likelihood of endemics occurring in the analysis area (Cook et al. 2006); known endemics include the insular dusky shrew and large mammal species managed by ADF&G.

Vegetation Classification and the Size-Density Model

Old-growth forests on the Tongass can be classified as unproductive and productive. Productive old-growth (POG) is defined as old growth forest capable of producing at least 20 cubic feet of wood fiber per acre per year, or having greater than 8,000 board feet per acre (USDA Forest Service 2008a). The Size-Density Model (SDM), which uses a combination of tree sizes and tree densities to classify forest structure (Caouette et al. 2006), is used by Forest Service managers and planners to map POG and assess impacts to wildlife and habitats. This classification system builds on the timber volume-based classification system (volume strata) for POG used prior to the 2008 Forest Plan (low-, medium-, and high-volume), which used only hydric soils and steep slopes as measures productivity and growth. By incorporating the characterization of forest structure, the SDM is more applicable in assessing biodiversity, estimating timber values, and describing wildlife habitat than using timber volume alone. The following seven POG types have been defined which illustrate the crosswalk between the volume strata approach and the SDM (USDA Forest Service 2008c):

- SD4H: Volume class 4 on hydric soils. Low productive older forests associated with wet, poorly drained land types. Canopy closure is variable. Trees are small, old, and defective. Stand volume is low.
- SD4N: Volume class 4 on non-hydric soils, north aspect, or flat. Low to moderately productive older upland forests. Canopy characteristics are variable and patchy, with moderate canopy closure and relatively coarse canopy texture. Stand volume is low to moderate.
- SD4S: Volume Class 4 on non-hydric soils, not north aspect, or flat. Highly productive younger upland forests. Stand volume is moderate, but increasing rapidly. Crown competition is high. Canopy characteristics tend to be uniform, with high canopy closure and fine canopy texture.
- SD5H: Volume class 5 on hydric soils. Moderately productive older forests associated with wet, poorly drained land types. Canopy closure, texture, and structure tend to be variable and patchy. Stand volume and annual growth is also variable and patchy.
- SD5N: Volume class 5 on non-hydric soils, north aspect, or flat. Moderately productive older upland forests. Stand volume is moderate to high. Canopy characteristics tend to be variable, with moderate canopy closure and coarse canopy texture.
- SD5S: Volume class 5 on non-hydric soils, not north aspect, or flat. Highly productive upland forests. Stand volume is high. Canopy characteristics tend to be uniform, with moderate to high canopy closures.
- SD67: Volume classes 6 and 7. Highly productive forests associated with riparian areas, alluvial fans, colluvial toe slopes, karst geology, and wind-protected uplands. Stand volume is high. Stand age can vary. Canopy closure is low to moderate and canopy texture is coarse.

POG is defined further in terms of two categories. High-volume POG is defined as the grouping of the three SD Model types that represent the highest volume stratum—SD5S, SD5N, and SD67 types. Large-tree POG is defined as the SD67 type, representing the most productive of the POG types, and typically containing the highest density of large trees. The 2008 Forest Plan Final EIS provides more information on the development and use of the SDM, and Appendix B of the Forest Plan Final EIS describes the modeling methods used to determine the amount of original (1954) POG existing prior to commercial timber harvest (Forest Service 2008c).

Deer and Wolf Analysis

Forest Plan Standards and Guidelines require the use of the most recent version of the interagency deer habitat capability model to assess impacts to deer habitat (WILD4.XIV.A.2; USDA Forest Service 2008a). The deer model takes into account snow depth (indicative of typical, moderate winter severity), elevation, aspect, and conifer forest successional stage to provide a habitat suitability index (HSI) of habitat capability. High model scores represent features that are correlated with high value deer habitat. These features include closed canopy (based on volume class rather than canopy cover), maritime influence, low elevation south facing slopes, and low average snow depth. Habitat capability values are used in this analysis to estimate changes that result from timber harvest, but do not reflect actual deer numbers. Shortcomings of the model are described in detail in the 2008 Forest Plan Final EIS (USDA Forest Service 2008c). Model assumptions, based on recent direction provided by the Forest Service, include the following:

- Historic conditions were defined as the conditions that existed prior to the onset of large-scale logging in 1954. Historic conditions were reconstructed by converting the 1986 vegetation mapping (TIM86) to the SDM types and then converting the areas mapped as harvested prior to that date into the different volstrata and SD67 POG, based on the proportion of these categories in areas harvested prior to 1992.
- All vegetation removal is treated as even-aged harvest.
- Stem exclusion was considered 25 years post-harvest (stands 26 to 150 years of age).
- Values output by the model were standardized to range from 0 to 1.0 by dividing all values by 1.3.
- 100 deer per square mile was used as the multiplier.
- Only NFS lands were in the project-related effects (direct and indirect effects) analysis. All land ownerships (NFS and non-NFS lands) were included in the cumulative effects analysis; however, non-NFS lands were given a zero value (conservatively assuming harvest of all non-NFS lands).
- All elevations are included in the analysis, but the model gives acres above 1,500 feet a zero value.
- Model runs assumed 2013 as the current year, and 2015 for project implementation.
- All lakes and lake islands were excluded from the analysis.
- Entire land areas for WAAs where project activities are proposed (WAAs 2007, 5130, 5131, 5132, 5133, 5135, 5136, 5137, 5138) were included in the direct and indirect effects analysis.
- No predation was included.

Affected Environment

Wildlife Habitat

The proposed project is located within the Kupreanof/Mitkof Island biogeographic province, which includes the greatest extent of low-lying, muskeg wetlands of the biogeographic provinces in Southeast Alaska (USDA Forest Service 2008c). Typical of Southeast Alaska and the Tongass National Forest, vegetation within the analysis area is dominated by temperate coastal rain forests at lower elevations (less than 2,000 feet elevation), with interspersed muskegs, other wetlands, and other nonforest types. At higher elevations, alpine vegetation, rock, glaciers, and snowfields dominate. The discussion of wildlife habitat in this analysis focuses on the old-growth forest ecosystem that all the species of concern are associated with.

Old-growth Forest Ecosystem

Old-growth forests support high levels of biodiversity due to their structural and ecological complexity. In Southeast Alaska, old-growth forests are typically greater than 150 years old, and are characterized by complex canopies; an interspersion of trees of multiple age classes; the presence of snags, decadent trees, and fallen trees; and a variation in the amounts and distribution of live trees. These features create intricate habitat niches that support many plant and animal species (Spies 2004).

There are currently approximately 141,673 acres of POG forest within the analysis area, of which 48,506 acres are high-volume POG and 7,799 acres are large- tree POG (Table WILD-1). Note that a majority of the POG within the analysis area is below 1,500 feet elevation.

Table WILD-1. Existing Total, High-Volume, and Large-Tree POG by Elevation within VCUs Crossed by the KPI Route Corridors

Scale[1/]	Elevation (ft)	Acres of Productive Old-growth[2/]		
		Total	High Volume	Large Tree
VCU				
4230	<800	266	1	0
	801-1,500	198	41	0
	>1,500	255	127	0
	Total	719	169	0
4240	<800	6,650	1,043	26
	801-1,500	3,443	1,375	132
	>1,500	1,482	483	47
	Total	11,575	2,901	206
4250	<800	9,366	1,750	412
	801-1,500	633	71	32
	>1,500	270	13	10
	Total	10,269	1,834	454
4260	<800	8,355	1,297	352
	801-1,500	1,720	808	102
	>1,500	436	182	4
	Total	10,512	2,288	457
4271	<800	3,257	447	221
	801-1,500	703	288	22
	>1,500	277	129	0
	Total	4,236	864	243
4290	<800	15,745	4,292	1,181
	801-1,500	4,864	1,499	183
	>1,500	522	116	14
	Total	21,131	5,907	1,378
4370	<800	5,556	1,889	50
	801-1,500	3,732	1,899	63
	>1,500	1,274	513	21
	Total	10,562	4,301	134

Table WILD-1. Existing Total, High-Volume, and Large-Tree POG by Elevation within VCUs Crossed by the KPI Route Corridors (continued)

Scale[1/]	Elevation (ft)	Acres of Productive Old-growth[2/] Total	High Volume	Large Tree
4380	<800	6,404	1,280	338
	801-1,500	3,121	952	138
	>1,500	588	110	0
	Total	10,113	2,342	476
4410	<800	764	219	158
	801-1,500	324	120	50
	>1,500	143	84	19
	Total	1,231	423	227
4420	<800	3,128	1,336	329
	801-1,500	819	544	32
	>1,500	885	189	12
	Total	4,833	2,068	373
4440	<800	5,631	1,692	383
	801-1,500	3,242	1,264	171
	>1,500	2,093	972	16
	Total	10,966	3,927	570
4450	<800	7,598	4,093	626
	801-1,500	5,077	3,121	209
	>1,500	1,951	923	1
	Total	14,626	8,138	836
4460	<800	2,615	1,122	362
	801-1,500	1,785	938	212
	>1,500	448	272	17
	Total	4,849	2,332	592
4470	<800	14,356	5,419	1,217
	801-1,500	8,943	4,810	534
	>1,500	2,752	781	102
	Total	26,050	11,010	1,852
VCUs Combined	<800	89,691	25,880	5,655
	801-1,500	38,604	17,732	1,880
	>1,500	13,378	4,895	263
	Total	141,673	48,506	7,799

Notes:
1/ Includes NFS and non-NFS lands; accounts for entire VCUs crossed by the KPI route corridors.
2/ High-volume POG includes the SD5N, 5S, and 6/7 categories; large-tree POG includes the SD6/7 category.

Landscape Connectivity and Fragmentation

Landscape connectivity is defined as the degree to which the structure of a landscape helps or hinders the movement of wildlife species (Taylor et al. 1993). A landscape with a high degree of connectivity is one in which wildlife move readily between habitat patches over the long-term (USDA Forest Service 2008c). Fragmentation occurs when large blocks of habitat are broken into smaller parcels by natural (e.g., windthrow) or human induced (e.g., roads, timber harvest, transmission line corridors) forces. As habitat is lost or fragmented, residual habitat patches become smaller and more isolated from each other. Open spaces left by fragmentation can act as travel barriers for some species, or increase the risk of predation for other species that venture across them. On the Tongass, connectivity between areas of similar habitats (i.e., old-growth forest) or between high and low elevation habitats is important to maintaining well-distributed, viable wildlife populations.

Landscape connectivity can be both structurally and functionally based. Structural connectivity refers to the physical connections between areas of habitat that facilitate movement of wildlife (e.g., riparian corridors; Julin 1997). Functional connectivity refers to the degree of movement or flow of organisms through broader linkage "zones" which contain an appropriate juxtaposition of habitats and land uses that facilitate movement across the landscape. On the Tongass, matrix lands (defined as lands outside of reserves where timber harvest may occur) also provide a limited degree of functional connectivity between OGRs and other non-development LUDs.

Compared to other island groups with numerous fiords and rugged relief that reduce connectivity for wildlife, Kupreanof and Mitkof islands have a low degree of natural fragmentation (Carstensen et al. 2007). However, the narrow area of land between Portage Bay and Duncan Canal is a pinch point separating the Lindberg Peninsula from the rest of Kupreanof Island which may restrict dispersal or migration of some land-based wildlife species. Old-growth forest within the analysis area is naturally fragmented because it is interspersed between extensive areas of muskeg. It has also been fragmented by past timber harvest and to a lesser extent road development.

Forest Plan Conservation Strategy and Old-Growth Reserves

Conservation Strategy

The Forest Plan Conservation Strategy was developed to maintain the integrity of the old-growth forest by retaining intact, largely undisturbed habitat. This strategy, initially incorporated into the 1997 Forest Plan, was reviewed and amended for incorporation into the 2008 Forest Plan. The conservation strategy includes two major components: (1) a forest-wide network of large, medium and small OGRs allocated to the Old-Growth LUD plus all small islands less than 1,000 acres, and (2) a series of standards and guidelines applicable to lands where timber harvest is permitted (USDA Forest Service 2008b, 2008c).

The OGR system was designed to maintain habitats of the species that have the most viability concerns (USDA Forest Service 2008c). The reserve network also includes other non-development LUDs such as Wilderness, LUD II, Remote and Semi-Remote Recreation that essentially maintain the old-growth ecosystem. The intent of the reserve system was to help ensure the maintenance of well-distributed viable populations of old-growth associated wildlife species across the Tongass, with focus on those species that are most sensitive to habitat loss and fragmentation. For a complete review of the Forest Plan Conservation Strategy, including assumptions underlying the design of the OGR system, refer to Appendix D of the 2008 Forest Plan Final EIS (USDA Forest Service 2008c).

Within the matrix (i.e., areas outside of reserves where timber harvest may occur), components of the old-growth ecosystem are maintained through a series of standards and guidelines designed to provide for important ecological functions such as dispersal of organisms, movement between forest stands, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (USDA Forest Service 2008c). Matrix lands include Experimental Forest, Modified Landscape, Scenic Viewshed, and Timber Production LUDs. Standards and guidelines applicable to these lands include the 1,000-foot beach buffer, variable-width stream buffers, reserve tree/cavity-nesting habitat, and a number of species-specific standards and guidelines (e.g., raptor nest and wolf den buffers).

Old-growth Reserves

The analysis area includes small OGRs located in VCUs 4250, 4260, 4290, 4380, 4420, 4440, and 4460. The analysis area also includes portions of medium OGRs in VCUs 4240, 4370, and 4470. Under the Forest Plan conservation strategy, small OGRs were intended to facilitate functional connectivity (i.e., connectivity through disconnected patches of old-growth forest) between larger reserves and ensure well-distributed wildlife populations.

Appendix D of the 2008 Forest Plan FEIS (USDA Forest Service 2008c) and Appendix K of the Forest Plan (USDA Forest Service 2008a) outline design criteria including minimum acreage requirements for the reserve system. Medium must include at least 5,000 acres of POG, of which 2,500 acres were intended to be high-volume. Small reserves must contain at least 16 percent of the area of the NFS land area of a VCU in a contiguous landscape, with at least 50 percent of that area consisting of POG. Table WILD-2 displays the consistency of each OGR in the analysis area with Forest Plan minimum acreage requirements.

According to the Forest Plan (Appendix K, p K-1) modifications to OGRs other than minor (e.g., correction of mapping errata) may require a project level review if (1) actions proposed within the OGR will reduce the integrity of the old-growth habitat in the OGR or (2) the OGR will be affected by a land conveyance, power line, mine or other project that was not considered in the Forest Plan.

The following briefly describes each OGR within the analysis area:

VCU 4240 (Bohemia) – This is a medium OGR located on the northern end of Kupreanof Island, adjacent to Frederick Sound. Currently, the medium OGR in VCU 4240 alone does not meet Forest Plan minimum acreage requirements for POG; however the adjacent non-development LUD incudes the additional POG acres (Table WILD-2).

VCU 4250 (no name) – This is a split small OGR located in the northwestern portion of Kupreanof Island. There is a northern piece north of Hamilton Bay, and a larger, southern piece bordering the southern shore of Hamilton Bay and extending to the VCU boundary. This small OGR connects to the small OGR in VCU 4260. NFS roads make up a portion of the boundary of the northern portion of this OGR (approximately 1.7 miles). Currently, the small OGR in VCU 4250 does not meet Forest Plan minimum acreage requirements (Table WILD-2).

VCU 4260 (no name) – This small OGR extends east from Hamilton Bay, and overlaps into VCU 4400 (not included in the analysis area). It also connects with small OGRs in VCUs 4250 to the west. Currently, the small OGR in VCU 4260 meets Forest Plan minimum acreage requirements (Table WILD-2).

VCU 4290 (**Tunehean and Irish Creeks)** – This is a split small OGR is located in the central portion of Kupreanof Island. There is a northern piece that includes a portion of Irish Creek, and a southern piece that includes a portion of Tunehean Creek. Currently, the small OGR in VCU 4290 alone does not meet Forest Plan minimum acreage requirements; however, a non-development LUD adjacent to the northern piece includes the additional total and POG acres (Table WILD-2).

VCU 4370 (South Lindenberg) – This medium OGR is located along the west side of Duncan Canal. It overlaps into VCUs 4470 and 4480 (outside the analysis area). Currently, the medium OGR in VCU 4370 does not meet Forest Plan minimum acreage requirements (Table WILD-2).

VCU 4380 (no name) – This small OGR is located in the east central portion of Kupreanof Island. Currently, the small OGR in VCU 4380 alone does not meet Forest Plan minimum acreage requirements; however, adjacent a non-development LUD includes the additional total and POG acres (Table WILD-2).

VCU 4420 (Portage Bay) – This small OGR is located along the west shore of Portage Bay. Currently, the small OGR in VCU 4420 meets Forest Plan minimum acreage requirements (Table WILD-2).

VCU 4440 (no name) – This small OGR is located near the northeastern portion of the Lindenberg Peninsula, northwest of Scott Peak. It connects with the small OGR in VCU 4430 (outside the KPI analysis area). NFS roads form a portion of the border of this OGR and occur within the OGR (approximately 2.3 miles, of which 0.05 is open). Currently, the small OGR in VCU 4440 meets Forest Plan minimum acreage requirements (Table WILD-2).

Table WILD-2. Existing Old-Growth Reserves in the KPI Analysis Area

VCU/OGR[1/]	OGR Size	Required OGR acres[2/]	Existing OGR acres	Required POG acres	Existing POG acres	Required High-volume POG acres[3/]	Existing High-volume POG acres	Forest Plan Acreage requirements met?
VCU 4240-Bohemia	Medium	NA	14476	5,000	4224	2,500	1345	No. Acceptable because adjacent Non-development LUD includes the additional total and POG acres; falls short on high volume POG.
VCU 4250-no name	Small	6540	5462	3270	2691	NA	NA	No. Falls short on total and POG acreage.
VCU 4260- no name [4/]	Small	6794	6829	3397	3425	NA	NA	Yes
VCU 4290-Tunehean and Irish Creeks	Small	8571	6933	4285	3627	NA	NA	No. Acceptable because Non-development LUD adjacent to northern piece includes the additional total and POG acres.
VCU 4370- South Lindenberg	Medium	NA	5274	5,000	2575	2,500	1800	No
VCU 4380- No name	Small	4422	4360	2211	2205	NA	NA	No. Acceptable because adjacent Non-development LUD includes the additional total and POG acres.
VCU 4420-Portage Bay	Small	1797	1806	898	1527	NA	NA	Yes
VCU 4440- no name	Small	3858	3905	1929	2495	NA	NA	Yes
VCU 4460- no name	Small	1786	1883	893	1080	NA	NA	Yes
VCU 4470 – South Lindenberg (west OGR), Goose Lake (east OGR)	Medium	NA	5700	5,000	1953	2,500	696	No. Acceptable because adjacent Non-development LUD add additional POG acres; but falls short on high volume POG.

Notes:
1/ There are no OGRs in VCU 4230, 4271, 4410, 4450.
2/ For small OGRs, 16% of NFS acres in a VCU; Medium OGR should be at least 10,000 acres but can include adjacent non-development LUD acreage. These Forest Plan OGR acreage requirements do not apply to medium OGRs, as indicated by "NA" in the corresponding table cells.
3/ For small OGRs, 50% of OGR acres; for medium OGRs at least 5,000 acres should be POG, of which 2,500 should be high-volume POG. There are no high-volume POG acreage requirements for small OGRs, as indicated by "NA" in the corresponding table cells.
4/ Small OGR overlaps with VCU 4400.

VCU 4460 (no name) – This small OGR is located on the east side of the Lindenberg Peninsula between Sherman and Del Monte Peaks. Currently, the small OGR in VCU 4460 meets Forest Plan minimum acreage requirements (Table WILD-2).

VCU 4470 (South Lindenberg, Goose Lake) – This VCU includes the South Lindenberg medium OGR which overlaps into VCUs 4370 and 4480 (outside the analysis area); it also includes a medium OGR near Goose Lake. Currently, medium OGRs in VCU 4470 alone do not meet Forest Plan minimum acreage requirements for POG and high-volume POG, but the adjacent non-development LUD includes the additional POG acreage (Table WILD-2).

Management Indicator Species

MIS are species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements (Forest Service Manual [FSM] 2631.3). In accordance with the 1982 Planning Regulations, 13 wildlife species were identified as MIS in the Forest Plan (USDA Forest Service 2008c). Nine of these species are addressed below along with the rationale for their selection. All of the wildlife MIS are associated with POG forests of Southeast Alaska.

Black Bear

Black bears were chosen as an MIS because of their importance for hunting and for recreation and tourism. They also may play a role in transferring marine nutrients into the terrestrial environment (Schoen and Peacock 2006). Black bears will use habitats from sea level to the alpine but appear to prefer estuarine, riparian, and forested coastal habitats (USDA Forest Service 2008c). They require large-diameter trees and snags for denning which are found in POG forests. In GMU 3, the highest quality black bear habitat is characterized by low-elevation POG forest with abundant and productive salmon streams and interspersed by small openings and disturbed areas such as wetlands, avalanche chutes, clear cuts, and subalpine meadows (ADF&G 2008).

There are 282,962 acres of POG within the WAAs encompassing the KPI Project, ranging from 11,571 acres in WAA 5135 to 63,884 acres in WAA 2007 (Table WILD-3). There are many Class I fish-bearing (salmon) streams in the analysis area for black bears, the most important being Coho Creek, Colorado Creek, Taylor Creek, Fivemile Creek, Twelvemile Creek, Big John Creek, Big Creek, Cathedral Falls Creek, Petersburg Creek, and Hamilton Creek (see the *Aquatic Resources* section for additional information). The Wildlife and Subsistence Resource Report provides additional information on harvest statistics for black bears in GMU 3 (Tetra Tech 2014f).

Table WILD-3. Existing POG (All Elevations) within the Analysis Area WAAs

WAA	Acres of POG
2007	63,884
5130	42,315
5131	25,065
5132	12,018
5133	44,622
5135	11,571
5136	27,400
5137	24,775
5138	31,312
Total	**282,962**

Sitka Black-tailed Deer

The Sitka black-tailed deer was selected as an MIS species because it is an important game and subsistence species in Southeast Alaska. They are also an important prey species for Alexander Archipelago wolves and black bears. ADF&G managers believe the deer population in GMU 3 is declining, based on observed declines in pellet-group densities and estimated hunter harvest (Lowell 2011). Factors potentially contributing to this decline include three consecutive severe winters (2006-2007, 2007-2008, and 2008-2009), reduction in deer habitat capability (harvest of POG forest and succession of young-growth stands to the stem exclusion phase), and predation by wolves (Lowell 2011).

Research conducted in Southeast Alaska indicates that low-elevation, high-volume old-growth habitats are particularly important to deer, especially during severe winters (Schoen and Kirchhoff 1990; Hanley and Rose 1987; Yeo and Peek 1992). These old-growth stands intercept snow, provide thermal cover, and support the largest biomass of herb and shrub forage for deer (Alaback 1982; Schoen et al. 1984). During periods of heavy snow, Sitka black-tailed deer on Mitkof Island move to lower elevation, south-facing slopes that are closer to water where snow is less deep (Doerr et al. 2005).

Random events such as snow and other weather conditions can influence the ecology and behavior of wintering deer by decreasing forage availability and increasing the amount of energy it takes to move through the forest (Hanley et al. 1989; Farmer et al. 2006; White et al. 2009). Thus, the habitats available to deer differ depending on winter severity, and can be defined as:

- Average snow winter habitat is defined as all POG below 1,500 feet elevation, and
- Deep snow winter habitat is defined as high-volume POG below 800 feet elevation, representing the shift toward use of lower elevations and more dense stands of POG during severe winters.

There are 257,707 acres of average snow winter habitat and 55,460 acres of deep snow winter habitat in the analysis area (Table WILD-4).

Spring, summer, and fall habitats (non-winter) are also important for deer reproduction and population recovery following severe winters, and for building up pre-winter body reserves. These habitats include all vegetation types, except young-growth in the stem exclusion phase. There are 537,189 acres of non-winter habitat in the analysis area (Table WILD-4).

Table WILD-4. Existing Deep Snow Winter Habitat, Average Snow Winter Habitat, and Non-Winter Habitat by WAA (all landownerships included)

	Deep Snow Winter Habitat[1/]		Average Snow Winter Habitat[2/]		Non-winter Habitat[3/]	
WAA	Acres	% of WAA with Available Habitat	Acres	% of WAA with Available Habitat	Acres	% of WAA with Available Habitat
2007	13,135	9.8	55,729	41.4	98,377	73.2
5130	9,243	9.9	41,713	44.8	85,199	91.5
5131	4,026	5.7	24,352	34.7	44,293	63.0
5132	1,769	2.0	11,487	13.0	49,012	55.6
5133	8,359	7.8	42,796	39.7	80,871	75.1
5135	1,041	1.9	10,088	18.2	36,211	65.4
5136	5,497	9.2	22,486	37.5	48,711	81.3
5137	5,991	11.8	21,437	42.4	43,167	85.4
5138	6,399	9.1	27,618	39.5	51,347	73.4
Total	**55,460**	**7.6**	**257,707**	**35.3**	**537,187**	**73.6**

Notes:
1/ High-volume POG (SD 5S, 5N, 67) at or below 800 feet elevation; no GIS snow layer applied
2/ All POG (SD 4H, 4N, 4S, 5H, 5S, 5N, 67) at or below 1,500 feet elevation
3/ Spring/summer/fall habitat; all POG, non-productive old-growth and non-forested muskeg, alpine habitats

The interagency deer winter habitat capability model was used to assess existing habitat capability in the WAAs coinciding with the KPI Project. Model assumptions are described above under Methods. Historic (1954) and current (2013) deer habitat capability is presented in Table WILD-5. Current habitat capability in the analysis area WAAs (NFS lands only) ranges from 72 to 97 percent of that existing in 1954 (Table WILD-5).

Table WILD-5. Deer Winter Habitat Capability (NFS Lands Only)

		2013 (Current) Deer Habitat Capability [1/]	
WAA	**1954 (Historic) Deer Habitat Capability [1/]**	**Deer Habitat Capability Units**	**% of Original**
2007	2,838	2,238	79
5130	2,860	2,688	94
5131	2,118	1,856	88
5132	1,180	856	72
5133	2,927	2,783	95
5135	1,158	1,127	97
5136	1,538	1,263	82
5137	1,322	1,265	96
5138	1,890	1,638	87
Total	**17,831**	**15,714**	**88**

1/ Deer habitat capability, in deer habitat units, calculated from the deer model for winter habitat. Habitat Suitability Indices were standardized to range from 0.0 to 1.0; 100 deer per square mile used as multiplier; all tree clearing was treated as even-aged harvest; no predation was included.
Source: GIS Database, deer_model.aml, 2013

Alexander Archipelago Wolf

The Alexander Archipelago wolf was selected as an MIS because it is a species of concern and an important furbearer. Although there are no quantitative estimates of wolf abundance for GMU 3, wolf numbers are thought to be highest on islands in the central and southern half of Southeast Alaska, including Mitkof and Kupreanof Islands (ADF&G 2012). In GMU 3, some members of the public have expressed public concerns about overly abundant wolf populations in relation to low deer numbers and poor chances of harvesting deer (ADF&G 2012).

Wolves in Southeast Alaska use a wide variety of habitats but spend most of their time in productive and unproductive old-growth forests at low elevations (below 270 feet [82 meters]); young seral forests and clearcuts are typically avoided (Person 2001). In GMU 3, wolves feed primarily on deer, though moose are an important food source on some GMU 3 islands (Lowell 2009). Wolves will also feed on beaver and spawning salmon when available (Darimont et al. 2002; Szepanski et al. 1999).

Critical deer winter habitat was considered by Person (2001) to be a good measure of habitat quality for wolves in southern Southeast Alaska. Forest Plan Standards and Guidelines require, where possible, the provision of sufficient deer habitat capability to first maintain sustainable wolf populations, and then to consider meeting estimated human deer harvest demands. This is generally considered to equate to the habitat capability to support a minimum of 18 deer per square mile (using habitat capability model outputs; USDA Forest Service 2008a). However, other factors (e.g., local knowledge of habitat conditions) are to be considered by the biologist, as well, rather than solely relying upon model outputs. Table WILD-6 summarizes existing deer habitat capability in terms of modeled deer densities in the analysis area WAAs, where between 72 and 97 percent of the 1954 deer habitat capability remains.

Table WILD-6. Existing Deer Winter Habitat Capability in terms of Deer Density by WAA (NFS Lands Only)

WAA	1954 (Historic) Deer Habitat Capability (deer/mi²)[1/]	2013 (Current) Deer Habitat Capability[1/]	
		Deer/mi²	% of Original
2007	17.4	13.8	79
5130	20.3	19.1	94
5131	19.3	16.9	88
5132	20.5	14.9	72
5133	17.4	16.6	95
5135	13.4	13.0	97
5136	16.5	13.5	82
5137	16.8	16.0	96
5138	19.6	17.0	87
Total	**17.9**	**15.8**	**88**

Note:
1/ Deer habitat capability, in deer habitat units, calculated from the deer model for winter habitat. Habitat Suitability Indices were standardized to range from 0.0 to 1.0; 100 deer per square mile used as multiplier; all tree clearing was treated as even-aged harvest; no predation was included.
Source: GIS Database, deer_model.aml, 2013

Although most wolves (i.e., 59 percent) are harvested by hunters and trappers working from boats, harvest-related wolf mortality is correlated with roads and other habitat features, which influence their vulnerability to harvest (Person and Russell 2008; Person and Logan 2012). Person and Russell (2008) found that rate of harvest of both resident and non-resident wolves increased with density of roads, which provide access to hunters and trappers. The Forest Plan states that a road density of 0.7 to 1.0 mile per square mile or less may be necessary to reduce harvest-related mortality risk where locally unsustainable wolf mortality has been identified (USDA Forest Service 2008a). Unsustainable wolf mortality has not been identified as a concern for wolves in GMU 3. However, ADF&G recently (email from R. Lowell on June 22, 2015) stated that although the department does not currently have concerns regarding wolf mortality on Etolin Island (part of GMU 3); concerns do remain about continued reductions in productive old growth forest habitat and increasing road densities on northern Etolin. Currently, total road density below 1,200 feet elevation in the analysis area WAAs is 0.4 mile per square mile, ranging from 0.0 mile per square mile in WAA 5137 to 0.9 mile per square mile in WAA 2007 (Table WILD-7).

Table WILD-7. Existing Road Density below 1,200 Feet Elevation

WAA[1/]	Road Density (mi/mi²)[2/]		
	Open	Closed	Total
2007	0.8	0.1	0.9
5130	0.1	0.0	0.2
5131	0.4	0.0	0.4
5132	0.3	0.0	0.4
5133	0.0	0.0	0.1
5135	0.2	---	0.2
5136	0.4	0.1	0.5
5137	0.0	---	0.0
5138	0.6	0.0	0.6
Total (all WAAs combined)	**0.4**	**0.0**	**0.4**

Notes:
1/ Includes NFS and non-NFS lands.
2/ Closed roads are defined as all NFS roads with Operating Maintenance Level = 1, plus all decommissioned NFS roads; open roads include all other NFS roads and all state and private roads. Dashed lines indicate WAAs with no closed roads.

In March 2013, ADF&G submitted a proposed operational plan to the Alaska Board of Game for intensive management of Sitka black-tailed deer within GMU 3. Within the KPI project area, the experimental treatment program included Mitkof Island and the northern and eastern potions Kupreanof Islands for treatment (i.e., wolf removal). However, a predator control program authorized under intensive management regulations is currently considered inactive within GMU 3.

Marten

The marten was selected as an MIS because of its close association with old-growth forests and its importance as a furbearer. Although only one species of marten is formally recognized in Southeast Alaska two distinct lineages exist. The coastal form *caurina* is endemic and thought to occur only on Kuiu and Admiralty Islands. The continental form occurs elsewhere, including Mitkof and Kupreanof Islands. With the exception of Kuiu Island, no formal field surveys were conducted in GMU 3 to determine marten status or trends; however, based on results of the trapper questionnaire and ADF&G managers' field observations, the marten population appears stable (Lowell 2010).

Coastal habitats (beach fringe) and riparian areas have the highest habitat value for marten, followed by upland forested habitats below 1,500 feet in elevation (USDA Forest Service 2008a). Marten favor large- and medium-sized old-growth forests because they intercept snow, provide cover and denning sites, and provide habitat for marten prey species (Flynn and Schumacher 2001). These forests are also used by deer during winter, and winter-kill carcasses of deer represented a significant portion of marten diet in winter (Ben David et al. 1997). Therefore, the availability of deep-snow marten habitat, defined as high-volume POG (SD 5N, 5S, and 67) below 800 feet in elevation, provides a measure of habitat quality for marten. Within the analysis area WAAs, there are currently 55,460 acres of deep snow marten habitat (Table WILD-8).

Table WILD-8. Original and Existing Deep Snow Marten Habitat

WAA	Deep Snow Marten Habitat (acres)[1/, 2/]
2007	13,135
5130	9,243
5131	4,026
5132	1,769
5133	8,359
5135	1,041
5136	5,497
5137	5,991
5138	6,399
Total	**55,460**

Notes:
1/ Includes NFS and non-NFS lands.
2/ High volume POG (SD 5S, 5N, 6/7) at or below 800 feet elevation

Although marten travel easily through non-commercial forests, POG, and clearcuts with established cover (Flynn et al. 2007), they require large, contiguous patches of old-growths (Hargis et al. 1999; Flynn et al. 2004). These areas provide refugia from trapping pressure. Large areas of unroaded, non-coastal habitat provide important refugia for marten in GMU 3. Increased human access associated with new roads or corridors may result in increased marten harvest-related mortality. Existing road densities (all elevations included) in the analysis area WAAs are listed in Table WILD-9.

Table WILD-9. Existing Road Density including All Elevations

WAA[1/]	Road Density (mi/mi^2)[2/]		
	Open	Closed	Total
2007	0.8	0.1	0.9
5130	0.1	0.0	0.2
5131	0.4	0.0	0.4
5132	0.3	0.0	0.4
5133	0.0	0.0	0.1
5135	0.2	---	0.2
5136	0.4	0.1	0.5
5137	0.0	---	0.0
5138	0.6	0.0	0.6
Total	**0.4**	**0.0**	**0.4**

Notes:
1/ Includes NFS and non-NFS lands.
2/ Closed roads are defined as all NFS roads with Operating Maintenance Level = 1, plus all decommissioned NFS roads; open roads include all other NFS roads and all state and private roads. Dashed lines indicate WAAs with no closed roads.

River Otter

The river otter was selected as an MIS because of its association with coastal and freshwater aquatic environments and the immediately adjacent (within 100 to 500 feet) upland habitats (USDA Forest Service 2008c). Beach characteristics affect the availability of food and cover, and adjacent upland vegetation is important in providing cover for otters. Old-growth forests provide canopy cover, large-diameter trees and snags, and burrow and den sites (Melquist and Hornocker 1983). River otters rest in cavities or beneath the roots of large conifers or snags in POG forests with open understories (SD5N, SD5S, SD67 categories; Larsen 1984; Ben-David et al. 1996; Bowyer et al. 2003). Suitable river otter habitat is located in the creek drainages and along the shoreline in the analysis area. ADF&G currently allows unlimited trapping of this species in GMU 3. Protection under the Forest Plan is provided through Beach, Estuary, and Riparian standards and guidelines (USDA Forest Service 2008a). However, modifications to shoreline and riparian habitats can occur in association with roads and utility corridors if these habitats are crossed. There are 18,656 acres of beach fringe and 37,810 acres of riparian buffers within the analysis area; there is no estuary fringe in the analysis area (Table WILD-10).

Table WILD-10. Existing Acres of Beach Fringe and Riparian Buffers in the Analysis Area

WAA	Beach Fringe (acres)[1/]	Riparian Buffers (acres)[1/]
4230	311	1,513
4240	2,031	4,883
4250	3,490	3,974
4260	0	4,448
4271	0	750
4290	0	6,053
4370	1,385	2,156
4380	1,313	2,992
4410	0	280
4420	2,345	840
4440	110	2,470

Table WILD-10. Existing Acres of Beach Fringe and Riparian Buffers in the Analysis Area (continued)

WAA	Beach Fringe (acres)1/	Riparian Buffers (acres)1/
4450	512	2,345
4460	1,251	379
4470	5,906	4,729
Total	**18,656**	**37,810**

Note:
1/ Approximately 980 acres are classified as both beach fringe and riparian buffer. There are no acres within estuary fringe within the analysis area.

Red Squirrel

The red squirrel was selected as an MIS because it is an important prey species for marten and because it requires forests with cone-producing trees and cavities in trees and snags for nesting and denning. Red squirrels are also a small game species.

Red squirrels use POG forests for nesting and denning, but may also use young growth stands because cone production typically begins 40 years after timber harvest (USDA Forest Service 2008c). Forest Plan Reserve Tree/Cavity-Nesting Habitat standards and guidelines maintain habitat for this species (USDA Forest Service 2008a). There are 282,962 acres of POG within the analysis area (Table WILD-3).

Vancouver Canada Goose

The Vancouver Canada goose was selected as an MIS because of its association with wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the Forest (USDA Forest Service 2008c). The Vancouver Canada goose is a primarily non-migratory waterfowl species that occurs year-round throughout Southeast Alaska (Hupp et al. 2010). However, geese do move locally between nesting, brood rearing, molting, and wintering grounds. This species nests in forested habitats associated with beach fringe, estuary fringe, and riparian corridors. Hupp et al. (2010) documented nests in forests adjacent to muskegs. Forest Plan Waterfowl and Shorebird, Wetland, Riparian, and Beach and Estuary Fringe standards and guidelines maintain Vancouver Canada goose habitat (USDA Forest Service 2008a). However, modifications to shoreline and riparian habitats can occur in association with roads and utility corridors if these habitats are crossed.

Bald Eagle

The bald eagle was selected as an MIS because of its use of coastal areas for foraging and nesting. Bald eagles typically nest in large trees in spruce-hemlock forest, and over 90 percent of the nests are within 500 feet of a saltwater beach. Southeast Alaska, the bald eagle population increased until the 1980s, but since then has remained stable, with an adult population of approximately 13,000-26,000 birds (Hodges 2011).

Bald eagles are especially sensitive to disturbance early in the breeding season. They are also susceptible to water quality impacts that adversely impact their prey populations (e.g., herring, flounder, pollock, and salmon). The availability of nesting habitat is not seen as a significant limiting factor, in part due to the full protection of the 1,000-foot shoreline beach buffer on the Tongass (Hodges 2011). Further protection to bald eagles is afforded by Forest-wide standards and guidelines that require the maintenance of Beach and Estuary Fringe as well as riparian buffers (USDA Forest Service 2008a).

Bald eagles are managed by the USFWS under the National Bald and Golden Eagle Protection Act and through the Bald Eagle Take Permit Program (USFWS 2009). Bald eagle nesting activity within the analysis area has been documented along the shores of Frederick Sound, Duncan Canal, and Keku Strait. There are two nests within 600 feet of the northwest end of the transmission line corridor (all alternatives) along Keku Straight. There are an additional 18 nests within 600 feet of the Northern Route corridor (Alternatives 2 and 3).

Hairy Woodpecker, Red-breasted Sapsucker, Brown Creeper

The red-breasted sapsucker, hairy woodpecker, and brown creeper were selected as MIS to represent old-growth-associated and snag-dependent species. Hairy woodpeckers and red-breasted sapsuckers are primary cavity excavators that require snags and dying trees for foraging and nesting. The brown creeper requires large diameter old-growth trees. All three species are associated with interior forest conditions (Kissling and Garton 2008). Therefore, these species may be affected by activities that remove large trees or result in habitat fragmentation. Existing acres of each POG category within the analysis area are provided in Table WILD-1. The existing level of landscape connectivity and fragmentation is described above under the *Wildlife Habitat* subsection. Habitat for these species is maintained by Forest Plan Reserve Tree/Cavity-Nesting Habitat standards and guidelines.

Threatened, Endangered, and Sensitive Species

Threatened, endangered, and candidate species potentially occurring in the analysis area were identified through consultation with the USFWS and NMFS. Table WILD-11 identifies those carried forward in the analysis based on known occurrences or the presence of suitable habitat in the analysis area. These species are addressed in detail in the Biological Evaluation (BE) and separate Biological Assessment (BA) prepared for the proposed project, which is included in the project record (Tetra Tech 2014c and Tetra Tech 2015, respectively). For the remaining species, the analysis area is outside of their known range or suitable habitat is not present in the analysis area. Therefore, the proposed project will have no effect on these species and they are not addressed further.

Table WILD-11. Threatened, Endangered, Candidate, and Alaska Region Sensitive Species in the Analysis Area

Common Name	Scientific Name	Status	Jurisdiction
Humpback whale	*Megaptera novaeangliae*	Endangered	NMFS
Steller sea lion (Western DPS)	*Eumetopias jubatus*	Endangered	NMFS
Steller sea lion (Eastern DPS)[1/]	*Eumetopias jubatus*	R10 Sensitive Species	Forest Service
Chinook salmon	*Oncorhynchus tshawytshca*	Threatened or Endangered; depending on the run	NMFS
Snake River sockeye salmon	*O. nerka*	Threatened or Endangered; depending on the run	NMFS
Steelhead	*O. mykiss*	Threatened or Endangered; depending on the run	NMFS
Lower Columbia River coho salmon	*O. kisutch*	Threatened or Endangered; depending on the run	NMFS
Hood Canal Chum Salmon	*O. keta*	Threatened or Endangered; depending on the run	NMFS
Green Sturgeon (Southern DPS)	*Acipenser medirostris*	Threatened	NMFS
Black Oystercatcher	*Haematopus bachmani*	R10 Sensitive Species	Forest Service
Queen Charlotte goshawk	*Accipiter gentilis laingi*	R10 Sensitive Species	Forest Service

Note:
1/ Steller sea lion (Eastern DPS) was delisted (see CFR Vol. 78, No. 213 dated November 4, 2013). The final rule recently took effect on December 4, 2013; therefore, this species is Forest Service Alaska Region Sensitive Species. Species identified as Candidate by the USFWS and/or NMFS will automatically be designated as R10 sensitive species.

Forest Service Alaska Region Sensitive Species potentially occurring in the analysis area were identified from the most recent Regional Forester's list (USDA Forest Service 2009d). The Queen Charlotte goshawk and the black oystercatcher have the potential to occur in the analysis area (Table WILD-1). A detailed discussion of the Queen Charlotte goshawk is provided below because this species is associated with the old-growth forest ecosystem. The black oystercatcher is associated with rocky shorelines along the coast and is, therefore, not considered further because these areas are protected by the 1,000-foot beach buffer that is part of the Forest Plan's Beach and Estuary Fringe Standards and Guidelines.

Queen Charlotte Goshawk

The Queen Charlotte goshawk is of special concern to the State of Alaska (Cotter 2007) and has been included by Stenhouse and Senner (2005) on Audubon's Alaska WatchList. The Queen Charlotte goshawk is recognized as a distinct subspecies of the northern goshawk (*Accipiter gentilis*) that occurs only in coastal areas of British Columbia and in Southeast Alaska. In 2007, in response to a court-ordered remand on a petition to list the species, the USFWS updated a 1997 status review for the Queen Charlotte goshawk, and concluded that Alaska supports a DPS of this species though listing of this DPS was not warranted (USFWS 2007).

The goshawk is a year-round resident in Southeast Alaska and may occupy different or overlapping breeding and winter territories. Goshawk breeding territories can be described hierarchically in terms of the nest site, the nest area, post-fledging area (PFA), and foraging area (see Reynolds et al. 1992 and the project BE for detailed descriptions). Goshawks in Southeast Alaska typically nest in large, contiguous patches of tall, mature, and old trees with dense canopies. When mature and old-growth habitats are not available they will nest in maturing young-growth with sufficient structure (Reynolds et al. 2006; Boyce et al. 2006). Goshawk foraging areas typically consist of mature and old-growth forest stands, though they will also forage in young forest as well as along edges and in openings as long as suitable perches from which to observe and attack prey are present (Iverson et al. 1996, Bosakowski et al. 1999; McClaren 2004; Boyce et al. 2006; Reynolds et al. 2006).

Goshawks consume a wide variety of prey species and are capable of alternating between prey species, depending on prey occurrence and availability. In prey rich areas such as Kupreanof and Mitkof islands, blue grouse and red squirrels are the dominant species taken (Lewis et al. 2006).

Within the analysis area, there are currently approximately 141,673 acres of POG, of which 48,506 acres are high-volume POG that provide potential goshawk habitat (Table WILD-1). There are six known goshawk nest territories (some including multiple alternative nest sites) within the analysis area VCUs (USDA Forest Service 2010b) including:

- The Scott Peak territory (VCU 4440; activity documented in 2003)
- The Duncan Creek territory (VCU 4390; activity documented at alternative nest sites in 1994, 1999, 2000, and 2001)
- The Mitchell Creek territory (VCU 4370; activity documented in 1994 and 1995)
- The Mountain Point territory (VCU 4470; activity documented in 1994)
- The Big John Creek territory (VCU 4290; activity documented at alternative nest sites in 1992 and 1993)
- The Irish Lake territory (VCU 4290; activity documented in 1996)

Two new nests were discovered during Project surveys, including one south of Petersburg in VCU 4470 and one just west of Duncan Canal along the Center-South Route in VCU 4380. The Northern route corridor (Alternatives 2 and 3) comes within 600 feet of the nest associated with the Scott Peak territory and one of the newly documented nests. The Center-South route corridor (Alternative 4) comes within 600 feet of a nest associated with the Mitchell Creek territory and one of the newly documented nests.

Migratory Birds

Executive Order 13186 provides for the conservation of migratory birds and their habitats and requires the evaluation of the effects of Federal actions on migratory birds, with an emphasis on species of concern. Agencies are required to support the conservation and intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

The Tongass National Forest has identified 40 bird species of management concern that may occur on the Forest. This list was derived from Boreal Partners in Flight (1999) and USFWS (2002) species of concern lists. The hemlock/Sitka spruce/cedar forest habitat type, the most common type in the analysis area, is the primary habitat type used by 14 of these species, and the secondary habitat type used by 8 species. Any of these species could occur in the vicinity of the analysis area during various times of the year. See the Wildlife and Subsistence resource report for a list of species (Tetra Tech 2014f). The main management issue for migratory birds on the Tongass is the removal of POG forests, which can remove perching, foraging, and nesting habitat and result in habitat fragmentation, potentially reducing the suitability of remaining forest for species associated with interior forest conditions (Kissling 2003; Sperry 2006).

Endemics

The Federal 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 and improve knowledge of habitat relationships of rare or endemic terrestrial mammals that may represent unique populations with restricted ranges.” Likewise, the NFMA directs that management prescriptions “shall preserve and enhance the diversity of plant and animal communities, including endemic(s).”

Due to its archipelago geography and highly dynamic glacial history, Southeast Alaska has been found to be a region with an especially high degree of endemism (Demboski et al. 1998). Approximately 20 percent of the small mammal taxa (species and subspecies) known to occur in Southeast Alaska are endemic to an island or a group of islands (Dawson et al. 2007). However, there remain many uncertainties about the extent of endemism in Southeast Alaska because research to date has primarily focused on mammals, thus the level of endemism in other organisms such as plants, birds, amphibians, and invertebrates is unknown. Kupreanof and Mitkof Islands are not considered hotspots of endemism (Cook et al. 2006). However, the following endemic wildlife species are known to occur on Kupreanof and Mitkof Islands (ISLES 2013):

- Alexander Archipelago wolf: endemic to Southeast Alaska (Weckworth et al. 2005; discussed above).
- Alexander Archipelago black bear: endemic to coastal British Columbia and Southeast Alaska, except Admiralty, Baranof, and Chichagof islands (Stone and Cook 2000; discussed above)
- Insular dusky shrew (*Sorex monticolus elassodon*): restricted to the Alexander Archipelago and Haida Gwaii; occurs in forest, shrub, and meadow habitat but requires microhabitats with dense ground cover which may aid in predator avoidance (Nagorsen 1996). They are closely associated with riparian zones (Smith and Belk 1996)

The EIS discussion focuses on the insular dusky shrew, as this is the only endemic species that is not addressed in its own subsection. Vegetation removal, particularly in riparian zones, could reduce the amount of, and fragment, shrew habitat.

Subsistence

Subsistence refers to the natural resources used by rural Alaskans. Under Section 803 of ANILCA, subsistence is defined as: "the customary and traditional uses by Alaska residents of wild renewable resources for direct, personal, or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

ANILCA provides for "the continuation of the opportunity for subsistence users by rural residents of Alaska, including both Natives and non-Natives, on the public lands." It also states that "customary and traditional" subsistence uses of renewable resources "shall be the priority consumptive use of all such resources on the public lands of Alaska."

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 analysis area coincides with the Petersburg/Kupreanof community use area, which includes the towns of Petersburg and Kupreanof, and the Kake community use area, which includes the town of Kake (USDA Forest Service 2008c). More than 90 percent of households within these community areas harvest some subsistence resource (USDA Forest Service 1997b).

Subsistence resources in vicinity of the KPI Project include deer, moose, marine mammals, salmon, other finfish, marine invertebrates (e.g., crabs, clams, and shrimp), waterfowl, berries, seaweed, other plants, wood (Firman and Bosworth 1990). The most important subsistence resources based on edible pounds harvested include land mammals, salmon and shellfish for Petersburg/Kupreanof households, and deer, salmon, and other finfish for Kake households (USDA Forest Service 1997b). The primary subsistence use areas within the analysis area include Duncan Canal, Mitkof Island, and west Kupreanof Island (USDA Forest Service 2008c). Petersburg/Kupreanof residents harvest deer within WAAs 2007, 5133, and 5138; Kake residents primarily harvest deer from the southern end of Admiralty Island in GMU 4, though hunt to some extent in the analysis area in WAAs 5131 and 5132 (USDA Forest Service 2008c).

ANILCA requires that the analysis of potential effects on subsistence uses focus on three factors: 1) subsistence resource distribution and abundance, 2) access to subsistence resources, and 3) competition for the use of subsistence resources. These factors are addressed below in the context of the KPI Project.

Distribution and Abundance

Deer and moose occur throughout the analysis area year round. Marine mammals, such as seals, occur in the nearshore marine waters adjacent to the analysis area. Streams and lakes within the analysis area and adjacent marine waters provide habitat and contribute to the production of fish that support the local subsistence, sport, and commercial fisheries of the area. Waterfowl occur in the analysis area during spring and fall migration and primarily on lakes and in bays and estuaries. Subsistence plants, which include firewood, seaweed, and berries, occur in previous harvested areas (berries) and near beach and estuarine areas.

Access

The primary modes of access for harvesting wildlife and other subsistence resources include boats, foot travel, motorized vehicles, and all-terrain vehicles. The analysis area is accessed primarily from saltwater by boat or floatplane. Petersburg and Kake are served by the Alaska Marine Highway and Petersburg has daily jet service. Four NFS road systems are located within the analysis area: the Mitkof road system on Mitkof Island, and the Tonka, Portage, and Kake road systems on Kupreanof Island (see Figure TRAN-1 in the *Transportation* section). Most of these NFS roads were constructed as part of previous timber sale contracts for the purpose of timber haul and administration. None of the communities within the analysis area are connected by the existing road systems. Changes in access can affect the level of effort required, time involved, and the effectiveness of the hunt, as well as potentially increase competition for subsistence resources (if associated with increased hunter success; USDA Forest Service 2009a).

Competition

Competition for subsistence resources may occur when resources are abundant and access is available to local and non-local users. Competition can also occur between different subsistence user groups and between subsistence hunters and sport hunters. The analysis area is accessible by other communities (e.g., Sitka and Juneau) from the sea and air.

Environmental Effects

Habitat

Clearing the right-of-way of vegetation for the construction and operation of the proposed project would result in the removal of existing forested wildlife habitat. Following project construction, non-forested vegetation would be allowed to grow to a height at which it would not interfere with the transmission line. Thus habitat for wildlife species that use shrub, muskeg, or other low-growing habitats would be maintained over time. Existing snags would be maintained where they do not pose a hazard to personnel or to the transmission line structures.

Old-growth Forest Ecosystem and Landscape Connectivity and Fragmentation

Effects Common to All Alternatives

A functional and interconnected old-growth ecosystem is essential to maintaining various components of biodiversity, including structural complexity (within-stand and landscape level), connectivity (unfragmented, contiguous blocks of old growth), stand age and species composition, and various ecological processes (e.g., tree establishment, disturbance, and nitrogen fixation [USDA Forest Service 2008c]). Through the permanent (through the life of the project) removal of POG, all of the action alternatives would reduce biodiversity by shifting the age-structure of the forest within the proposed right-of-way (i.e., removed trees are replaced by younger generation cohorts; Franklin et al. 1997); changing the composition of understory vegetation (Deal and Tappeiner 2002); and removing key habitat features, such as large decadent trees, snags, and downed logs. These changes may reduce the range of habitats that support diverse plants and animal communities and alter the ecological processes supported by the old-growth ecosystem. The amount of POG and its distribution across the landscape provide a measure of the effects of the project on the old-growth forest ecosystem. All action alternatives would maintain at least 97 percent of the existing POG in each of the analysis area VCUs and would affect less than 1 percent of the total, high-volume, or large-tree POG within the analysis area as a whole (Table WILD-12).

Indirectly, project-related vegetation clearing would fragment and potentially reduce the quality of remaining habitats. Fragmentation may remove linkages between habitat patches, making it harder for some wildlife to move across the landscape. Remaining habitat patches would become smaller and less suitable for species associated with interior forest conditions. A continuously distributed population could become a series of small, subpopulations that rely on the ability of dispersing individuals of genetic interchange and recolonization in the event of local extirpation. The degree to which this would occur would depend on species-specific dispersal capabilities, the distance between habitat patches, and conditions between habitat patches (Wilcove et al. 1986). It can be assumed that the alternatives that remove the most POG would have the greatest adverse effects to the old-growth forest ecosystem.

Low elevation passes, beach fringe, and riparian areas provide natural movement corridors for wildlife within the analysis area VCUs. They are also important components of the conservation strategy that provide connectivity between old-growth reserves and other non-development LUDs. All vegetation clearing for the action alternatives would occur below 1,500 feet and would include clearing within the beach fringe and riparian corridors. This could potentially reduce low elevation travel corridors, as well as connectivity between interior forest and saltwater. Where possible, the transmission line would span streams, limiting the amount of riparian vegetation removal. Alternatives that remove the most POG within beach fringe, riparian buffers, and other corridors are assumed to have the greatest effects to landscape connectivity.

Table WILD-12. Impacts to Total, High-Volume, and Large-Tree POG by VCU

VCU	Acres Impacted and Percent Existing POG Remaining[1/]							
	Alt 1		Alt 2		Alt 3		Alt 4	
	Acres	%	Acres	%	Acres	%	Acres	%
TOTAL POG								
4230	0	100	0	100.0	0	100.0	0	100.0
4240	0	100	16	99.9	16	99.9	0	100.0
4250	0	100	17	99.8	17	99.8	27	99.7
4260	0	100	5	100.0	5	100.0	2	100.0
4271	0	100	0	100.0	0	100.0	29	99.3
4290	0	100	0	100.0	0	100.0	10	100.0
4370	0	100	0	100.0	0	100.0	48	99.5
4380	0	100	0	100.0	0	100.0	164	98.4
4410	0	100	12	99.0	12	99.0	0	100.0
4420	0	100	9	99.8	9	99.8	0	100.0
4440	0	100	52	99.5	52	99.5	0	100.0
4450	0	100	0	100.0	0	100.0	0	100.0
4460	0	100	104	97.9	104	97.9	0	100.0
4470	0	100	112	99.6	108	99.6	17	99.9
Total	**0**	**100**	**327**	**99.8**	**324**	**99.8**	**296**	**99.8**
HIGH-VOLUME POG								
4230	0	100	0	100.0	0	100.0	0	100.0
4240	0	100	0	100.0	0	100.0	0	100.0
4250	0	100	1	99.9	1	99.9	2	99.9
4260	0	100	0	100.0	0	100.0	0	100.0
4271	0	100	0	100.0	0	100.0	3	99.7
4290	0	100	0	100.0	0	100.0	0	100.0
4370	0	100	0	100.0	0	100.0	10	99.8
4380	0	100	0	100.0	0	100.0	32	98.6
4410	0	100	11	97.4	11	97.4	0	100.0
4420	0	100	0	100.0	0	100.0	0	100.0
4440	0	100	18	99.5	18	99.5	0	100.0
4450	0	100	0	100.0	0	100.0	0	100.0
4460	0	100	41	98.2	41	98.2	0	100.0
4470	0	100	27	99.8	26	99.8	3	100.0
Total	**0**	**100**	**99**	**99.8**	**97**	**99.8**	**51**	**99.9**
LARGE-TREE POG								
4230	--	--	--	--	--	--	--	--
4240	0	100	0	100.0	0	100.0	0	100.0

Table WILD-12. Impacts to Total, High-Volume, and Large-Tree POG by VCU (continued)

VCU	Acres Impacted and Percent Existing POG Remaining[1/]							
	Alt 1		Alt 2		Alt 3		Alt 4	
	Acres	%	Acres	%	Acres	%	Acres	%
4250	0	100	0	100.0	0	100.0	1	99.8
4260	0	100	0	100.0	0	100.0	0	100.0
4271	0	100	0	100.0	0	100.0	1	99.6
4290	0	100	0	100.0	0	100.0	0	100.0
4370	0	100	0	100.0	0	100.0	0	100.0
4380	0	100	0	100.0	0	100.0	1	99.8
4410	0	100	0	100.0	0	100.0	0	100.0
4420	0	100	0	100.0	0	100.0	0	100.0
4440	0	100	4	99.3	4	99.3	0	100.0
4450	0	100	0	100.0	0	100.0	0	100.0
4460	0	100	8	98.6	8	98.6	0	100.0
4470	0	100	0	100.0	0	100.0	0	100.0
Total	**0**	**100**	**12**	99.8	**12**	99.8	**3**	100.0

Note:
1/ Total POG = SD 4H, 4S, 4N, 5S, 5N, 67 classes; high-volume POG = SD5S, 5N classes, 67; large-tree POG = SD67 class.

Cumulative Effects Common to All Alternatives

Past timber harvest has reduced the amount of POG in the analysis area VCUs and resulted in reduction of POG and fragmentation of the old-growth forest ecosystem. Ongoing and foreseeable projects that have similar effects include timber harvest on NFS lands, including micro-sales and Free Use, and on state lands, as well as road construction/maintenance projects. Young-growth management and other habitat restoration activities would have beneficial effects to the old-growth forest ecosystem by reducing the stem exclusion phase of stand development and promoting stand development. All action alternatives would contribute to the cumulative loss of POG forest and fragmentation within the analysis area VCUs. However, because less than one percent of the existing POG forest would be impacted under any action alternative when viewed by VCU and the analysis area as a whole, incremental additions to cumulative impacts would be minor under all alternatives.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and there would be no direct or indirect effects on the old-growth forest ecosystem because there would be no transmission line construction or associated activities. The existing amount of total POG, high-volume POG, and large-tree POG would be maintained in the analysis area VCUs under Alternative 1 (Table WILD-1). The amount of POG within the beach fringe and riparian buffers would also be maintained (Table WILD-13). Under Alternative 1, the level of fragmentation would remain unchanged, except for naturally occurring events (e.g., windthrow).

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects as no action would be undertaken. Viable, well-distributed populations would be expected to continue across the Kupreanof/Mitkof biogeographic province.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Alternative 2 would affect a total of 327 acres of POG, including 99 acres of high-volume POG and 12 acres of large-tree POG (Table WILD-12). This includes 182 acres of POG within the beach fringe and riparian buffers (Table WILD-13). The total acreage of POG forest, acres of high-volume POG, and acres of large-tree POG affected under Alternative 2 would be comparable to Alternative 3, and the greatest among the action alternatives (Table WILD-12).

Table WILD-13. Acres of POG Affected within Beach Fringe and Riparian Buffers[1/]

VCU	Acres Impacted			
	Alt 1	Alt 2	Alt3	Alt 4
4230	0	0	0	0
4240	0	3	3	0
4250	0	5	5	6
4260	0	3	3	0
4271	0	0	0	4
4290	0	0	0	1
4370	0	0	0	19
4380	0	0	0	88
4410	0	0	0	0
4420	0	0	0	0
4440	0	20	20	0
4450	0	0	0	0
4460	0	84	84	0
4470	0	66	62	11
Total	**0**	**182**	**178**	**130**

Note:
1/ Note there are no areas of estuary fringe within the analysis area.

Alternative 2 would reduce the amount of POG forest adjacent to the shoreline of Frederick Sound; however, north-south connectivity would be maintained through a narrower corridor. Alternative 2 would also cross one of the remaining POG corridors across the northern end of the Lindenberg Peninsula, connecting Frederick Sound and Portage Bay, reducing the east-west connection between these areas. Additionally, Alternative 2 would cross the pinch point between the Lindenberg peninsula and the rest of Kupreanof Island. However, the proposed alternative would follow an existing road in this area, resulting in moderate effects to connectivity.

Cumulative Effects

Alternative 2 would contribute to the cumulative loss of POG forest and fragmentation in the analysis area VCUs, comparable to Alternative 3 but to a lesser extent than Alternative 4. Alternative 2 would also contribute to the reduction in connectivity across the analysis area created by past timber harvest and road development. The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. An estimated 38 acres of the disturbed area is classified as POG forest, with 12 acres identified as high-volume POG and 6 acres identified as large-tree POG. In addition to the above acres, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit-related disturbance as part of the Kake road project.

Given the amount of POG forest and corridors that would remain following implementation of this alternative (Tables WILD-12 and WILD-13), Alternative 2 in combination with past, ongoing, and foreseeable projects would be expected to maintain viable, well-distributed populations across the Kupreanof/Mitkof biogeographic province.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Alternative 3 would affect 324 acres of POG forest, including 97 acres of high-volume POG and 12 acres of large-tree POG (Table WILD-12). This includes 178 acres of POG within the beach fringe and riparian buffers (Table WILD-13). The total acreage of POG forest, acres of high-volume POG, and acres of large-tree POG affected under Alternative 3 would be comparable to Alternative 2, and the second most among the action alternatives. Effects to corridors and landscape connectivity would be the same as described under Alternative 2.

Cumulative Effects

Alternative 3 would contribute to the cumulative loss of POG forest and fragmentation in the analysis area VCUs, comparable to Alternative 2 but to a slightly lesser extent. Contributions to reductions in connectivity and the additional cumulative disturbance associated with the Kake road project would be the same as described under Alternative 2. Given the amount of POG forest and corridors that would remain following implementation of this alternative (Tables WILD-12 and WILD-13), Alternative 3 in combination with past, ongoing, and foreseeable projects would be expected to maintain viable, well-distributed populations across the Kupreanof/Mitkof biogeographic province.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would affect 296 acres of POG forest, including 51 acres of high-volume POG and 3 acres of large-tree POG (Table WILD-12). This includes 130 acres of POG within the beach fringe and riparian buffers (Table WILD-13). The total acreage of POG forest affected under Alternative 4 would be the least among the action alternatives.

Alternative 4 would result in the least habitat fragmentation among the other action alternatives due to the lower amount of POG forest removed. Alternative 4 would cross one of the remaining POG corridors across the southern end of the Lindenberg Peninsula, and a corridor across Kupreanof Island connecting Duncan Canal with Hamilton and Big John Bays. East-west connectivity would be maintained in these areas but through narrower corridors.

Cumulative Effects

Alternative 4 would contribute to the cumulative loss of POG forest and fragmentation in the analysis area VCUs. Alternative 4 would also contribute to the reduction in connectivity across the analysis area created by past timber harvest and road development. The Kake road project would disturb an estimated 167 acres of land in areas where it would not follow existing roads. An estimated 63 acres of the disturbed area is classified as POG forest, with 22 acres identified as high-volume POG and 6 acres identified as large-tree POG.

Given the amount of POG forest and corridors that would remain across Kupreanof Island following implementation of this alternative, Alternative 4 in combination with past, ongoing, and foreseeable projects would be expected to maintain viable, well-distributed populations across the Kupreanof/Mitkof biogeographic province.

Old-growth Reserves

Evaluation and modification of small OGRs during project-level environmental analysis are addressed under Old-growth LUD Standard and Guideline WILD1(B). Situations in which modifications of OGRs may require completion of a project-level review are described in Appendix K of the Forest Plan (USDA Forest Service, 2008b, p. K-1). These include if:

- Actions are proposed within the OGR that will reduce the integrity of the old-growth habitat in the OGR, and
- The OGR will be affected by a land conveyance, power line, mine or other project that was not considered in the Forest Plan.

The KPI Project was officially considered in the Forest Plan. The two route corridors evaluated here are identified as Potential Power Transmission Corridors, which were taken into account in the Forest Plan Final EIS analyses (USDA Forest Service 2008c). Therefore, the analysis of old-growth reserves here focuses on actions proposed within individual small OGRs. Note that none of the proposed KPI Project alternatives would cross or otherwise impact medium or large OGRs.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no effect on the OGR system and, therefore, no change in the ability of existing small OGRs to comply with the Forest Plan minimum acreage requirements (Forest Plan Appendices D and K; Table WILD-14).

Cumulative Effects

Alternative 1 would not change the cumulative effects to the old-growth reserve system as analyzed by the Forest Plan Final EIS because no actions within small OGRs are proposed under this alternative. The effects of individual ongoing or reasonably foreseeable development projects that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed as they are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 would cross small OGRs in VCUs 4440 and 4460. This would result in the conversion of 42 acres of OGR in VCU 4440 and 25 acres of OGR in VCU 4460 to the Transportation and Utility System (TUS) LUD (Table WILD-14). Under both alternatives this would also result in a minor reduction in the amount of POG forest within the small OGRs (13 acres in VCU 4440 and 6 acres in VCU 4460; Table WILD-14). However, both small OGRs would continue to meet minimum Forest Plan acreage requirements under alternatives 2 and 3 (Table WILD-14). No new roads would be constructed in these small OGRs. Therefore, neither alternative would reduce the integrity of the old-growth forest ecosystem within the small OGRs in VCUs 4440 and 4460.

Cumulative Effects

Alternatives 2 and 3 would make no contribution to the amount of roads and a negligible contribution to the amount of early seral habitat currently within the small OGRs in VCUs 4440 and 4460. Conversion of acreage within the proposed right-of-way from OGR to the TUS LUD would reduce the overall amount of small OGR and POG acres included in the reserve system, but both small OGRs would continue to meet Forest Plan minimum acreage requirements. The effects of individual ongoing or foreseeable development projects, including the Kake road project, that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed as they are proposed.

Table WILD-14. Old-Growth Reserves Consistency with Forest Plan Appendix K Criteria

	VCU 4250		VCU 4260		VCU 4380		VCU 4440		VCU 4460	
	Alt 1 (existing), 2, 3	**Alt 4**	**Alt 1 (existing), 2, 3**	**Alt 4**	**Alt 1 (existing), 2, 3**	**Alt 4**	**Alt 1 (existing) and 4**	**Alt 2 and 3**	**Alt 1 (existing) and 4**	**Alt 2 and 3**
Forest Plan Appendix K Criteria										
Required OGR (acres)1/	6,540		6,794		4,422		3,858		1,786	
Required POG (acres)2/	3,270		3,397		2,211		1,929		893	
OGR acres	5,462	5448	6,829	6,827	4,360	4,317	3905	3863	1,883	1,859
POG acres	2,691	2,685	3,425	3,424	2,205	2,174	2495	2482	1,080	1,074
Acreage requirements met?3/	No	No	Yes	Yes	No, but acceptable because adjacent non-development LUD provides additional total and POG acres	No, but acceptable because adjacent non-development LUD provides additional total and POG acres	Yes	Yes	Yes	Yes

Notes:
1/ 16% of VCU acres
2/ 50% of OGR acres
3/ Non-development LUD acreage can count toward Forest Plan minimum acreage requirements for small OGRs.

Alternatives 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would cross small OGRs in VCUs 4250, 4260, and 4380. This would eventually result in the conversion of 14 acres of OGR in VCU 4250, 752 acres of OGR in VCU 4260, and 23 acres in VCU 4380 to TUS LUD (Table WILD-14). This would also result in a reduction in the amount of POG forest within the small OGRs (7 acres in VCU 4250, 375 acres in VCU 4260, and 31 acres in VCU 4380; Table WILD-14). The existing small OGRs in VCU 4250 and 4380 currently do not meet Forest Plan minimum acreage requirements and would continue to do so under Alternative 4 (Table WILD-14). The small OGR in VCU 4260 currently meets minimum acreage requirements and would continue to do so under Alternative 4 (Table WILD-14). Therefore, Alternative 4 would not appreciably reduce the integrity of the old-growth forest ecosystem within the small OGRs in VCUs 4250, 4260, or 4380.

Cumulative Effects

Alternative 4 would not contribute additional roads and would result in a negligible increase the amount of early seral forest in the small OGRs. Conversion of acreage within the right-of-way from OGR to the TUS LUD would reduce the overall amount of small OGR and POG acres included in the reserve system. Forest Plan minimum acreage requirements would continue to be met in VCU 4260, and VCUs 4250 and 4380 would continue to fall short on total and POG acreage with minor additional acreage reductions under Alternative 4 in these VCUs. The effects of individual ongoing or foreseeable development projects , including the Kake road project, that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed as they are proposed.

Management Indicator Species

Black Bear

Effects Common to All Alternatives

Preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the Forest Plan Standards and Guidelines. Therefore, none of the alternatives are expected to substantially affect black bear habitat. However, all of the action alternatives would remove POG forest, which would reduce the amount of available black bear denning habitat (e.g., large woody structures such as hollow logs and hollow living trees; Davies et al. 2012; Table WILD-15). Removal of POG would increase forage availability for black bears in the resulting early-successional plant communities within the right-of-way which would be maintained over the life of the project. Additionally, under all action alternatives the right-of-way would cross (span) Class I salmon streams which could reduce the quality of black bear foraging habitat, particularly if riparian habitat would need to be removed. The following analysis assumes that alternatives that remove the greatest amounts of POG forest and have the most Class I stream crossings where riparian habitat removal is necessary for conductor line clearance would result in the greatest impacts to black bear habitat.

Table WILD-15. Acres of POG Removed by Alternative

WAA	Alt 1	Alt 2	Alt3	Alt 4
2007	0	45	43	10
5130	0	0	0	28
5131	0	5	5	74
5132	0	110	110	134
5133	0	0	0	179
5135	0	16	16	0
5136	0	199	199	0
5137	0	12	12	0
5138	0	77	76	116
Total	**0**	**464**	**461**	**541**

Construction of the transmission line has the potential to adversely affect black bears through activities that create noise or disturbance. However, these effects would be temporary and localized, lasting only during construction and sporadically during operation.

Road associated with the KPI Project may also indirectly increase the susceptibility of black bears to harvest if road access is increased or improved. Although there is no road density threshold for black bears, it can be assumed that an increase in roads, particularly in open habitats such as clearcuts, muskegs, and alpine areas, where bears forage and are easier to see, increases the potential for human-bear interactions. None of the alternatives propose new road construction. However, temporary shovel trails and temporary access spurs proposed under all action alternatives could still be used by hunters on foot. No new roads would be developed under the proposed alternatives and motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. As a result, increase in the harvest of bears due to human access along temporary shovel trails and access spurs would be minor if it were to occur.

Cumulative Effects Common to All Alternatives

Reductions in POG and new Class I stream crossings would contribute to the similar effects of ongoing and foreseeable timber harvest on NFS, state, and private lands. Timber harvest projects would result in a short-term (about 25 years) increase in the forage availability for bears (Porter 2008). However, over the long-term (25-150 years), as the forest canopy fills, forage species would be reduced. This could result in localized declines in the black bear population. Young-growth stands also lack large hollow trees and root masses important for denning. The Mitkof, Tonka, and Central Kupreanof restoration projects would improve habitat conditions for black bears over the short-term by increasing the period during which forage is available and over the long-term promote the development of larger trees which could provide suitable den sites.

Road building associated with past timber harvest in the analysis area WAAs has resulted in a limited number of roads used by hunters in the vicinity of Kake, Petersburg, and Kupreanof. No new roads would be developed under the proposed alternatives and motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. As a result, increase in the harvest of bears due to human access along temporary access spurs would be minor if it were to occur. Other timber harvest projects on NFS and state lands that involve road construction have the potential to result in road-related effects to black bears. Hunter access would also increase as a result of the Kake road project. The 2015 Kake Access Transportation Needs Assessment conducted as part of the KAP found that the primary use of a road connecting Kake and Petersburg, were one to be constructed, would be for "partial use trips" for recreation and subsistence (FHWA 2015). This finding would likely also apply to the Kake road project. The KPI Project would not contribute to this long-term increase in access were it to occur. In the foreseeable future, additional road storage and decommissioning would occur with implementation of the Petersburg Ranger District ATM, as funding allows.

Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, the proposed transmission line and associated facilities would not be constructed; therefore, this alternative would have no direct or indirect effects to black bears.

Cumulative Effects

Alternative 1 would not remove POG or result in Class I stream crossings or the construction of additional roads, and therefore would not contribute to cumulative effects to black bears.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Estimated POG removal would range from 461 acres under Alternative 3 to 541 acres under Alternative 4. Alternative 2 would result in the removal of approximately 464 acres of POG (Table WILD-15). Although all three alternatives would involve construction of temporary shovel trails and access spurs, none would result in Class I stream crossings by shovel trail or temporary access spur (Table 2-1). However, right-of-way corridor clearing under all three alternatives would span Class I salmon streams which could reduce the quality of black bear foraging habitat, particularly if riparian habitat would need to be removed. The number of Class I streams spanned under Alternatives 2, 3, and 4 are 37, 35, and 33, respectively.

Alternatives 2 and 3 would both involve the construction of an estimated 21.6 miles of temporary shovel trails and 7.6 miles of temporary access spurs, as well as the use of approximately 2 miles of temporary matting panels. Under Alternative 4, the corresponding totals would be 6.5 miles for shovel trails, 7.3 miles of temporary matting panels, and 6.2 miles of temporary access spurs. These proposed shovel trails, matting panels, and spurs would not be continuous or result in the connection of existing road systems (see Figures 2-1 and 2-2 for proposed shovel trail and matting panel locations). Temporary access spurs would be temporary work pads extending from existing roads to nearby structure locations (see Chapter 2 for more information). The development of these shovel trails and temporary access spurs is unlikely to result in substantial change to hunter access or measurably increase black bear susceptibility to harvest over the long term.

Cumulative Effects

All three action alternatives would make a minor contribution to the reduction in black bear habitat associated with ongoing and foreseeable timber harvest and road development projects. As noted with respect to direct and indirect effects, none of the alternatives would contribute substantially to increased harvest of black bears due to improved access.

Sitka Black-tailed Deer

Effects Common to All Alternatives

Over the long term, reductions in habitat capability resulting from the removal of POG forest reduce carrying capacity, or the numbers of deer an area is capable of supporting given the available resources. This could lead to a decline in the deer population, particularly following severe winters, if the demand for resources (e.g., food or habitat) exceeds that which is available. Declines in the deer population may decrease the availability of deer to wolves and hunters (Person 2001; Farmer et al. 2006; Brinkman et al. 2009).

All of the action alternatives would result in minor reductions in deer habitat capability (all alternatives would reduce current habitat capability by 2 percent or less in the affected WAAs; Table WILD-16). This is due to the linear nature of the project and that the action alternatives result in minor reductions in POG forest. Therefore, none of the alternatives are expected to reduce carrying capacity or result in a decline in the deer population over the long-term.

Table WILD-16. Deer Habitat Capability by WAA by Alternative (NFS Lands Only)

WAA	Habitat Capability Units (% change from 2013 values)				
	2013 (Current) Deer Habitat Capability [1/]	Alt 1	Alt 2	Alt 3	Alt 4
2007	2,238	--	2,235 (-<1%)	2,235 (-<1%)	2,235 (-<1%)
5130	2,688	--	2,688 (+/-0%)	2,688 (+/-0%)	2,688 (+/-0%)
5131	1,856	--	1,843 (-1%)	1,843 (-1%)	1,843 (-1%)

Table WILD-16. Deer Habitat Capability by WAA by Alternative (NFS Lands Only) (continued)

WAA	Habitat Capability Units (% change from 2013 values)				
	2013 (Current) Deer Habitat Capability 1/	Alt 1	Alt 2	Alt 3	Alt 4
5132	856	--	856 (+/-0%)	856 (+/-0%)	855 (-<1%)
5133	2,783	--	2,783 (+/-0)	2,783 (+/-0%)	2,783 (+/-0%)
5135	1,127	--	1,127 (+/-0)	1,127 (+/-0%)	1,127 (+/-0%)
5136	1,263	--	1,246 (-1%)	1,246 (-1%)	1,250 (-1%)
5137	1,265	--	1,264 (-<1%)	1,264 (-<1%)	1,265 (+/-0%)
5138	1,638	--	1,599 (-2%)	1,599 (-2%)	1,599(-2%)
Total	**15,714**		**15,641 (-<1%)**	**15,641 (-<1%)**	**15,645 (-<1%)**

Note:
1/ DHC calculated from the deer model for winter habitat at all elevations. Habitat Suitability Indices (HSIs) were standardized to range from 0.0 to 1.0; 100 deer per square mile used as multiplier; no predation was included.
Source: GIS Database, deer_model.aml, 2013.

Removal of POG under all of action alternatives would decrease the amount of available average snow and deep snow winter habitat (Table WILD-17). This could alter the distribution of these habitats on the landscape (Schoen et al. 1984), although they are already patchily distributed in the analysis area. Clearing of forested vegetation in the right-of-way would increase foraging habitat over the long-term, but could also reduce overall the amount of non-winter habitat (through POG reduction). If deer use of the right-of-way increases due to forage production, the linear nature of the cleared right-of-way may increase their exposure to predation by wolves (James and Stuart-Smith 2000). However, muskeg, alpine, and other non-forested habitats within the right-of-way would be maintained under all alternatives.

Table WILD-17. Changes to Average Snow Winter Range, Deep Snow Winter Range, and Non-Winter Habitat for Deer by WAA by Alternative (NFS and Non-NFS Lands)

WAA	Acres Impacted			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Deep Snow Winter Range1/				
2007	0	0	0	0
5130	0	0	0	0
5131	0	0	0	1
5132	0	0	0	1
5133	0	0	0	3
5135	0	0	0	0
5136	0	8	8	0
5137	0	1	1	0
5138	0	6	2	3
Total	0	**15**	**10**	**7**
Average Snow Deer Winter Range2/				
2007	0	7	4	2
5130	0	0	0	2
5131	0	1	1	8
5132	0	4	4	7
5133	0	0	0	14
5135	0	3	3	0
5136	0	31	31	0
5137	0	1	1	0
5138	0	10	6	10
Total	**0**	**57**	**50**	**43**

Table WILD-17. Changes to Average Snow Winter Range, Deep Snow Winter Range, and Non-Winter Habitat for Deer by WAA by Alternative (NFS and Non-NFS Lands) (continued)

WAA	Acres Impacted			
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**
Non-winter Habitat 3/				
2007	0	16	8	3
5130	0	0	0	6
5131	0	19	19	11
5132	0	21	21	17
5133	0	0	0	33
5135	0	17	17	0
5136	0	67	67	0
5137	0	3	3	0
5138	0	12	7	17
Total	**0**	**153**	**141**	**88**

Notes:
Values may not sum correctly due to rounding.
1/ High volume POG (SD 5S, 5N, 6/7) at or below 800-foot elevation
2/ All POG (SD 4H, 4N, 4S, 5H, 5S, 5N, 6/7) at or below 1,500-foot elevation
3/ Spring/summer/fall habitat; all POG, non-productive old-growth, non-forested, muskeg and alpine habitats. Note that muskegs and other habitats with low growing vegetation would be maintained within the right-of-way with exception of clearing of a centerline road under Alternatives 2, 4, and 6 therefore acreages presented are conservative.

Cumulative Effects Common to All Alternatives

Cumulative past harvest activities have reduced deer habitat capability within the analysis area. Habitat capability will continue to be reduced as natural and harvest-associated windthrow occur and previously harvested stands reach the stem-exclusion stage. This could result in further declines in the deer population. The proposed action alternatives would make a negligible contribution to these effects. Additional timber harvest on NFS lands and other lands would further reduce deer habitat capability, as would construction of the Kake road project; small sales and free use have a negligible effect on deer habitat capability because they do not result in substantial stand modification.

Average snow, deep snow, and non-winter habitat have also been reduced by past timber harvest. Further reductions by the proposed alternatives would be minor. Restoration projects under the Kake Watershed Plan and the Mitkof, Tonka, and Central Kupreanof restoration projects (see Chapter 3, *Analyzing Effects* under *Restoration Activities in the Project Area*) would improve deer habitat quality.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct effects to deer habitat capability or to average snow, deep snow, or non-winter habitat because no action would be undertaken.

Cumulative Effects

Alternative 1 would not contribute to cumulative reductions in deer habitat capability or habitat loss for deer.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Alternative 2 would result in a very minor reduction in deer habitat capability in the analysis area (less than 1 percent reduction within the analysis area WAAs; Table WILD-16). Viewed by individual WAA, effects would range from 0 to approximately 1 percent (WAAs 5131, 5132, and 5136) and 2 percent

(WAA 5138) (Table WILD-16). Alternative 2 would affect approximately 15 acres of deep snow winter habitat, 57 acres of average snow winter habitat, and 153 acres of non-winter habitat (one percent or less of the existing levels of these habitats in the analysis area; Table WILD-17). Note that non-forested habitat within the right-of-way would be maintained, retaining habitat value for deer.

Cumulative Effects

Alternative 2 would make very minor contributions to reductions in deer habitat capability and loss of deer habitat. Alternative 2 would maintain 53 to 97 percent of the historic habitat capability in the analysis area WAAs (Table WILD-18). With the anticipated reduction in deer habitat capability as previously harvested stands in the analysis area reach the stem exclusion stage and as foreseeable timber harvest projects are implemented, the incremental addition of Alternative 2 would not be expected to affect current deer population trends. Implementation of the Kake road project would add to the cumulative reduction in deer habitat capability, but would not alter the impact of the incremental addition of Alternative 2.

Table WILD-18. Cumulative Changes in Deer Habitat Capability by WAA by Alternative (NFS and Non-NFS Lands)

WAA	Deer Habitat Capability as Percent of 1954 Values				
	1954 (Historic) Deer Habitat Capability[1/]	Alt 1	Alt 2	Alt 3	Alt 4
2007	3,761	79	79	79	79
5130	2,900	94	94	94	94
5131	2,119	88	87	87	87
5132	3,027	54	53	53	53
5133	2,927	95	95	95	95
5135	1,158	97	97	97	97
5136	1,539	82	81	81	81
5137	1,322	96	96	96	96
5138	2,108	88	86	86	86
Total	**20,863**	**84**	**83**	**83**	**83**

Note:
1/ DHC calculated from the deer model for winter habitat at all elevations. Habitat Suitability Indices (HSIs) were standardized to range from 0.0 to 1.0; 100 deer per square mile used as multiplier; no predation was included.
Source: GIS Database, deer_model.aml, 2013.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Alternative 3 would result in a very minor reduction in deer habitat capability in the analysis area (less than 1 percent reduction within the analysis area WAAs; Table WILD-16), comparable to Alternative 2. Alternative 3 would affect approximately 10 acres of deep snow winter habitat, 50 acres of average snow winter habitat, and 141 acres of non-winter habitat (one percent or less of the existing levels of these habitats in the analysis area; Table WILD-17).

Cumulative Effects

Cumulative effects to deer under Alternative 3 would be the same as described under Alternative 2.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would result in a very minor reduction in deer habitat capability in the analysis area (less than 1 percent reduction within the analysis area WAAs; Table WILD-16). Alternative 4 would affect approximately 7 acres of deep snow winter habitat, 43 acres of average snow winter habitat, and 88 acres of non-winter habitat (one percent or less of the existing levels of these habitats in the analysis area; Table WILD-17).

Cumulative Effects

Alternative 4 would make very minor contributions to reductions in deer habitat capability and loss of deer habitat. Alternative 4 would maintain 53 to 97 percent of the historic habitat capability in the analysis area WAAs, the same as Alternatives 2 and 3 (Table WILD-18). With the anticipated reduction in deer habitat capability as previously harvested stands in the analysis area reach the stem exclusion stage and as foreseeable timber harvest projects are implemented, the incremental addition of Alternative 4 would not be expected to affect current deer population trends. Implementation of the Kake road project would add to the cumulative reduction in deer habitat capability, but would not alter the impact of the incremental addition of Alternative 4.

Alexander Archipelago Wolf

Effects Common to All Alternatives

The proposed project has the potential to directly adversely affect wolves through activities that create noise or disturbance, which could result in the displacement of individual wolves. There are no known wolf dens within the proposed rights-of-way; however, if a den site were discovered prior to or during construction the 1,200-foot Forest Plan den site buffer would applied. Therefore none of the alternatives would directly or indirectly impact active wolf dens.

Potential indirect effects of the proposed project include the reduction in habitat capability for the wolf prey base (deer) through the removal of POG forest from the right-of-way. It is assumed that a decline in the deer population would likely result in a decline in the wolf population and a reduction in wolf density (USDA Forest Service 2008c). Resonating effects could include reductions in opportunities to hunt or trap wolves. Therefore, impacts to wolves are assessed in terms of the reduction in deer habitat capability (based on habitat capability model outputs in terms of deer density). Note that this density does not represent actual population numbers but represents the functioning of the predator-prey system dynamic. Current deer habitat capabilities in the analysis area WAAs are below the Forest Plan guideline of 18 deer per square mile; however, all of the action alternatives would result in minor reductions in deer habitat capability (all alternatives would result in reductions 2 percent or less from the current habitat capability in the affected WAAs; Table WILD-19).

Table WILD-19. Relative Changes in Modeled Deer Density by WAA and Alternative (NFS Lands Only)

WAA	Habitat Capability		
	2013 (Current) Deer Habitat Capability (deer/mi^2)	Alt 1	Alt 2, 3, and 4
2007	13.8	13.8	13.7
5130	19.1	19.1	19.1
5131	16.9	16.9	16.8
5132	14.9	14.9	14.9
5133	16.6	16.6	16.6
5135	13.0	13.0	13.0
5136	13.5	13.5	13.3
5137	16.0	16.0	16.0
5138	17.0	17.0	16.6
Total	**15.8**	**15.8**	**15.7**

The proposed project could also indirectly affect wolves through increased human access along existing roads. None of the alternatives would involve new road construction. Construction access would be via existing roads and temporary access spurs, temporary shovel trails, and helicopter. Therefore, road densities in analysis area WAAs would continue to fall within Forest Plan recommendations and no long-term increases in hunter access would be anticipated. Motorized access to project-specific temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. As a result, human access along temporary shovel trails and access spurs would be minor if it were to occur.

Cumulative Effects Common to All Alternatives

Timber harvest that has occurred since 1954 has reduced habitat capability for deer in GMU 3 through the removal of POG. The proposed action alternatives would make a negligible contribution to this decline: 0.1 deer in WAA 2007 and 5131; 0.2 deer in WAA 5136; 0.4 deer in WAA 5138; and 0.1 deer for all WAAs combined. Ongoing and reasonably foreseeable timber harvest projects on NFS and lands in other ownership would have similar effects. Collectively these actions have the potential to result in localized declines in the deer population, and thus the prey base for wolves. The Mitkof, Tonka, and Central Kupreanof restoration projects would improve deer habitat quality. The proposed operational plan ADF&G submitted to the Alaska Board of Game in March 2013 for intensive management of Sitka black-tailed deer within GMU 3 included an experimental treatment program (i.e., wolf removal) for Mitkof Island and the northern and eastern potions Kupreanof. The KPI action alternatives would not incrementally add to the effects of this program were it to be implemented.

The existing road system in the analysis area is limited, and would not be expanded as a result of the action alternatives. Roads proposed in association with ongoing and foreseeable timber harvest projects would increase analysis area road densities providing hunters and trappers with greater access to unroaded areas. Hunter and trapper access would increase as a result of the Kake road project. New roads have the potential to increase wolf harvest rates. With no new road construction proposed, the KPI action alternatives would not incrementally add to these potential effects. Implementation of the Petersburg District ATM, which involves road closures, would reduce access on NFS lands.

Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, the proposed transmission line and associated facilities would not be constructed; therefore, this alternative would have no direct or indirect effects to wolves. Modeled deer densities would remain at currently estimated levels (Table WILD-19). Indirectly, overtime as previously harvested forest stands in the analysis area mature, deer habitat capability would be expected to decline.

Cumulative Effects

Alternative 1 would not directly contribute to cumulative effect to wolves because no action would be undertaken. Under this alternative, deer habitat capability in the analysis area WAAs would remain between 54 and 95 percent of the historic (1954) values (Table WILD-20).

Table WILD-20. Cumulative Impacts to Deer Habitat Capability by WAA by Alternative (NFS and Non-NFS Lands)

WAA	1954 (Historic) Deer Habitat Capability	Deer Habitat Capability as Percent of 1954 Values	
		Alt 1	Alt 2, 3, and 4
2007	18.8	79	79
5130	20.5	94	94
5131	19.3	88	87
5132	22.1	54	53
5133	17.4	95	95
5135	13.4	97	97
5136	16.5	82	81
5137	16.8	96	96
5138	19.3	88	86
Total	**18.6**	**84**	**83**

Alternatives 2, 3, and 4

Direct and Indirect Effects

Vegetation clearing along the right-of-way under all alternatives would result in a minor reduction in deer habitat which would be maintained over the long-term (see deer discussion above). This reduction of 0.1 percent decline under the action alternatives is not expected to measurably reduce modeled deer densities, and thus affect the prey base for wolves. Current deer habitat capability would be reduced by two percent or less from current valued in all analysis area WAAs (Table WILD-19). As noted above, none of the action alternatives would increase analysis area road densities and potential increases in access due to project-related temporary shovel trails and access spurs would be limited.

Cumulative Effects

The action alternatives would maintain between 53 and 97 percent of original (1954) deer habitat capability by WAA, the same as the existing levels (Table WILD-20). Therefore, the action alternatives would make a negligible contribution to impacts to the wolf prey base. Increased road densities (particularly open road densities) resulting from ongoing and foreseeable projects, especially the Kake road project, would likely increase wolf harvest mortality risk. None of the KPI alternatives involve road construction and would, therefore, not contribute to this potential long-term cumulative increase.

American Marten

Effects Common to All Alternatives

Construction of the proposed project has the potential to directly affect marten through disturbance which may displace individuals or could adversely affect young. The removal of forest cover and old-growth ecosystem features such as decadent live trees and snags (POG) within the proposed rights-of-way would reduce the structural complexity important to marten in relation to prey access, denning and resting sites, escape from predation, and thermoregulation (Buskirk and Zielinski 1997; Hargis et al. 1999; Flynn and Schumacher 2001). However, low growing vegetation, woody debris, and other features would be left in place within the right-of-way to the extent that they do not pose a safety hazard. Alternatives that result in the greatest reduction in deep snow marten winter habitat would be expected to have the greatest effects to marten (Table WILD-21).

Table WILD-21. Changes to Marten Deep Snow Winter Habitat by WAA by Alternative (NFS and Non-NFS Lands)

WAA	Acres Deep Snow Winter Habitat Impacted[1/]			
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**
2007	0	0	0	0
5130	0	0	0	0
5131	0	0	0	1
5132	0	0	0	1
5133	0	0	0	3
5135	0	0	0	0
5136	0	8	8	0
5137	0	1	1	0
5138	0	6	2	3
Total	**0**	**15**	**10**	**7**

Note:
1/ High volume POG (SD 5S, 5N, 6/7) at or below 800-foot elevation

Clearing of forested portions of the right-of-way would also increase fragmentation of the larger blocks of POG forest in the analysis area. However, connectivity would be maintained through narrower forested corridors under all alternatives (see Old-growth Forest and Landscape Connectivity discussion above). Additionally, because most of the large blocks of POG forest in the analysis area are unroaded or have very limited road systems, and none of the action alternatives propose roads, these areas would continue to provide trapping refugia for marten. Under all alternatives, short-term, localized increases in trapper access may occur along temporary shovel trails during the construction period; however, this is expected to minor were it to occur and would not be expected to measurably increase marten harvest rates. Additionally, although the right-of-way would create a linear corridor, there would be no permanent access along its length and it would not be maintained, cleared, or compacted for use by snowmobiles or other motorized uses. Therefore, none of the alternatives are expected to increase snowmobile-based marten trapping. Refugia would also continue to be maintained in the OGRs and other non-development LUDs in the analysis area.

Cumulative Effects Common to All Alternatives

Deep snow marten winter habitat has been reduced from historic levels in the analysis area by past timber harvest and other projects involving the removal of POG forest. The proposed project would result in minor additional reductions in deep snow marten habitat, contributing to similar effects resulting from on-going and foreseeable timber harvest projects on NFS, state, and private lands. Given the sensitivity of marten to changes in habitat, there has likely already been some change in marten distribution in the analysis area due to reductions in connectivity among patches of habitat.

The existing road system in the analysis area is limited, and would not be expanded as a result of the action alternatives. Roads proposed in association with ongoing and reasonably foreseeable timber harvest projects, including the Kake road project, would increase analysis area road densities and contribute to potential issues associated with human access and overexploitation of marten along the road system. With no new road construction proposed, the KPI action alternatives would not incrementally add to these potential effects. Additionally, as stated above, the project would not be expected to increase snowmobile-based marten trapping along the right-of-way. Implementation of the Petersburg District ATM, which involves road closures, would reduce access on NFS lands. The Forest Plan conservation strategy as a whole will continue to be critical in maintaining a sustainable marten population in the analysis area WAAs.

Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, the proposed transmission line and associated facilities would not be constructed; therefore, this alternative would have no direct or indirect effects to marten.

Cumulative Effects

Alternative 1 would not contribute to cumulative effect to marten because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Effects to deep snow winter habitat would range from approximately 7 acres under Alternative 4 to 15 acres under Alternative 2 (Table WILD-21). Alternative 3 would affect approximately 10 acres of deep snow winter habitat. In all cases, the affected acres comprise less than 1 percent of deep snow winter habitat present in the analysis area. All three alternatives would involve construction of temporary shovel trails and access spurs, and the use of temporary matting panels (Table 2-1). The development and use of these temporary shovel trails, matting panels, and temporary access spurs is unlikely to result in increased trapping pressure.

Cumulative Effects

All three action alternatives would make a minor contribution to the reduction in deep snow marten winter habitat in the analysis area. None of these alternatives would be expected to contribute substantially to increased trapping pressure because new access resulting from the action alternatives would be limited (as discussed above).

River Otter

Effects Common to All Alternatives

River otters prefer habitats, especially old-growth forest, immediately adjacent to coastal and fresh water aquatic environments, with most use occurring within 500 feet of the these areas. These habitats are protected by Forest Plan Standards and Guidelines for the beach and estuary fringe, riparian areas, and lakes. However, clearing of riparian forest and beach fringe within the right-of-way would occur under all action alternatives (Table WILD-13). Alternatives that result in the greatest reduction in these habitats would be expected to result in the greatest effects to river otters. However, effects to aquatic habitats used by river otters would be negligible due to the implementation R10, National Core, and State of Alaska BMPs for maintaining water quality. Therefore, all of the action alternatives would be expected to have minor effects to river otters.

Cumulative Effects Common to All Alternatives

All of the action alternatives would make minor contributions to the reduction of riparian and beach fringe habitat in the analysis area. Ongoing and foreseeable timber harvest, young-growth treatments, restoration, and road building activities on NFS lands would be subject to the same standards and guidelines, minimizing effects to river otter habitat. Young-growth treatments on NFS lands in riparian, beach, and estuary habits would improve habitat quality for river otters, as would restoration activities in the analysis area, particularly those focused on riparian and in-stream habitat improvement. Cumulative water quality impacts with the potential to affect aquatic habitats used by river otters would be expected to be minor, as all ongoing and foreseeable projects would implement R10, National Core, and State of Alaska BMPs for maintaining water quality.

Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, the proposed transmission line and associated facilities would not be constructed; therefore, this alternative would have no direct or indirect effects to river otters.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to river otters because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Effects to beach fringe and riparian buffer habitats would range from approximately 130 acres under Alternative 4 to 182 acres under Alternative 2 (Table WILD-13). Alternative 3 would affect approximately 178 acres of beach fringe and riparian buffer habitats. In all cases, the affected acres comprise less than 1 percent of these habitats present in the analysis area.

Cumulative Effects

All of the action alternatives would make a minor contribution to the loss of beach fringe and riparian buffer habitats in the analysis area. Given the implementation of Forest Plan Standards and Guidelines, including construction BMPs, these alternatives in combination with past, ongoing, and foreseeable projects would all be expected to maintain the river otter population.

Red Squirrel

Effects Common to All Alternatives

All action alternatives would reduce the quality and quantity of red squirrel nesting, foraging, and denning habitat in the analysis area. Effects would be expected to be greatest under alternatives that would remove the most POG forest. Fragmentation would also increase under all action alternatives. However, red squirrels will utilize forest openings, and therefore movements would not be expected to be inhibited by the right-of-way. Therefore, impacts on red squirrels are likely to be minor.

Cumulative Effects Common to All Alternatives

Past timber harvest has reduced the amount of red squirrel denning, nesting, and foraging habitat available in the Analysis area. Ongoing and foreseeable timber harvest on NFS lands, state, and private lands would result in additional habitat loss, as would construction of the Kake road project. All of the action alternatives would make a minor contribution to the reduction in red squirrel habitat within the analysis area (less than 1 percent of existing habitat). However, given the implementation of Forest Plan Standards and Guidelines, including construction BMPs, these alternatives in combination with past, ongoing, and foreseeable projects would all be expected to maintain the red squirrel population.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to the red squirrel because the proposed transmission line and associated facilities would not be constructed and no POG forest would be removed. Under Alternative 1, the analysis area would continue to be subject to natural disturbances (i.e., windthrow), which would create gaps of various sizes over time.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to red squirrels because no action would be undertaken.

Alternative 2, 3, and 4

Direct and Indirect Effects

Removal of POG under each alternative is discussed in the *Habitat* subsection above (Table WILD-12). Alternatives 2 and 3 would remove the greatest amount of POG, and therefore would have the greatest effect to red squirrels, followed by Alternative 4.

Cumulative Effects

All of the action alternatives would make a minor contribution to the reduction in red squirrel habitat within the analysis area (less than 1 percent of existing habitat). However, given the implementation of Forest Plan Standards and Guidelines, including construction BMPs, these alternatives in combination with past, ongoing, and foreseeable projects would all be expected to maintain the red squirrel population.

Vancouver Canada Goose

Effects Common to All Alternatives

Due to the extensive nature of wetlands in the analysis area, complete avoidance all wetlands is not feasible. Where a wetland cannot be avoided, impacts would be minimized through the implementation of BMPs as directed by the Forest Plan (see the *Wetlands* section of this EIS for additional information). Forest Plan Standards and Guidelines provide additional protection of areas that are important for Vancouver Canada goose nesting, brooding, rearing, and molting (see Forest Plan S&G XII *Waterfowl and Shorebird Habitats*, pages 4-93 to 4-94).

Clearing of the right-of-way and associated activities under all action alternatives would have the potential to affect Vancouver Canada geese through noise and disturbance if activities occur in the vicinity of nest sites. The proposed project would also affect this species through the removal of forested wetlands. Conversion of these stands to young growth would be expected to lower the ability of this habitat to support Vancouver Canada geese. Shrubs and trees would be expected to quickly revegetate the right-of-way, and wetland characteristics (e.g., soil moisture levels) may partially return to normal. However, since long-term right-of-way maintenance would prevent a mature forest in the right-of-way, wetland characteristics may remain altered in these wetlands, reducing habitat quality over the long-term. Alternatives that affect the most forested wetlands are assumed to have the greatest effects to Vancouver Canada geese.

Cumulative Effects Common to All Alternatives

Past timber harvest and road building have disturbed wetlands in the analysis area (see the *Wetlands* section for additional discussion), reducing the amount of habitat available for the Vancouver Canada goose. Previously logged forested wetlands in the process of regenerating generally support young forests, which may become suitable for geese, though habitat suitability would decline once stands hit the stem exclusion stage. The action alternatives would make a minor contribution to these effects.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to the Vancouver Canada goose because the proposed transmission line and associated facilities would not be constructed and no forested wetlands would be removed.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to the Vancouver Canada goose because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

All three action alternatives would affect forested wetlands. Including estimated right-of-way clearing, the total acres of forested wetlands potentially disturbed range from 106 acres (Alternative 4) to 166 acres (Alternative 2). An estimated 157 forested wetland acres would be disturbed under Alternative 3 (Table WET-3). Thus, all alternatives would reduce the amount of habitat available for Vancouver Canada geese. However, in all cases, this represents a small share of the total forested wetlands in the analysis area for Vancouver Canada geese.

Cumulative Effects

Clearing of the right-of-way and other construction activities would contribute to noise and disturbance resulting from other ongoing and foreseeable projects within and near forested wetlands which could affect nesting geese. The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor for Alternatives 2 and 3, including an estimated 13 acres of additional forested wetlands. For Alternative 4, the Kake road project would disturb an estimated 167 acres of land in areas where it would not follow existing roads, including an estimated 21 acres of forested wetlands. The cumulative disturbance of the KPI Project in conjunction with the Kake road project would still represent a small share of the total forested wetlands in the analysis area for Vancouver Canada geese. Further, all activities on NFS lands would implement Forest Plan standard and guidelines which maintain habitat for this species.

Bald Eagle

Effects Common to All Alternatives

Clearing for the right-of-way and other construction activities that create noise and disturbance (e.g., helicopter transport of transmission line structures) have the potential to result in minor, temporary disturbance to individual birds. As required by the Forest Plan, all alternatives would be conducted in accordance with the Bald and Golden Eagle Protection Act, including maintaining appropriate distances from active bald eagle nests. Helicopter flight paths that would avoid disturbance to bald eagle nests based on Bald and Golden Eagle Protection Act requirements would be identified as appropriate.

Cumulative Effects Common to All Alternatives

It is assumed that all ongoing and foreseeable actions in the analysis area would also be conducted in accordance with the Bald and Golden Eagle Protection Act. Therefore, no adverse cumulative effects to bald eagles are anticipated under any alternative.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to bald eagles because the proposed transmission line and associated facilities would not be constructed.

Cumulative Effects

Alternative 1 would make not contribution to cumulative effect to bald eagles because no action would be undertaken. As noted above, it is assumed that all other ongoing and foreseeable projects would be conducted in accordance with the Bald and Golden Eagle Protection act; therefore no adverse cumulative effects would occur.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Bald eagle nesting habitat in the analysis area is protected by OGRs, non-development LUDs, and the 1,000-foot beach and estuary buffer. As most nests are located in large trees within 500 feet of water (within the beach fringe), the loss of POG, particularly large tree POG, and the impacts to the beach fringe may provide the best indicator of impacts on eagles.

Tables WILD 12 and WILD 13 provide a breakdown of acres of POG that would need to be cleared for the transmission line right-of-way by alternative. Alternative 2 would affect a total of 327 acres of POG, including 99 acres of high-volume POG and 12 acres of large-tree POG (Table WILD-12). This includes 182 acres of POG within the beach fringe and riparian buffers (Table WILD-13). The total acreage of POG forest, acres of high-volume POG, and acres of large-tree POG that would be affected under Alternative 3 is very similar to Alternative 2. Alternative 4 would affect 296 acres of POG forest, including 51 acres of high-volume POG and 3 acres of large-tree POG (Table WILD-12). This includes 130 acres of POG within the beach fringe and riparian buffers (Table WILD-13). However, not all of this clearing would take place within the first 500 feet. Regardless, should an active nest be found adjacent to any proposed activity, appropriate nest site buffers and timing restrictions would be implemented to protect nesting bald eagles.

The marine crossings proposed under the action alternatives could directly or indirectly affect foraging habitat (coastal areas), through short-term reductions in water quality. However, impacts to bald eagle prey resources in the marine environment are not anticipated due to the implementation of spill control/rapid response measures in the event of an oil or fuel spill during construction and implementation of other BMPs for water quality (see the *Aquatic Resources* section for additional discussion). Therefore, all of the action alternatives would have negligible effects to bald eagles.

Cumulative Effects

Alternatives 2, 3, and 4 would make negligible contributions to cumulative effects to bald eagles associated with temporary, localized noise. All project activities would be implemented in accordance with the Bald and Golden Eagle Protection Act. It is assumed that ongoing and foreseeable actions in the analysis area would also be conducted accordingly. Thus, the proposed alternatives in combination with ongoing and foreseeable activities would have negligible cumulative effects to bald eagles.

Hairy Woodpecker, Red-breasted Sapsucker, and Brown Creeper

Effects Common to All Alternatives

Clearing for the right-of-way and associated activities under all action alternatives have the potential to disturb nesting adults and young, destroy nests, reduce habitat availability or cause nest abandonment. Because these species are year-round residents, timber harvest activities could also disturb and displace birds during the non-breeding season.

Direct effects to the red-breasted sapsucker, hairy woodpecker, and brown creeper would also result from the removal of nesting and foraging habitat (POG forest) and associated structural components (e.g., large-diameter trees, snags) from within the proposed rights-of-way. Indirectly, right-of-way clearing would increase fragmentation, reducing the effectiveness of interior forest habitat and creating habitat edges along which there may be increased rates of nest predation by avian predators (Kissling and Garton 2008). Alternatives that remove more POG forest would be expected to have greater effects to these species.

Cumulative Effects Common to All Alternatives

Past timber harvest in the analysis area has reduced the amount of foraging and nesting habitat available in the analysis area for the red-breasted sapsucker, hairy woodpecker, and brown creeper. Fragmentation resulting from past timber harvest has also reduced patch sizes, decreasing the suitability of remaining habitat through the loss of interior forest conditions. All of the action alternatives would make minor contributions to these effects. Ongoing and foreseeable timber harvest on NFS lands, including small sales and free use, state lands, and private lands would result in additional habitat loss and associated fragmentation. The Kake road project also has the potential to result in additional habitat loss and associated fragmentation relative to all three KPI action alternatives. Young-growth treatments on NFS lands and restoration projects may provide additional foraging opportunities for cavity nesters through the increase in downed wood. Under all alternatives, the Forest Plan conservation strategy would maintain snag and large-tree habitat for these species.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to the hairy woodpecker, red-breasted sapsucker, and brown creeper because no POG forest would be removed. Under Alternative 1, the analysis area would continue to be subject to natural disturbances (i.e., windthrow), which would create gaps of various sizes over time.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to the hairy woodpecker, red-breasted sapsucker, or brown creeper because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Removal of POG under each alternative is discussed in the *Habitat* subsection above (see also Table WILD-12). Alternatives 2 and 3 would remove the greatest amount of POG and result in the greatest amount of fragmentation, and therefore would have the greatest effect to the hairy woodpecker, red-breasted sapsucker, and brown creeper, followed by Alternative 4.

Cumulative Effects

All of the action alternatives would make a minor contribution to the reduction in habitat for the hairy woodpecker, red-breasted sapsucker, and brown creeper within the analysis area (less than 1 percent of existing habitat). However, given the implementation of Forest Plan Standards and Guidelines, including construction BMPs, these alternatives in combination with past, ongoing, and foreseeable projects would all be expected to maintain populations of these species.

Threatened, Endangered, and Sensitive Species

A preliminary determination was made to assess the effects of the project on threatened, endangered, candidate, and sensitive species. A detailed analysis of effects to each species is provided in the project BE (Tetra Tech 2014c). None of the alternatives would adversely affect listed species or their habitats, nor would they be likely to result in a trend toward Federal listing or a loss of viability for any sensitive species. A detailed analysis of effects to the Queen Charlotte goshawk is provided below.

Queen Charlotte Goshawk

Effects Common to All Alternatives

The proposed alternatives have the potential to directly adversely affect goshawks through activities that create noise or disturb adults or young, potentially resulting in the temporary displacement of individual birds or nest abandonment.

If a new nest were located during the course of the project, Forest Plan Standards and Guidelines for goshawk nest protection would apply (USDA Forest Service 2008a, page 4-99). These guidelines include maintaining an area of not less than 100 acres of productive old-growth forest (if present) generally centered over the nest tree or probable nest site to provide for prey handling areas, perches, roosts, alternate nests, hiding over, and foraging opportunities for young goshawks (USDA Forest Service 2008a).

Timing restrictions would apply to activities in the vicinity of an active nest to allow that year's brood to successfully fledge. Probable nest stands (e.g., a goshawk is observed but no direct or indirect evidence of a confirmed nest is documented) may allow activities within the 100 acres surrounding a probable nest stand, but only if two years of monitoring indicate no use. Goshawks are year-round residents in the analysis area; therefore, Project activities could disturb or temporarily displace birds during the non-breeding season.

Direct effects to goshawks would also result from the reduction of perching, foraging, and potential nesting habitat through the removal of POG forest. Indirectly, removal of forest cover within the right-of-way has the potential to affect the abundance and availability of prey (e.g., red squirrels). It is assumed that alternatives that remove the most POG forest would have the greatest effects to goshawks.

Under all action alternatives, there is the risk of collision with the transmission line and electrocution during project operation. Collisions with transmission line structures (e.g., poles) are unlikely because goshawks are adept at navigating and avoiding structures while flying through forested environments. To minimize the risk of collisions with guy wires and the transmission line and electrocution, the line would be constructed in compliance with Avian Power Line Interaction Committee (APLIC) standards.

Cumulative Effects Common to All Alternatives

Past timber harvest and associated activities in the analysis area has removed and fragmented POG forest potentially used by goshawks. Ongoing and future timber harvest on NFS and state and private lands in the analysis area would result in additional loss of old-growth forest. The action alternatives would make a minor contribution to these effects. Ongoing and foreseeable young-growth treatment and other thinning projects on NFS lands will, over the long-term, enhance goshawk habitat.

Foraging goshawks could be temporarily disturbed or displaced by activities associated with construction of the proposed project. Similar disturbance also has the potential to occur in association with the other timber harvest, restoration, ongoing road maintenance activities, and new road construction, including the Kake road project. Minor short-term cumulative effects to goshawks may occur if the noise or disturbance associated with these activities and the proposed project coincide.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects to goshawks because the proposed transmission line and associated facilities would not be constructed.

Cumulative Effects

Alternative 1 would not contribute to cumulative effects to goshawks as no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Removal of POG under each alternative is discussed in the *Habitat* subsection above (see also Table WILD-12). Alternatives 2 and 3 would remove the greatest amount of POG (327 acres and 324 acres, respectively), followed by Alternative 4 (296 acres; Table WILD-12). Alternatives 2 and 3 would also remove the most high-volume POG (99 acres and 97 acres, respectively), followed by Alternative 4 (51 acres). Regardless of the alternative, the reduction in total and high-volume POG would be minor, comprising one percent or less of the existing amount within the analysis area as a whole, and 2 percent or less from any individual VCU (Table WILD-12).

As noted in the *Affected Environment* subsection, two new nests were discovered during Project surveys, including one south of Petersburg in VCU 4470 and one just west of Duncan Canal along the Center-South Route in VCU 4380. The Northern route corridor (Alternatives 2 and 3) comes within 600 feet of the nest associated with the Scott Peak territory and one of the newly documented nests. The Center-South route corridor (Alternative 4) comes within 600 feet of a nest associated with the Mitchell Creek territory and one of the newly documented nests. If a new nest were located during the course of the project, Forest Plan Standards and Guidelines for goshawk nest protection would apply (USDA Forest Service 2008a, pages 4-99). Under the Forest Plan Standards and Guidelines, no goshawk nests would be removed and at least 100 acres of POG would be mapped and maintained near nests. Timing restrictions would apply to activities in the vicinity of a nest to allow that year's brood to successfully fledge. Probable nest stands (e.g., a goshawk is observed but no direct or indirect evidence of a confirmed nest is documented) may allow activities within the 100 acres surrounding a probable nest stand, but only if two years of monitoring indicate no use. Depending on the selected alternative and the timing of construction in the vicinity of these nest locations, a combination of follow up surveys and/or implementation of a timing restriction within 600 feet of the nest tree locations from March 15 to August 15 would apply. Activity restrictions are removed for active nests that become inactive or unsuccessful.

Cumulative Effects

All of the action alternatives have the potential to result in a local reduction in goshawk nesting and foraging habitat, due to the removal of POG forest. The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor for Alternatives 2 and 3, including 114 acres of NFS lands. An estimated 38 acres of the disturbed area is classified as POG forest, with 12 acres identified as high-volume POG and 6 acres identified as large-tree POG. For Alternative 4, the Kake road project would disturb an estimated 167 acres of land in areas where it would not follow existing roads, including an estimated 63 acres classified as POG forest, with 22 acres identified as high-volume POG and 6 acres identified as large-tree POG. In addition to the above acres, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit-related disturbance as part of the Kake road project. However, given the amount of remaining POG forest within the analysis area, including high volume POG (Table WILD-12), none of the alternatives would be expected to result in a reduction in the density of goshawks using the analysis area or in impacts to goshawk prey populations. Given that goshawks are highly mobile and that habitat is protected under the Forest Plan conservation strategy, the effects of the proposed project in combination with past, present, and foreseeable activities may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing.

Migratory Birds

Effects Common to All Alternatives

Direct effects to migratory birds would result from disturbances that disrupt breeding birds, remove active bird nests, or cause nest abandonment. For species that are year-round residents, clearing of the right-of-way and associated activities have the potential to disturb and displace birds during the non-breeding season. The migratory bird species most likely to be adversely affected by the project are those that primarily nest in POG forests (e.g., Western screech-owl, rufous hummingbird, red-breasted sapsucker, Pacific-slope flycatcher, Steller's jay, northwestern crow, chestnut-backed chickadee, golden-crowned kinglet, varied thrush, Townsend's warbler, and blackpoll warbler). Species associated with early successional habitats and forest edges (e.g., MacGillivray's warbler, golden-crowned sparrow, and golden-crowned kinglet) may benefit from clearing of the right-of-way.

Habitat fragmentation can strongly influence bird community composition and bird distribution and has been identified as a major cause of population declines of breeding migratory songbirds (DellaSala et al. 1996; Manuwal and Manuwal 2002). Clearing of the right-of-way would reduce the effectiveness of interior forest habitat, and increase the potential for nest predation and nest parasitism for some species, which can ultimately reduce reproductive success (Robinson et al. 1995).

Migratory birds would be most susceptible to impacts from vegetation removal occurring in suitable nesting habitat during the nesting/fledging period. The USFWS has recommended time periods for Alaska during which to avoid vegetation clearing in order to avoid these impacts. In forests and woodlands of Southeast Alaska, this time period is April 15 through July 15 (USFWS 2006). As a result, the effect of any action alternative on migratory birds is likely to be minor.

Under all alternatives there is the risk that migratory birds could collide with the transmission line or be electrocuted. The transmission line would be built to APLIC standards which would minimize this risk (APLIC 2006).

Cumulative Effects Common to All Alternatives

Past timber harvest in the analysis area has removed migratory bird habitat or reduced its suitability through fragmentation (and associated edge effects such as predation). The action alternatives would make a minor contribution these effects. Ongoing and foreseeable timber harvest and road development projects would result in additional loss of habitat for some migratory bird species. Young-growth treatment on NFS lands and restoration activities that involve thinning, would collectively improve habitat conditions for old-growth associated migratory birds; though over the long-term, these stands would become available for harvest again. Species associated with early successional and scrub habitats would experience short-term benefits from ongoing and foreseeable timber harvest projects.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no adverse direct and indirect effects to migratory birds because no action would be undertaken.

Cumulative Effects

Alternative 1 would make not contribution to cumulative effect to migratory birds because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Removal of POG forest in the analysis area by alternative and associated fragmentation effects are discussed in the *Habitat* subsection above. Alternatives 2 and 3 would remove the greatest amount of POG (327 acres and 324 acres, respectively), followed by Alternatives 4 (296 acres; Table WILD-12).

Cumulative Effects

All of the action alternatives would contribute to the reduction in habitat for migratory bird species associated with POG habitats and increase fragmentation. However, effects would be localized and would not preclude migratory birds from using the analysis area. Species associated with early successional and scrub habitats would benefit from clearing of the right-of-way. Birds may be displaced if project activities occur during the nesting season.

Endemics

Effects Common to All Alternatives

The insular dusky shrew, the only known endemic species potentially occurring in the analysis area and not addressed above, is associated with riparian habitats and therefore could be affected by vegetation removal where the transmission line right-of-way, temporary shovel trails, or temporary access spurs cross riparian zones. Construction of the proposed project through these areas could directly disturb shrews and remove and fragment suitable habitat. It is assumed that alternatives that remove the most riparian habitat (habitat within riparian buffers) would have the greatest effect to insular dusky shrews.

Cumulative Effects Common to All Alternatives

All of the action alternatives would make minor contributions to the reduction of riparian habitat in the analysis area. Ongoing and foreseeable timber harvest, young-growth treatments, restoration activities, and road development/improvement projects on NFS lands would be subject to the same standards and guidelines, minimizing effects to insular dusky shrew habitat. Young-growth treatments on NFS lands in riparian, beach, and estuary habits would improve habitat quality for this species, as would restoration activities in the analysis area, particularly those focused on riparian habitat improvement.

Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, the proposed transmission line and associated facilities would not be constructed; therefore, this alternative would have no direct or indirect effects to the insular dusky shrew.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to the insular dusky shrew because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Acres of riparian habitat impacted would range from 33 acres under Alternatives 2 and 3 to 110 acres under Alternative 4, less than 1 percent of this habitat available in the analysis area.

Cumulative Effects

All the action alternatives would make a minor contribution to the loss of riparian habitat in the analysis area. Given the implementation of Forest Plan Standards and Guidelines, including construction BMPs, the proposed alternatives in combination with past, ongoing, and reasonably foreseeable projects would be expected to result in minor impacts to the insular dusky shrew.

Subsistence

Effects Common to All Alternatives

ANILCA requires that any analysis of project-related effects on Federal lands within Alaska take into account, 1) subsistence resource distribution and abundance, 2) access to these resources by subsistence users, and 3) competition for the use of these subsistence resources. Changes in access to subsistence resources due to project-related activities can affect the level of effort required, time involved, and the effectiveness of harvesting these resources. Altered distributions and abundance of subsistence resources can affect competition between subsistence and non-subsistence user, as well as competition between individual subsistence users.

None of the proposed alternatives would present “a significant possibility of a significant restriction” of subsistence uses for any subsistence resources (fish and marine invertebrates, food plants, personal use timber, upland game birds and waterfowl, furbearers, big game, and marine mammals).

Potential impacts to these resources are described below. The discussion of the alternatives focuses on deer which are the largest terrestrial component of subsistence food resources, and are considered an indicator for potential subsistence resource consequences concerning the abundance and distribution of resources (USDA Forest Service 2008c).

<u>Fish and Marine Invertebrates</u>: The proposed project would not affect the abundance and distribution of, access to, or competition for anadromous or marine fish and marine invertebrates. The risk of project-related impacts to fish populations would be minimal because of Forest Plan beach and estuary, riparian, and fish standards and guidelines which maintain water quality and fish habitat (see the *Aquatic Resources* section for additional discussion). Although the project may adversely affect Freshwater EFH and Marine EFH, effects would be temporary and localized (see the *Aquatic Resources* section). Fishing and marine invertebrate harvesting occurs primarily from boats, on beaches, and along estuaries. No project-related activities expected to occur in the marine environment would preclude access to, or increase competition, for these resources.

<u>Food Plants and Personal Use Timber</u>: None of the alternatives are expected to negatively affect the abundance or distribution of subsistence plants gathered for food, because these resources are abundant in previously harvested areas, and may increase in abundance within the cleared right-of-way. The proposed project would not preclude Alaska residents from obtaining timber and firewood for personal use. Temporary shovel trails under all action alternatives may temporarily increase local access to areas where food plants and firewood can be gathered. Therefore, short-term changes in competition for food plants or personal use timber may occur. However, motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged.

<u>Upland Game Birds and Waterfowl</u>: All action alternatives would result in a minor reduction in upland game bird habitat (i.e., POG). No measurable effects to waterfowl would occur, given that most species occur in the analysis area only during migration on lakes and in bays and estuaries (an exception is the Vancouver Canada goose which uses forested wetlands which are protected under Forest Plan Standards and Guidelines), and thus would be minimally exposed to project-related activities in the vicinity of these areas. Thus no changes in the abundance or distribution of upland game birds and waterfowl are anticipated under any of the alternatives. No new roads would be developed under the proposed alternatives and motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. As a result, potential increases in the number of hunters due to improved access would likely be minor. Further, competition would likely remain the same because upland birds and waterfowl do not contribute a large percentage of the foods for the subsistence communities in the analysis area.

<u>Furbearers</u>: Estuary, riparian, and forested coastal habitats that receive the greatest use by furbearers, such as river otters and ermine, are protected under the Forest Plan conservation strategy and standards and guidelines. Although the action alternatives would remove a minor amount of beach fringe and riparian buffer habitat, the proposed project would not be expected to affect the abundance or distribution of these species. Clearing of the right-of-way would reduce the amount and increase fragmentation of POG forest, which could affect the local distribution of marten. However, no measurable increase in hunter access would occur under any of the action alternatives (see Marten discussion above), and therefore no increase in harvest vulnerability for any furbearer would be expected. Therefore, none of the action alternatives would be expected to result in an increase in competition among local communities.

<u>Marine Mammals</u>: Marine mammals have the potential to be exposed to disturbance and noise associated with MAF or LTF activity, potential collisions with vessels, and fuel or oil spills associated with vessel traffic during construction of the marine crossings. Marine construction activities and associated vessel traffic are not likely to affect the abundance or distribution of marine mammals in Frederick Sound (Alternatives 2 and 3), Wrangell Narrows (Alternatives 2, 3, and 4), or Duncan Canal (Alternative 4), given the transient nature of these species and the fact that such vessels typically operate at low, constant speeds, giving the marine mammal species time for avoidance, and would operate at infrequent intervals. Additionally, it is assumed that all vessels operating on behalf of the proposed project would adhere to Marine Mammal Protection Act, ESA, and NMFS guidelines for approaching marine mammals, as required under the Forest Plan. Therefore, no change in access to, or competition for, marine mammals would occur as a result of the project.

Cumulative Effects Common to All Alternatives

Past timber harvest has altered the distribution of subsistence resources used by the communities in the vicinity of the KPI Project, through changes in the distribution of habitat types. The proposed project would make minor contributions to these effects. Young-growth treatments and habitat restoration projects would likely have a positive effect on the abundance and distribution of deer and other land-based subsistence resources. Ongoing and reasonably foreseeable timber harvest projects and associated road construction would contribute to these effects, as would the Kake road project. Effects may include decreased habitat capability for deer, and reductions in habitat for other subsistence resources (e.g., game birds) which could decrease distribution and abundance of subsistence resources, as well as increased access to and competition for subsistence resources due to new roads. The 2015 Kake Access Transportation Needs Assessment conducted as part of the KAP found that the primary use of a road connecting Kake and Petersburg, were one to be constructed, would be “partial use trips” for recreation and subsistence (FHWA 2015). This finding would likely also apply to the Kake road project. The KPI Project would not contribute to this long-term increase in access were it to occur. In the foreseeable future, additional road storage and decommissioning would occur with implementation of the Petersburg Ranger District ATM, as funding allows.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 would have no direct or indirect effects on subsistence resources as no project-related activities would occur.

Cumulative Effects

Alternative 1 would make no contribution to cumulative effects to subsistence resources because no action would be undertaken.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Distribution and Abundance

After clearing for the right-of-way, deer may locally shift their patterns of activity in response to the transition from mature forest to early successional vegetation (Wallmo and Schoen 1980). As described above, implementation of the action alternatives would result in negligible decline in deer winter habitat capability (one percent or less from existing amounts) which would not be expected to lead to a reduction in the deer population (Table WILD-16; see also the deer discussion above for additional detail). Therefore, the action alternatives would be expected to result in minor effects to the distribution of deer, and negligible effects to deer abundance.

Access

Road building is an important agent of change in Southeast Alaska. Road networks provide greater access to areas previously not accessible and can affect subsistence both positively and negatively by providing access, dispersing hunting pressure, and creating the potential for increased competition for favored hunting areas among communities connected by the existing road system (USDA Forest Service 2008c). No new roads would be developed under the proposed alternatives and motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. Access would decrease as these temporary spurs are allowed to revegetate following the 3-year construction period, after which none of the action alternatives would affect subsistence access. As a result, potential increases in the number of hunters due to improved access would likely be minor. Historical access would remain available under all the alternatives.

Competition

Competition for subsistence resources is a result the distribution and fluctuation in population levels of game species, harvest regulations, mobility, and access provided to rural communities in the form of roads, ferries, and commercial air carriers. The analysis area is commonly used by subsistence hunters from Kake, Kupreanof, and Petersburg. The existing road networks on Kupreanof Island connect Kake and Petersburg to parts of the analysis area, allowing access to the area for hunting and other subsistence activities. However, the communities are not connected to each other via the road network. None of the action alternatives would result in increased competition for deer because the existing level of access to the analysis area would be maintained over the long-term (no new roads are proposed under any of the alternatives) and deer population levels would not change (the minor reduction in habitat capability under all action alternatives would not be expected to reduce the number of deer available to hunters).

Cumulative Effects

The action alternatives would make very minor contributions to reductions in deer habitat capability. All action alternatives would maintain 53 to 97 percent of the historic habitat capability in the analysis area WAAs (Table WILD-18). The Kake road project, as currently conceived, would follow the State's right-of-way easement from Kake to Petersburg for a total length of 52.6 miles. Part of this would involve new road construction. In other areas, the Kake road project would likely involve improvements to the existing NFS road system. This road project would improve access to areas that are presently more challenging to reach and could result in an increase in the number of hunters in these areas, and an increase in competition. The KPI Project would not contribute to these potential impacts were they to occur.

Mitigation

The effects of the KPI Project on wildlife would be limited through the site-specific application of Forest Plan Standards and Guidelines including Beach and Estuary, Nesting Habitat, Bald Eagle, Heron and Raptor Nest Protection, Alexander Archipelago wolf, Goshawk, and Marine Mammals, and project-specific mitigation measures (see Chapter 2).

Transportation

Introduction

The transportation section provides an assessment of the current condition of the project area and the potential effects of implementing the proposed action and the alternatives on transportation. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the proposed project (i.e., the no action alternative).

Analysis Area and Methodology

The analysis area for direct, indirect, and cumulative effects to transportation consists of the VCUs crossed by one of more of the action alternatives. The information sources used for this analysis include GIS transportation data maintained by the Tongass National Forest. Impacts are assessed based on the proposed access for each alternative. Potential impacts during construction include the transportation of workers, equipment, and materials along the proposed rights-of-way, as well as the potential removal of merchantable timber (i.e., trees with commercial value as timber). Impacts during operation are primarily related to the proposed development of permanent helicopter pads for future maintenance needs.

Affected Environment

The analysis area includes state and municipal roads located in and around Petersburg and Kake, as well as NFS roads. State and municipal roads in the analysis area include the Mitkof Highway and Sandy Beach Road in Petersburg and Keku Road in Kake. The Petersburg and Kake community road systems are on non-NFS lands and not under the jurisdiction of the Tongass National Forest. There is no interconnecting highway system between islands or communities in the analysis area.

Four NFS road systems are located within the analysis area: the Mitkof road system on Mitkof Island, and the Tonka, Portage, and Kake road systems on Kupreanof Island. Most of these NFS roads were constructed as part of previous timber sale contracts for the purpose of timber haul and administration. Most current road use is administrative, logging traffic, or public use, with the latter use mainly occurring in the vicinity of communities (USDA Forest Service 2009a).

National Forest System Roads

Forest Road Classification

Forest roads are classified as NFS roads, temporary roads, and unauthorized roads by 36 CFR 212.1. The definitions for these road types are provided below.

- *National Forest System road:* “A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.” 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 timber harvest and other activities. When a road is not needed in the short term but future use is anticipated, it is closed and placed in storage. NFS roads are managed by a system of maintenance levels (ML), depending on their intended use and suitability for various types of vehicles. These levels are ML 1 (closed and in storage), ML 2 (suitable for high-clearance vehicles), ML 3 (suitable for passenger vehicles, rough surface), ML 4 (suitable for passenger vehicles, smooth surface), and ML 5 (suitable for passenger cars, dust free, possibly paved). These levels are summarized further below:

- ML 1 – Closed: Assigned to intermittent service roads during the time they are closed to vehicle traffic. Emphasis is normally given to maintaining drainage facilities and runoff patterns. ML 1 roads may be of any type, class, or construction standard, and may be managed at any other maintenance level when they are open for traffic.
- ML 2 – Mixed Use: Assigned to roads open for use by high-clearance vehicles and OHVs. Traffic is normally minor, usually consisting of one use or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.
- ML 3 – Passenger Vehicles: Assigned to roads open and maintained for travel by a prudent driver in a highway legal vehicle. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low-speed, single-lane roads with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
- ML 4 – Passenger Vehicles: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double-lane and aggregate surfaced. However, some roads may be single-lane. Some roads may be paved and/or dust abated.
- ML 5 – Passenger Vehicles: Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities. Some may be aggregate surface and dust abated.

- *Temporary road or trail:* "A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail, and that is not included in a forest transportation atlas." Temporary roads are intended for short-term use and maintained for a limited time usually to access a timber harvest unit. Temporary roads are decommissioned after their intended use.
- *Unauthorized Road or Trail:* "A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas." These include unplanned roads and off-road vehicle tracks that have not been designated and managed as roads or trails. Roads that are no longer under permit or authorization and have not been decommissioned are also considered unauthorized.
- *Decommissioned Road:* A road removed from the long-term forest road transportation system. Decommissioning ranges from blocking the entrance to the road 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

Forest Roads in the Analysis Area

There are four NFS road systems located within the KPI project area: the Mitkof road system on Mitkof Island and the Tonka, Portage, and Kake road systems on Kupreanof Island (Figure TRAN-1). The Decision Notice and Finding of No Significant Impact (DN/FONSI) for the ATM Plan EA for the Petersburg Ranger District identified 130.7 miles of NFS roads on Mitkof Island and 237.7 miles on Kupreanof Island (Table TRAN-1). Originally built to support logging operations, these roads are now used in support of multiple use activities.

Almost one-quarter of the NFS roads on Mitkof Island are ML 1 (closed to vehicle traffic), with the remainder allocated to ML 2 (35 percent) and ML 3 (42 percent). Slightly more than half (52 percent) of the NFS roads on Kupreanof Island are ML 2, with the remaining roads either ML 1 (25 percent) or ML 3

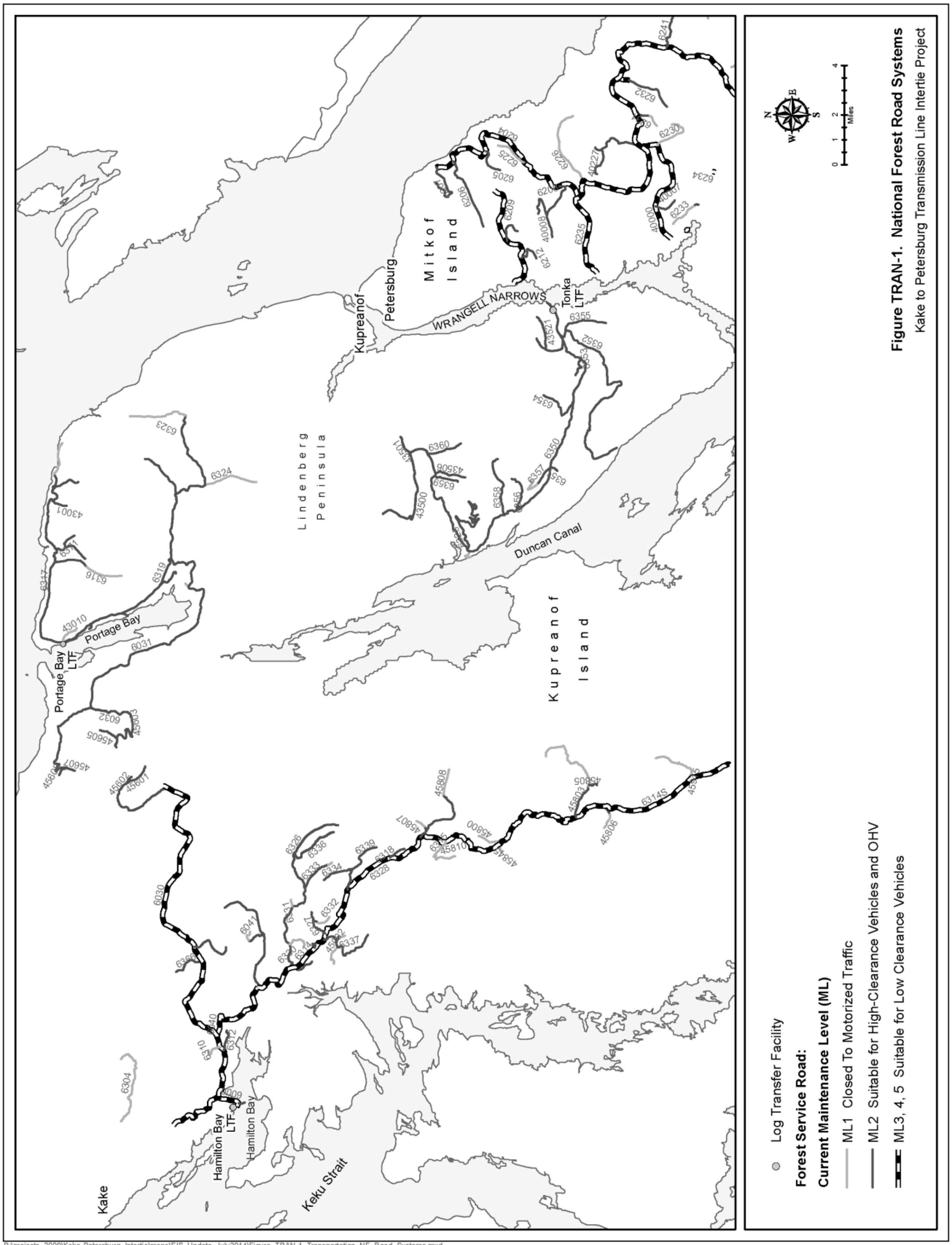


Figure TRAN-1. National Forest Road Systems
Kake to Petersburg Transmission Line Intertie Project

R:\projects_2009\Kake-Petersburg_Intertie\maps\EIS_Update_July2014\Figure_TRAN-1_Transportation_NF_Road_Systems.mxd

(22 percent) (Table TRAN-1). ML 4 and ML 5 roads are suitable for passenger vehicles and generally connect with community road systems. ML 4 and ML 5 roads on the Petersburg Ranger District typically access parking areas and comprise less than one percent of total roads on the District (USDA Forest Service 2009a). ML 3, ML 4, and ML 5 roads are closed to OHVs.

Table TRAN-1. NFS Roads on Mitkof and Kupreanof Islands

Road Type[1/]	ML 1	ML 2	ML 3	Total
Mitkof Island				
Miles	29.7	46	55	130.7
Percent of Total	23	35	42	100
Kupreanof Island				
Miles	60.5	124.7	52.5	237.7
Percent of Total	25	52	22	100

Notes:
ML – maintenance level
1/ ML 4 and ML 5 access parking areas and constitute less than one percent of roads on the Petersburg Ranger District.
Source: USDA Forest Service 2009a

The three NFS road systems on Kupreanof Island: Tonka, Portage, and Kake are not connected with one another and the Tonka and Portage road systems have no direct land-based access from communities (Figure TRAN-1). The Kake road system is accessed via road from the city of Kake. The Kake road system accounts for almost half of the total NFS road mileage on Kupreanof Island and about half of the open road mileage (Table TRAN-2). The remaining miles are divided between the Portage and Tonka road systems. The Portage road system has more total miles, but fewer open miles than the Tonka road system (Table TRAN-2).

Table TRAN-2. NFS Road Systems on Kupreanof Island

NFS Road System	ML 1		ML 2 and ML 3		Total	
	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total
Kake	26.7	44	88.1	50	114.8	48
Portage	22.8	38	40.3	23	63.1	27
Tonka	10.9	18	49.1	28	60.0	25
Total	**60.4**	**100**	**177.5**	**100**	**237.9**	**100**

Notes:
ML – maintenance level
1/ Totals may not sum or match Table TRAN-1 exactly due to rounding.
Source: USDA Forest Service 2009a

There are a total of 231 miles of NFS road within the analysis area (Table TRAN-3). Almost one-half (45 percent) of these miles are part of the Kake road system. ML 2 roads accounted for almost two-thirds (62 percent) of the total NFS road miles (Table TRAN-3).

Table TRAN-3. NFS Road Systems within the Transportation Analysis Area (miles)

NFS Road System	ML 1	ML 2	ML 3	Total
Mitkof	1.8	8.6	15.0	25.4
Kake	15.6	40.5	47.3	103.4
Portage	5.7	39.4	0	45.1
Tonka	1.4	55.6	0	57.1
Total	**24.6**	**144.1**	**62.3**	**231.0**
Percent of Total	10.6%	62.4%	27.0%	100.0%

The NFS road systems in the project area are used for recreation, hunting and fishing, and subsistence activities (USDA Forest Service 2009a). Most of the developed recreation areas on Mitkof Island are accessible to passenger vehicles on ML 3 roads, which are suitable for low clearance vehicles. The ML 3 road system also provides access to dispersed recreation opportunities and is an important winter recreation resource for Petersburg residents. OHVs are mainly used on these roads for game retrieval in the fall (USDA Forest Service 2009a).

The Kake road system on Kupreanof Island provides access to developed recreation facilities, including Big John Bay Cabin, Seal Point boat ramp and picnic area, Cathedral Falls Trail, Hamilton Trail, and Goose Lake Trail. The Portage road system accesses the Portage Bay cabin, although the primary access to the cabin is by boat. No developed facilities are accessed by the Tonka road system. The Tonka, Portage, and Kake road systems provide opportunities for road-related access to dispersed uses in undeveloped settings as well as opportunities involving wheeled vehicles. The Kake road system also gets substantial use from local residents and from visitors accessing the road system from the ferry (USDA Forest Service 2009a).

Road Maintenance and Reconstruction

The maintenance and reconstruction of the existing NFS roads in the analysis area is an ongoing process that occurs on a periodic basis. The extent of this work depends largely on the volume of timber hauled and, to a lesser extent, on public use. Road maintenance consists of periodic repairs to an existing road surface, brushing, cleaning, and repairing drainage features. Maintenance can include reconditioning the original road template, grading the road surface, cleaning roadside ditches, and removing vegetation that may encroach upon the road or block vision. Grading and other maintenance generally take place more often on ML 3 roads than on ML 2 roads. ML 1 roads are left to a self-maintaining condition that requires little or no maintenance. These tasks are performed to keep the roads in the safe and useful condition for which they were designed.

Normally this type of 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). This work is done through separate service contracts to reduce the backlog of deferred maintenance, recondition roads to comply with best management practices, and maintain the existing infrastructure for National Forest management activities. Ongoing maintenance and reconditioning activities may coincide in time with implementation of the proposed project, but would not be part of the project. Reasonably foreseeable maintenance and reconditioning activities were considered in the cumulative effects analysis for this project.

Management of NFS roads is dynamic in the sense that roads are given both an operational maintenance level (OPML) and an objective maintenance level (OBML). The purpose of maintenance levels is to define the level of service provided by, and maintenance required for, a specific road or segment. OPML is the maintenance level currently assigned to a road considering current needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained and reflects the current condition. OBML is the maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The OBML may be the same as, or higher or lower than, the OPML (FSH 7709.58, Sec. 12.3 – Transportation System Maintenance Handbook). Roads can be changed from the OPML status to the designated OBML through a variety of activities. Road storage and re-designation of a road from a ML2 to ML 1 is the most common activity.

Non-National Forest System Roads

Parts of each of the action alternatives are located on non-NFS lands. This includes the final 5.1-mile-long section that extends to Kake and is common to all alternatives (Figures 2-1 and 2-2). In addition, a 1.4-mile-long section of Alternative 2 would be located underground along Sandy Beach Road in Petersburg. Alternative 4 follows an existing substation access road and a short (0.5-mile-long) section of the Mitkof Highway from the existing SEAPA substation south of Petersburg to the proposed Wrangell Narrows crossing location (Figure 2-2).

Marine Access Facilities

A marine access facility (MAF) is an area used by humans to transfer items from land to saltwater or vice versa, that contains a structure such as a mooring buoy, dock, log transfer facility (LTF), boat ramp, or a combination of these. An LTF is used to transfer logs and timber products from land-based transportation forms to water-based transportation forms (or vice-versa). These facilities are often used for the movement of equipment needed for logging and road building. Three existing MAFs—the Portage Bay, Little Hamilton Bay, and Tonka LTFs—would likely be used for transport of construction personnel, equipment, and materials and could be potentially used to transport logs cleared from the right-of-way. These LTFs may be summarized as follows:

- The Portage Bay LTF is located on Portage Bay on the north side of Kupreanof Island and could be used by Alternatives 2 and 3. This LTF is accessed by an existing isolated NFS road system that does not connect to any community (Figure TRAN-1).
- The Little Hamilton Bay LTF is located on Little Hamilton Island, which is connected to Kupreanof Island by a land bridge road. Little Hamilton Island is located in Hamilton Bay on the west side of Kupreanof Island (Figure TRAN-1). Logs could be hauled to the Little Hamilton Bay LTF for transportation by barge or raft under all three action alternatives.
- The Tonka LTF is located on Forest Service road 6350 (FS 6350) on Kupreanof Island (see TRAN-1). Originally constructed as an A-frame in 1977, modifications have been made to this LTF through the years, including a low angle ramp installation in 1990, drainage improvements in 2008, and various small boat float maintenance/modification tasks. The Tonka LTF was made larger and improved in 2013. The dock was replaced and a sort yard was added. This LTF could be used by Alternative 4.

If any of these LTFs are used, the applicant will be issued a special use permit that will comply with the terms and conditions of the Forest Service's existing Alaska Pollutant Discharge Elimination System (APDES) permit.

Rock Quarries

Reconstruction and maintenance of existing NFS roads in the analysis area would require a rock source, preferably within 2 miles of the site of road construction or maintenance. Most of the road network that is currently present on Kupreanof and Mitkof Islands consists of unimproved gravel/rock roads. As a result, rock quarries have been developed on the islands to supply the rock needed to construct these roads. Review of Forest Service GIS information indicates that existing rock pits and quarries are distributed along the existing NFS road systems that would be used by the proposed alternatives. There are no developed rock sources in the unroaded areas that would be crossed by one or more of the alternatives. Construction access to these areas would be via temporary shovel trails supported by the use of temporary matting panels in some wetland areas. Project-related demand for rock is expected to be limited in these areas.

Environmental Effects

Effects Common to All Alternatives

National Forest System Roads

The proposed transmission line design is a short span, road-side design that takes advantage of the existing NFS roads that would be followed by the action alternatives. The existing NFS roads that are part of the action alternatives include several isolated road systems on Kupreanof Island—the Tonka, Portage, and Kake road systems—that do not connect with one another (Figure TRAN-1). Existing NFS roads would be used to access portions of all three action alternatives. Trucks and other equipment would use these existing NFS roads to transport workers, materials, and machinery along the length of the line where they exist. No new NFS roads or temporary roads would be constructed under any of the action alternatives. No new permanent bridges are proposed under of any of the alternatives.

Use of existing NFS roads during construction and operation of the proposed transmission line would not result in long-term negative effects to the NFS transportation system. There would be no change to the portions of the system that are open for public and other uses and the system would continue to be managed in accordance with the Petersburg Ranger District ATM Plan and Motor Vehicle Use Map (MVUM), under all alternatives.

Short-term effects may occur during construction in cases where construction crews and other users are using the roads simultaneously. However, in most locations traffic is typically very light due to the remote nature of the potentially affected road systems. Standard safety considerations, such as signing, should be sufficient to control traffic even during the peak use occurring during the fall hunting season. The Kake road system, which provides access to Big John Bay Cabin, Seal Point boat ramp and picnic area, Cathedral Falls Trail, Hamilton Trail, and Goose Lake Trail, receives heavier use than other the Tonka and Portage road systems. However, standard safety considerations are still expected to be sufficient to control traffic on this road system.

Non-National Forest System Roads

Parts of each of the action alternatives are located on non-NFS lands. This includes the final 5.1-mile-long section that extends to Kake and is common to all alternatives (Figures 2-1 and 2-2). There would be no long-term effects to non-NFS roads under any of the proposed alternatives. Use of non-NFS roads for construction traffic would be limited to those roads necessary to gain access to the project corridor. Temporary traffic delays could potentially occur at localized spots, but would only occur while construction is taking place in adjacent or nearby areas. If construction vehicles cause temporary traffic blockages, traffic could be rerouted around affected intersections. Standard safety considerations are expected to be sufficient to control traffic on non-NFS roads.

Temporary Access

The action alternatives all cross areas where there are no existing roads. Surface access in these areas would be via shovel trails supported by temporary matting panels in some wetland areas. The miles of proposed shovel trail and temporary matting are identified by action alternative in Table TRAN-4. Helicopters would be used to support these activities, especially in areas without roads. Project construction activities potentially facilitated by helicopters may include delivery of construction laborers, equipment, and materials to intermittent material drop locations or specific pole sites; structure placement; hardware installation; and wire stringing operations.

Table TRAN-4. Temporary Shovel Trails and Helicopter Placement

Characteristic	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Total Unroaded Length (miles)	23.6	23.6	13.8
- Length of Shovel Trails (miles)	21.6	21.6	6.5
- Length of Temporary Matting (miles)	2.0	2.0	7.3
Length of Temporary Access Spurs (miles)	7.6	7.6	6.2
Number of Helicopter Pads	83	83	47

Shovel Trails and Temporary Matting Panels

Shovel trails would be temporary and for short-term use during proposed project construction only and would be decommissioned following construction. Shovel trails would be up to 16 feet wide. Shovel trails would be used in wetland areas in locations where native materials (logs and slash) removed during right-of-way clearing are available for use as an underlayment to allow for the passage of wide tracked equipment. Temporary matting panels would be installed in wetland areas where sufficient native materials are not available. The proposed temporary matting panels would likely be similar to the high density polyethylene mats shown in Figure 2-8 (in Chapter 2). These mats are 8 feet by 14 feet wide, weigh approximately 1,050 pounds each, and can be configured to form a 7-foot-wide or a 13-foot-wide useable surface.

Public motorized traffic on temporary shovel trails proposed under this project would be prohibited. This prohibition would include OHVs. Non-motorized (i.e. bicycles, pedestrians, etc.) use during and after project construction would also be discouraged.

Temporary Access Spurs

In locations where the proposed transmission line follows existing NFS roads, the transmission structures would be located adjacent to the road to the extent possible, but would not be immediately adjacent to the roads in all locations due to the ruggedness of the terrain and other environmental constraints. Roads are typically designed to follow natural contours to reduce the steepness of the road surface and, as a result, tend to wind through areas of steep terrain. Transmission lines are designed to follow straight lines as much as possible and minimize the number of structures and angles. Transmission lines are able to span between ridges and across terrain where construction may be difficult, as well as across environmentally sensitive areas. In locations where the proposed structures would be located off the road by more than 20 feet, an access work pad would be created by extending the road fill to the site. Where the distance from the road makes this impractical, temporary matting would be used to gain access to the site during construction. These temporary spurs, consisting of access work pads and/or temporary matting, are referred to as "temporary access spurs" in this EIS. Like shovel trails, temporary access spurs are assumed to be up to 16 feet wide.

Helicopter Pads

Helicopters would be used for construction along portions of all three action alternatives. Use of helicopters would require the installation of temporary helicopter pads along the proposed right-of-way for the selected alternative. Upon completion, these pads would, over time be replaced with permanent helipads. These helipads would be approximately 16 feet by 16 feet and made of aluminum, with a four- to six-leg foundation support system. The pads would be located within the proposed right-of-way, which would be cleared. The four- to six-leg support system would be the only parts of the pad in direct contact with the ground. Disturbance associated with these legs would be approximately 54 square feet or 0.01 acre per pad. Pads would be installed every 0.25 mile along the portions of the alternative where there are no existing roads. The permanent pads would be painted to blend in with the surrounding environment. Paint colors would be approved by the Forest Service.

Rock Quarries

Reconstruction and maintenance of existing NFS roads in the analysis area would require a rock source, preferably within 2 miles of the site of road construction or maintenance. Crushed rock may also be needed in some locations where temporary access spurs involve extending existing road fill. Existing developed rock sources are distributed along the existing NFS road systems and are expected to provide the necessary rock. Project-related demand for rock is expected to be limited in unroaded areas.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line would not be built. The project would not use existing transportation facilities or require the development of new temporary (shovel trails and temporary access spurs) or permanent (helicopter pads) transportation infrastructure.

Cumulative Effects

There are several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects are described at the beginning of this chapter and include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. The proposed project would not be approved or built under this alternative and would, therefore, not contribute cumulatively to the effects of other reasonably foreseeable projects in the analysis area.

Alternative 2 – Proposed Action

Direct and Indirect Effects

National Forest System Roads

Under Alternative 2, the proposed project would closely follow approximately 27.9 miles of existing NFS roads that would be used for construction access, as well as access for operation and maintenance (Table TRAN-5). During construction, trucks and other equipment would use these existing NFS roads to transport workers, materials, and machinery along the length of the line. This alternative would follow 10.5 miles of ML 2 roads that are part of the Portage road system. Alternative 2 would also follow

Table TRAN-5. NFS Roads Followed by Alternatives 2 and 3

Road System	Road Number	Road Name	Miles	ML[1/]	Lanes	Road Surface
Portage	6319	Goose Creek	4.8	2	Single	Pit run shot rock
Portage	6031	Goose Cove	5.7	2	Single	Pit run shot rock
Portage Subtotal			**10.5**			
Kake	6030	Goose Lake	12.3	3	Single	Crushed aggregate or gravel surface
Kake	6040	Kake Road	5.1	3	Single	Crushed aggregate or gravel surface
Kake Subtotal			**17.4**			
Grand Total			**27.9**			

Notes:
ML = maintenance level
1/ OPML and OBML are the same for each section of road, with the exception of Road 6040, which has an OPML of 3 and an OBML of 5.

17.4 miles of ML 3 roads that are part of the Kake road system (Table TRAN-5). The Portage and Kake road systems are not connected with one another (Figure TRAN-1).

The following paragraphs provide an overview of the existing NFS road that would be followed by Alternatives 2 and 3:

- **Road 6319 (Goose Creek).** The proposed transmission line would follow 4.8 miles of this road under Alternatives 2 and 3 (Table TRAN-5). Road 6319 is a single-lane, ML 2 road (suitable for high-clearance vehicles) with a pit run shot rock surface for 4.8 miles of this distance. Shovel trail would be used between this road and where it connects to the Portage road system. The road is classified by the Forest Service as a collector road in long-term service and is part of the Portage road system.
- **Road 6031 (Goose Cove).** The proposed transmission line would follow 5.7 miles of this road under Alternatives 2 and 3 (Table TRAN-5). Road 6031 is a single-lane, ML 2 road (suitable for high clearance vehicles) with a pit run shot rock surface. This road is part of the Portage road system and classified by the Forest Service as a collector road in long-term service.
- **Road 6030 (Goose Lake).** The proposed transmission line would follow 12.3 miles of this road under Alternatives 2 and 3 (Table TRAN-5). Road 6030 is a single-lane, ML 3 road (suitable for passenger cars) with a crushed aggregate or gravel surface. This road is part of the Kake road system and classified by the Forest Service as a collector road in long-term service.
- **Road 6040 (Kake Road).** The proposed transmission line would follow 5.1 miles of this road under Alternatives 2 and 3 (Table TRAN-5). Road 6040 is a single lane, ML 3 road (suitable for passenger cars) with a crushed aggregate or gravel surface. This road is part of the Kake road system and classified by the Forest Service as an arterial in long-term service. The OPML for this road is ML 3 as noted; the OPML is ML5 (high degree of user comfort).

Existing bridges that would be used by Alternative 2 are identified in Table TRAN-6.

Table TRAN-6. Existing Bridges That Would Be Used by Alternatives 2 and 3

Road	Alternative Milepost[1/]	Name	Operational Status	Year Built	Bridge Material	Length of Bridge (feet)
6319	20.4	Planned Scott Peak Timber Sale	na	Planned	na	na
6319	22.6	Muskeg Creek on Remote System	Open	1981	Steel	51
6319	23.2	On Remote System	Open	1981	Steel	41
6031	25.8	Portage Creek on Remote System	Open	1996	Steel	91
6030	42.3	Rainbow Creek	Open	1984	Steel	60
6030	43.3	Upper Hamilton River	Open	1983	Steel	80
6030	47.6	Cathedral Falls Creek	Open	1983	Steel	120
6040	53.9	Slo Duck Creek	Open	2008	Concrete, Prestressed	80
6040	57.4	Jenny Creek	na	na	na	na

Notes:
na = not available
1/ The milepost counts start at the existing SEAPA Substation near Petersburg and include water crossing miles.

Non-National Forest System Roads

The proposed transmission line would also follow existing non-NFS roads under Alternative 2, including the final 5.1-mile-long section that extends across non-NFS land to Kake (Figure 2-1). This section of road continues from FR 6040 and consists of 3.6 miles of road managed by BLM and 1.5 miles managed by the State of Alaska. The BLM-managed portion has a crushed aggregate or gravel surface; the state part has a pit run shot rock surface. Both parts are single lane.

This alternative would also be located along 0.5 mile of Garbage Dump Hill Road, a double-lane private road south of Petersburg. Garbage Dump Hill Road has a crushed aggregate or gravel surface.

In addition, a 1.4-mile-long section of Alternative 2 would be located underground along Sandy Beach Road in Petersburg. The three phase conductors of the proposed transmission line would be enclosed in a single HDPE conduit approximately 8 inches in diameter. The conduit would be placed in a trench, approximately 4 feet deep and 3 feet wide, along the length of the placement, and the rest of the trench would be backfilled. Parts of this road may need to be closed while construction is taking place in this location, but these closures would be short term and limited to localized spots, and local residents would be notified in advance of necessary closures.

Temporary Access

Three sections of Alternative 2 do not follow existing roads (Figure 2-1).

- The first section extends across private land south of the Petersburg Airport.
- The second section extends north along the shoreline of Kupreanof Island from the point where the proposed transmission line comes ashore near Prolewy Point until it meets FR 6319 inland.
- The third section crosses the unroaded section of NFS lands west of Portage Bay between the existing Portage and Kake road systems.

These three sections combined account for 23.6 miles (41 percent) of the overhead portion of the route. Construction access to these areas would be via shovel trails supported by temporary matting panels. Shovel trails would be used for an estimated 21.6 miles, with temporary matting used for 2.0 miles (Table TRAN-4). Figure 2-1 shows where existing roads, shovel trails, and temporary matting would be used during construction. Helicopters would be used to support construction activities, especially in areas without roads. Helicopter pads would be located along the sections of the alternative that are not located adjacent to an existing road. These pads would be spaced approximately every 0.25 mile. An estimated 83 permanent helicopter pads would be developed as part of this alternative. In addition, where the proposed transmission line follows existing roads, an estimated 7.6 miles of temporary access spurs would be required to access the proposed transmission line structure locations (Table TRAN-4).

Marine Access

Under Alternative 2, two existing MAFs—the Portage Bay and Little Hamilton Bay LTFs—would likely be used for transport of construction personnel, equipment, and materials and could be potentially used to transport logs cleared from the right-of-way (Figure 2-1).

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

National Forest System Roads

Under Alternative 3, the proposed project would closely follow approximately 27.9 miles of existing NFS roads that would be used for construction access, as well as access for operation and maintenance (Table TRAN-5). During construction, trucks and other equipment would use these existing NFS roads to transport workers, materials, and machinery along the length of the line. This alternative would follow 10.5 miles of ML 2 roads that are part of the Portage road system. Alternative 3 would also follow 17.4 miles of ML 3 roads that are part of the Kake road system (Table TRAN-5). This alternative would use the same roads as Alternative 2. Detailed information is provided for these roads in the Alternative 2 section, above.

Existing bridges that would be used by Alternative 3 are identified in Table TRAN-6.

Non-National Forest System Roads

The proposed transmission line would also follow existing non-NFS roads under Alternative 3, specifically the final 5.1-mile-long section that extends across non-NFS land to Kake (Figure 2-1). This section of road continues from FR 6040 and consists of 3.6 miles of road managed by BLM and 1.5 miles managed by the State of Alaska. The BLM-managed portion has a crushed aggregate or gravel surface; the state part has a pit run shot rock surface. Both parts are single lane.

This alternative would also be located along 0.5 mile of Garbage Dump Hill Road, a double-lane private road south of Petersburg. Garbage Dump Hill Road has a crushed aggregate or gravel surface.

Temporary Access

As with Alternative 2, three sections of Alternative 3 do not follow existing roads (Figure 2-1).

- The first section extends across private land south of the Petersburg Airport.
- The second section extends north along the shoreline of Kupreanof Island from the point where the proposed transmission line comes ashore near Prolewy Point until it meets FR 6319 inland.
- The third section crosses the unroaded section of NFS lands west of Portage Bay between the existing Portage and Kake road systems.

Surface construction access in these areas would be via shovel trails supported by temporary matting panels in some wetland areas. A total of 21.6 miles of temporary shovel trails would be constructed in these sections, with approximately 2 miles of temporary matting panels also installed (Table TRAN-4, Figure 2-1). As described above, the proposed shovel trails and temporary matting would be temporary and for short-term use during project construction only. All shovel trails would be decommissioned following construction, and all temporary matting panels would be removed. In addition, where the proposed transmission line follows existing roads, an estimated 7.6 miles of temporary access spurs would be required to access the proposed transmission line structure locations. An estimated 83 permanent helicopter pads would be developed as part of this alternative (Table TRAN-4).

Marine Access

Under Alternative 3, two existing MAFs—the Portage Bay and Little Hamilton Bay LTFs—would likely be used for transport of construction personnel, equipment, and materials and could be potentially used to transport logs cleared from the right-of-way (Figure 2-1).

Alternative 4 – Center-South Route

Direct and Indirect Effects

National Forest System Roads

Under Alternative 4, the proposed project would closely follow approximately 30.5 miles of existing NFS roads that would be used for construction access, as well as access for operation and maintenance (Table TRAN-7). During construction, trucks and other equipment would use these existing NFS roads to transport workers, materials, and machinery along the length of the line. This alternative would follow

9.5 miles of FR 6350, which is part of the Tonka road system. Alternative 4 would also follow 21.0 miles of existing roads (FR 45808, 6328, 6314, and 6040) that are part of the Kake road system (Table TRAN-7). The Tonka and Kake road systems are not connected with one another (Figure TRAN-1).

Table TRAN-7. NFS Roads Followed by Alternative 4

Road System	Road Number	Road Name	Miles	ML[1/]	Lanes	Road Surface
Tonka	6350	Mitchell-Tonka	6.2	2	Single	Pit run shot rock
Tonka	6350	Mitchell-Tonka	3.3	2	Single	Crushed aggregate or gravel
Tonka Subtotal			**9.5**			
Kake	45808	Screwdriver	2.7	2	Single	Pit run shot rock
Kake	6328	Jasper High	6.4	3	Single	Crushed aggregate or gravel
Kake	6314	Keku Strait	3.6	3	Single	Crushed aggregate or gravel
Kake	6040	Kake Road	8.2	3	Single	Crushed aggregate or gravel
Kake Subtotal			**21.0**			
Grand Total			**30.5**			

Notes:
ML = maintenance level
1/ OPML and OBML are the same for each section of road, with the exception of Road 6040, which has an OPML of 3 and an OBML of 5.

The following paragraphs provide an overview of the existing NFS roads that would be followed by Alternative 4:

- **Road 6350 (Mitchell-Tonka).** The proposed transmission line would follow 9.5 miles of this road under Alternative 4 (Table TRAN-7). Road 6350 is a single-lane, ML 2 road (suitable for high clearance vehicles) for this entire length. About two-thirds of this length (6.2 miles) has a pit run shot rock surface; the remaining 3.3 miles has a crushed aggregate or gravel surface. This road is part of the Tonka road system and classified by the Forest Service as a collector road in long-term service.
- **Road 45808 (Screwdriver).** The proposed transmission line would follow 2.7 miles of this road under Alternative 4 (Table TRAN-7). Road 45808 is a single lane, ML 2 road (suitable for high clearance vehicles) road with a pit run shot rock surface. Shovel trail would be used past this road. This road is part of the Kake road system and classified by the Forest Service as a local road in long-term service.
- **Road 6328 (Jasper High).** The proposed transmission line would follow 6.4 miles of this road under Alternative 4 (Table TRAN-7). Road 6328 is a single-lane, ML 3 road (suitable for passenger cars) with a crushed aggregate or gravel surface. This road is part of the Kake road system and classified by the Forest Service as a collector road in intermittent service.
- **Road 6314 (Keku Strait).** The proposed transmission line would follow 3.6 miles of this road under Alternative 4 (Table TRAN-7). Road 6314 is a single-lane, ML 3 road (suitable for passenger cars) with a pit run shot rock surface. This road is part of the Kake road system and classified by the Forest Service as a collector road in intermittent service.
- **Road 6040 (Kake Road).** The proposed transmission line would follow 8.2 miles of this road under Alternative 4 (Table TRAN-7). Road 6040 is a single-lane, ML 3 road (suitable for passenger cars) with a crushed aggregate or gravel surface. This road is part of the Kake road system and classified by the Forest Service as an arterial in long-term service. The OPML for this road is ML3 as noted; the OPML is ML 5 (high degree of user comfort).

Existing bridges that would be used by Alternative 4 are identified in Table TRAN-8.

Table TRAN-8. Existing Bridges That Would Be Used by Alternative 4

Road	Alternative Milepost[1/]	Name	Operational Status	Year Built	Bridge Material	Length of Bridge
6350	1.5	Float Plane Dock Tonka Mountain	Closed	na	na	na
6350	1.5	LTF Tonka Mountain	Closed	na	na	na
6350	3.7	Mitchell Creek	Open	1980	Timber	77
6350	6.2	Halfway Creek	Open	1976	Timber	58
6350	7.4	Big R 3820 Spruce Creek	Open	2004	Steel	70
45808	25.8	Kake	Open	1998	Steel	71
45808	27.6	Kake	Open	1998	Steel	61
6328	33.8	Upper Coffee Creek	Open	1997	Steel	51
6314	37.6	Hamilton River	Open	1978	Steel	195
6040	41.0	Cathedral Falls	Open	1978	Steel	109
6040	45.9	Slo Duck Creek	Open	2008	Concrete, Prestressed	80
6040	49.4	Jenny Creek	na	na	na	na

Notes:
na = not available
1/ The milepost counts start at the Proposed Tap/Switchyard (Center-South route) and include the water crossing miles.

Non-National Forest System Roads

The proposed transmission line would also follow existing non-NFS roads under Alternative 4, including the final 5.1-mile-long section that extends across non-NFS land to Kake (Figure 2-2). Like Alternatives 2 and 3, the final 5.1-mile-long section that extends across non-NFS land to Kake would follow existing roads. This section of road continues from FR 6040 and consists of 3.6 miles of road managed by BLM and 1.5 miles managed by the State of Alaska. The BLM-managed portion has a crushed aggregate or gravel surface; the state part has a pit run shot rock surface. Both parts are single lane.

Alternative 4 also follows an existing substation access road and a short (0.9-mile-long) section of the Mitkof Highway from the existing SEAPA substation south of Petersburg to the proposed Wrangell Narrows crossing location (Figure 4). The Mitkof Highway is a three-lane road with a bituminous surface treatment.

Temporary Access

One section of Alternative 4 does not follow existing roads (Figure 2-2). This section of the proposed transmission line extends approximately 13.8 miles between the existing Tonka and Kake road systems, accounting for 27 percent of the overhead portion of the alternative route (Table TRAN-4, Figure 2-2). Surface access for construction along this portion of the route would be via shovel trails supported by temporary matting panels. Shovel trails would be used for an estimated 6.5 miles, with temporary matting panels used for 7.3 miles (Table TRAN-4). Figure 2-2 shows where existing roads, shovel trails, and temporary matting would be used during construction. Helicopters would be used to support construction activities, especially in areas without roads. Helicopter pads would be located along the 13.8 miles of the alternative that are not located adjacent to an existing road. These pads would be spaced approximately every 0.25 mile. In addition, where the proposed transmission line parallels existing roads, an estimated 6.2 miles of temporary access spurs would be required to access the proposed transmission line structure locations (Table TRAN-4).

Marine Access

Under Alternative 4, two existing LTFs—the Tonka and Little Hamilton Bay LTFs—would likely be used for transport of construction personnel, equipment, and materials and could be potentially used to transport logs cleared from the right-of-way (Figure 2-2).

Alternatives 2, 3, and 4

Cumulative Effects

Past timber harvest in the analysis has resulted in a total of 231 miles of existing NFS roads in the transportation analysis area (Table TRAN-3). There are also several projects in the vicinity of the proposed project that are either presently occurring or are reasonably foreseeable. These projects include timber harvesting, pre-commercial and commercial thinning, road improvement/building, and wildlife habitat restoration. No new temporary or permanent roads are proposed on NFS lands under any of the action alternatives and, therefore, none of the alternatives are expected to cumulatively add to the existing NFS road systems in the analysis area. Although some improvements may be required to the existing NFS roads that would be used as part of this project, these improvements would be consistent with the current ML designations of the affected roads and would not affect the existing ATM Plan for these roads.

The Kake road project, as currently conceived, would follow the State’s right-of-way easement from Kake to Petersburg for a total length of 52.6 miles. Part of this would involve new road construction. In the absence of a road design or related analysis, the extent of this new construction is currently unknown, but the state’s right-of-way generally follows existing roads for about 24 miles. This suggests that a Kake road project could potentially involve the construction of 28.6 miles of new road. In other areas, the Kake road project would likely involve improvements to the existing NFS road system, and may involve changes in long-term management. The Kake road project is currently in the planning stage. While it is reasonable to assume that rock sources would be required, the road has not been designed and ADOT&PF has not identified potential sources or possible rock pit locations. As a result, it is not possible to assess the potential cumulative impacts of rock pits for the Kake road project. However, assuming that rock pits for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, the result could be up to 50 acres of rock pit–related disturbance. None of the KPI Project alternatives would contribute to these long-term changes.

Scenery

Introduction

This section provides an assessment of the current condition of the project area and the potential effects of implementing the proposed action and the alternatives on scenic resources. Scenery resource direction for the project area is contained in the 2008 Forest Plan and described in the scenery Forest-wide standards and guidelines (Chapter 4) for each specific management prescription or LUD (Chapter 3). The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the project (i.e., the no action alternative).

Analysis Area and Methodology

The analysis area for direct, indirect, and cumulative effects to scenic resources is the KPI project area. Construction-related impacts would last for the duration of construction; operation-related impacts would last for the period the transmission line is in place.

Forest-wide standards and guidelines for scenery apply and provide for scenic resource protection across the Forest (USDA Forest Service 2008a, chapter 4). The degree of acceptable alteration to the landscape is defined in terms of Scenic Integrity Objectives (SIOs). The objectives are based on the desired future condition of each LUD and the degree of visibility of these landscapes from identified VPRs and use areas listed in Appendix F of the 2008 Forest Plan.

The scenery analysis considers the potential effects from four main categories of project actions: 1) structure installation, 2) new temporary shovel trails and temporary matting panels, 3) temporary access spurs, and 4) vegetation clearing. This analysis:

- Evaluates whether the SIOs established by the Forest Plan would be met;
- Estimates the amount and type of disturbance by scenic attractiveness class, distance zone based on the potentially affected VPRs, and Existing Scenic Integrity (ESI);
- Evaluates potential visual impacts from a series of viewpoints selected to represent the VPRs from which a viewer would theoretically have views of parts of the proposed alternatives;
- Evaluates the potential cumulative effects on scenery in conjunction with past, present, and reasonably foreseeable future projects; and
- Provides recommendations for mitigation measures designed to help avoid and minimize effects to scenic resources.

For each project alternative, a GIS-based viewshed analysis was used to identify the VPRs from which a viewer would theoretically have uninterrupted views of parts of the proposed transmission facilities. These areas were initially defined by identifying those areas where views of the proposed facilities would be blocked by intervening topography or vegetation, with the analysis subsequently focusing on those areas where potential views were not blocked by topography or vegetation. Vegetation heights ranged from 20 to about 174 feet (6 to 53 meters) tall based on an estimated distribution of tree size density.

The VPRs with theoretically uninterrupted views identified through this process were then reviewed in conjunction with other sources of information including topographic maps, aerial photography, and reconnaissance level field review. Based on this review, a series of viewpoints were selected to represent the potentially affected VPRs. Viewshed analyses were then run from each of these viewpoints. These subsequent viewshed analyses were used to identify the distance of the proposed facilities from the viewpoint in terms of four distance zones: foreground, middleground, background, and seldom seen.

These viewshed analyses were also used to identify the number of structures that would theoretically be visible from the selected viewpoints, as well as the distance to the closest structure. In most cases, structures located in the background or seldom seen distance zones, greater than 5 miles from the viewpoint would be difficult to detect. The viewshed analyses employed different average viewer height depending on the type of VPR. These heights varied by the type of VPR, ranging from 5 feet to 60 feet above the ground or water surface (Tetra Tech 2012).

Affected Environment

The Scenery analysis area encompasses approximately 493,806 acres, located on Kupreanof Island and portions on Mitkof Island in Southeast Alaska. This total includes 453,980 acres of NFS lands, with the remaining lands (39,826 acres) owned and managed by the Alaska DNR, the Sealaska Corporation, Kake Tribal Corporation, the city of Kake, and Petersburg Borough. The Tongass National Forest, including Mitkof and Kupreanof Islands, is covered primarily by temperate rainforest consisting of Sitka spruce and western hemlock, with lesser amounts of mountain hemlock, Alaska yellow-cedar, and lodgepole pine. Red alder occupies riparian areas and other sites where bare mineral soils are exposed. The majority of the analysis area is occupied by old-growth forests and harvested timber areas, intermixed with peatland, muskeg, riparian plant communities, and beach habitat that are largely unaltered. Regeneration is rapid and most of the logged areas are covered by dense stands of young growth. Topography in the analysis area ranges from low, flat marshes to hills and mountains ranging from 1,000 feet to nearly 4,000 feet (Portage Mountain) above mean sea level.

Landscape Character

The Tongass National Forest is divided into 11 geographic areas defined as landscape character types. Landscape character types are large geographic areas that have general or distinguishing visual characteristics that, when combined with other physical, biological, and cultural attributes, help define an area's meaning of "place". The analysis area includes parts of two landscape character types: the Kupreanof Lowlands and Inside Passage Fjordlands. The portion of the analysis area west of Duncan Canal and Portage Bay falls within the Kupreanof Lowlands landscape character type; the area to the east, including the Lindenberg Peninsula and Mitkof Island, is located within the Inside Passage Fjordlands landscape character type (USDA Forest Service 2005b).

The Kupreanof Lowlands landscape character type consists of rolling terrain and lowlands, with numerous rocky islands, shorelines, and rock reefs evident in the intricate network of waterways within this landscape type. Spruce and hemlock forest covers much of the area, with significant areas of muskeg-lodgepole pine association also present. Timber harvest has occurred in many parts of the area during the last 30 years. Tidal meadows are found along many of the small waterways, particularly at the heads of the bays. This landscape character type has relatively low vegetation variety, except in estuarine areas. Much of the area around Kake is privately owned and buildings and roads are prevalent (USDA Forest Service 2005b).

The Inside Passage Fjordlands is a complex landscape type consisting primarily of tall rounded mountains, long broad ridges, deep fiords, and long connected inland waterways. The landscape type contains many glacially modified landforms including hanging valleys with steep-sided slopes, broad U-shaped valleys, and coastal lowlands. The islands and land masses that characterize this landscape character type are connected by a network of broad waterways that serve as major transportation routes. Most of the lower rounded mountain areas support productive western hemlock and Sitka spruce forests. Many portions of these forests have been harvested over the past 50 years or more and now support young second-growth forests. Forested wetlands and emergent wetlands are common. Roads, buildings, and other structures are very visible in and around Petersburg (USDA Forest Service 2005b).

Scenic Attractiveness

Scenic attractiveness is used by the Forest Service as the primary indicator of the intrinsic beauty of a landscape and the positive responses it evokes in people. This characterization helps determine landscapes that are important for scenic beauty, as well as those that are of lesser value, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, and land use patterns and cultural features (USDA Forest Service 2005b).

The Forest Service's Scenery Management System (SMS) provides a process that rates the inherent scenic attractiveness based on the values listed above as either Class A - Distinctive, B - Typical, or C - Indistinctive. Class A areas are those where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. Class B areas consist of the more frequently found features in the landscape character type. Class C areas generally have weak or missing attributes that contribute to scenic quality. The majority of land within the analysis area is either classified as Indistinctive (56 percent) or Typical (31 percent), with about 3 percent classified as Distinctive.

Visual Priority Routes

Appendix F of the Forest Plan identifies routes and public use areas from which scenery is to be emphasized for each Ranger District. They include popular roads people drive, cabins or recreation areas that people use, and trails on which they hike or canoe. They can also be cruise ship, ferry boat, personal watercraft routes that are frequently traveled, or popular saltwater anchorages. VPRs specific to the Petersburg Ranger District are identified on pages F-3 and F-4 of Appendix F to the Forest Plan (USDA Forest Service 2008a).

There are 46 VPRs within the analysis area. Some of these VPRs are included for more than one reason and show up more than once in the following list, which is organized by VPR type. Wrangell Narrows, for example, is identified as both an Alaska Marine Highway Route and a Tour Ship Route. Papke's Landing (marked with an asterisk) is not an official VPR in the Forest Plan; however, it has been identified by the Forest Service as a popular location used by residents in the area.

• **Communities**	Kake Kupreanof Petersburg
• **Alaska Marine Highway Routes**	Wrangell Narrows Frederick Sound
• **Tour Ship Routes**	Wrangell Narrows Frederick Sound
• **Sm. Boat & Mid-size Tour Boat Routes**	Keku Strait Towers Arm Duncan Canal to Salt Chuck Petersburg Creek Estuary
• **Saltwater Use Areas**	Beacon Point Duncan Canal to Indian Point Frederick Point Hamilton Creek Estuary Portage Bay Mouth of Narrows Mouth of Blind Sough

• **Boat Anchorages**	Castle Islands Portage Bay Papke's Landing (boat launch)*
• **Public Use Roads**	Kake to Seal Point Road Mitkof State Highway (Highway 7) Forest Road 6235 Three Lakes Loop
• **Dispersed Recreation Areas**	Goose Lake Hamilton Creek Petersburg Creek Petersburg Lake
• **Recommended Wild, Scenic, & Recreational Rivers**	Petersburg Creek
• **Developed Recreation Areas**	Frenchy Ridge Shelter Twin Creek Shelter
• **Forest Service Recreation Cabins**	Big John Bay Breiland Slough Castle Flats Castle River Petersburg Lake Portage Bay Ravens Roost Salt Chuck East Towers Arm West Point
• **Hiking Trails**	Colp Lake Trail (#461) Castle River Trail (#459) Goose Lake Trail (#462) Hamilton Creek Trail (#463) Big John Bay Trail (#465) Cathedral Falls Trail (#467) Petersburg Lake Trail (#534) Portage Mtn. Loop Trail (#535) Petersburg Mountain Trail (#585) Upper Twin Ski Trail (#605) Twin Ridge Ski Trail (#606) Raven Trail (#607)

A GIS-based viewshed analysis prepared for the proposed project indicated that none of the action alternatives would be visible from 14 of the VPRs identified above. The analysis also identified one additional VPR, Beecher Pass State Marine Park, that is located outside of the analysis area VCU boundaries, but could be potentially affected by the proposed project.

Based on GIS analysis, there are 36 VPRs with potential viewpoints, as well as Papke's Landing:

• **Communities**	Kake Kupreanof Petersburg
• **Alaska Marine Highway Routes/Tour Ship Routes**	Frederick Sound Wrangell Narrows

• **Sm. Boat & Mid-size Tour Boat Routes**	Keku Strait Petersburg Creek Estuary Towers Arm Duncan Canal to Salt Chuck
• **Saltwater Use Areas**	Beacon Point Duncan Canal to Indian Point Mouth of Narrows Frederick Point Portage Bay Hamilton Creek Estuary
• **Boat Anchorages**	Castle Islands Papke's Landing (boat launch)* Portage Bay
• **Public Use Roads**	Kake to Seal Point Road Mitkof State Highway (Highway 7) Forest Road 6235 Three Lakes Loop
• **Dispersed Recreation Areas**	Hamilton Creek Goose Lake Petersburg Creek
• **State Marine Park**	Beecher Pass
• **Forest Service Recreation Cabins**	Big John Bay Castle Flats Portage Bay Towers Arm West Point
• **Hiking Trails**	Big John Bay Trail (#465) Colp Lake Trail (#461) Goose Lake Trail (#462) Portage Mtn. Loop Trail (#535) Petersburg Lake Trail (#534) Petersburg Mountain Trail (#585) Raven Trail (#607)

These VPRs were reviewed in conjunction with other sources of information including topographic maps, aerial photography, and reconnaissance level field review, and a series of viewpoints were selected to represent the potentially affected VPRs (Figure SCEN-1). These viewpoints are used as a basis for evaluation of the visual consequences of the proposed alternatives.

Visibility and Distance Zones

The SIO for a given area is determined by the LUD assigned to that area, its visibility (i.e., seen vs. not seen areas), and distance zones (i.e., foreground, middleground, and background). Distance zones are mapped based on distance from VPRs and other key features, such as other recreation sites, roads, and trails. Distance zones are defined in the Forest Plan as follows:

- **Foreground**: The part of the visible landscape located up to 0.5 mile from the viewer.
- **Middleground**: The visible portion of the landscape located from 0.5 mile to 5 miles from the viewer.
- **Background**: The distant part of the visible landscape located from 5 to 15 miles from the viewer.
- **Seldom Seen**: The part of the landscape more than 15 miles from a VPR or is not visible to the viewer from VPRs, although they may be viewed from other areas.

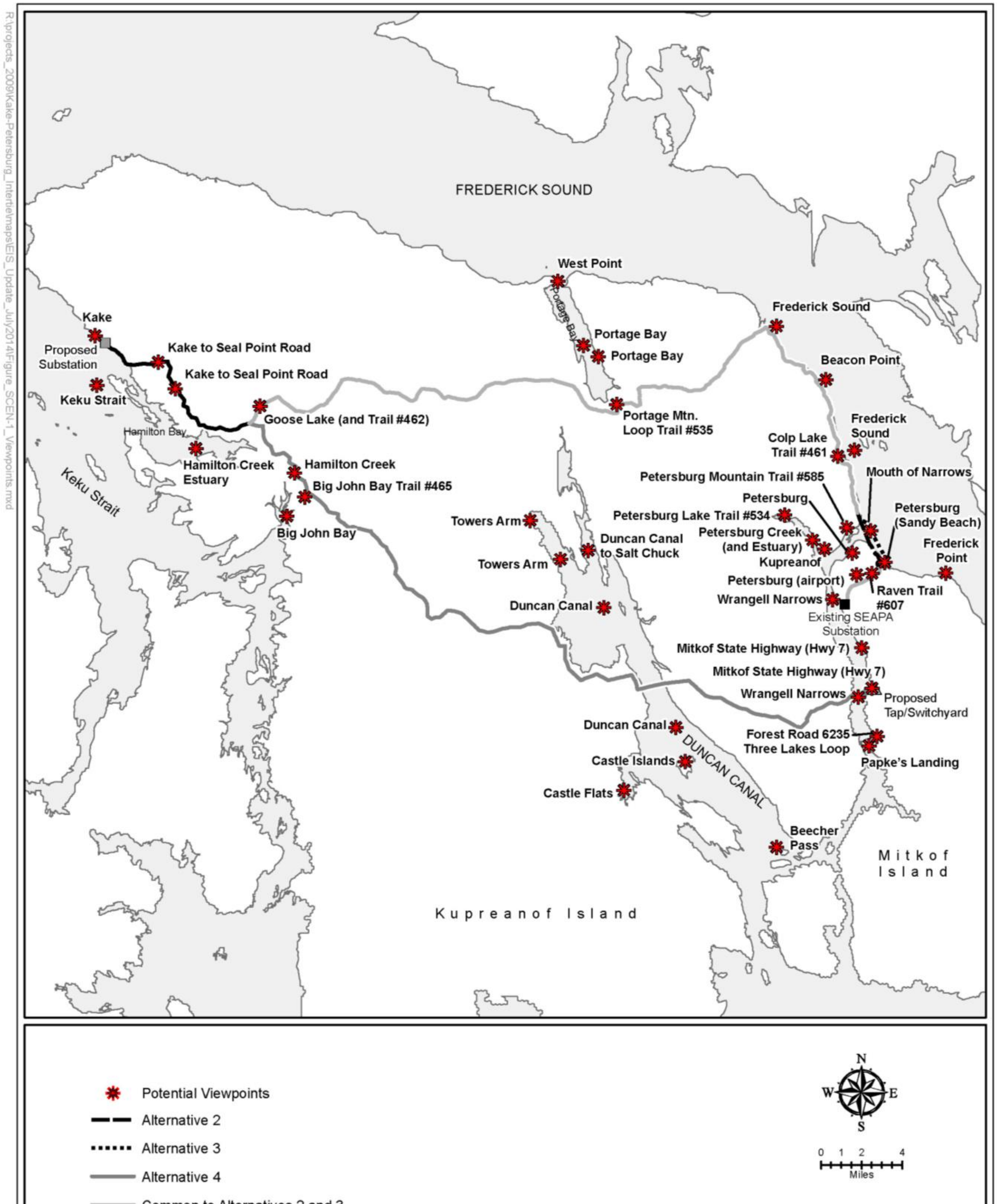


Figure SCEN-1. Viewpoints

Kake to Petersburg Transmission Line Intertie Project

These zones were mapped for the entire forest as part of the planning process that supported the 2008 Forest Plan Revision. Approximately 10 percent of the NFS lands in the analysis area are allocated to Foreground, with 45 percent allocated to Middleground, 2 percent to Background, and 43 percent to Seldom Seen.

Scenic Integrity Objectives (SIO)

The Forest Service developed and implemented the Visual Management System (VMS) in 1974 (USDA Forest Service 1974). This system was replaced by the newer (but similar) SMS in 1995. While the overall visual resource framework is essentially the same between the two systems, the terminology within the SMS has been modified slightly and when combined with VMS incorporates assessment of biological, physical, and social/cultural resources within a geographic area. Under this new system, Scenic Integrity Objective or SIO is the term used to describe the visual condition of the landscape. The SIO is also used to describe the degree of acceptable alteration of the characteristic landscape, and is assigned to the combination of LUDs and distance zones, as seen from VPRs.

The SIOs adopted by the Forest Plan are defined as follows:

- **Very High SIO:** Landscapes where the landscape character is intact with only minute, if any, deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- **High SIO:** Landscapes where the landscape character "appears" intact. Deviations are not readily evident to the casual observer.
- **Moderate SIO:** Landscapes where the landscape character "appears slightly altered." Deviations are noticeable to the casual observer, but do not dominate the landscape.
- **Low SIO:** Landscapes where the landscape character "appears moderately altered." Deviations can begin to dominate a scene, but must blend with the surrounding landscape, as viewed by the casual observer.
- **Very Low SIO:** Landscapes where the landscape character "appears heavily altered." Deviations may strongly dominate the landscape character. Deviations clearly dominate, but must blend to some degree.

SIOs were mapped for the entire forest as part of the planning process that supported the 2008 Forest Plan Revision. The total SIO acres for NFS lands in the analysis area are summarized in Table SCEN-1. The High SIO areas in the analysis area generally coincide with the Wilderness and Old-Growth Reserve LUDs.

Table SCEN-1. Scenic Integrity Objectives (SIOs) in the Analysis Area

SIO	Analysis Area Acres	Percent of Analysis Area Total	Percent of NFS Lands in the Analysis Area
Very High	0	0.0	0.0
High	124,938	25.4	27.6
Moderate	71,415	14.4	15.7
Low	34,132	6.9	7.5
Very Low	220,398	44.6	48.5
NA	3,127	0.6	0.7
TOTAL NFS	**454,010**	**91.9**	**100.0**
Non-National Forest	39,796	8.1	N/A
Total All Lands	**493,806**	**100.0**	**N/A**

N/A – not applicable

Both of the route corridors—the Northern route corridor (Alternatives 2 and 3) and the Center-South route corridor (Alternative 4)—are identified as Potential Power Transmission Corridors in the Forest

Plan. Potential Power Transmission Corridor is one of four subcategories that comprise the TUS LUD. The TUS LUD management prescription applies to existing major system corridors, as well as to the planning and design of future system corridors. Prior to construction of new systems, in this case the proposed KPI Project, the management prescriptions of the underlying LUDs remain applicable (USDA Forest Service 2008a, p. 3-128). As a result, the acres shown in Table SCEN-1 include the SIOs for the LUDs that underlie the Potential Power Transmission Corridors. Upon initiation of construction, and during system operation, the TUS management prescription applies and takes precedence over any underlying LUD. As such, the Forest Plan notes, the TUS LUD represents “a ‘window’ through the underlying LUD through which roads and/or utilities can be built” (p. 3-128). The landscape may be dominated by activities associated with transportation and utility systems and the SIO for the TUS LUD is low in all distance zones.

Existing Scenic Integrity (ESI)

The Forest Plan (USDA Forest Service 2008a, p. 4-56) states that it is important to compare the existing scenic integrity of the project area to the SIO of the land use designation. This is to determine if the existing condition conflicts with Forest Plan SIOs and how much additional disturbance is allowed. ESI is defined as the current state of the landscape, considering previous human alterations (USDA Forest Service 2008a, p. 7-11). Six levels are used to describe the landscape’s existing scenic integrity, ranging from unaltered to heavily altered. ESI is measured by the following condition types as described in the Forest Plan:

- **Very High**: Landscapes where the landscape character is intact with only minute, if any, deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- **High:** Landscapes where the landscape character “appears” intact. Deviations may be present but repeat form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- **Moderate:** Landscapes where the landscape character “appears slightly altered.” Noticeable deviations remain visually subordinate to the landscape being viewed.
- **Low:** Landscapes where the landscape character “appears moderately altered.” Deviations begin to dominate the landscape character being viewed, but borrow attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.
- **Very Low:** Landscapes where the landscape character “appears heavily altered.” Deviations may strongly dominate the landscape character. They do not borrow from attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed.
- **Unacceptable Low:** Landscapes where the landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little, if any, form, line, color, texture, pattern, or scale from the landscape character.

The latest spatial data on record that represents ESI is the existing visual conditions (EVC) layer. The main potential disturbance to landscape character on NFS lands to have occurred since the layer was published in 2005 would be timber harvest activities and associated road building. Thus, the EVC layer was compared against the most recent available data identifying areas of timber harvest activities and associated roads. Following the guidance in Appendix E of Agriculture Handbook Number 701 (USDA Forest Service 1995), no recent disturbance was found that would warrant a change in ESI/EVC type. EVC ratings within the analysis area are shown in Figure SCEN-2. Just over two-thirds of the NFS acres are unaltered (ESI Very High), meaning that only ecological change has occurred in those areas. At the other end of the spectrum, another 21 percent of the NFS lands in the analysis area are heavily or extremely altered (ESI Very Low and Unacceptable Low) (Table SCEN-2).

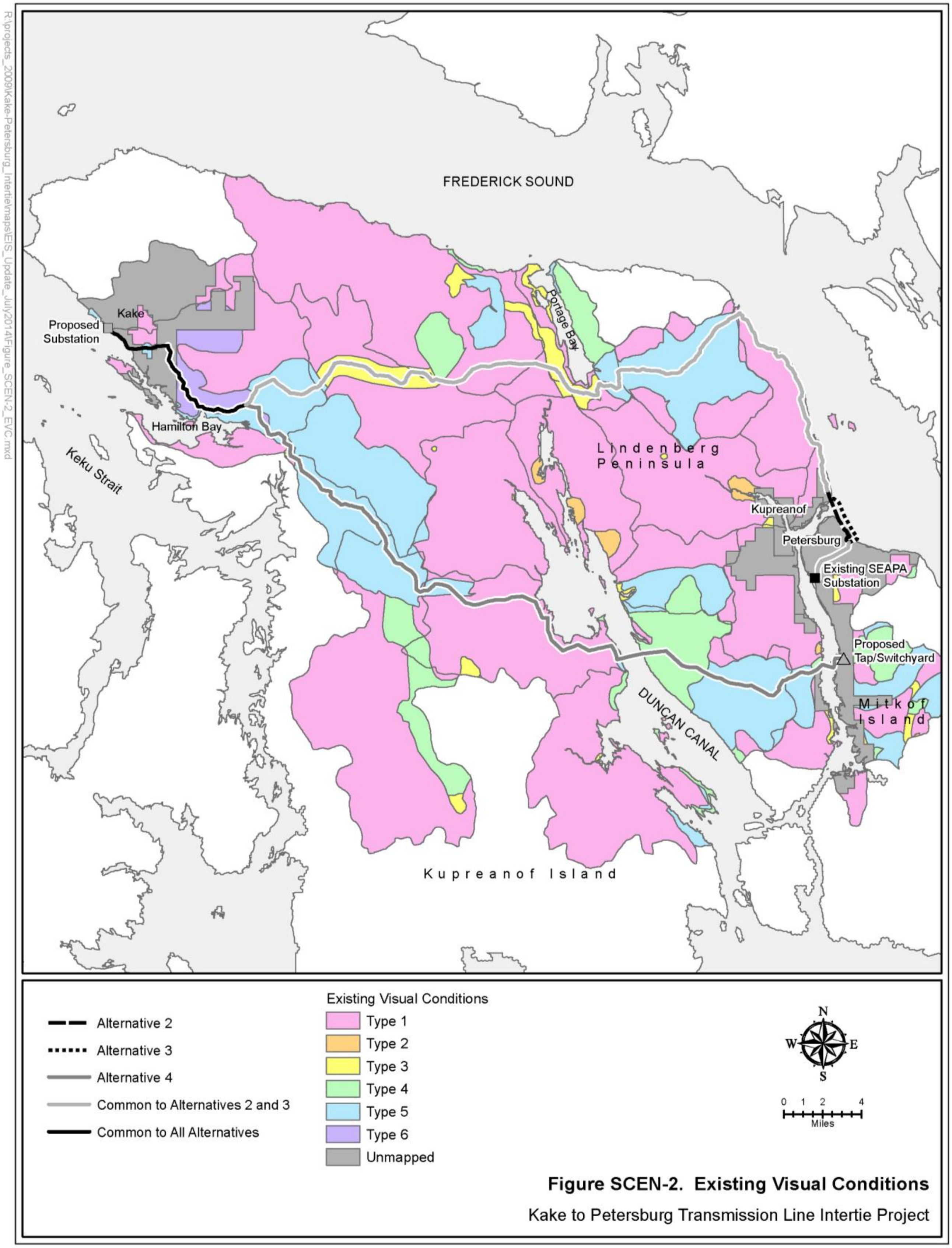


Figure SCEN-2. Existing Visual Conditions

Kake to Petersburg Transmission Line Intertie Project

Table SCEN-2. Existing Visual Conditions in the Analysis Area

ESI/EVC Type	Analysis Area Acres	Percent of Analysis Area Total	Percent of NFS Lands in the Analysis Area
Very High/Type 1	309,738	62.7%	68.2%
High/Type 2	2,656	0.5%	0.6%
Moderate/Type 3	11,888	2.4%	2.6%
Low/Type 4	31,942	6.5%	7.0%
Very Low/Type 5	88,627	17.9%	19.5%
Unacceptable Low/Type 6	6,106	1.2%	1.3%
Unmapped	3,053	0.6%	0.7%
TOTAL NFS	**454,010**	**91.9%**	**100%**
Non-National Forest	39,796	8.1%	N/A
Total All Lands	**493,806**	**100%**	**N/A**

Notes:
EVC – existing visual condition
N/A – not applicable

Visual Absorption Capacity

Visual absorption capacity (VAC) is an estimate of the relative ability of a landscape to absorb change resulting from alterations such as timber harvest and vegetation clearing. VAC incorporates elements of slope, distance zone, visibility, and landscape complexity in measuring this capacity for change. The Forest Plan management prescriptions provide direction in determining the maximum harvest treatment and allowable visual disturbance within development areas using VAC classes. The classes are Low, Intermediate, and High, and, as identified, express a low, intermediate, or high capacity of the landscape to absorb change. As noted in the SIO discussion, above, the landscape in TUS LUDs may be dominated by activities associated with transportation and utility systems and the SIO for the TUS LUD is low in all distance zones. VAC classes are not part of the scenery guidance provided for the TUS LUD management prescription.

The management prescription for the TUS LUD indicates that the following should be considered during the design phase of routes that are visible from VPRs:

a) Vegetation of slopes seen from the road.
b) Providing “planting pockets” or terraces or slopes, where needed.
c) Maintaining landforms through road location and design.
d) Breaking up the straight line effect of linear corridors by considering special treatment of vegetation on clearing slopes or application of other design techniques and principles.
e) Requiring roadside cleanup of construction debris and logging slash on all roads receiving general public use or expected to have such future use.

Environmental Effects

Effects Common to All Alternatives

Direct and Indirect Effects

Installation of the proposed transmission line structures and conductor (wires) would have visual impacts under all of the action alternatives, as would the construction of temporary shovel trails and temporary access spurs, and vegetation clearing elsewhere in the right-of-way. The proposed submarine cable termination yards would also have potential visual impacts. Overall, the proposed action alternatives would each disturb a very small percentage of the analysis area (less than half of 1 percent).

Scenic Attractiveness Class

Project disturbance is summarized by scenic attractiveness class and alternative in Table SCEN-3. None of the alternatives would disturb lands classified as Distinctive. The majority of the land expected to be disturbed under each alternative is classified as Indistinctive (Table SCEN-3).

Table SCEN-3. Project Disturbance by Scenic Attractiveness Class and Alternative

Scenic Attractiveness Class	Alternative					
	2 (Proposed Action)		3		4	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Distinctive	0	0%	0	0%	0	0%
Typical	401	45%	382	44%	105	14%
Indistinctive	472	53%	472	54%	610	83%
Unmapped	18	2%	18	2%	24	3%
Total	**891**	**100%**	**873**	**100%**	**739**	**100%**

Notes:
1/ Totals may not sum due to rounding.
2/ Totals include both NFS and non-NFS lands.
3/ Disturbance totals include disturbance related to structure installation, temporary shovel trails, matting panels, and temporary access spurs, and vegetation clearing.

Distance Zones

Project disturbance is summarized by distance zone and alternative in Table SCEN-4. Total disturbance in the Foreground for the action alternatives would range from 132 acres under Alternative 4 to 325 acres under Alternative 2 (with just slightly less, 307 acres, for Alternative 3).

Table SCEN-4. Project Disturbance by Distance Zone and Alternative

Distance Zone/ Alternative	Alternative					
	2 (Proposed Action)		3		4	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Foreground	325	36%	307	35%	132	18%
Middleground	285	33%	285	33%	209	28%
Background	1	0%	1	0%	11	1%
Seldom Seen	262	29%	262	30%	363	49%
Unmapped	18	2%	18	2%	24	4%
Total	**891**	**100%**	**873**	**100%**	**739**	**100%**

Notes:
1/ Totals may not sum due to rounding.
2/ Totals include both NFS and non-NFS lands.
3/ Disturbance totals include disturbance related to structure installation, temporary shovel trails, matting panels, and temporary access spurs, and vegetation clearing.

Scenic Integrity Objectives

Both of the route corridors—the Northern route corridor (Alternatives 2 and 3) and the Center-South route corridor (Alternative 4)—are identified as Potential Power Transmission Corridors in the Forest Plan, one of four subcategories that comprise the TUS LUD. The Forest Plan Standards and Guidelines for the TUS LUD indicate that the landscape may be dominated by activities associated with transportation and utility systems and requires the application of Forest-wide standards and guidelines for the Low SIO (USDA Forest Service 2008a, p. 3-132). All three action alternatives would meet the level of scenic quality prescribed for this SIO in the Forest Plan. Measures that would be employed to meet this SIO are common to all of the action alternatives and summarized below in the *Mitigation* section for this resource.

Existing Scenic Integrity (ESI)

Project disturbance is summarized by existing visual condition and alternative in Table SCEN-5. As discussed in the *Affected Environment* section, six levels are used to describe a landscape's existing scenic integrity, ranging from unaltered to heavily altered. Total disturbance in areas currently identified as unaltered would range from 222 acres for Alternative 4 to 309 acres for Alternatives 2 and 3.

Table SCEN-5. Project Disturbance by Existing Visual Condition and Alternative

	Alternative					
	2 (Proposed Action)		3		4	
ESI/EVC Type	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Very High/Type 1	309	35%	309	35%	222	30%
High/Type 2	0	0%	0	0%	0	0%
Moderate/Type 3	149	17%	149	17%	9	1%
Low/Type 4	4	0%	4	0%	66	9%
Very Low/Type 5	206	23%	206	24%	327	44%
Unacceptable Low/Type 6	49	5%	49	5%	49	7%
Unmapped	174	20%	156	19%	66	9%
Total	**891**	**100%**	**873**	**100%**	**739**	**100%**

Notes:
1/ Totals may not sum due to rounding.
2/ Totals include both NFS and non-NFS lands.
3/ Disturbance totals include disturbance related to structure installation, temporary shovel trails, matting panels, and temporary access spurs, and vegetation clearing.

Visibility

The line would consist of single wood pole structures with horizontal post insulators and three conductors (wires) (see Figure 2-4 in Chapter 2). The average pole would be approximately 55 feet tall and spaced approximately 350 feet to 400 feet apart. When seen in the foreground or silhouetted against the sky these structures would be highly visible. However, when the structures are seen against a coarsely textured forest backdrop, they tend to be absorbed into the background, greatly reducing their visual dominance. Under most viewing and lighting conditions in this region, transmission line conductors (wires) are difficult to detect and even at close range are typically not a visually prominent part of the scene, even when they are silhouetted against the sky. Conductors can, however, be highly visible under certain circumstances, primarily when the sun strikes a conductor at precisely the right angle to cause the light to reflect; this is most likely to occur when the conductor is new. Over time conductors tend to weather and lose their reflectivity.

No new roads would be constructed under any of the proposed alternatives. Existing forest roads would be used to access portions of all three action alternatives. Trucks and other equipment would use these existing roads to transport workers, materials, and machinery along the length of the line. However, all of the proposed action alternatives cross areas where there are no existing roads. Two primary options would be used for construction in these areas: temporary shovel trails and helicopter placement. Helicopters would also be used to haul personnel, construction equipment, and material to the right-of-way, as well as between isolated sections of road.

The proposed shovel trails would be temporary and for short-term use during project construction only. Shovel trails would be up to 16 feet wide and would use native materials where available. Temporary mats would be laid down to move the shovel rig along, where needed. In locations where poles are located off existing forest roads by more than 20 feet, temporary access spurs would be created by extending the road fill to the site. Where the distance from the road makes this impractical, temporary matting would be used to gain access to the site during construction. Shovel trails and temporary access spurs would be decommissioned following construction. Exposed soil along these temporary surfaces could introduce areas of light color into the scene, and contrast with the surrounding landscape. This impact would be short term and would lessen over time as the disturbed areas revegetate.

The average right-of-way width in areas classified by the Forest Service as productive forest is assumed for the purposes of analysis to be 300 feet, but not all of that width would necessarily need to be cleared, with the extent of the clearing being primarily dictated by line safety criteria. In order to maintain the safety of the structures and conductor, all trees that could grow up under the line or potentially fall over onto the line within 10 years of construction must be cut down. Trees and brush would, however, be left whenever possible to reduce the impact on the environment, especially in visually sensitive areas, riparian zones, erosion prone areas, and sensitive wildlife habitats. The average right-of-way clearing width along existing roads is assumed for the purposes of analysis to be 100 feet. The average clearing width in areas classified by the Forest Service as unproductive forest is also assumed to be 100 feet.

Impacts from right-of-way clearing would generally be greatest from locations with views straight down a cleared corridor or when viewed from the air. In many cases, right-of-way clearing would be "scalloped," narrowing near the towers, where there is little sway in the conductors, and widening at mid-span, narrowing the apparent width of the corridor and reducing the straight linear effect that can make a right-of-way corridor look unnatural. In addition, changes in topography and vegetation patterns (particularly in muskeg and alpine areas) would break up and reduce the straight linear effect in many locations along the proposed routes.

Views straight down a cleared right-of-way corridor from the VPRs in the project area would be rare under all of the proposed action alternatives. More typical views would be of the transmission line crossing the side of a forested slope, with the right-of-way clearing often only detectable as a slight linear break or shadow in the forest pattern. Cleared areas may be visible on especially steep slopes and the tops of structures and short stretches of conductor may also be visible. However, as noted above, wood poles and conductors would in most cases be absorbed by the forested backdrop and difficult to detect.

In addition to assessing the potential visual impacts of the alternatives based on estimated disturbance to scenic attractiveness classes, distance zones, SIOs, and existing scenic integrity, the following alternative-specific analyses also addresses how visible the proposed project would be from the VPRs in the proposed project vicinity. The VPRs from which one or more of the alternatives would be potentially visible are identified in the *Visual Priority Routes* section, above. GIS analysis was used to identify the number of structures that could potentially be visible from each of the selected viewpoints, taking into account the effects of topography and intervening vegetation. These structures are identified by distance zone (foreground, middleground, background, and seldom seen) in the following sections based on the distance from the representative viewpoint to the closest structure that the GIS analysis identified as "seen." Structures in the foreground (0 to 0.5 mile from the viewer) would be expected to have the highest degree of visibility.

Cumulative Effects

The direct and indirect effects analysis is based on the existing visual condition of the potentially affected landscape and, therefore, takes into account the cumulative effects of past activities in the analysis area.

Known current and reasonably foreseeable future projects in the vicinity of the KPI Project are discussed at the beginning of Chapter 3 of this EIS.

Assuming implementation of the Forest Plan, harvest of all suitable timber lands outside of Inventoried Roadless Areas will occur within the next 100 to 120 years. During this period, the KPI analysis area would be transitioning towards meeting the desired condition for the development LUDs. Over time, the landscape in the analysis area will be characterized by a mixture of stands ranging in stages of development. Age-classes of these stands will include recently harvested or regenerating stands, stands of young-growth composed of pole sized trees, to more mature young-growth and old-growth stands. The appearance of the activities associated with timber harvest within the Timber Production LUD will present a landscape highly modified by this change. Landscapes within the Modified Landscape and Scenic Viewshed LUDs will also appear modified by change although less than those allocated to the Timber Production LUD. At the other end of the spectrum, landscapes within the Old-Growth Habitat and Semi-remote Recreation LUD's will remain unchanged.

Alternative 1 – No Action

Direct and Indirect Effects

The no action alternative would have no direct or indirect effects on scenic resources because there would be no new transmission line built under this alternative and no associated structure installation; use of helicopters, temporary shovel trails, or temporary access spurs; or vegetation-clearing activities.

Cumulative Effects

The no action alternative would not contribute to cumulative effects on scenic resources because there would be no new transmission line built and no direct and indirect effects.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Scenic Attractiveness Class

More than half (53 percent) of the lands that would be disturbed by Alternative 2 have an assigned scenic attractiveness class of indistinctive (Table SCEN-3). This is the least attractive of the three scenic attractiveness classes and generally represents areas with low scenic quality. Another 45 percent of the area that would be disturbed has an assigned scenic attractiveness class of typical, which is assigned to areas with ordinary or common scenic quality. None of the areas that would be disturbed have an assigned scenic attractiveness class of distinctive, which represents areas with unique, unusual, or outstanding scenic quality.

Distance Zones

Approximately 36 percent of the acres disturbed by Alternative 2 are located in areas that have been mapped as foreground, with 33 percent located in areas mapped as middleground (Table SCEN-4). The remaining acres are located in areas mapped as seldom seen (29 percent) or unmapped (2 percent). Disturbance located in the Foreground would be relatively close to one or more of the VPRs in the proposed project vicinity, but would not necessarily be visible to the average viewer. Visibility from the potentially affected VPRs is discussed below.

Scenic Integrity Objectives

Alternative 2 would meet the level of scenic quality prescribed for the Low SIO in the Forest Plan within 1 year in the foreground distance and within 5 years in the middleground and background distance zones following completion of construction. Measures that would be employed to meet this SIO are summarized in the *Mitigation* subsection, below.

Existing Scenic Integrity

About one-third of the lands that would be disturbed (35 percent) by Alternative 2 have an ESI of Very High (EVC Type 1), which is assigned to landscapes where only ecological change has occurred (Table SCEN-5). These areas are mainly located along Frederick Sound and west of Portage Bay (Figure SCEN-2). These areas are part of the IRAs that would be crossed by the proposed alternative (see Figure 1-3). Nearly one-quarter of the lands that would be disturbed (23 percent) have an ESI of Very Low (EVC Type 5), with another 5 percent in Unacceptable Low (Type 6); these types are assigned to landscapes where existing changes are very noticeable and obvious to the average viewer. The Very Low areas crossed by this alternative are primarily areas where timber harvest has occurred in the past; the Unacceptable Low areas are adjacent to the city of Kake (Figure SCEN-2).

Visibility

The GIS analysis conducted for the proposed project identified a total of 22 VPRs from which Alternative 2 could be potentially seen. These VPRs are identified in Table SCEN-6, with the corresponding viewpoint locations shown in Figure SCEN-1. Table SCEN 6 also identifies the number of structures that could potentially be visible from each of the selected viewpoints by distance zone (foreground, middleground, background, and seldom seen) based on the distance to the closest structure that the GIS analysis identified as "seen." Based on this analysis, structures would be visible within the foreground (from 0 to 0.5 mile) from nine of the viewpoints selected to represent potentially affected VPRs (Table SCEN-6). The following sections discuss the potential visual impacts from each of the VPRs and viewpoints identified in Table SCEN-6. The following discussion proceeds east to west, while the listing in Table SCEN-6 is by VPR type.

Table SCEN-6. Number of Structures Potentially Visible from VPRs with view of Alternatives 2 and 3

VPR/Viewpoint	VCU	Distance to Closest "Seen" Structure (miles)[1/]	Number of Structures Visible[1/]			
			Foreground 0-0.5 miles	Middleground 0.5 – 5 miles	Background 5 - 15 miles	Seldom Seen > 15 miles
Community						
Kake	4230	0.61	0	6	0	0
Petersburg (airport)	4470	0.45	2	1	0	0
Petersburg (Sandy Beach)	4470	3.70	0	5	0	0
Kupreanof	4470	2.53	0	1	0	0
Small Boat & Mid-size Tour Boat Route						
Keku Strait	4250	1.90	0	13	0	3
Alaska Marine Highway Route/Tour Ship Route						
Frederick Sound (North)	4460	0.48	1	10	0	0
Frederick Sound (South)	4460	0.84	0	15	3	0
Wrangell Narrows (North)	4470	0.72	0	7	0	0
Saltwater Use Areas						
Beacon Point	4460	0.43	2	4	0	0
Hamilton Creek Estuary	4250	1.80	0	1	0	0
Mouth of Narrows	4470	1.84	0	6	0	0
Portage Bay	4420	2.10	0	4	0	0
Frederick Point	4470	5.80	0	0	23	0

Table SCEN-6. Number of Structures Potentially Visible from VPRs with view of Alternatives 2 and 3 (continued)

VPR/Viewpoint	VCU	Distance to Closest "Seen" Structure (miles)1/	Number of Structures Visible1/			
			Foreground 0-0.5 miles	Middleground 0.5 – 5 miles	Background 5 - 15 miles	Seldom Seen > 15 miles
Public Use Road						
Kake to Seal Point Road (North)	4250	0.08	4	13	0	0
Kake to Seal Point Road (South)	4250	0.04	5	0	0	0
Forest Service Recreation Cabin						
Portage Bay	4420	2.62	0	3	0	0
West Point	4420	6.66	0	0	2	0
Big John Bay	n/a	0	0	0	0	0
Dispersed Recreation Area						
Goose Lake (and Trail #462)	4250	0.04	4	0	0	0
Hiking Trail						
Portage Mountain Loop Trail (# 535)	4420	0.08	4	0	0	0
Colp Lake Trail (#461)	4460	0.02	2	0	0	0
Raven Trail (#607)	4470	0.44	2	1	0	0
Petersburg Mtn. Loop Trail (#585)	4470	2.84	0	3	0	0
Petersburg Lake Trail (#534)	4450	4.90	0	1	0	0
Big John Bay Trail (#465)	4271	5.08	0	0	3	0

Note:
1/ "Seen" structures in this context are those that could be potentially visible based on the intervening topography and vegetation. In most cases, structures in the Background and Seldom Seen distance zones would be very difficult to detect.

Frederick Point

Frederick Point is identified in the Forest Plan as a priority Saltwater Use Area. Views of the project from this area would be limited by intervening topography and the distance across Frederick Sound. The GIS analysis summarized in Table SCEN-6 indicated that boaters in this area may see 23 of the proposed structures in the background, between 5 to 15 miles away, with the closest seen structure nearly six miles from the viewpoint. At this distance, project structures would be difficult to discern against the forest slope along the eastern edge of the Lindenberg Peninsula.

Petersburg

Three viewpoint locations were selected to represent views from Petersburg. These points are identified in Figure SCEN-1 as Petersburg, Petersburg (airport), and Petersburg (Sandy Beach). The GIS analysis summarized in Table SCEN-6 indicated that parts of two structures would be visible between 0 and 0.5 miles (foreground) and one between 0.5 and 5 miles from the Petersburg (airport) viewpoint (Figure SCEN-1), with the closest structure located about 0.45 mile away. The proposed transmission line would follow an existing gravel road south of the airport in this location and represent an incremental addition to the overall level of alteration visible in this scene. Parts of five structures would be visible between 0.5 and 5 miles from the Petersburg (Sandy Beach) viewpoint (Figure SCEN-1), with the closest structure 3.7 miles away. At that distance, across the mouth of Wrangell Narrows, the structures would not dominate the landscape scene. A linear break in the forest line would be most visible, with structures largely blending into the forested slope. Depending on the final location of any onshore facility required for the

HDD bore, additional visual impacts may occur within the closer middleground to Sandy Beach. These would be mitigated through vegetative screening to the greatest extent possible.

Raven Trail (#607)

This 4.2-mile-long trail starts in Petersburg just south of the airport, and climbs south to the Ravens Roost Forest Service Recreation Cabin. No portion of the project would be visible from the top of the trail and cabin; thus, a viewpoint was selected for this VPR where the trail is crossed once by the transmission line approximately 0.3 mile from the trailhead (Figure SCEN-1). The GIS-based analysis indicated that two structures would be immediately visible in the foreground, with the closest structure 0.4-mile away, and one additional structure in the middle ground 0.5 to 5 miles away (Table SCEN-6). At the crossing location, the transmission line structures and right-of-way clearing would dominate the view. As this location is still within sight of the Petersburg airport before reaching the natural, forested extent of the trail, the transmission line would represent an incremental addition to the existing alteration of the landscape.

Mouth of Narrows

The Mouth of Narrows is the waterway entrance to Wrangell Narrows from Frederick Sound, identified in the Forest Plan as a priority Saltwater Use Area. Alternative 2 would cross the Mouth of Narrows via an HDD bore that would place the cable beneath the channel or via a submarine cable. The GIS-based analysis indicated that six proposed structures would be visible between 0.5 and 5 miles away from the viewpoint, with the closest seen structure approximately 1.84 miles to the north (Table SCEN-6). A linear break in the forested slope would also likely be visible at the closest middleground distances.

If a submarine cable was used to cross the Mouth of Narrows, submarine cable termination yards would be located either side of the Mouth. These yards would occupy relatively small areas (about 30 feet by 30 feet) that would serve as the interface between the overhead sections of the line and the submarine cable. They would be located near the shoreline on each side, but situated behind the tree lines to limit visibility from the water to the extent possible. The termination yards would contain lightning arrestors and risers that connect the overhead system to the submarine cable and include structures up to 50 feet in height. A photograph of a typical submarine cable termination facility is provided as Figure 2-9 in Chapter 2 of this EIS.

Views of the proposed project would be limited in duration for boaters and passengers on larger vessels passing through the Mouth of Narrows. Potential impacts from the waterway could be reduced by maintaining existing screening vegetation between the proposed transmission line and the shoreline.

Wrangell Narrows

The Wrangell Narrows separates Mitkof and Kupreanof Islands and is identified in the Forest Plan as part of the Alaska Marine Highway and a Tour Ship Route. All three action alternatives would cross Wrangell Narrows and two viewpoints were selected to represent this VPR (Figure SCEN-1). Wrangell Narrows (North) was primarily selected to assess views of Alternatives 2 and 3. Wrangell Narrows (South) was selected to assess views of Alternative 4 and is located where this alternative crosses the Wrangell Narrows.

The GIS-based analysis indicated that proposed structures for Alternative 2 would only be visible from the Wrangell Narrows (North) viewpoint, with seven structures between 0.5 and 5 miles away. The closest seen structure would be about 0.7 miles from this viewpoint to the east where the transmission line originates on Mitkof Island at the existing SEAPA substation. Views of the project for ferry and cruise ship passengers would likely be limited in duration as their respective vessels pass by the northwest end of Mitkof Island. As this portion of the project is in close proximity to the city of Petersburg, the limited view of infrastructure would be consistent with viewer expectations for this area and would add incrementally to the overall level of alteration visible in the scene. Potential impacts from the waterway could be reduced by maintaining existing screening vegetation between the proposed transmission line and the shoreline.

Petersburg Mountain Loop Trail (#585)

The approximately 3.6-mile trail starts at the shared trailhead near the State Dock in Kupreanof and climbs to Narrows Peak at the top of Petersburg Mountain. The viewpoint selected for this VPR is located just over halfway up the trail, still relatively close to the shoreline just after the trail turns west for a steep climb (Figure SCEN-1). The GIS-based analysis indicated that three proposed structures would be visible between 0.5 and 5 miles away, with the closest seen structure about 2.8 miles to the south, across the city of Petersburg (Table SCEN-6). From the top peak of the trail, additional structures may be visible in the background. Given the existing view of Petersburg from the trail, these structures would be consistent with existing infrastructure elements and would add incrementally to the overall level of alteration visible in the scene.

Kupreanof

The community of Kupreanof would be largely shielded by vegetation, intervening topography, and the city of Petersburg from potential views of the proposed project. The GIS analysis summarized in Table SCEN-6 indicated, though, that one structure located approximately 2.5 miles to the southeast would be visible to residents. Viewed from the community, the structure would be consistent with existing infrastructure elements and would add incrementally to the overall level of alteration visible in the scene.

Petersburg Lake Trail (#534)

This approximately 10.5-mile trail begins near the State Dock in Kupreanof and generally follows Petersburg Creek up to Petersburg Lake (connecting with the Portage Mountain Loop Trail for hikers continuing northward). Viewers at Petersburg Lake and the most northern end of the trail would not be able to see any portion of the project. Thus, a representative viewpoint was selected for the trail closer in, approximately 3 miles up the trail (Figure SCEN-1). The GIS-based analysis indicated that from this viewpoint, only one proposed structure may be visible 4.9 miles to the south. At this distance, the structure and transmission line may be difficult to discern against other infrastructure existing in the city of Petersburg between the trail and the proposed project. Visual impacts closer to the trailhead would be similar to those discussed above for the community of Kupreanof.

Frederick Sound and Beacon Point

Frederick Sound is identified in the Forest Plan as part of the Alaska Marine Highway and a Tour Ship Route. Beacon Point is identified as a Saltwater Use Area located in Frederick Sound. Alternatives 2 and 3 would both extend north along the shoreline of the Lindenberg Peninsula, which borders Frederick Sound to the west. The proposed transmission line would be located at the toe of the slope and existing vegetation would be left in place, largely screening the structures and line from the water. Three viewpoints on Frederick Sound were selected to represent these VPRs (Figure SCEN-1). The GIS-based analysis indicated that proposed structures would be visible from each of these viewpoints; however structures would be visible in the foreground (0 to 0.5 miles) from only the northern Frederick Sound viewpoint (1 structure) and Beacon Point viewpoint (2 structures), all close to a half mile away (Table SCEN-6). Four to 15 structures would be visible between 0.5 and 5 miles from the three viewpoints, and an additional three structures would be visible in the background (5 to 15 miles) from the southern Frederick Sound viewpoint. The proposed transmission line would also likely be visible as a linear break in the forest pattern when viewed from Frederick Sound, and where it would span the larger creeks that incise this stretch of shoreline. Views of the proposed project for ferry and cruise ship passengers would likely be limited in duration as their respective vessels pass these specific locations. Recreational boaters at Beacon Point would have a more consistent view of the proposed project, depending on their movement within Frederick Sound.

Colp Lake Trail (#461)

The 2.1-mile Colp Lake Trail begins near the shoreline of Frederick Sound and extends southwest to Colp Lake. Alternative 2 crosses the trail once within the first 1,000 feet of the hike. The GIS analysis summarized in Table SCEN-6 indicated that two structures would be visible in the foreground from this location. These structures would be visible from limited locations along the trail, primarily due to intervening forest vegetation. The overhead conductor would span the trail and be visible to hikers approaching from either direction. At the crossing location, the transmission line structures and right-of-way clearing would dominate the view and the transmission line would represent the introduction of a manmade feature into a predominantly natural landscape. The proposed alternative crosses the trail at a right angle and changes direction within a half mile before and after crossing the trail, thereby reducing potential views along the right-of-way.

Portage Mountain Loop Trail (#535)

The 11-mile-long Portage Mountain Loop Trail begins at the Petersburg Lake Cabin. The trail extends northwest from the cabin to Portage Bay and follows the south shoreline of the bay, before heading south to end at the Salt Chuck East Cabin. The trail is unmaintained with occasional blue diamonds for guidance. Alternative 2 crosses the Portage Mountain Loop Trail twice near Portage Bay. The viewpoint selected to represent this VPR is located where the line would cross the portion of the trail that extends north from Petersburg Lake to Portage Bay.

The GIS analysis summarized in Table SCEN-6 indicated that four structures would be visible in the foreground from this location. These structures would be visible from limited locations along the trail, primarily due to intervening forest vegetation. The overhead conductor would span the trail and be visible to hikers approaching from either direction. At the crossing location, the transmission line structures and right-of-way clearing would dominate the view and the transmission line would represent the introduction of a manmade feature into a predominantly natural landscape. The proposed alternative crosses the trail at an angle and changes direction shortly before and after crossing the trail, thereby reducing potential views along the right-of-way. This alternative would have similar visual impacts at the second location where it would cross this trail.

Portage Bay

Portage Bay is a priority Saltwater Use Area, with an associated Forest Service Recreation Cabin located on the eastern shore of the bay. Two viewpoints were selected to represent the Saltwater Use Area and Cabin location, respectively (Figure SCEN-1). The GIS-based analysis summarized in Table SCEN-6 indicated that proposed structures would be visible from both viewpoints between 0.5 and 5 miles away, four structures from the water and three structures from the cabin. The closest seen structure from the water would be 2.1 miles to the south, and the closest seen structure from the cabin would be 2.6 miles to the south. Boaters in Portage Bay may be able to see additional structures as they travel southward; however forest vegetation would still largely screen the project from view. The transmission line would likely be visible as a linear break in the forest pattern from both viewpoints.

West Point

West Point is a priority Forest Service Recreation Cabin located at the mouth of Portage Bay. The GIS-based analysis indicated that two proposed structures would be visible in the background view, 5 to 15 miles away, with the closest structure approximately 6.6 miles to the south. With Portage Bay and forested slopes between West Point and the transmission line, views would be extremely limited and the identified structures likely only potentially discernible against the backdrop in ideal weather conditions.

Big John Bay Cabin and Trail (#465)

Big John Bay is identified as a priority Forest Service Recreation Cabin in the Forest Plan. The associated 2.1-mile trail leading from FR 45001 to the cabin is also identified as a VPR. Each VPR was assigned a representative viewpoint for analysis (Figure SCEN-1). All three alternatives are potentially visible from the trail viewpoint. However, the GIS-based analysis indicated that Alternative 2 would only be visible in the background, 5 to 15 miles away, along the western end of the transmission line corridor common to all three alternatives (Table SCEN-6). At this distance and with intervening vegetation, Alternative 2 would be difficult to discern against the forested backdrop and would not reduce the visual experience of hiking and camping at Big John Bay. Although the initial GIS analysis suggested that the project would be visible from Big John Bay Cabin, this would not be the case as cabin is situated on a small wooded point facing away from the proposed project.

Goose Lake Dispersed Recreation Area and Trail (#462)

The 0.6-mile-long trail leading to and general vicinity around Goose Lake is identified as a priority Hiking Trail and Dispersed Recreation Area in the Forest Plan. Alternative 2 would cross the trail near the trailhead. A viewpoint was selected near this crossing as a representative location (Figure SCEN-1). The GIS-based analysis indicated that four proposed structures would be visible in the foreground, with the closest structure immediately next to the viewpoint (Table SCEN-6). These structures would be visible from limited locations along the trail, primarily due to intervening forest vegetation. The overhead conductor would span the trail and be visible to hikers approaching from either direction. At the crossing location, the transmission line structures and right-of-way clearing would dominate the view and the transmission line would represent the introduction of a manmade feature into a predominantly natural landscape. The proposed alternative crosses the trail at an angle, and the trail proceeds immediately into the recreation area where intervening vegetation limits further view of the proposed project.

Hamilton Creek Estuary

Hamilton Creek Estuary is identified in the Forest Plan as a priority Saltwater Use Area. One representative viewpoint was selected for this location (Figure SCEN-1). All three alternatives would be visible from this area; however, Alternative 2 would only be visible along the western end of the transmission line corridor common to all three alternatives. The GIS-based analysis indicated the one proposed structure would be visible to boaters, in the middleground approximately 1.8 miles away. The proposed transmission line would add incrementally to the overall level of alteration visible in the scene, primarily as a linear break in the forest. Potential impacts from the waterway could be reduced by maintaining existing screening vegetation between the proposed transmission line and the shoreline.

Kake to Seal Point Road

The Kake to Seal Point Road, identified in the Forest Plan as a Public Use Road, is the main public travel route from Kake to Seal Point, used by local residents and visitors to access recreation and other activities in the Seal Point area. Two viewpoints were selected to represent potential views from this VPR, one closer to Kake to the north and a second about 1.5 miles farther away from town to the south. The GIS-based analysis summarized in Table SCEN-6 indicated that nine of the proposed structures would be visible in the foreground from these viewpoints (4 from the northern point, and 5 from the southern), with an additional 13 structures visible between 0.5 to 5 miles away from the northern viewpoint Figure SCEN-1), with the closest structures immediately next to each viewpoint. The proposed transmission line would parallel this road for the entire length of the road, approximately six miles, and the structures and the line itself would be visible to people traveling along the road for its entire length. If located immediately adjacent to the road shoulder within the same cleared right-of-way as the road, the proposed transmission line would likely dominate the view from the road and represent a noticeable deviation from the existing visual setting. The potential for the transmission line to dominate road views could be reduced by setting the structures away from the road and leaving a visual buffer of trees along the road to screen views of the structures and the line.

Keku Strait

Keku Strait is identified in the Forest Plan as a Small Boat and Mid-Size Tour Boat Route. The GIS analysis summarized in Table SCEN-6 indicated that parts of 13 structures would be visible between 0.5 to 5 miles from the viewpoint selected to represent this VPR (Figure SCEN-1), with the closest structure located about 1.9 miles away. These structures would be located on non-NFS lands along the part of the Kake to Seal Point Road that follows the coastline southeast of Kake. The structures would be set against a generally forested background and would be broadly consistent with viewer expectations for this location, based on its proximity to the community of Kake, as indicated by the Very Low and Unacceptable Low ESI (EVC Types 5 and 6) in this area (Figure SCEN-2). The proposed transmission line would add incrementally to the overall level of alteration visible in the scene. Potential impacts from the waterway could be reduced by maintaining existing screening vegetation between the proposed transmission line and the shoreline.

Kake

The GIS analysis summarized in Table SCEN-6 indicated that parts of six structures would be visible between 0.5 to 5 miles from the viewpoint selected to represent the city of Kake (Figure SCEN-1), with the closest structure located about 0.6 mile away. These structures would be located on non-NFS lands along the part of the Kake to Seal Point Road that follows the coastline southeast of Kake. Viewed from the community, these structures would be consistent with existing infrastructure elements and would add incrementally to the overall level of alteration visible in the scene.

Cumulative Effects

As noted in the cumulative effects discussion common to all alternatives, implementation of the Forest Plan over the next 100 to 120 years would result in timber harvest in the development LUDs within the analysis area (see Figure 1-4). Reasonably foreseeable timber sales and other projects are identified in the *Reasonably Foreseeable Future Actions* section at the beginning of this chapter. Unit-specific data available for four of the reasonably foreseeable timber sales indicate that 356 acres within the analysis area for Alternative 2 could be harvested as part of the Scott Peak timber sale, which is currently under litigation. An estimated 2.7 acres of this total coincide with the proposed disturbance footprint for Alternative 2. Mitigation measures would reduce the potential impacts of proposed harvest in these locations and minimize visibility from VPRs in accordance with the Forest Plan (USDA Forest Service 2008a). The incremental addition of Alternative 2 to the proposed project is not expected to result in impacts substantially greater than those disclosed in the preceding section.

The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. Parts of the Kake road project corridor are identified as an “Existing State Road Corridor” in the Forest Plan, with the remaining parts of the corridor identified as a “Proposed State Road Corridor (Proposed Ferry Routes Not Shown).” These corridor designations are two of four subcategories that comprise the TUS LUD. “Existing Power Transmission Corridor” and “Potential Power Transmission Corridor” are the other two TUS LUD subcategories. Mitigation measures for the Kake road project would likely reduce potential impacts and minimize visibility from VPRs in accordance with the Forest Plan (USDA Forest Service 2008a).

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Alternatives 2 and 3 are the same with the exception of the approximately 3-mile-long section that extends from Sandy Beach Park on Mitkof Island to Kupreanof Island (see Figure 2-1). Under Alternative 3, the proposed transmission line would cross Frederick Sound via a 3.1-mile-long submarine cable. The crossing would originate near Sandy Beach Park and come ashore near Prolewy Point on the east shore of Kupreanof Island. In both cases, this portion of the route is located entirely on non-NFS lands (see Figure 2-1).

Scenic Attractiveness Class, Distance Zones, Scenery Integrity Objectives, and Existing Scenic Integrity

As noted above, Alternatives 2 and 3 are the same with the exception of an approximately 3-mile-long section located on non-NFS lands. The impact discussions related to Scenic Attractiveness Class, Distance Zones, SIOs, and ESI are, as a result, predominantly the same for both alternatives. See the discussion for these items for Alternative 2, above. For the analysis of disturbance by Distance Zone, Alternative 3 affects slightly less area (18 acres) classified as foreground.

Visibility

The majority of Alternative 3 would have the same impacts in relation to VPRs as discussed above for Alternative 2. There would be additional visual impacts in the immediate vicinity of the submarine cable termination yards on Mitkof and Kupreanof Islands, and potentially from just offshore in Frederick Sound. These impacts would be similar to those described above for Alternative 2 in the Mouth of Narrows subsection.

Cumulative Effects

As discussed with respect to Alternative 2, the incremental addition of Alternative 3 to the one reasonably foreseeable timber sale project that would coincide with the proposed transmission line is not expected to result in substantially greater impacts than those that would be expected to occur as a result of the proposed project alone. Similar to Alternative 2, the Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. Mitigation measures for the Kake road project would likely reduce potential impacts and minimize visibility from VPRs in accordance with the Forest Plan (USDA Forest Service 2008a).

Alternative 4 – Center South Route

Direct and Indirect Effects

Scenic Attractiveness Class

Approximately 83 percent of the lands that would be disturbed by Alternative 4 have an assigned scenic attractiveness class of indistinctive (Table SCEN-3). This is the least attractive of the three scenic attractiveness classes and generally represents areas with low scenic quality. The remaining 17 percent of the area that would be disturbed has an assigned scenic attractiveness class of typical (14 percent), which is assigned to areas with ordinary or common scenic quality, or is unmapped. None of the areas that would be disturbed have an assigned scenic attractiveness class of distinctive, which represents areas with unique, unusual, or outstanding scenic quality.

Distance Zones

Approximately 18 percent of the acres disturbed by Alternative 4 are located in areas that have been mapped as foreground, with 28 percent located in areas mapped as middleground (Table SCEN-4). The remaining acres are located in areas mapped as background (1 percent), seldom seen (49 percent), or are unmapped (4 percent). Disturbance located in the foreground would be relatively close to one or more of the VPRs in the project vicinity, but would not necessarily be visible to the average viewer. Visibility from the potentially affected VPRs is discussed below.

Scenic Integrity Objectives

Alternative 4 would meet the level of scenic quality prescribed for the Low SIO in the Forest Plan within one year in the Foreground distance and within five years in the Middle and Background distance zones following completion of construction. Measures that would be employed to meet this SIO are summarized in the *Mitigation* section, below.

Existing Scenic Integrity

More than half of the lands that would be disturbed by Alternative 4 have an ESI of Very Low (44 percent) or Unacceptable Low (7 percent) (EVC Types 5 and 6, respectively) (Table SCEN-5). The ESI categories of Very Low and Unacceptable are assigned to landscapes where changes are very noticeable and obvious to the average viewer. The Very Low areas crossed by this alternative are primarily areas where timber harvest has occurred in the past; the Unacceptable Low areas are adjacent to the city of Kake (Figure SCEN-2). Approximately 30 percent of the lands that would be disturbed have an ESI of Very High (EVC Type 1), which is assigned to landscapes where only ecological change has occurred. This area coincides with the IRA west of Duncan Canal.

Visibility

The GIS analysis conducted for this project identified a total of 17 VPRs from which Alternative 4 could be potentially seen, and one additional location popular with local residents (Papke's Landing). These VPRs are identified in Table SCEN-7, with the corresponding viewpoint locations shown in Figure SCEN-1. Table SCEN-7 also identifies the number of structures that could potentially be visible from each of the selected viewpoints by distance zone (foreground, middleground, background, and seldom seen) based on the distance to the closest structure that the GIS analysis identified as "seen." Based on this analysis, structures would be visible within the foreground (from 0 to 0.5 mile) from five of the selected viewpoints (Table SCEN-7). The following sections discuss the potential visual impacts from each of the VPRs and viewpoints identified in Table SCEN-7. The following discussion proceeds east to west, while the listing in Table SCEN-7 is by VPR type.

Table SCEN-7. Number of Structures Potentially Visible from VPRs with a view of Alternative 4

VPR/Viewpoint	VCU	Distance to Closest "Seen" Structure (miles)1/	Number of Structures Visible1/			
			Foreground 0-0.5 mile	Middleground 0.5 – 5 miles	Background 5 - 15 miles	Seldom Seen > 15 miles
Community						
Kake	4230	0.61	0	6	0	0
Alaska Marine Highway Route and Tour Ship Route						
Wrangell Narrows (north)	4470	4.66	0	5	0	0
Wrangell Narrows (south)	4470	0.27	1	4	0	0
Small Boat & Mid-size Tour Boat Route						
Keku Strait	4250	1.90	0	13	0	0
Towers Arm	4400	5.95	0	0	12	0
Duncan Canal to Salt Chuck	4411	6.16	0	0	3	0

Table SCEN-7. Number of Structures Potentially Visible from VPRs with a view of Alternative 4 (continued)

VPR/Viewpoint	VCU	Distance to Closest "Seen" Structure (miles)[1/]	Number of Structures Visible[1/]			
			Foreground 0-0.5 mile	Middleground 0.5 – 5 miles	Background 5 - 15 miles	Seldom Seen > 15 miles
Saltwater Use Area						
Duncan Canal (north of line)	4380	3.10	0	11	1	0
Duncan Canal (south of line)	4370	2.50	0	5	0	0
Hamilton Creek Estuary	4250	1.80	0	5	0	0
Boat Anchorage						
Castle Islands	4350	3.38	0	3	0	0
Papke's Landing	4470	2.48	0	4	0	0
Public Use Road						
Kake to Seal Point Road (north)	4250	0.08	4	13	0	0
Kake to Seal Point Road (south)	4250	0.04	5	0	0	0
Forest Road 6235 Three Lakes Loop	4470	2.33	0	4	0	0
Forest Service Recreation Cabins						
Big John Bay	n/a	0.00	0	0	0	0
Castle Flats	4350	5.77	0	0	1	0
Towers Arm	4400	10.56	0	0	4	0
Dispersed Recreation Areas						
Hamilton Creek	4250	0.11	1	0	0	0
Hiking Trails						
Big John Bay Trail (#465)	4271	0.28	5	8	3	0
State Marine Park						
Beecher Pass	n/a	10.20	0	0	3	4

Note:
1/ "Seen" structures in this context are those that could be potentially visible based on the intervening topography and vegetation. In most cases, structures in the Background and Seldom Seen distance zones would be very difficult to detect.

Wrangell Narrows

As noted under Alternative 2, the Wrangell Narrows separates Mitkof and Kupreanof Islands and is identified in the Forest Plan as part of the Alaska Marine Highway and a Tour Ship Route. All three action alternatives would cross Wrangell Narrows and two viewpoints were selected to represent this VPR (Figure SCEN-1). Wrangell Narrows (North) was primarily selected to assess views of Alternatives 2 and 3. Wrangell Narrows (South) was selected to assess views of Alternative 4 and is located where this alternative crosses the Wrangell Narrows.

As currently proposed, Alternative 4 would involve a submarine cable crossing of or HDD bore beneath the Wrangell Narrows at this location; the proposed transmission line would not span this waterway. If Alternative 4 and a submarine cable crossing were the selected alternative and approach, submarine cable termination yards would be needed on both ends of the cable crossing. These yards would occupy relatively small areas (about 30 feet by 30 feet) that would serve as the interface between the overhead sections of the line and the submarine cable. They would be located near the shoreline on either side of the Narrows, but situated behind the tree lines to limit visibility from the water to the extent possible. The termination yards would contain lightning arrestors and risers that connect the overhead system to the submarine cable and include structures up to 50 feet in height. A photograph of a typical submarine cable termination facility is provided as Figure 2-9 in Chapter 2 of this EIS.

The GIS-based analysis summarized in Table SCEN-7 indicated that parts of the proposed structures either side of the Wrangell Narrows would be visible from both viewpoints; however primarily from the Wrangell Narrows (South) viewpoint. These structures would likely be partially shielded from view by the existing tree line and the parts that were visible would be viewed against a textured forested backdrop and likely absorbed into the background. The transmission line corridor on both sides of the Narrows would extend away from the water at an angle, further reducing the potential for views straight down a cleared right-of-way corridor. In addition, existing manmade changes are evident at this crossing on either side of the waterway. The Tonka LTF is located on the west shore and an old wooden structure is present on the east, with existing roads also visible on both shorelines.

Mitkof State Highway (Highway 7)

Two viewpoints were selected to provide a representative view from this VPR. The first is located approximately midway between the points of origin for the alternatives (about 2 miles north of Alternative 4), and the second is located near where Alternative 4 would connect to the existing Tyee transmission line and cross the highway heading east towards Wrangell Narrows. The GIS-based analysis indicated that no proposed structures for Alternative 4 would be visible from either viewpoint (and therefore is not shown in Table SCEN-7). However, from the second viewpoint, Alternative 4 would be directly visible to passing motorists where the transmission line crosses the highway, and potentially visible as the route parallels the highway for approximately three-quarters of a mile to the Wrangell Narrows crossing location. The potential for the transmission line to dominate road views south of the direct crossing would be reduced by leaving a visual buffer of trees along the road to screen views of the structures and the line to the extent possible. Further, existing commercial, light industrial, and residential development occurs along this corridor; therefore, the transmission line would represent an incremental addition to existing alterations to the landscape.

Forest Road 6235 Three Lakes Loop

Two viewpoints were selected to provide a representative view from this VPR. The first is located near the juncture with Mitkof State Highway (about two mile south of Alternative 4), and the second just up the road about a half mile. The GIS-based analysis indicated that no proposed structures would be visible from the second viewpoint. At that point in the road, it begins to curve away from Wrangell Narrows and wraps around a large hillside, thereby screening the majority of the roadway from potential views of the project. From the first viewpoint close to the highway, four proposed structures would be visible in the middleground, with the closest seen structure 2.3 miles to the north (Table SCEN-7). The transmission line would be an incremental addition to existing infrastructure along that end of the road, consistent with viewer expectations as they exit the less altered setting in the interior of Mitkof Island.

Papke's Landing

While not a VPR, the Forest Service identified Papke's Landing as a popular boat launch used by residents in the area (Figure SCEN-1). The GIS-based analysis indicated that four proposed structures would be visible between 0.5 and 5 miles away, with the closest seen structure approximately 2.5 miles to the north and on the opposite side of Wrangell Narrows (Table SCEN-7). These structures would be set against a forested backdrop and difficult to detect from this location. Boaters traveling from this point northward would experience similar effects as discussed for Wrangell Narrows above.

Beecher Pass State Marine Park

The GIS-based viewshed analysis indicated that Alternative 4 could be potentially visible from the Beecher Pass State Marine Park. However, the selected viewpoint is more than 10 miles from the closest "seen" structure and it is highly unlikely that the proposed project would be visible from this location (Table SCEN-7, Figure SCEN-1).

Castle Islands

The Castle Islands are identified as a Boat Anchorage in the Forest Plan. The GIS analysis summarized in Table SCEN-7 indicated that parts of the proposed structures either side of the Duncan Canal could be visible from the viewpoint selected to represent this location (Figure SCEN-1). However, these structures would be more than 3 miles from this viewpoint, partially screened by existing vegetation and set against a forested backdrop, and would, therefore, be very difficult to detect from this location.

Castle Flats

Castle Flats is a priority Forest Service Recreation Cabin on the western side of Duncan Canal (Figure SCEN-1). The GIS-based analysis indicated that one proposed structure may be visible from this location in the background, more than five miles away (Table SCEN-7). At this distance with intervening vegetation and water, it is highly unlikely that the project would be visible from this location.

Duncan Canal

Duncan Canal is identified in the Forest Plan as a Saltwater Use Area. Two viewpoints were selected to assess the potential impacts of Alternative 4 as viewed from this VPR (Figure SCEN-1). Crossing the Duncan Canal would involve a second submarine cable crossing or HDD bore; the proposed transmission line would not span this waterway. Based on the selected viewpoints, north and south of the proposed crossing location, there would be no structures visible in the foreground (Table SCEN-7). Viewed from both Duncan Canal viewpoints, a number of structures would be partially visible, more than two miles away. These structures would be set against a forested backdrop and difficult to detect from this location.

Closer to the crossing location, individual structures either side of the waterway would likely be partially visible from the water. If Alternative 4 and submarine cable were the selected alternative and approach, submarine cable termination yards would be located on the shoreline either side of the canal, but situated behind the tree lines to limit visibility from the water to the extent possible. Although the cleared right-of-way corridor for this alternative would extend east from this crossing for almost a mile, existing vegetation that would be retained between the proposed submarine cable termination yard and the water would reduce the potential for views straight down the cleared corridor.

Duncan Canal to Salt Chuck

Duncan Canal to Salt Chuck is identified in the Forest Plan as a Small Boat and Mid-Size Tour Boat Route. However, the selected viewpoint for this VPR near the mouth of North Arm (Figure SCEN-1) is over six miles from the closest “seen” structure and it is highly unlikely that the proposed project would be visible from this location (Table SCEN-7).

Towers Arm Waterway and Cabin

Towers Arm is identified in the Forest Plan as a Small Boat and Mid-Size Tour Boat Route. The GIS-based viewshed analysis indicated that Alternative 4 could be potentially visible from this location. However, similar to Duncan Canal to Salt Chuck neighboring to the east, the selected viewpoint for this VPR at the mouth to Towers Arm (Figure SCEN-1) is almost 6 miles from the closest “seen” structure and it is highly unlikely that the project would be visible from this location (Table SCEN-7). The Forest Service Recreation Cabin associated with Towers Arm is located at the far end of the waterway, with the closest “seen” structure over 10 miles to the south and equally or more unlikely to be visible from this location (Table SCEN-7).

Big John Bay Cabin and Trail (#465)

Big John Bay is identified as a priority Forest Service Recreation Cabin in the Forest Plan. The associated 2.1-mile trail leading from FR 45001 to the cabin is also identified as a VPR. Each VPR was assigned a representative viewpoint for analysis (Figure SCEN-1). All three alternatives are potentially visible from the trail viewpoint. However, Alternative 4 would be primarily visible from both viewpoints, especially from Trail #465 with five proposed structures in the foreground (Table SCEN-7). An additional eight structures would be visible to hikers along the trail between 0.5 and 5 miles away, and 20 structures would be visible from the cabin in the middleground, with the closest seen structure about 1.9 miles away (Table SCEN-7). Hikers would experience a short-term disruption to the otherwise natural setting, though structures would be visible from limited locations along the trail, primarily due to intervening forest vegetation. Although the initial GIS analysis suggested that the project would be visible from Big John Bay Cabin, this would not be the case as cabin is situated on a small wooded point facing away from the project.

Hamilton Creek

Hamilton Creek is identified as a priority Dispersed Recreation Area in the Forest Plan. One representative viewpoint was selected for this VPR where Alternative 4 would cross Hamilton Creek (Figure SCEN-1). The GIS-based analysis indicated that one proposed structure would be visible in the immediate foreground next to the viewpoint (Table SCEN-7). Tall forested vegetation likely screens other structures from viewers within the recreation area. The right-of-way would dominate the scene for users along the direct crossing, as the right-of-way would create a linear gap in the forest for approximately half of a mile.

Hamilton Creek Estuary

Hamilton Creek Estuary is identified in the Forest Plan as a priority Saltwater Use Area. One representative viewpoint was selected for this location (Figure SCEN-1). All three alternatives would be visible from this area; however, Alternative 4 would be visible to a greater extent from this viewpoint along its corridor immediately prior to rejoining Alternatives 2 and 3. The GIS-based analysis indicated that five proposed structures would be visible to boaters in the middleground, with the closest seen structure approximately 1.8 miles away in the corridor common to all three alternatives, and four additional structures over 3.3 miles away along the Alternative 4 route (Table SCEN-7). The proposed transmission line would add incrementally to the overall level of alteration visible in the scene, primarily as a linear break in the forest. Potential impacts from the waterway could be reduced by maintaining existing screening vegetation between the proposed transmission line and the shoreline. The more distant structures visible along the Alternative 4 corridor would be set against a forested backdrop and very difficult to detect from the waterway.

Kake to Seal Point Road, Keku Strait, and Kake

All three action alternatives follow the same alignment in the locations that would be visible from these VPRs; therefore, the visual impacts would be the same as those described above for Alternative 2.

Cumulative Effects

Implementation of the Forest Plan over the next 100 to 120 years would result in timber harvest in the development LUDs within the analysis area (see Figure 1-4). Reasonably foreseeable projects within the analysis area for this alternative include the Central Kupreanof timber sale project. A total of 16.9 acres of identified harvest units for these projects coincide with the disturbance footprint for Alternative 4. Although NEPA-cleared, unless market conditions change, the Central Kupreanof units are not expected to be offered for sale over the next 5 years. Mitigation measures would reduce the potential impacts of proposed harvest in these locations and minimize visibility from VPRs in accordance with the Forest Plan (USDA Forest Service 2008a). The incremental addition of Alternative 4 to these projects is not expected to result in impacts substantially greater than those disclosed in the preceding section.

The Kake road project would disturb an estimated 167 acres of land in areas that are presently unroaded. As noted in the cumulative effects discussion for Alternative 2, parts of the Kake road project corridor are identified as an “Existing State Road Corridor” in the Forest Plan, with the remaining parts of the corridor identified as a "Proposed State Road Corridor (Proposed Ferry Routes Not Shown)." These corridor designations are two of four subcategories that comprise the TUS LUD. "Existing Power Transmission Corridor" and "Potential Power Transmission Corridor" are the other two TUS LUD subcategories. Mitigation measures for the Kake road project would likely reduce potential impacts and minimize visibility from VPRs in accordance with the Forest Plan (USDA Forest Service 2008a).

Mitigation

The effects of the KPI Project on scenery would be limited through the site-specific application of Forest Plan Standards and Guidelines and project-specific mitigation measures (see Chapter 2). The proposed alternatives will continue to be refined as the project continues. Future design efforts will take into consideration measures designed to respond to visual concerns, specifically regarding the location of structures and other project components.

Recreation

Introduction

The recreation section provides an assessment of the current condition of the analysis area and the potential effects of implementing the proposed action and the alternatives on recreation resources. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the proposed project (i.e., the no action alternative).

Analysis Area and Methodology

The analysis area for recreation consists of the 18 VCUs that comprise the KPI project area (Figure 1-2) and VCU 4270. The analysis area is shown in Figure REC-1. VCU 4270 has been added because one of the proposed action alternatives passes in close proximity and the potentially affected Big John Bay Cabin is located in this area. The analysis of existing recreation opportunities is based on the Forest Service Recreation Opportunity Spectrum system (ROS). Key ROS setting characteristics considered in the analysis include remoteness, size of the area, evidence of humans and human activity, user density, and land management objectives. Potential impacts to ROS settings are estimated based on projected system and temporary road construction using GIS analysis. Impacts to recreation places and sites, OHV use, and Special Use Permits and Outfitter/Guide use are assessed qualitatively. Construction-related impacts would last for the duration of construction; operation-related impacts would last for the period the transmission line is in place.

Affected Environment

Recreation use in the analysis area includes freshwater fishing, big game and waterfowl hunting, OHV use, kayaking and canoeing, hiking and wildlife viewing, picnicking, and camping. The following section is divided into five parts that provide an overview of regional and local tourism and describe ROS settings, recreation places and sites, OHV use, and outfitter/guide use in the analysis area.

Tourism

Southeast Alaska

The visitor industry in Alaska is very seasonal, with the majority of visitation taking place between May and September. An estimated 1,064,000 out-of-state visitors came to Southeast Alaska from May 2011 through April 2012, with the majority of these visitors arriving by cruise ship (McDowell Group 2013). In addition to experiencing the Tongass from the deck of the cruise ship and exploring ports of call, many passengers also take at least one trip to the Forest during their visit (McDowell Group 2005). Non-cruise visitors tend to either use package deals designed to provide transportation, lodging, meals, and activities, or visit as independent travelers. Independent travelers tend to design their own travel itineraries, utilize public transportation systems, and stay in local communities. For the majority of Alaska visitors, it is important to experience the natural resources, cultural history, and wildness of the region. The McDowell Group (2013) estimated that total visitor-related employment supported 10,200 jobs and $370 million in labor income in Southeast Alaska from May 2011 through April 2012, about 21 percent of total regional employment and 15 percent of total labor income.

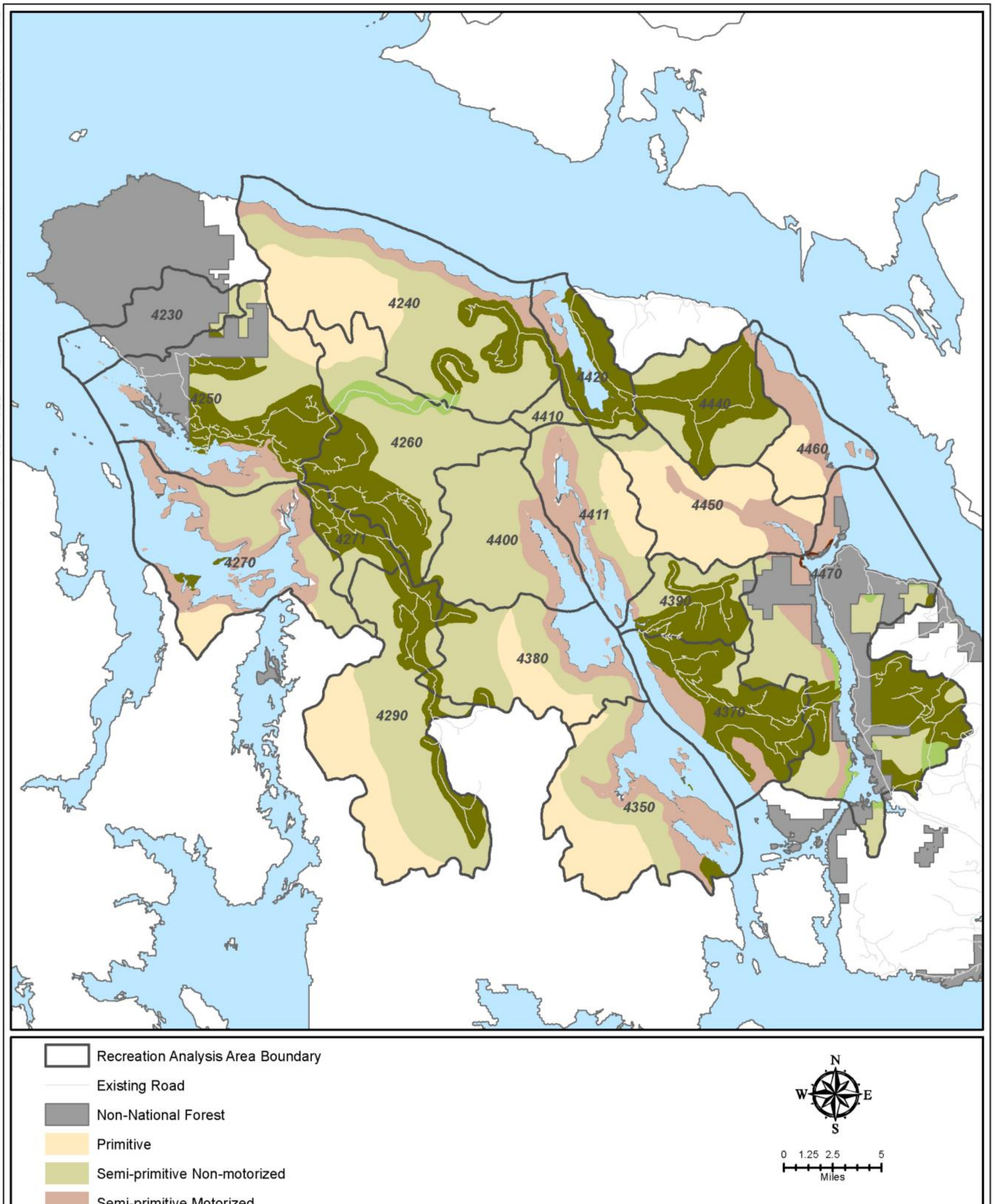


Figure REC-1. Recreation Opportunity Spectrum Settings within the Analysis Area

Kake to Petersburg Transmission Line Intertie Project

Petersburg

Visitors to Petersburg arrive by airplane, ferry, small cruise ship, or private vessel. Commercial flight service is provided by Alaska Airlines, which operates one commercial jet flight north and south each day. Approximately six ferries stop in Petersburg each week, with the schedules varying between summer and winter. Visitor statistics compiled by the Petersburg Chamber of Commerce in 2005 indicated that there were a total of 24,000 visitors (excluding business travelers), including 10,000 cruise ship passengers, 6,000 passengers from private vessels, 4,500 air passengers, and 3,400 ferry passengers (Dugan et al. 2009).

Petersburg is a common stop for out-of-town yachts and pleasure craft traveling up or down the Inside Passage during the summer. An estimated 1,800 of these types of vessels moored at Petersburg Harbor in summer 2006 (Dugan et al. 2009). Other visitors bring their cars and recreational vehicles (RVs) on the Alaska Marine Highway System. Informal estimates suggest that more than 700 RVs visited Petersburg in 2006 (Dugan et al. 2009). Petersburg is located away from the sea lines traveled by large cruise ships, but several smaller cruise ships, typically carrying 200 or fewer passengers, visit regularly during the summer, with an estimated 8 to 10 cruise vessels visiting a week in summer 2006. Cruise ship passengers do not spend much time in Petersburg, typically visiting for a limited number of hours. Other independent (i.e., non-cruise) visitors typically spend from 2 to 7 days in Petersburg (Dugan et al. 2009).

An estimated 29,000 out-of-state residents visited Petersburg in summer 2006, about 2.5 percent of total visitors to Southeast Alaska (McDowell Group 2007). A study by the University of Alaska Institute of Social and Economic Research estimated that 13,000 visitors participated in nature-based tourism in Petersburg in 2007, bringing in an estimated $2.7 million in gross revenues, with most of this revenue related to fishing lodges and charters (Dugan et al. 2009). Other nature-based tourism activities include whale watching in Frederick Sound, LeConte Glacier tours, and flightseeing and air services, including wilderness drop-offs.

Petersburg offers more unguided recreation opportunities than many other Southeast Alaska communities. Fishing and boating opportunities are available in protected waters close to town and the developed road system around Mitkof Island includes 22 miles of paved road, as well as 200 miles of logging roads. Petersburg also offers opportunities for unguided hiking, with at least 25 hiking trails located on the Petersburg Ranger District, including 7 trails on Mitkof Island that can be accessed by road.

Recreation Opportunity Spectrum

The ROS system is a land classification system developed by the Forest Service to help identify and describe possible combinations of recreation activities, settings, and experiences for management purposes (USDA Forest Service 1982). The ROS system portrays the appropriate combination of activities, settings, and experiences along a continuum that ranges from primitive to highly modified environments. Seven classifications are identified along this continuum:

- Primitive (P)
- Semi-Primitive Non-Motorized (SPNM)
- Semi-Primitive Motorized (SPM)
- Roaded Natural (RN)
- Roaded Modified (RM)
- Rural (R)
- Urban (U)

ROS classes represent a spectrum of possible experiences, from those with a high probability of self-reliance, solitude, challenge, and risk to those with a relatively high degree of interaction with other people. The settings, activities, and probable recreation experience opportunities associated with each ROS setting are described in Appendix I to the 2008 Forest Plan (USDA Forest Service 2008a).

The ROS is not a management system and does not specify or prescribe what types of activities are allowed in an area. The LUDs assigned in the Forest Plan prescribe allowable management activities, along with Federal, State, and local laws and regulations. Therefore, if a LUD allows for increased development, timber harvest, or increased recreation use, then the descriptive ROS character may change to reflect the new development. Since expanded development is allowed within the analysis area based on the area's LUDs, a change in ROS setting is allowed as a management objective of the existing plan. In addition, changes to existing ROS allocations were anticipated as part of the management objectives and direction incorporated in the Forest Plan (USDA Forest Service 2008c).

The recreation analysis area encompasses approximately 520,000 acres, including approximately 40,000 acres of non-NFS lands. These non-NFS lands are not included in the ROS analysis, leaving approximately 479,000 acres of NFS land within the analysis area. One-quarter of this area (25.4 percent) has been inventoried as RM (Table REC-1). Community road systems, including the existing networks of Forest Service roads, provide access to developed and dispersed recreation opportunities in these areas. The SPNM setting accounts for about 41 percent of the analysis area, with the P and SPM settings accounting for about 19 percent and 14 percent, respectively. The areas inventoried as P and SPNM, where opportunities for more remote recreation are available, largely coincide with the Petersburg Creek-Duncan Salt Chuck Wilderness (which would not be crossed by any of the alternatives) and the Inventoried Roadless Areas in the recreation analysis area. The areas inventoried as SPM are primarily located along coastlines and other waterways (Figure REC-1). The remaining land in the analysis area, approximately 3 percent, has been inventoried as RN (1.2 percent) and R (< 0.1 percent) (Table REC-1). The RN areas are located along the shoreline near Sandy Beach. The R areas are located on either side of Petersburg Creek and generally coincide with the city of Kupreanof (Figure REC-1).

Table REC-1. ROS Designations within the Analysis Area

ROS Class	Acres	Percent of Analysis Area
Primitive (P)	92,416	19.3
Semi-Primitive Non-Motorized (SPNM)	194,840	40.7
Semi-Primitive Motorized (SPM)	64,518	13.5
Roaded Natural (RN)	5,638	1.2
Roaded Modified (RM)	121,691	25.4
Rural (R)	180	0.0
Total	**479,283**	**100.0**

Notes:
1/ ROS designations are presented for NFS lands within the analysis area only.
2/ The Recreation analysis area consists of the 18 VCUs in the KPI project area (Figure 1-2) plus VCU 4270 (Figure REC-1).

Recreation Places and Sites

The majority of the Tongass National Forest is undeveloped and 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 on the Forest. While most areas of the Forest have the potential to provide recreation opportunities to a varying degree, patterns of use tend to be associated with existing road systems, known protected boat anchorages, boat landings, and aircraft landing sites. These types of locations, with one or more physical characteristics that are particularly attractive to people for recreation activities, were identified as recreation places as part of the planning analysis for the

1997 Forest Plan and incorporated as part of the process that resulted in the current Forest Plan (USDA Forest Service 2008a).

Four main types of recreation places were identified: marine, hunting, fishing, and tourism (USDA Forest Service 2008a). In the analysis area, marine recreation places are located at Portage Bay, Big John Bay, Petersburg Creek, and along Duncan Canal, near the Castle Islands. Recreation places important for hunting include the same area near the Castle Islands, Big John Bay, and the area that extends along the northern reaches of Duncan Canal and between Duncan Canal and Portage Bay. The area near the Castle Islands and Petersburg Creek are also identified as fishing recreation places. Tourism recreation places are located along Petersburg Creek, Portage Bay, and Big John Bay.

The types of recreation in and around the analysis area consists of dispersed, water oriented activities located in Duncan Canal and Wrangell Narrows, and vehicle oriented activities such as hunting and freshwater fishing accessed from the Tonka road system. Additional pursuits include wildlife viewing, charter boat sightseeing, sea kayaking, mountain biking, and hiking. There are numerous private residences and cabins along the east shoreline of Wrangell Narrows. Much of the recreational use in the east portion of the analysis area is accessed from surrounding Forest Service recreation cabins or from Petersburg by boat and involves fishing and hunting. The Kake road system provides access to recreation opportunities in the west portion of the analysis area, including a number of developed sites.

Recreation sites are specific sites and/or facilities where recreation activities are localized. Recreation sites include, but are not limited to, developed recreation sites, such as trails, picnic sites, campsites, interpretive sites, and Forest Service cabins. They also include undeveloped sites with significant natural features like waterfalls or geologic formations that are destinations for National Forest visitors. Like recreation places, developed and undeveloped recreation sites on the Tongass were identified as part of the planning process for the 1997 Forest Plan. Developed recreation sites are identified by name in Figure REC-2. Recreation sites are discussed in the following sections.

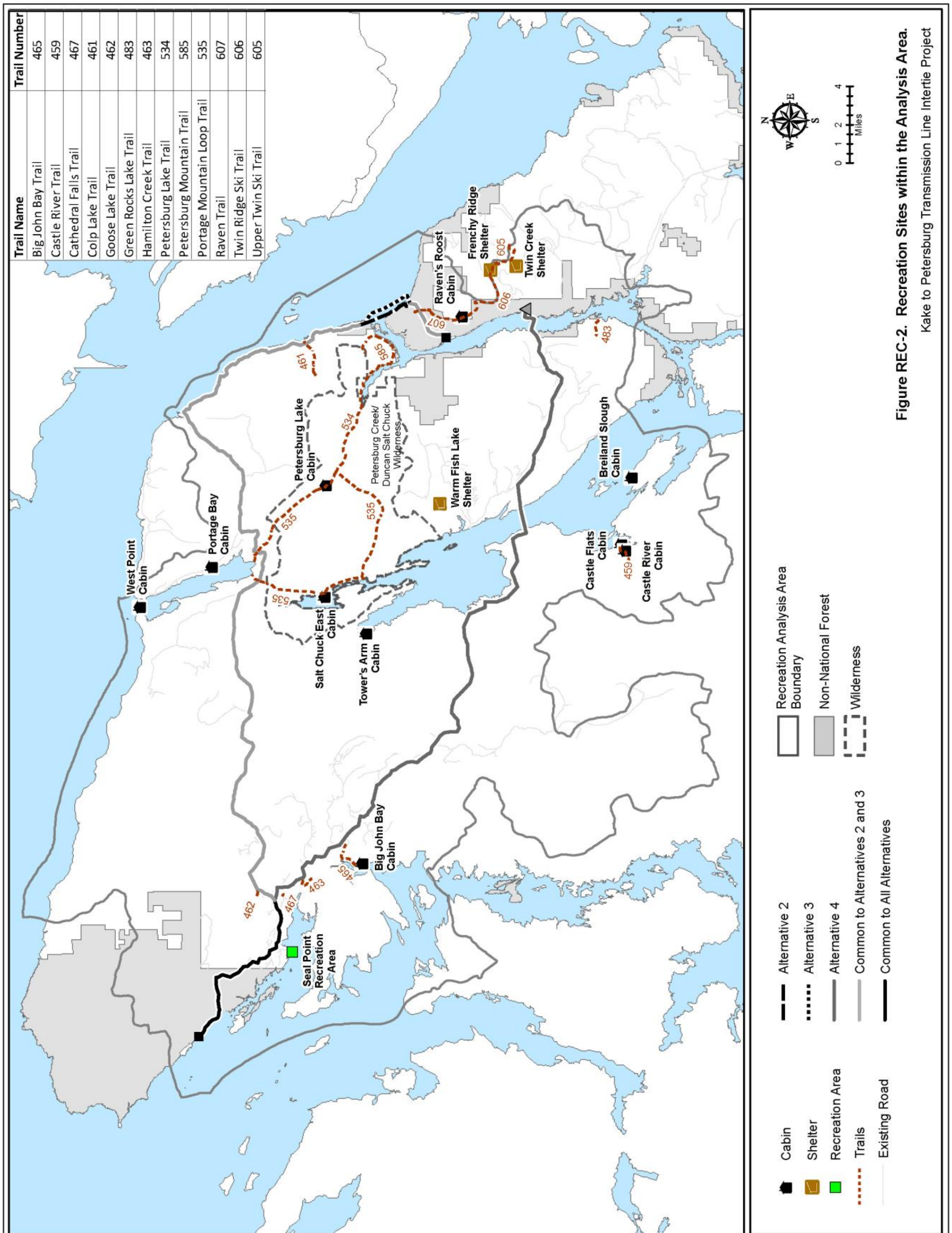
Developed Recreation Sites

A total of 24 developed recreation sites are located on NFS lands in the analysis area (Table REC-2; Figure REC-2). These sites are mainly Forest Service recreation cabins, trails, and shelters. The Seal Point Recreation Area is also located within the analysis area. In addition to these developed sites located on NFS lands, there are also two parks in Petersburg located in close proximity to one or more of the alternatives. These parks—Outlook Park and Sandy Beach Park—are included in Table REC-2.

Table REC-2. Developed Recreation Sites in the Project Area

Trails	Cabins	Shelters	Other Recreation Sites
Big John Bay Trail	Big John Bay Cabin	Frenchy Ridge Shelter	Outlook Park[1/]
Castle River Trail	Breiland Slough Cabin	Twin Creek Shelter	Sandy Beach Park[1/]
Cathedral Falls Trail	Castle Flats Cabin	Warm Fish Lake Shelter	Seal Point Recreation Area
Colp Lake Trail	Castle River Cabin		
Goose Lake Trail	Petersburg Lake Cabin		
Hamilton Creek Trail	Portage Bay Cabin		
Petersburg Lake Trail	Raven's Roost Cabin		
Petersburg Mountain Trail	Salt Chuck East Cabin		
Portage Mountain Loop Trail	Towers Arm Cabin		
Raven Trail	West Point Cabin		

Note:
1/ Outlook Park and Sandy Beach Park are owned and operated by the Petersburg Borough. The other 24 developed recreation sites identified above are on NFS lands.



Trail Name	Trail Number
Big John Bay Trail	465
Castle River Trail	459
Cathedral Falls Trail	467
Colp Lake Trail	461
Goose Lake Trail	462
Green Rocks Lake Trail	483
Hamilton Creek Trail	463
Petersburg Lake Trail	534
Petersburg Mountain Trail	585
Portage Mountain Loop Trail	535
Raven Trail	607
Twin Ridge Ski Trail	606
Upper Twin Ski Trail	605

Figure REC-2. Recreation Sites within the Analysis Area.
Kake to Petersburg Transmission Line Intertie Project

R:\projects_2009\Kake-Petersburg_Intertie\maps\ESI_Update_July2014\Figure_REC-2_Rec_sites_landscape.mxd

Trails

Big John Bay Trail

The 2.1-mile-long Big John Bay Trail is located on the northeast side of Big John Bay, on the west side of Kupreanof Island. The trail begins at FR 45001 and ends at Big John Bay Cabin. The trailhead is approximately 16 miles from Kake and may be accessed via Forest Service roads. Alternative 4 parallels FR 45001 and would pass within 0.5 mile of the Big John Bay Trailhead.

Castle River Trail

The Castle River Trail is located on Kupreanof Island, on the west side of Duncan Canal, approximately 16 air miles or 30 water miles southwest of Petersburg. The 1.1-mile-long Castle River Trail extends from Castle Flats Cabin to the Castle River boat tie up site. The trail leads to several fishing spots along the river, which supports runs of silver salmon and steelhead. The area is also popular for moose, bear, and waterfowl hunting. Alternative 4 passes approximately 5 miles north of this trail.

Cathedral Falls Trail

The Cathedral Falls Trail is located about 8 miles southeast of Kake and accessed via the Kake to Seal Point Road (FR 6040) and FR 6314. The 0.25-mile-long trail extends from the end of FR 6314 to the falls on Cathedral Falls Creek. Cathedral Falls is popular for trout and salmon fishing. All three action alternatives pass approximately 0.5 mile northwest of this trail.

Colp Lake Trail

The 2.1-mile-long Colp Lake Trail begins at the mouth of Fivemile Creek, on the shores of Frederick Sound, and passes through muskeg and a small stand of timber, ending at Colp Lake. Located about 5 miles north of Petersburg, the trailhead may be accessed via boat or floatplane to the mouth of Fivemile Creek. The Northern Route corridor (Alternatives 2 and 3) crosses this trail.

Goose Lake Trail

The Goose Lake Trail is a 0.6-mile gravel trail that begins at the parking lot at the FR 6030 parking lot trailhead and ends at Goose Lake. The lake is popular for trout fishing, moose hunting, waterfowl hunting, and winter cross-country skiing. Short parts of the trail are boardwalk. All three alternatives follow FR 6030 and pass in close proximity to the Goose Lake Trailhead.

Hamilton Creek Trail

The Hamilton Creek Trail is located on northwest Kupreanof Island, near Hamilton Bay. The 0.6-mile-long trail begins at FR 6314 and ends at Hamilton Creek. The trailhead is approximately 13 miles from Kake and may be accessed via Forest Service roads. Alternative 4 parallels FRs 6040 and 6314 and would pass in close proximity to the Hamilton Creek Trailhead.

Petersburg Lake Trail

The Petersburg Lake and Petersburg Mountain Trailheads are located on Kupreanof Island near the State Dock. The Petersburg Lake Trail extends 10.5 miles from the trailhead to Petersburg Lake Cabin. Four miles up the Creek from the Dock is the high tide trail head and the entrance to the Petersburg Creek – Duncan Salt Chuck Wilderness. From the high tide trailhead, follow the trail through the forest and muskeg for 6.5 miles to Petersburg Lake and cabin. At its closest point, this trail is about 1.9 miles and 2.3 miles west of Alternatives 2 and 3, respectively.

Petersburg Mountain Trail

The 3.6-mile-long Petersburg Mountain Trail begins at the shared trailhead near the State Dock in Kupreanof and ends on the top of Petersburg Mountain. The trail offers views of Petersburg and the surrounding bays and glaciers. Alternatives 2 and 3 cross the mouth of Wrangell Narrows northeast of the trail, coming ashore near Prolewy Point, approximately 0.7 mile and 0.8 mile from the trail at their closest respective points.

Portage Mountain Loop Trail

The 11-mile-long Portage Mountain Loop Trail begins at the Petersburg Lake Cabin. The trail extends northwest from the cabin to Portage Bay and follows the south shoreline of the bay, before heading south to end at the Salt Chuck East Cabin. The trail is unmaintained with occasional blue diamonds for guidance. The Northern Route corridor (Alternatives 2 and 3) crosses the Portage Mountain Loop Trail twice near Portage Bay.

Raven Trail

The Raven Trail begins near the east side of Petersburg Airport and extends 4.2 miles to Raven's Roost Cabin, passing south of the airport. The trail can be accessed from Haugen Drive or Sandy Beach Road or via the Twin Ridge Ski Trail. The Northern Alternative corridor (Alternatives 2 and 3) crosses the Raven Trail.

Twin Ridge Ski Trail and Upper Twin Ski Trail

These two ski trails are both located on Mitkof Island and connect other existing developed recreation facilities (Figure REC-2). The Upper Twin Ski Trail runs approximately 2.1 miles between Twin Creek Shelter and Frenchy Ridge Shelter. The Twin Ridge Ski Trail continues from Twin Creek Shelter and extends about 4.5 miles to Raven’s Roost Cabin. Alternative 4 would originate approximately 1.5 miles west of these trails at its closest point.

Unnamed Trail to Green Rocks Lake

In addition to the above named trails, an unnamed trail is located on the west shore of the Wrangell Narrows on Kupreanof Island, approximately 3.2 miles south of Alternative 4. This trail is approximately 1-mile-long and provides access to Green Rocks Lake (Figure REC-2).

Cabins

There are currently 20 public use Forest Service cabins on the Petersburg Ranger District. Ten of these cabins are located in the analysis area. Use for recreation cabins is recorded by reserved nights at each cabin. Use data are presented for the 10 cabins in the analysis area in Table REC-3. Use in 2013 ranged from 9 reserved nights at the Towers Arm Cabin to 121 reserved nights at West Point Cabin. Viewed as a five year average, use ranged from an average of 11 reserved nights at the Towers Arm Cabin to 104 reserved nights at West Point Cabin (Table REC-3).

Table REC-3. Estimated Use of Forest Service Cabins in the Analysis Area, 2008–2012

Cabin	2009	2010	2011	2012	2013	5-Year Average
Big John Bay	39	55	44	48	71	51
Breiland Slough	91	66	57	49	61	65
Castle Flats	73	69	49	47	45	57
Castle River	89	89	82	78	94	86
Petersburg Lake	81	82	85	68	72	78
Portage Bay	38	42	39	33	29	36
Ravens Roost	14	26	31	34	18	25
Salt Chuck	42	37	75	71	66	58
Towers Arm	15	7	11	14	9	11
West Point	85	108	104	103	121	104

Note:
1/ Use is recorded in reserved nights per cabin.
Source: USDA Forest Service 2014a

Big John Bay Cabin

This single-level, hunter-style cabin is located on the northeast side of Big John Bay, on the west side of Kupreanof Island. The cabin is situated on a small wooded point that faces a large expanse of tidal grass and saltwater flats. The cabin can be accessed by boat or trail from the town of Kake or by float plane from Petersburg. The 2.1-mile-long Big John Bay Trail connects the cabin to FR 45001. A 15-foot tide is required for boats or float planes to directly access the cabin. The cabin provides access to grouse and waterfowl hunting. Alternative 4 passes approximately 1.4 miles northeast of this cabin.

Breiland Slough Cabin

The Breiland Slough single level hunter style cabin is located approximately 16 air miles or 30 water miles southwest of Petersburg on Kupreanof Island, on the west side of Duncan Canal near the Castle Islands. Situated on a small spit of land, the cabin is surrounded by forest and grass flats. The cabin offers access to king salmon, halibut, and crab fishing from the gravel beach in front of the cabin. The cabin is accessible by boat or float plane from Petersburg or Wrangell. Alternative 4 passes approximately 5 miles north of this cabin.

Castle Flats Cabin

The Castle Flats single-level, hunter-style cabin is located approximately 16 air miles or 30 water miles southwest of Petersburg on Kupreanof Island, on the west side of Duncan Canal. The cabin is situated on the edge of the mud flats of Castle River. The surrounding area is predominantly flat with old growth forest, muskeg, and riparian vegetation cover. The cabin is accessible only by boat or float plane from Petersburg or Wrangell and a 13-foot tide is required for boats or float planes to directly access the cabin. The cabin provides access to black bear, moose, deer, grouse, and waterfowl hunting, and also offers bird and wildlife watching opportunities. Alternative 4 passes about 5 miles north of this cabin.

Castle River Cabin

The Castle River modified A-frame style cabin is located approximately 1 mile from the Castle Flats Cabin at the mouth of the Castle River on west side of Duncan Canal on Kupreanof Island. The area near the cabin is predominantly flat to rolling with muskeg and old growth forest. The cabin is accessible only by boat or float plane from Petersburg or Wrangell and a 13-foot tide is required for boats or float planes to directly access the cabin. The cabin provides access to steelhead and coho salmon fishing near the cabin and upstream. It also provides access to black bear, moose, deer, grouse, and waterfowl hunting. The Castle River and Castle Flats cabins are connected by the 1.1-mile-long Castle River Trail. Alternative 4 passes approximately 5.2 miles north of this cabin.

Petersburg Lake Cabin

The Petersburg Lake wooden pan-abode style cabin is located on the southeast end of Petersburg Lake. This cabin is located in the Petersburg Creek-Duncan Salt Chuck Wilderness, which is managed for natural conditions. Motorized equipment or mechanized transportation are not allowed with the exceptions of motorized boats or airplanes. The area around the lake and creek is flat, but surrounded by steep terrain. Access is provided by the 10.5-mile-long Petersburg Lake Trail with extends along Petersburg Creek from the Kupreanof State Dock to the cabin. Cutthroat trout and sockeye salmon can be fished in Petersburg Lake, and steelhead, coho, sockeye, and pink salmon fishing is available in the creek. The Forest Service provides a rowboat for cabin users to access areas across Petersburg Lake. The closest alternative corridor to this cabin (the Northern Route corridor) passes approximately 4.2 miles to the north.

Portage Bay Cabin

The Portage Bay single-level, hunter-style cabin is located on the east shore of Portage Bay on northern Kupreanof Island. The area is hilly along the eastern shore of Portage Bay, and flat and rolling south and west of the bay. The cabin provides access to king salmon, halibut, and crab fishing in front of the cabin, as well as elsewhere in Portage Bay and Frederick Sound. Black bear and deer hunting is also available in the vicinity of the cabin. The closest alternative corridor to this cabin (the Northern Route corridor) passes approximately 2.0 miles to the south.

Raven's Roost Cabin

The Raven's Roost alpine cabin is located on Mitkof Island, on a mountain ridge behind the Petersburg Airport. The ridge near the cabin is flat muskeg; otherwise the surrounding terrain is steep mountain slope. The cabin can be accessed via the 4.2-mile-long Raven Trail, which begins near the east side of the airport. Access is also provided by skiing 5.4 miles up the undeveloped and primitive Twin Ridge Ski Trail from the Twin Creek Road. This cabin is located approximately 1.2 miles southeast of the existing SEAPA substation where Alternatives 2 and 3 would originate.

Salt Chuck East Cabin

The Salt Chuck East modified A-frame cabin is located on the east side of Duncan Canal Salt Chuck on northern Kupreanof Island, approximately 15 air miles and 40 water miles from Petersburg. The cabin is located in the Petersburg Creek-Duncan Salt Chuck Wilderness, which is managed for natural conditions. Motorized equipment or mechanized transportation are not allowed with the exceptions of motorized boats or airplanes. The area surrounding the cabin is flat and wooded. The 11-mile-long primitive Portage Mountain Loop Trail connects the Salt Chuck East Cabin with Portage Bay and Petersburg Lake. The cabin provides access to coho fishing in nearby saltwater, as well as grouse and waterfowl hunting opportunities. The closest alternative corridor to this cabin (the Northern Route corridor) crosses approximately 3.4 miles to the north.

Towers Arm Cabin

The Towers Arm single-level, hunter-style cabin is located on Kupreanof Island on the west side of Towers Arm in Duncan Canal. Access is via boat or floatplane, with a 15-foot tide required for boat access and a 16-foot tide required for floatplanes. The cabin provides access to steelhead and coho fishing in the adjacent Towers Creek. It also provides access to black bear and deer hunting. The Northern Route corridor (Alternatives 2 and 3) passes approximately 6.8 miles to the north; the Center-South Route corridor (Alternative 4) passes about 5.1 miles to the south of this cabin.

West Point Cabin

The West Point A-frame cabin is located at the mouth of Portage Bay on the north end of Kupreanof Island. The area surrounding the cabin is flat with a mixed spruce and hemlock forest. There are large expanses of gravel beach near the cabin. Portage Bay is a protected bay suitable for use by small non-motorized craft and kayaks. The cabin provides access to king salmon, halibut, and crab fishing in front of the cabin and in Portage Bay and Frederick Sound. Frederick Sound also provides opportunities for humpback whale viewing. The closest alternative corridor to this cabin (the Northern Route corridor) crosses approximately 4.9 miles to the south.

Shelters

Frenchy Ridge Shelter

The Frenchy Ridge Shelter is a three-sided Adirondack-style shelter, located on Mitkof Island, approximately 10 miles south of Petersburg. The surrounding area is forest and muskeg. The shelter may be accessed by motor vehicle via Forest Roads and the Twin-Frenchy Snowmobile Trail. The proposed tap location for Alternative 4 is located approximately 2.3 miles west of this shelter.

Twin Creek Shelter

The Twin Creek Shelter is a three-sided Adirondack-style shelter located just off Twin Creek Road. The surrounding area is forest and muskeg. The shelter is located on Mitkof Island, approximately 6 miles south of Petersburg. The shelter may be accessed by motor vehicle via Twin Creek Road. The shelter is located approximately 2.7 miles northeast for Alternative 4.

Warm Fish Lake Shelter

The Warm Fish Lake Shelter is a three-sided shelter located on the Lindenberg Peninsula, east of Duncan Canal. The shelter provides access to trout fishing opportunities on Warm Fish Lake. Alternative 4 passes approximately 4.2 miles south of this shelter.

Other Developed Recreation Sites

Outlook Park

Outlook Park is located on the beach side of Sandy Beach Road. The park was developed by the city of Petersburg in 2003 and is now managed by the recently formed Petersburg Borough. The park includes a gazebo and offers benches, public beach access, and views of Frederick Sound and the coastal range. Interpretive panels provide information on humpback and orca whales as well as other marine mammals that frequent Frederick Sound (Petersburg Borough 2013). The HDD bore proposed as part of Alternative 2 would originate in the vicinity of Outlook Park.

Sandy Beach Park

Sandy Beach Park is a day use picnic area located at the end of Sandy Beach Road. The park is managed by the Petersburg Borough. Situated on a small cove, the park includes three enclosed shelters with tables, two of them with large stone fireplaces, public restrooms, a play area for children, horseshoe pits, and a sand volleyball court. Abundant sea life and ancient petroglyphs and fish traps are visible at low tides (Petersburg Borough 2013). The submarine cable crossing proposed as part of Alternative 3 would originate in the vicinity of Sandy Beach Park.

Seal Point Recreation Area

Located about 8.5 miles southeast of Kake, the Seal Point Recreation Area may be accessed by motor vehicle via the Kake to Seal Point Road (FR 6040). The area is primarily used for recreation and subsistence fishing, big game and waterfowl hunting, picnicking, and berry picking, with day and overnight use. As of 2012, the area consisted of a boat ramp, originally built in 1998, and two cleared areas used for parking. A NEPA EA was completed for the Seal Point Recreation Enhancement Project. The proposed enhancements include: development of two day use areas, each with a single bathroom, picnic shelter, fire ring and/or pedestal grill, and picnic tables; reconstruction and extension of the existing boat ramp; and conversion and expansion of existing clearings into parking areas (USDA Forest Service 2012e). One of the proposed day use areas and the existing boat ramp are located on Little Hamilton Island, which is accessed via a land bridge road. The Seal Point Recreation Enhancement Project is expected to be completed by September 2014. All three action alternatives follow the Kake to Seal Point Road (FR 6040) and would pass in close proximity to the Seal Point Recreation Area. Further, all three action alternatives would likely use the Little Hamilton Bay LTF, which is located on the other side of Little Hamilton Island from the boat ramp and day use area.

Forest Roads and Off-Highway Vehicle Use

The NFS road systems in the project area are used for recreation, hunting and fishing, and subsistence activities (USDA Forest Service 2009a). Four NFS road systems are located within the KPI project area: the Mitkof road system on Mitkof Island and the Tonka, Portage, and Kake road systems on Kupreanof

Island. These road systems are discussed in more detail in the *Transportation* section of this EIS and shown on Figure TRAN-1 in that section.

Most of the developed recreation on Mitkof Island is accessible to passenger vehicles on ML 3 roads, which are suitable for low clearance vehicles. The Mitkof Highway provides direct access to ML 3 roads at multiple locations. The ML 3 road system also provides access to dispersed recreation opportunities and is an important winter recreation resource for Petersburg residents. OHVs are mainly used on these roads for game retrieval in the fall (USDA Forest Service 2009a).

The Kake road system on Kupreanof Island provides access to developed recreation facilities, including Big John Bay Cabin, Seal Point boat ramp and picnic area, Cathedral Falls Trail, Hamilton Trail, and Goose Lake Trail. The Portage road system accesses the Portage Bay cabin, although the primary access to the cabin is by boat. The Tonka road system provides access to the Warm Fish Lake Shelter. Primary access to the road systems on Kupreanof Island is from MAFs. Recreation use on those areas accessed by the road systems on Kupreanof Island is low, with most of the use occurring during hunting season. The Tonka, Portage, and Kake road systems provide opportunities for road-related access to dispersed uses in undeveloped settings as well as opportunities involving wheeled vehicles. The Kake road system also gets substantial use from local residents and from visitors accessing the road system from the ferry (USDA Forest Service 2009a).

The use of OHVs is a growing activity on the Tongass. Use is limited by topography, dense vegetation, and wet soils. These types of vehicles are most frequently used on road systems connected to communities, with riders seeking out primitive roads or spur roads. State of Alaska OHV laws state that OHVs may not be used on any state highway or open road connected to a state highway.

The Forest Service addressed OHV use on the Petersburg Ranger District through the Access Travel Management Plan process. The DN/FONSI for the Petersburg Ranger District Access and Travel Management Plan EA was issued in 2009 (USDA Forest Service 2009b). This DN/FONSI designated roads, trails, and areas that are open to public motor vehicles on the Petersburg Ranger District and an MVUM was prepared based on this decision. The decision and resulting MVUM also closed remaining routes and areas on the Districts to various forms of motorized subsistence access under ANILCA Section 811(b) (USDA Forest Service 2009b).[4] According to the January 2013 MVUM for the Petersburg Ranger District, the Mitkof, Tonka, Portage, and Kake road systems are open to all motor vehicles, including smaller OHVs that may not be licensed for highway use (USDA Forest Service 2014b). One exception is FR 6040 (Kake Road), which is open to highway legal vehicles only from Kake until it intersects with FR 6030, east of Hamilton Bay.

Outfitter/Guides and Special Use Permits

Several commercial outfitters/guides are authorized to use the analysis area for a variety of uses, including fishing, sightseeing, and hunting. A total of 1,407 service days were used in 2013. Use over the past 6 years has ranged from 1,322 service days in 2012 to 1,767 service days in 2008 (Table REC-4). The number of outfitter/guides using the analysis area averaged 16 each year from 2010 through 2013. General outfitter/guide locations, activities, and primary seasons of use are summarized in Table REC-5.

[4] MVUMs for the Tongass National Forest are updated annually in January and available at Ranger District offices or online (http://www.fs.usda.gov/detail/tongass/maps-pubs/?cid=stelprdb5430063).

Table REC-4. Outfitter/Guide Use in the Analysis Area, 2007–2013

Year	Number of Service Days[1/]
2007	1,571
2008	1,767
2009	1,493
2010	1,346
2011	1,518
2012	1,322
2013	1,407

Note:
1/ A service day is a day, or any part of a day, that an outfitted/guided client is on National Forest System land.
Source: USDA Forest Service 2014c

Table REC-5. General Outfitter/Guide Locations and Activities

General Location	Outfitter/Guide Activities	Primary Season of Use
Big John Bay	Black bear hunting, wolf hunting, non-hunters accompanying hunters	April, May, June, September
Duncan Canal	Black bear hunting, wolf hunting	April, May
	Camping, freshwater fishing, hiking, sightseeing	July, August
Hamilton Bay	Black bear hunting, wolf hunting, non-hunters accompanying hunters	April, May, June, September
Lindenberg Peninsula	Black bear hunting, wolf hunting, deer hunting	April, May, June, September
	Camping, sightseeing	June, July, August
North Keku Strait	Black bear hunting, wolf hunting, non-hunters accompanying hunters	April, May, June
	Camping, hiking, sightseeing	June, July
North Kupreanof Island	Black bear hunting, wolf hunting, deer hunting	April, May, June, September
	Camping, freshwater fishing, hiking, sightseeing, outfitting kayaks	June, July, August
Petersburg Creek	Freshwater fishing	April, May
	Hiking, sightseeing	May, June, July, August, September
Portage Bay	Black bear hunting, wolf hunting, deer hunting,	May, June, September
	Camping, hiking, sightseeing, outfitting kayaks	May, June, July, August
Wrangell Narrows	No reported outfitter/guide use.	None

Source: USDA Forest Service 2014c

A private individual is currently authorized to maintain a tent platform near Duncan Creek for non-commercial fishing and hunting. Another individual is authorized to maintain a tent platform near Irish Lakes. There are also eight privately owned cabins located on NFS lands in the analysis area. These cabins are authorized for use under special use permit. Three of these cabins are located near Duncan Canal, four are located near Petersburg Creek, and one is located near Portage Bay (USDA Forest Service 2014c).

Environmental Effects

The analysis area for direct, indirect, and cumulative effects to recreation is the KPI project area. Effects are discussed in terms of changes in the ROS settings in the analysis area, as well as potential impacts to Recreation Places and Sites, OHV Use, and Outfitter/Guides and Special Use Permits. Changes in ROS settings are quantified in acres; other potential impacts are discussed in qualitative terms.

Effects Common to All Action Alternatives

Recreation Opportunity Spectrum

The distribution of ROS settings in the analysis area would change under all of the action alternatives (Table REC-6). Viewed in terms of the analysis area, the resulting changes would represent a small share of the affected settings under any of the alternatives. Change to existing ROS settings would occur where land allocated to the SPNM, SPM, and RN ROS settings are within 0.5 mile of a new shovel trail or the proposed transmission line right-of-way. These areas would change to RM. Change from a more primitive ROS represents a change in recreation resources in the affected areas. People are likely to have a different type of recreation experience in these areas following the proposed project's construction.

Table REC-6. ROS Settings by Alternative

ROS Setting	Alternative			
	1	**2**	**3**	**4**
Primitive (P)	92,416	92,416	92,416	92,416
Semi-Primitive Non-Motorized (SPNM)	194,840	194,751	194,751	194,717
Semi-Primitive Motorized (SPM)	64,518	64,282	64,282	64,399
Roaded Natural (RN)	5,638	5,545	5,545	5,638
Roaded Modified (RM)	121,691	122,108	122,108	121,932
Rural (R)	180	180	180	180
Grand Total	**479,283**	**479,283**	**479,283**	**479,283**
Net Change in Acres				
SPNM to RM	0	89	89	123
SPM to RM	0	235	235	118
RN to RM	0	92	92	0
Total Acres Changed to RM	**0**	**417**	**417**	**241**

Note:
1/ Totals may not sum due to rounding.

Recreation Places and Sites

The action alternatives could potentially result in short- and long-term impacts to recreation places and sites. Short-term impacts would result from the presence of construction crews and equipment on roads in the analysis area, which may have temporary impacts on recreation access, and could also affect the quality of the recreation experience in affected areas. The presence of these crews and equipment and the noise associated with their activities are likely to have effects on the quality of the recreation experience in adjacent and nearby areas. These types of impacts would generally be limited to the immediate area of activity and limited in duration. Recreation users engaged in dispersed recreation activities, like hunting, fishing, and OHV use, would likely be temporarily displaced to other similar locations in the general vicinity.

There would be no long-term changes in motorized access under any of the action alternatives. No new roads are proposed under any of the action alternatives, and the proposed shovel trails and temporary access spurs would be decommissioned following construction. It is possible that hikers and hunters could hike along the cleared right-of-way in areas where there are no existing roads. However, this type of use is not expected to noticeably change existing patterns of recreation use.

Long-term impacts would result from changes in scenery as a result of right-of-way clearing and the presence of the transmission line. These impacts are likely to be greater for recreation places and sites located in more remote, pristine areas. The introduction of a transmission line and cleared right-of-way would likely be perceived negatively when viewed from recreation places and sites such as cabins and trails by recreationists expecting a natural, undisturbed landscape. In recreation places and sites where there has already been an alteration to the landscape from timber harvest activities and related road development, the presence of a transmission line would not contrast with the adjacent landscape as much as it would in undisturbed areas. However, unlike timber harvest units, right-of-way clearing would be maintained for the life of the proposed transmission line.

Forest Roads and Off-Highway Vehicle Use

The action alternatives would all follow existing Forest Roads. All three action alternatives would follow FR 6040, the main road leading out from Kake. The road forks approximately 10 miles southeast of Kake. At that point, the alternative corridors diverge. The Northern Route corridor (Alternatives 2 and 3) follows the north fork—FR 6030—which extends east toward Portage Bay. The Center-South Route corridor (Alternative 4) follows the south fork. These roads are heavily used by Kake residents and visitors for recreation. Alternatives 2 and 3 also follow part of the Portage road system (FR 6319) (see Figures 2-1 and TRAN-1). Alternative 4 follows the Tonka road system (FR 6350) across the southern part of the Lindenberg Peninsula (Figures 2-2 and TRAN-1).

The action alternatives would likely require temporary closure of parts of these road systems to allow safe access for construction equipment and crews. Vegetation clearing would be apparent to users of the affected roads. Long-term visual impacts would result where the proposed transmission line is adjacent to an existing road. The poles and conductors would be visible, as would the cleared right-of-way, which would be maintained for the life of the proposed project.

There would be no new roads constructed under any of the alternatives. The proposed temporary shovel trails and temporary access spurs would be decommissioned following construction. Public motorized traffic on temporary shovel trails and access spurs proposed under this project would be prohibited. This prohibition would include OHVs. Non-motorized (i.e., bicycles, pedestrians, etc.) use during and after project construction would also be discouraged.

Outfitter/Guides and Special Use Permits

Several commercial outfitters/guides are authorized to use the analysis area for a variety of uses, including fishing, sightseeing, and hunting. As noted above, this number has averaged 16 each year from 2010 through 2013. The total numbers of annual service days are identified for 2007 through 2013 in Table REC-4. Increased traffic and temporary road closures could have an impact on the locations that outfitter/guides choose for access. These impacts would be localized and temporary. None of the proposed alternatives are expected to result in long-term impacts to the ability of outfitter/guides to use these areas. The distant sound of construction equipment may be occasionally apparent in some locations, but would not be expected to noticeably change the recreation experience in areas away from the road systems and the transmission line right-of-way.

A private individual is currently authorized to maintain a tent platform near Duncan Creek for non-commercial fishing and hunting. Another individual is authorized to maintain a tent platform near Irish Lakes. There are also eight privately owned cabins located on NFS lands in the analysis area. These cabins are authorized for use under special use permit. Three of these cabins are located near Duncan Canal, four are located near Petersburg Creek, and one is located near Portage Bay (USDA Forest Service 2014c). The closest cabin to Alternatives 2 and 3 is located near Portage Bay, approximately 3.3 miles north of the proposed alignment. Three privately owned cabins on Duncan Canal are located approximately the same distance from, and closest to, Alternative 4. These cabins are located approximately 2.6 miles north of the proposed Alternative 4 alignment. Alternative 4 passes closest to both of the tent platforms, passing approximately 3.4 miles south of the nearest one.

Alternative 1 – No Action

Direct and Indirect Effects

The no action alternative would have no direct or indirect effects on scenic resources because there would be no new transmission line built under this alternative and no associated structure installation, use of helicopters, temporary shovel trails, or temporary access spurs, or vegetation clearing activities.

Cumulative Effects

The no action alternative would not contribute to cumulative effects on scenic resources because there would be no new transmission line built and no direct and indirect effects.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Recreation Opportunity Spectrum

Under Alternative 2, an estimated total of 417 acres would change from the SPNM, SPM, and RN ROS settings to RM (Table REC-6). The largest change would occur to the SPM setting, with an estimated 235 acres expected to change from the SPM ROS to RM; this represents just 0.4 percent of the total acres in the analysis area currently allocated to this ROS setting (Table REC-6).

Developed Recreation Sites

The estimated distances between Alternative 2 and the developed recreation sites located in the recreation analysis area are summarized in Table REC-7. In addition to these sites on NFS lands, the proposed alternative would also pass close to Sandy Beach and Outlook Parks, which are managed by Petersburg Borough. The locations of the sites on NFS lands relative to the proposed alternative are shown in Figure REC-2. Short-term impacts resulting from the presence of construction crews and equipment would likely be greater to those sites located closer to the proposed transmission line alignment. This would particularly be the case for those sites that are accessed by roads that would be followed by the transmission line and/or used during transmission line construction. Under Alternative 2, these sites are Goose Lake Trail, the Seal Point Recreation Area, Sandy Beach Park, and Outlook Park. Short-term, project-related impacts to the Seal Point Recreation Area would likely include the use of the Little Hamilton Bay LTF, which is located on the same small island and uses the same land bridge road. Sources of short-term, construction-related impacts to Outlook Park would include the HDD process that would be used to place the transmission line beneath Wrangell Narrows.

Table REC-7. Estimated Distance between Developed Recreation Sites and Alternatives 2 and 3

Site[1/]	Site Type	Distance to Alternative (miles)
Colp Lake Trail (461)	Trail	0.0
Goose Lake Trail (462)	Trail	0.0
Portage Mountain Loop Trail (535)	Trail	0.0
Raven Trail (607)	Trail	0.0
Cathedral Falls Trail (467)[2/]	Trail	0.5
Petersburg Mountain Trail (585)[3/]	Trail	0.7
Twin Ridge Ski Trail (606)	Trail	1.4
Petersburg Lake Trail (534)[3/]	Trail	1.9
Raven's Roost Cabin	Cabin	1.2

Table REC-7. Estimated Distance between Developed Recreation Sites and Alternatives 2 and 3 (continued)

Site[1/]	Site Type	Distance to Alternative (miles)
Portage Bay Cabin	Cabin	2.0
Salt Chuck East Cabin	Cabin	3.4
Petersburg Lake Cabin	Cabin	4.2
West Point Cabin	Cabin	4.9
Twin Creek Shelter	Shelter	4.1
Seal Point Recreation Area[2/]	Other	0.9

Notes:
1/ These sites and distance are the same for both alternatives, except as noted.
2/ These distances are the same for both alternatives and Alternative 4, which all share a common alignment at these locations.
3/ These distances are from Alternative 2, which is slightly closer than Alternative 3 to these sites. The corresponding distances for Alternative 3 are: Petersburg Mountain Trail – 0.8 mile; Petersburg Lake Trail – 2.3 miles.

Long-term impacts would likely result from changes in scenery having detrimental effects on recreationists using the affected recreation sites. The majority of the developed sites in the analysis area are identified as VPRs in the 2008 Forest Plan and potential visual impacts are discussed to each site in the *Scenery* section of this EIS.

The proposed alternative would cross four trails: the Colp Lake, Goose Lake, Portage Mountain Loop, and Raven trails (Table REC-7). In all four cases, the proposed transmission line and right-of-way would be visible to recreationists using these trails. The introduction of the proposed transmission line is most likely to affect the quality of the recreation experience where it crosses the Colp Lake and Portage Mountain Loop trails because in both cases it would represent the introduction of a manmade feature into an otherwise mostly undisturbed landscape. These trails are among the least used on the District due to their remoteness. Other manmade features are present either at or near the other two trail crossings and in those cases the proposed transmission line would represent an incremental addition to the existing alternation of the landscape. The other two trails crossed (Goose Lake and Raven trails) are much more popular because they are on road systems connected to communities.

Alternative 2 would also pass relatively close to four other trails: Cathedral Falls Trail, Petersburg Mountain Trail, Petersburg Lake Trail, and the Twin Ridge Ski Trail (Figure REC-2). Although relatively close, there would either be no long-term visual impacts to these trails or the potential impacts would be very low, as the proposed transmission line would either not be visible (Twin Ridge Ski Trail), viewed from a distance as part of an existing developed landscape (Petersburg Mountain and Petersburg Lake trails), or an incremental addition to an already altered landscape (Cathedral Falls Trail).

Raven's Roost Cabin, located south of the Petersburg airport and existing SEAPA substation is the closest Forest Service cabin to this alternative. The proposed transmission line is not expected to be visible from this cabin or from the Salt Chuck East or Petersburg Lake cabins. The proposed transmission line could be potentially visible from the Portage Bay Cabin, but at most would likely be perceived as a linear break in the forest approximately 2.6 miles from the viewer. Although theoretically visible from the West Point Cabin, the closest structures would be about 6.6 miles from the cabin and unlikely to be visible (see the *Scenery* section).

Alternative 2 passes relatively close to two other developed recreation sites on NFS lands, the Twin Creek Shelter and Seal Point Recreation Area. The proposed transmission line alignment is not expected to be visible from the Twin Creek Shelter. The proposed transmission line would follow FR 6040, which provides access from Kake to the Seal Point Recreation Area. The Seal Point Recreation Area is a developed recreation site accessed by road. The Little Hamilton Bay LTF is located on the same island.

The long-term presence of a transmission line along FR 6040 is not expected to affect the quality of the recreation experience at the Seal Point Recreation Area.

The presence of the proposed transmission line under this alternative is not expected to affect the quality of the recreation experience at Sandy Beach or Outlook Parks. Both parks are located in the developed part of Petersburg Borough (within the former city limits) and accessed via Sandy Beach Road. The proposed transmission line would not be visible from either park under this alternative.

Cumulative Effects

In conjunction with other ongoing and reasonably foreseeable projects, this alternative is not expected to contribute to long-term changes to overall patterns of recreation use in the project area. Existing opportunities would continue to be available for those seeking remote and primitive recreation experiences and those seeking access to fishing and hunting opportunities would continue to have those opportunities. Similarly, opportunities to use existing developed recreation sites would also continue to be available.

Development of the Kake road project could result in long-term changes to patterns of recreation use, as motorized access would be available to areas that are currently remote and difficult to access. The 2015 Kake Access Transportation Needs Assessment conducted as part of the KAP found that the primary use of a road connecting Kake and Petersburg, were one to be constructed, would be for “partial use trips” for recreation and subsistence (FHWA 2015). This finding would likely also apply to the Kake road project. The identified partial use trips would likely include areas that are presently not accessed by roads. The KPI Project would not directly contribute to these long-term changes were they to occur.

Short-term cumulative impacts could occur if one or more of the reasonably foreseeable projects were to coincide in time and space with the proposed project. This could result in additional temporary disruptions to recreation use and could affect the quality of the recreation experience in localized areas. These types of impacts would be limited to the duration of construction and related activities in a particular location.

Alternative 3 – Northern Route with Submarine Cable

Direct and Indirect Effects

Recreation Opportunity Spectrum

Under Alternative 3, an estimated total of 417 acres would change from the SPNM, SPM, and RN ROS settings to RM (Table REC-6). The largest change would occur to the SPM setting, with an estimated 235 acres expected to change from the SPM ROS to RM; this represents just 0.4 percent of the total acres in the analysis area currently allocated to this ROS setting (Table REC-6).

Developed Recreation Sites

The estimated distances between Alternative 3 and the developed recreation sites located in the recreation analysis area are summarized in Table REC-7. The locations of these sites relative to the alternative are shown in Figure REC-2. With two minor exceptions, the distance between Alternatives 2 and 3 and the existing developed recreation sites on NFS lands are the same and the above discussion for Alternative 2 applies to this alternative also. The exceptions are the Petersburg Mountain Trail and Petersburg Lake Trail, which are slightly further from Alternative 3 (see Table REC-7, footnote 3). As with Alternative 2, the potential impacts to recreationists using these trails would be very low because the proposed transmission line, if visible at all, would be part of the existing developed landscape.

Alternatives 2 and 3 share the same alignment for the majority of their lengths (Figure 2-1). The only difference occurs in the vicinity of Sandy Beach Road in Petersburg. Alternative 2 would continue north from

Sandy Beach Park to Outlook Park and then cross Wrangell Narrows. Alternative 3 would cross Frederick Sound near the mouth of Wrangell Narrows with a 3.1-mile-long submarine cable. The proposed crossing would originate to the southeast of Sandy Beach Park on borough-owned land. A small facility would be located on land to provide the interconnection of the submarine cable and the overhead line (Figure 2-9). Sources of short-term, construction-related impacts to Sandy Beach Park would include placement of the submarine cable and installation of the submarine cable termination facility.

Cumulative Effects

Short-term and long-term cumulative effects to recreation under this alternative would be the same as those described for Alternative 2, above.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Recreation Opportunity Spectrum

Under Alternative 4, an estimated total of 241 acres would change from the SPNM, SPM, and RN ROS settings to RM (Table REC-6). The largest change would occur to the SPM setting, with an estimated 118 acres expected to change from the SPM ROS to RM; this represents just 0.2 percent of the total acres in the analysis area currently allocated to this ROS setting (Table REC-6).

Developed Recreation Sites

The estimated distances between Alternative 4 and the developed recreation sites located in the recreation analysis area are summarized in Table REC-8. The locations of these sites relative to the alternative are shown in Figure REC-2. Short-term impacts resulting from the presence of construction crews and equipment would likely be greater to those sites located closer to the proposed transmission line alignment. This would particularly be the case for those sites that are accessed by roads that would be followed by the transmission line and/or used during transmission line construction. Under Alternative 4, these sites are Big John Bay Trail, Cathedral Falls Trail, Hamilton Creek Trail, and Seal Point Recreation Area. Short-term, project-related impacts to the Seal Point Recreation Area would likely include the use of the Little Hamilton Bay LTF, which is located on the same small island and uses the same land bridge road.

Long-term impacts would likely result from changes in scenery having detrimental effects on recreationists using the affected recreation sites. The majority of the developed sites in the analysis area are identified as VPRs in the 2008 Forest Plan and potential visual impacts are discussed for each site in the *Scenery* section of this EIS.

The proposed alternative would either cross or be located directly across an existing road from the trailhead for three trails: Big John Bay, Cathedral Falls, and Hamilton Creek trails (Table REC-8). In all cases, the proposed transmission line and right-of-way would be visible to recreationists using these trails. However, the transmission line follows an existing road in these locations and the proposed alternative would represent an incremental additional to the existing alteration of the landscape.

Alternative 4 would also pass relatively close to four other trails: Twin Ridge Ski Trail, Upper Twin Ski Trail, the unnamed trail to Green Rocks Lake, and the Castle River Trail (Table REC-8). Although relatively close, there would either be no long-term visual impacts to these trails or the potential impacts would be very low, as the proposed transmission line would either not be visible (Twin Ridge and Upper Twin ski trails) or very difficult to detect from more than 3 miles away (unnamed trail to Green Rocks Lake and Castle River Trail).

Table REC-8. Estimated Distance between Developed Recreation Sites and Alternative 4

Site	Site Type	Distance to Alternative (miles)
Hamilton Creek Trail (463)	Trail	0.0
Big John Bay Trail (465)	Trail	0.3
Cathedral Falls Trail (467)[1/]	Trail	0.5
Twin Ridge Ski Trail (606)	Trail	1.5
Upper Twin Ski Trail (605)	Trail	2.7
Unnamed Trail to Green Rocks Lake (483)	Trail	3.2
Castle River Trail (459)	Trail	5.0
Big John Bay Cabin	Cabin	1.6
Raven's Roost Cabin	Cabin	3.3
Breiland Slough Cabin	Cabin	5.0
Castle Flats Cabin	Cabin	5.0
Towers Arm Cabin	Cabin	5.1
Castle River Cabin	Cabin	5.2
Frenchy Ridge Shelter	Shelter	2.3
Twin Creek Shelter	Shelter	2.7
Warm Fish Lake Shelter	Shelter	4.2
Seal Point Recreation Area[1/]	Other	0.9

Notes:
1/ These distances are the same for all three alternatives, which all share a common alignment at these locations.

Big John Bay Cabin is the closest Forest Service cabin to this alternative. The proposed transmission line would follow existing FR 6314 past the trailhead to the Big John Bay Trail that provides access to this cabin, but would not be visible from the cabin itself. The cabin is often accessed by boat without using the trail, although those visitors may use the trail while staying at the cabin. The other five cabins identified in Table REC-8 range from 3.3 miles to 5.2 miles from the proposed transmission line alignment under this alternative. The transmission line is not expected to be visible from any of these locations (see the *Scenery* section).

Alternative 4 passes relatively close to four other recreation sites: the Frenchy Ridge, Twin Creek, and Warm Fish Lake shelters, and Seal Point Recreation Area (Figure REC-2). The proposed transmission line alignment is not expected to be visible from the three shelters. Alternative 4 shares the same proposed alignment as Alternatives 2 and 3 in the vicinity of Seal Point Recreation Area. The long-term presence of a transmission line along FR 6040—which provides access from Kake to the Seal Point Recreation area—is not expected to affect the quality of the recreation experience at the Seal Point Recreation Area.

Cumulative Effects

In conjunction with other ongoing and reasonably foreseeable projects, Alternative 4 is not expected to contribute to long-term changes to overall patterns of recreation use in the project area. Existing opportunities would continue to be available for those seeking remote and primitive recreation experiences and those seeking access to fishing and hunting opportunities would continue to have those opportunities. Similarly, opportunities to use existing developed recreation sites would also continue to be available.

Development of the Kake road project could result in long-term changes to patterns of recreation use, as motorized access would be available to areas that are currently remote and difficult to access. The 2015 Kake Access Transportation Needs Assessment conducted as part of the KAP found that the primary use of a road connecting Kake and Petersburg, were one to be constructed, would be for "partial use trips" for recreation and subsistence (FHWA 2015). This finding would likely also apply to the Kake road project. The identified partial use trips would likely include areas that are presently not accessed by roads. The KPI Project would not directly contribute to these long-term changes were they to occur.

Short-term cumulative impacts could occur if one or more of the reasonably foreseeable projects were to coincide in time and space with the project. This could result in additional temporary disruptions to recreation use and could affect the quality of the recreation experience in localized areas. These types of impacts would be limited to the duration of construction and related activities in a particular location.

Mitigation

The effects of the KPI Project on recreation would be limited through the site-specific application of Forest Plan Standards and Guidelines and project-specific mitigation measures (see Chapter 2).

Inventoried Roadless Areas and Wilderness

Introduction

This section provides an overview of the existing conditions related to IRAs and assesses the potential direct, indirect, and cumulative effects of the proposed project on these areas. IRAs are defined as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act and were inventoried during the Forest Service's RARE II process and during subsequent updates and forest planning analyses. The Tongass is currently using the IRA boundaries associated with the 2001 Roadless Rule (USDA Forest Service 2001c), which are identified in a set of maps, associated with the Forest Service Roadless Area Conservation, Final EIS, Volume 2, dated November 2000. These maps identify 9.3 million acres in IRAs on the Tongass and correspond closely with the 1996 roadless area inventory that was prepared for the 1997 Forest Plan Revision (USDA Forest Service 1997b). Including Wilderness, the Tongass National Forest is currently more than 90 percent roadless.

Part of the Petersburg Creek-Duncan Salt Chuck Wilderness is located in the analysis area; however, none of the action alternatives cross this Wilderness area.

Analysis Area

The analysis area used to assess direct, indirect, and cumulative effects in this section is the estimated disturbance footprint for the action alternatives. This area was selected as the analysis area because all project-related disturbances are expected to occur within this area.

Methodology

This project-level analysis does not evaluate roadless areas for wilderness recommendation. It does, however, summarize the roadless characteristics associated with the IRAs in the analysis area. Detailed descriptions of the IRAs on the Tongass are included in Appendix C to the Tongass Land Management Plan Revision, Final Supplemental EIS (SEIS), Roadless Area Evaluation for Wilderness Recommendations (USDA Forest Service 2003). These characteristics are also discussed in more detail in the individual resource sections in this EIS. Table IRA-1 summarizes the roadless characteristics considered and the section in this chapter where potential effects are discussed.

Potential impacts to IRAs are primarily evaluated based on the projected level of disturbance that would occur within IRAs under the proposed action alternatives. Disturbance would occur as a result of structure installation, temporary shovel trails, temporary matting panels, temporary access spurs, helicopter pads, and right-of-way clearing. No new roads are proposed in IRAs under any of the alternatives. Temporary shovel trails and temporary access spurs would be decommissioned following construction, and temporary matting panels would be removed.

The analysis focuses on potential impacts to the unique or outstanding biological, physical, or social values of the IRAs. Roadless characteristics (i.e., values or features that make the area meet the minimum criteria for wilderness consideration under the Wilderness Act) are described in the Roadless Area Conservation Final EIS (USDA Forest Service 2000, Vol. 1, pp. 3-3 to 3-7).

Table IRA-1. Roadless Characteristics and Discussion Sections

2001 Roadless Rule Characteristics	Chapter 3 Section
Biological Values	
Diversity of plant and animal communities	Wildlife and Subsistence Use, Botany, Aquatic Resources
Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land	Wildlife and Subsistence Use, Botany, Aquatic Resources
Physical Values	
High quality or undisturbed soil, water, and air	Soils and Geology, Aquatic Resources; Air Quality and Climate Change
Sources of public drinking water	Aquatic Resources
Social Values	
Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized classes of dispersed recreation opportunities	Recreation
Reference landscapes	Scenery
Natural appearing landscapes with high scenic quality	Scenery
Traditional cultural properties and sacred sites	Cultural Resources
Other locally identified unique characteristics	Recreation; Cultural Resources

Source: USDA Forest Service 2000

Affected Environment

The proposed alternatives would cross four IRAs: 211 – North Kupreanof, 212 – Missionary, 213 – Five Mile, and 214 – South Kupreanof (Table IRA-2). These areas are shown in Figure 1-3 in Chapter 1 of this EIS. These IRAs range in size from 16,672 acres to 216,774 acres (Table IRA-2). The proposed transmission line originates on Mitkof Island, near Petersburg, with the majority of the proposed routes located on Kupreanof Island. Most of Kupreanof Island is within the Tongass National Forest and much of the land managed by the Forest Service is either designated Wilderness or within an IRA. It is not possible to build a transmission line between Petersburg and Kake that does not cross land that is either designated Wilderness or within an IRA (see Figure 1-3).

Table IRA-2. Inventoried Roadless Areas Partially Located within the KPI Analysis Area

Roadless Area Number	Roadless Area Name	Total Acres	Alternatives that would cross this IRA
211	North Kupreanof	114,636	2 and 3
212	Missionary	16,672	2 and 3
213	Five Mile[1/]	18,850	2 and 3
214	South Kupreanof	216,774	4

Note:
1/ The original Five Mile IRA was 19,455 acres. This total was reduced following the removal of a state-owned parcel previously included.

The following subsections describe the four IRAs that would be crossed by one or more of the proposed alternatives. These descriptions draw upon the 2003 Final SEIS IRA characteristics that were incorporated by reference into the 2008 Forest Plan Final EIS (USDA Forest Service 2003, Volume III Appendix C).

North Kupreanof IRA

The North Kupreanof IRA (#211) is located at the north end of Kupreanof Island and lies along the southern shore of Frederick Sound. It is accessed primarily from saltwater by boat or floatplane, as well as from existing NFS roads in the southwest and east that extend into the roadless area. The closest anchorage is in Portage Bay, which provides access to the Portage road system. FR 45601, which is part of the Kake road system is within the boundaries of this IRA. The NFS roads within the boundary of this IRA are ML 2 roads. FR 6030, the main ML 3 road heading east from Kake, is excluded from the IRA, which is located either side of this road corridor (Figure 1-3). Existing road systems in the analysis area are discussed in the *Transportation* section and shown on Figure TRAN-1. Alternatives 2 and 3 would cross approximately 11.4 miles of the North Kupreanof IRA, along the lower third of this IRA (Figure 1-3).

The 2003 Forest Plan SEIS discusses all the values used to rate the Wilderness potential of this IRA (USDA Forest Service 2003). This IRA appears unmodified from priority travel routes; however, recent timber harvest and road building along the eastern and southwestern boundaries of the IRA as well as in the interior (near FR 6030) may be seen from adjacent areas. There is a high opportunity for solitude and primitive recreational use in this IRA; however, floatplanes and powerboats may be seen or heard for brief periods. Current recreation use levels are low to moderate, and are concentrated mainly along saltwater (outside of the analysis area) and at specific locations adjacent to the major creeks and drainages. There are approximately 25.2 miles of existing road and 755.3 acres of past harvest within the North Kupreanof IRA. None of this past harvest occurred within the portion of the IRA that is located within the project's analysis area. Under Alternatives 2 and 3, the proposed transmission line would follow 5 miles of existing roads within the IRA.

Biological Values

The major streams in this IRA include Hamilton River, Big Creek, and Duncan Salt Chuck Creek. This area also contains the headwaters of Cathedral Falls Creek and Gunnuk Creek. The Hamilton River is a large stream and is known to produce very good runs of steelhead and coho salmon and has high value for sport fishing. Big Creek has an estimated annual escapement of 22,400 pink salmon. Duncan Salt Chuck Creek has high values for steelhead, coho salmon, and cutthroat trout, and ADF&G lists this stream as one of 19 "high value" watersheds in Southeast Alaska.

Sitka black-tailed deer and moose are present in this IRA; however, the majority of this IRA has low habitat qualities for deer and moose. Black bears are abundant and hunted in this area from the adjacent road system. There is a key wildlife and waterfowl migration route on the isthmus between Duncan Salt Chuck and Portage Bay that is partially located within this IRA. The saltwater to the north contains some of the highest population densities of humpback whales in Southeast Alaska.

The only federally listed threatened and endangered species likely to occur within or adjacent to this IRA are the humpback whale (endangered) and the Steller sea lion (threatened). These marine mammals are found in adjacent marine waters.

Physical Values

There is one small area of low vulnerability karst near Hamilton Creek, north of Towers Lake, and 117 acres of karst resources have been mapped in this IRA (less than 1 percent of the total IRA area). The USGS has identified potential copper resources in the Duncan Salt Chuck area. Furthermore, valid mining claims exist west of Duncan Salt Chuck Creek. The area within and adjacent to the Cathedral Falls Creek corridor has also been identified as an area with potential for mineral extraction of sedimentary uranium by the U.S. Bureau of Land Management. Parts of the Portage Mountain Loop Trail pass through this IRA (see Figure REC-2). No other developed recreation or other facilities exist to create a water demand within this IRA. The Gunnuck Creek area is allocated as a Municipal Watershed for the community of Kake, which is located west of North Kupreanof Roadless Area.

Social Values

The area contains no Research Natural Areas, and has not been identified for any other scientific value; however, the karst formation in the IRA may be of scientific interest since karst formations are relatively rare on the islands of Southeast Alaska.

Parts of the Portage Mountain Loop Trail pass through this IRA (see Figure REC-2). This trail is unmaintained. No other developed recreation facilities are located within the area. The closest developed recreation facilities are two public recreation cabins located nearby on Portage Bay (Figure REC-2). Black bear and waterfowl hunting, camping, beach combing, and sport fishing, as well as subsistence activities occur in the areas adjacent to saltwater and along major creeks. Outfitters and guides use the area for remote setting tours, camping, sea kayaking, whale watching, and black bear hunting.

The area is mostly unmodified, displaying uniformly rolling lowlands, with the Bohemian Mountain Range rising to over 2,200 feet. The majority of this IRA (87 percent) is natural appearing.

The area lies within the traditional territory of the Kake Tlingit and is adjacent to the present community of Kake. No known significant cultural resources exist within this area; however, the lower reaches of Cathedral Falls Creek and Hamilton River are areas of traditional and current subsistence uses.

Missionary IRA

The Missionary IRA (#212) lies at the north end of the Lindenberg Peninsula on Kupreanof Island. Access to this IRA is primarily by floatplane or boat. The isolated Portage road system accesses three sides of this IRA from the east (Figure TRAN-1). This road system does not extend into the IRA or connect to any communities. There are no sites suitable for landing wheeled aircraft or floatplanes in the interior of this area; therefore, access into the interior of this IRA is limited to foot or helicopter. Alternatives 2 and 3 would cross approximately 0.3 mile of the Missionary IRA, along its outer edge (Figure 1-3).

The 2003 Forest Plan SEIS discusses all the values used to rate the Wilderness potential of this IRA (USDA Forest Service 2003). About one-third of the area appears unmodified, mainly the Missionary Range; however, the remainder of the IRA has been heavily influenced by adjacent management activities, mainly consisting of timber harvest activities and roads. There is a moderate opportunity for solitude and primitive recreation within this IRA; however, air and boat traffic and occasional vehicle traffic pass nearby this IRA, which may be heard and observed by people in this roadless area. There are no existing roads within this IRA. There are 341.6 acres of past harvest within the Missionary IRA; none of this past harvest occurred within the portion of the IRA that is located within the project’s analysis area.

Biological Values

The streams in this roadless area include the headwaters of Todahl Creek and Portage Creek, and parts of Twelvemile Creek. These streams support runs of steelhead and cutthroat trout, Dolly Varden char, and pink, chum, and coho salmon. Sitka black-tailed deer and moose are present in this IRA, however, the majority of this area has only moderate habitat qualities for deer. Mink, river otters, beaver, porcupine, marten, ermine are well distributed in this IRA, and some trapping occurs.

The only federally listed threatened and endangered species likely to occur within or adjacent to this IRA are the humpback whale (endangered) and the Steller sea lion (threatened). These marine mammals are found in adjacent marine waters.

Physical Values

There are no known karst or cave resources in this IRA; however, unique geologic features of the area include an unusual mineral outcrop located near the east side of the IRA. Although the area has low minerals potential, claims have been filed on locations within the area in the past; however, no development has occurred. No developed recreation or other facilities exist in the IRA to create a water demand. There are no existing or planned hydroelectric or domestic water projects in the area.

Social Values

There are no developed recreation opportunities in this area. The closest developed recreation facilities are two public recreation cabins located nearby on Portage Bay (Figure REC-2). Dispersed recreation activities in this IRA include deer hunting when the season is open, and grayling fishing in the one lake where they are found. Commercial guides use the area for nature tours, freshwater fishing, and black bear hunting.

The area is mostly unmodified; however, its overall integrity is not considered pristine. The irregular shape of the area, and the roads and timber harvest up the Todahl Creek and Portage Creek valleys, have negatively affected the area's apparent naturalness.

The area lies within the traditional territory of the Stikine Tlingit. No known cultural sites exist in the area, though cultural resources have been identified along the adjacent coast.

Five Mile IRA

The Five Mile IRA (#213) is located along the eastern shore of Kupreanof Island. The area is bordered to the southwest by the Petersburg Creek-Duncan Salt Chuck Wilderness (Figure 1-3). The Five Mile IRA is primarily accessed from saltwater. The isolated Portage road system provides access to the west and north portions of the IRA. This road system does not extend into the IRA or connect to any communities. There are no sites suitable for landing wheeled aircraft or floatplanes in the interior of this IRA; therefore, access to the interior is generally limited to foot or helicopter. The Petersburg Mountain Trail, which provides access into the southern part of this area, is readily accessible from the state dock in the city of Kupreanof. The Colp Lake Trail is also located within the IRA (Figure REC-2). Alternatives 2 and 3 would cross approximately 10.7 miles of the Five Mile IRA, mainly along the shoreline of Frederick Sound (Figure 1-3).

The 2003 Forest Plan SEIS discusses all the values used to rate the Wilderness potential of this IRA (USDA Forest Service 2003). Most of the Five Mile IRA appears natural and unmodified, and much of the area is visible from major marine travel routes and provides a backdrop for the city of Petersburg; however, areas along the western and southeastern boundaries are affected by timber harvests and associated roads. Approximately 47 percent of the landscape of this IRA is considered distinctive from a scenery standpoint. The opportunity for solitude and primitive recreation within this IRA is considered high. This IRA lies within the traditional territory of the Stikine Tlingit, and there are known cultural resources in the area. There are no existing roads or past harvest units within the Five Mile IRA.

Biological Values

Five Mile Creek is the only ADF&G numbered stream in this IRA. This stream supports runs of steelhead and cutthroat trout, Dolly Varden char, and pink, chum, and coho salmon. Sitka black-tailed deer and moose are present in this IRA, and black bears are abundant. In addition, recent surveys have indicated that moose populations are increasing in this area. Mink, river otters, beaver, porcupine, marten, ermine, red squirrel, mice, shrews, and voles are also well distributed in this IRA. Numerous bald eagles are known to nest along the coastline of this IRA.

The only federally listed threatened and endangered species likely to occur within or adjacent to this IRA are the humpback whale (endangered) and the Steller sea lion (threatened). These marine mammals are found in adjacent marine waters.

Physical Values

There are no inventoried areas with potential mineral development potential in the area, and no karst, caves or other geologic features are located in this area. Two trails are located in the area. No other developed recreation or other facilities exist in this IRA to create a water demand. There are no existing or planned hydroelectric or domestic water projects in the area.

Social Values

No unique scientific or educational values have been identified in the area. The recreation potential for the Five Mile area is considered moderate to high. Residents of Petersburg and Kupreanof are the primary users of the trails within this IRA. The area has a rugged appearance and is visible from major marine travel routes along Frederick Sound. It also provides a backdrop for the city of Petersburg.

The IRA lies within the traditional territory of the Stikine Tlingit. Known cultural resources in the area include historic period cabins, fur farms, homesteads, culturally modified trees, prehistoric period fish traps, villages, and camps. Evidence of past use suggests the area was used more extensively both historically and prehistorically than current trends. The identified cultural resources are primarily located in beach fringe areas.

South Kupreanof IRA

The South Kupreanof IRA (#214) occupies most of the southern half of Kupreanof Island. The IRA is accessible primarily from saltwater (in upper Duncan Canal, Sumner Strait, or the southern end of Keku Strait) by boat or floatplane. Very few good anchorages are located along the southern shoreline (along Sumner Strait) and within Duncan Canal; however, several of the inland lakes are large enough to land small floatplanes. Access to the IRA is also provided by the Kake road system, which extends some distance into the area. There are no sites suitable for landing wheeled aircraft in the IRA. Alternative 4 would cross approximately 14.8 miles of the South Kupreanof IRA (Figure 1-3).

The 2003 Forest Plan SEIS discusses all the values used to rate the Wilderness potential of this IRA (USDA Forest Service 2003). Most of the IRA is unmodified. The beach area (where logging has occurred in the past) and areas adjacent to recent road building and timber harvest appear modified. Tree growth in areas harvested in the 1960s and 1970s along the beach has mostly restored the natural appearance of these areas, although these harvest units are still noticeable. There is a high opportunity for solitude and primitive recreation in this IRA. Use of floatplanes and motorboats may disrupt visitors on the shore for brief periods, but a person camped or traveling inland is unlikely to encounter others. There are approximately 31.1 miles of existing road and 1,241.7 acres of past harvest within the South Kupreanof IRA. The proposed project would parallel 3 miles of existing roads within the IRA. About 8.6 acres of past harvest are located within the portion of the IRA within the analysis area for the proposed project.

Biological Values

Castle River supports coho salmon, steelhead, and cutthroat trout, and ADF&G lists Castle River as one of the top 19 “high quality watersheds” in Southeast Alaska. Irish, Keku, and Tunehean Creeks have high commercial value for coho salmon and sport value for steelhead. Zim Creek is considered to have very good coho salmon smolt capability. Kushneahin Creek has high sport fish value for sockeye and steelhead, and limited habitat for coho salmon. The IRA has populations of Sitka black-tailed deer, black bear, wolves, and other animals and birds common to Kupreanof Island.

The only federally listed threatened and endangered species likely to occur within or adjacent to this IRA are the humpback whale (endangered) and the Steller sea lion (threatened). These marine mammals are found in adjacent marine waters.

Physical Values

There is a small area of low vulnerability karst located north of Taylor Creek along the shore of Towers Arm, and 54 acres of karst resources have been mapped in this IRA (less than 1 percent of the total IRA area). Stone columns comprised of columnar basalt formed the “totems” at the head of Totem Bay. The U.S. Bureau of Land Management lists the Tunehean Creek area as having potential for mineral extraction for copper and molybdenum. The USGS also identified the potential for copper resources in the Duncan Salt Chuck area. Valid mining claims exist west of Duncan Salt Chuck Creek. The one public recreation cabin still in service on this IRA (Towers Arm Cabin) relies on the use of surface water for its water needs. There are no existing or planned hydroelectric or domestic water projects in the area.

Social Values

The area contains no Research Natural Areas, and has not been identified for any other scientific value; however, the karst formation in the IRA may be of scientific interest since karst formations are relatively rare on the islands of Southeast Alaska.

Although this IRA has a high opportunity for primitive recreation, this IRA receives low to moderate recreational use. Recreation use includes bear, deer, moose, and waterfowl hunting; coho salmon, pink salmon, steelhead, and trout fishing; beachcombing; sea kayaking; camping, recreation cabin use; and viewing from marine access. The Irish Lakes are accessed from FR 6314 for hunting and fishing. Black bear hunting occurs all along the shoreline. The Towers Arm Cabin receives light use. Sea kayak paddling and camping occur along all of the shoreline. However, parts of the interior are not used for recreation or hunting as the only access to this area is by foot or helicopter, and other portions of the IRA are more desirable for these activities.

The majority of this IRA (89 percent) is natural appearing, with only ecological changes obvious to the viewer. Natural appearance dominates the landscape, except for the beach area along Keku and Sumner Straits which appears modified due to past beach logging.

The area lies within the traditional territory of the Kake and Stikine Tlingit. Archaeological sites known to occur in this IRA include historic period cabins, fur farms, and a saltery. Culturally modified trees dot the shoreline and historic period mining has occurred in the area interior. Prehistoric period sites include fish traps, villages, and camps.

Unroaded Areas

Unroaded areas are generally less than 5,000 acres in size and do not meet the minimum criteria for wilderness consideration under the Wilderness Act, but are of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition (USDA Forest Service 2008c).[5] The inventory for the 2003 Forest Plan Revision SEIS, which was subsequently updated for the 2008 Forest Plan Amendment, identified two unroaded areas that meet this definition and are partially within the analysis area. One has a total area of 1,418 acres, 10 acres of which are located within the analysis area common to all action alternatives. The other unroaded area has a total area of 4,467 acres, 16 acres

[5] Note that the term “unroaded” is used elsewhere in this document to describe all areas without roads, including IRAs; areas that meet this definition of unroaded (i.e., are less than 5,000 acres, etc.); and other areas with no roads.

of which are located within the analysis area for Alternative 4. The 2003 Forest Plan Revision SEIS analyzed these unroaded areas and found they did not have wilderness potential due to their size and/or configuration.

No standards and guidelines to maintain the physical, biological and social characteristics of unroaded areas have been established in the Forest Plan or national direction. Therefore, changes to these areas, as a result of project development activities, are acceptable under the Forest Plan and effects are generally expected to be similar to those in nearby roaded areas.

Wilderness

Petersburg Creek-Duncan Salt Chuck Wilderness

Part of the Petersburg Creek-Duncan Salt Chuck Wilderness is located in the VCUs crossed by the project; however, none of the proposed action alternatives cross this Wilderness area and it is not located within the analysis area for any of the action alternatives. Designated in 1980, the Petersburg Creek-Duncan Salt Chuck Wilderness consists of 46,849 acres on northeastern Kupreanof Island. The Wilderness runs on either side of Petersburg Creek, but does not include the creek itself (see Figure 1-3). In this area, Petersburg Creek passes through a U-shaped valley with mountains on either side (with peaks reaching 3,577 feet at their highest point). The creek opens into Duncan Salt Chuck, a large, tidally influenced salt marsh, with rocky rapids constricting its opening to the sea. A 14-inch-wide plank walkway covers part of the 6.5-mile-long trail that extends up Petersburg Creek to a Forest Service cabin on Petersburg Lake, which is also not part of the Wilderness. A more primitive trail – the Portage Mountain Loop Trail – extends across the Wilderness to a cabin on Duncan Salt Chuck (Figure REC-2).

Environmental Consequences

Effects Common to All Alternatives

Inventoried Roadless Areas

Due to the distribution of IRAs on Kupreanof Island, it is not possible to build a transmission line between Petersburg and Kake that does not cross land designated as an IRA (see Figure 1-3). As a result, the proposed action alternatives would all result in right-of-way clearing as well as the use of temporary shovel trails, temporary matting panels, and temporary access spurs within one or more IRAs. Furthermore, the proposed project would have a long-term impact to IRAs, due to the presence of the transmission line within these areas. However, no permanent or temporary roads would be constructed under any of the alternatives, and none of the alternatives would result in the addition of new roads in IRAs. Estimated disturbance by IRA, alternative, and disturbance type is presented in Table IRA-3.

Table IRA-3. Estimated Disturbance by IRA and Alternative (acres)

	Alternatives 2 and 3			Alternative 4
Impact Type	**North Kupreanof IRA (211)**	**Missionary IRA (212)**	**Five Mile IRA (213)[1/]**	**South Kupreanof IRA (214)**
Total IRA Acres	114,636	16,672	18,850	216,774
Project-Related Disturbance [2/]				
Structure Installation	28	0.9	29.1	38.3
Shovel Trails	6.5	0.4	14.8	6.0
Temporary Matting Panels	2.3	0.0	0.0	9.0
Temporary Access Spurs	2.3	0	0	0.7

Table IRA-3. Estimated Disturbance by IRA and Alternative (acres) (continued)

Impact Type	Alternatives 2 and 3			Alternative 4
	North Kupreanof IRA (211)	Missionary IRA (212)	Five Mile IRA (213)	South Kupreanof IRA (214)
Helicopter Pads	0.1	0	0.2	0.2
Right-of-Way Clearing	118.1	3.9	189.7	224.9
Total Project-Related Disturbance	**157.3**	**5.2**	**233.8**	**279.1**
As a Percent of Total IRA Acres	0.1	0.0	1.3	0.1

Notes:
1/ The original Five Mile IRA was 19,455 acres. This total was reduced following the removal of a state-owned parcel previously included.
2/ Disturbance estimates have been adjusted to avoid counting disturbance to the same area twice.

Wilderness

None of the proposed alternatives would affect the Petersburg Creek-Duncan Salt Chuck Wilderness because no project-related activities are planned within the Wilderness area. Therefore, there would be no direct, indirect, or cumulative effects to the Petersburg Creek-Duncan Salt Chuck Wilderness under any of the alternatives and the following alternative-specific discussions address IRAs only.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and there would be no direct or indirect effects on IRAs because there would be no transmission line construction or associated activities.

Cumulative Effects

The no action alternative would not contribute to cumulative effects on IRAs because there would be no transmission line construction or associated activities under this alternative. IRAs would, however, continue to be affected by existing roads and past timber harvests as described above in the *Affected Environment* section.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 would cross three IRAs: North Kupreanof, Missionary, and Five Mile (Figure 1-3). No new roads would be constructed within IRAs as part of these alternatives; however, right-of-way clearing, as well as construction of temporary shovel trails, use of temporary matting panels, and temporary access spurs, would occur within IRAs under both alternatives (Table IRA-3). The portions of Alternatives 2 and 3 that cross IRAs share a common alignment and design characteristics and are, therefore, discussed together in this section.

Alternatives 2 and 3 would both involve the construction of approximately 11.4 miles of new transmission line across the North Kupreanof IRA (Figure 1-3). Construction access would be via existing roads (5 miles) and temporary access spurs (1.7 miles), temporary shovel trail (4.5 miles), and temporary matting panels (1.8 miles). Temporary access spurs would provide access to structure locations more than 20 feet from an existing road. Project construction under Alternatives 2 and 3 would disturb an estimated 157.3 acres in this IRA, with the majority of this disturbance resulting from right-of-way clearing (Table IRA-3). Total estimated disturbance would affect approximately 0.1 percent of the IRA, with much of this disturbance occurring along or in the vicinity of existing roads.

Alternatives 2 and 3 would cross approximately 0.3 mile of the Missionary IRA. Construction access would be via temporary shovel trail. Project construction under Alternatives 2 and 3 would disturb an estimated 5.2 acres in this IRA, less than 0.1 percent of the IRA (Table IRA-3).

Alternatives 2 and 3 would both involve the construction of approximately 10.7 miles of new transmission line in the Five Mile IRA. Construction access would be via temporary shovel trail. Project construction under Alternatives 2 and 3 would disturb an estimated 233.8 acres in this IRA, with the majority of this disturbance resulting from right-of-way clearing. Total estimated disturbance would affect approximately 1.3 percent of the IRA (Table IRA-3).

Adverse impacts to the biological, physical, and social values associated with the IRAs in the project area are expected to be minor under Alternatives 2 and 3, with the possible exception of impacts to the social values associated with the Five Mile IRA. The presence of a transmission line along the shoreline of Frederick Sound would affect visual resources in this area, which is visible from major marine travel routes along Frederick Sound and provides a backdrop for the city of Petersburg. Visual impacts are assessed in the *Scenery* section of this EIS.

Cumulative Effects

Past projects have impacted the IRAs crossed by the proposed alternatives. These past projects include approximately 1,097 acres of past timber harvests and 25 miles of existing roads within the three IRAs crossed by Alternatives 2 and 3. Reasonably foreseeable projects in the analysis area include future timber harvests. The Bocephus units include 297 acres in the North Kupreanof IRA and 62 acres in the Missionary IRA. These units are presently unavailable for harvest because they are located in IRAs and do not coincide spatially with the areas that would be affected by Alternatives 2 or 3. The proposed alternatives would incrementally add to the cumulative effects of these past and reasonably foreseeable projects.

The Kake road project, as currently conceived, would follow the State's right-of-way easement from Kake to Petersburg for a total length of 52.6 miles, and would involve the construction of new road across three IRAs: North Kupreanof, Missionary, and Five Mile. Based on the limited information available and assuming a total right-of-way clearing width of 48 feet, the Kake road project would be could affect approximately 57 acres or less than 0.1 percent of the North Kupreanof IRA; 6 acres or less than 0.1 percent of the Missionary IRA; and 58 acres or 0.3 percent of the Five Mile IRA. In addition, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit–related disturbance as part of the Kake road project. The KPI Project does not involve road construction in IRAs and would not contribute to these long-term, road-related changes were they to occur.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Alternative 4 would cross one IRA: the South Kupreanof IRA (Figure 1-3). No new roads would be constructed within this IRA as part of this alternative; however, right-of-way clearing, as well as construction of temporary shovel trails and temporary access spurs, would occur within the South Kupreanof IRA under Alternative 4 (Table IRA-3).

Alternative 4 would involve the construction of approximately 14.8 miles of new transmission line across the South Kupreanof IRA (Figure 1-3). Construction access would be via existing roads (3.3 miles) and temporary access spurs (0.5 mile), temporary shovel trail (4.3 miles), and temporary matting panels (7.3 miles). Temporary access spurs would provide access to structure locations more than 20 feet from an existing road. Project construction under this alternative would disturb an estimated 279.1 acres in this IRA, with the majority of this disturbance resulting from right-of-way clearing (Table IRA-3). Total estimated disturbance would affect approximately 0.1 percent of the IRA. Adverse impacts to the biological, physical, and social values associated with this IRA are expected to be minor under this alternative, with the possible exception of impacts to the social values associated with recreation use in the vicinity of Duncan Canal.

Cumulative Effects

Past projects have impacted the IRAs crossed by the proposed alternative. These past projects include approximately 1,242 acres of past timber harvests and 31 miles of existing roads within the IRA crossed by Alternative 4. Reasonably foreseeable projects in the analysis areas include future timber harvests. There are no proposed timber harvest units in South Kupreanof IRA at this time. The proposed action would incrementally add to the cumulative effects of these past and reasonably foreseeable projects.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the IRA analysis area for Alternative 4 does not coincide in space with the Kake road project. This shared stretch of FR 6040 does not cross an IRA and, therefore, the Kake road project is not considered as part of the IRA cumulative effects analysis for Alternative 4.

Cultural Resources

Introduction

This section provides an overview of the cultural resources of the project area and assesses the potential effects of the proposed project on extant historical properties listed in or eligible for the National Register of Historic Places (NRHP), as required by the National Historic Preservation Act (NHPA) and its application guidance and sacred sites, as directed in Executive Order 13007 of 1996.

Analysis Area

The Area of Potential Effect (APE) is a phrase defined in implementing regulations of the NHPA. The regulations identify the APE as the geographic area within which the effects of an undertaking on federal land, in this case, construction of a transmission line and access roads, may cause changes in the character or use of historic properties, if such properties exist. The APE defined for the proposed project is a 300-foot-wide corridor centered along the centerline of the proposed transmission line alternatives, with broader coverage at water crossings to allow for final siting.

Methodology

Cultural resources on the Tongass National Forest include a diverse array of historic properties that represent prehistoric and historic sites and artifacts and may include sacred sites. The 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 NRHP. Section 106 of the NHPA requires that federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (ACHP) (36 CFR 800). The Section 106 review process seeks to consider historic preservation concerns with the needs of federal actions. Review occurs through consultation with Alaska State Historic Preservation Office (SHPO), the ACHP, Indian Tribes, and other parties with an interest in the effects of the undertaking on historic properties. Executive Order 13007 directs land managing agencies to protect and preserve Indian religious practices by allowing “access to and ceremonial use of Indian scared sites by Indian religious practitioners and” avoiding “adversely affecting the physical integrity of such sacred sites.”

One of the goals of consultation is to identify cultural resources and sacred sites that may potentially be affected by the undertaking, assess potential effects and seek ways to avoid, minimize, or mitigate any adverse effects on NRHP listed or legible sites. SEAPA’s cultural resource consultants, Historical Research Associates, Inc. (HRA), met with Forest Service representatives as well as with members of the Petersburg Indian Association and the Organized Village of Kake; tribal groups that may be culturally affiliated with the project area. Prior to circulation of the Draft EIS, the Forest Service contacted the Wrangell Cooperative Association, Sealaska Corporation, Sealaska Heritage, Kake Tribal Corporation and Tlingit and Haida Central Council, additional tribal groups that may be culturally affiliated with the project area. Following Forest Service review of the final Cultural Resource Report for this project the Alaska SHPO and the tribal groups were supplied with a copy of the report for comment (Greiser and Carlson 2013).

Project cultural resource personnel conducted investigations of major portions of the APE to ensure that the procedural requirements of 36 CFR 800 were met. In accordance with the Programmatic Agreement (2010) among the Forest Service Alaska Region, the ACHP, and the SHPO, the resource report was submitted under standard procedures of Section 106 of the NHPA. Field methods were based on the cultural resource sensitivity model outlined in the Programmatic Agreement (2010). The model defines high and low archaeological site sensitivity zones; surveys were conducted in both of these zones. Survey areas included intensive survey of lands in high sensitivity areas such as areas below 100 feet elevation and stream crossings and a sample of low sensitivity areas, mainly those above 100 feet elevation.

Affected Environment

Reference Condition

The Tongass National Forest has a rich and varied history. Its early history is represented by Indian groups including the Tsimshian and Haida in southern Southeast Alaska, and the Tlingit who are the dominant group that occupy areas from southern Southeast Alaska all the way to Yakutat and the Copper River area. Tribal groups within the Tlingit are mostly defined by territorial boundaries; for example, the Stikine Tlingit, the Sitka Tlingit, and the Hoonah tribes. Early contact with Europeans, and the subsequent exploitation and colonization of Alaska, Southeast Alaska's history included early Russian occupation, fur farming, large scale fishing and canning operations, and the timber industry. Historic properties representing these different uses and periods in history are present within the Forest and are managed as part of the Heritage Program. This is the context in which historic properties are evaluated for national register eligibility.

The portion of the KPI project area on Mitkof Island and the eastern half of Kupreanof Island 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, Wrangell, and Zarembo islands. The western half of Kupreanof Island lies within the Kake territory. Regionally, prehistoric site types include forts, stone and wood stake fish traps, pictographs and petroglyphs, seasonal fishing or hunting camps, and villages. Historic period sites include cabins, culturally modified trees, mining claims, fur farms, gardens, canneries, salteries, and smoke houses. There is also the potential for unknown or currently unidentified sacred sites.

Existing Condition

Kupreanof and Mitkof Island cultural resource sites represent typical site types in central Southeast Alaska. These include both prehistoric and historic period sites, some of which may date to several thousand years. Forest Service and Alaska Heritage Resources Survey (AHRS) records show there were three previously recorded cultural resource sites in the KPI project area. These include an experimental fur farm, a reported historic burial, and a prehistoric fish trap. The sites in the project area are located either along the project area shoreline or within 1,000 feet. The experimental fur farm was no longer used as a fur farm after 1972 and many of the buildings and features have been modified for use by state and federal agencies. Site investigations of the reported historic burial location indicate that the remains were removed prior to 1999. The prehistoric fish trap has been affected by natural causes such as erosion and natural decay of exposed wood but has the potential to provide information on historic or prehistoric subsistence practices.

Analysis and Field Survey Results

Prior to field investigation, various historical records and ethnographic accounts were examined to determine previous cultural use in the project area and its vicinity. Prior cultural resource surveys, Forest Service heritage program files, atlases and GIS archaeological site data, the AHRS listings, and the Tongass Site database were also reviewed.

HRA personnel reviewed 24 cultural resource survey reports conducted on Kupreanof and Mitkof islands for projects conducted since 1982 in or near the KPI project area. These reports include surveys for proposed timber sales, fish pass projects, a Public Health Service project, a sewer project, trail and road projects, a Forest Service right-of-way abandonment project, a cemetery boundary survey, a recreational project, and site investigations. Following this background research, HRA archaeologists conducted an intensive pedestrian survey of about 830 acres of high and low sensitivity areas of various types of terrain in search of undiscovered sites and other cultural resources and also conducted reconnaissance survey (primarily windshield survey) of 1,370 acres of low sensitivity areas. Two new cultural resource sites were located and recorded.

The cultural resource inventory resulted in the re-location of previously recorded sites: the Petersburg Creek Fish Trap site (49PET533), determined eligible for the National Register of Historic Places (NRHP) in 2004; and the Alaska Experimental Fur Farm (49PET118), determined not eligible for the NRHP in 1978. Two sites were recorded during the project analysis: the McKee Fur Farm (49PET727), determined eligible for the NRHP; and an abandoned road grade (49PET728), determined not eligible for the NRHP.

The two properties are determined eligible for the NRHP for the following reasons. The Petersburg Creek Fish Trap site represents a significant technological innovation and trend that occurred in the region during the middle and late Holocene. This site contributes to our understanding of past lifeways, particularly harvest activities and social structure. The McFee Fur Farm has the potential to yield information about a popular historic period industry. The farm was used to raise mink during the 1930s and 1940s and could further our understanding of homesteading and farming activities in southeast Alaska.

Environmental Consequences

Direct and Indirect Effects

Effects Common to All Alternatives

The cultural resource survey resulted in the relocation of one previously recorded prehistoric site, one previously recorded historic site, and the identification of two new historic sites; a previously recorded possible grave (historic burial) was not relocated in the project area. One of the previously recorded sites is recommended eligible for the NRHP and one of the newly recorded sites is also recommended eligible. Most of the project area crossed by the various alternatives is on steep or elevated terrain and within cultural resource low sensitivity areas. All of the action alternatives propose transmission line construction and use of temporary shovel trails and temporary access spurs. Implementation of the action alternatives in low sensitivity areas would have no effect on known cultural resources.

Alternative 1

The No Action Alternative would have no direct or indirect effects on historic properties or other cultural resources because there would be no new transmission line built under this alternative and no associated structure installation, use of helicopters, temporary shovel trails, or temporary access spurs, or vegetation clearing activities.

Alternative 2

Based on the cultural resource research and inventory, construction of the proposed transmission line and associated facilities under this alternative would have no effect on NRHP listed or eligible cultural resource sites. Additional surveys would be required if construction were to occur in areas with more than a low probability that have not been previously surveyed. Potential impacts to previously unknown cultural properties during construction would be addressed through the project-specific mitigation measure C1 (see the *Mitigation and Monitoring* subsection, below). To date, no sacred sites have been identified on or near Alternative 2.

Alternative 3

Based on the cultural resource research and inventory, construction of the potential transmission line and associated facilities under this alternative would have no effect on NRHP eligible cultural resource sites. Sandy Beach is a known area of sensitive cultural resources and site avoidance is critical in this area. Additional surveys would be required if construction were to occur in areas with more than a low probability that have not been previously surveyed. Potential impacts to previously unknown cultural properties during construction would be addressed through the project-specific mitigation measure C1 (see the *Mitigation and Monitoring* section, below). To date, no sacred sites have been identified on or near Alternative 3.

Alternative 4

Based on the cultural resource research and inventory, construction of the transmission line and access roads for this alternative would have no effect on NRHP eligible cultural resource sites. Potential impacts to previously unknown cultural properties during construction would be addressed through the project-specific mitigation measure C1 (see the *Mitigation and Monitoring* section, below). To date, no sacred sites have been identified on or near Alternative 4.

Cumulative Effects

The cumulative effects analysis area coincides with the project area boundary and the area of potential effect. Cumulative impacts to cultural resources on the Tongass may result from 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 and will continue to occur within the project area.

Most of the recorded cultural resource sites are concentrated near the marine shore; increased visitation and expanded use of the beach and estuary fringe could have a cumulative effect on cultural resources in the form of vandalism, looting, or inadvertent damage, such as ground compaction from trampling and/or camping. Transmission line construction has the potential for cumulative effects to historic properties located in high sensitivity areas. The transmission line related activities that take place inland and on steep terrain will be in low site sensitivity areas and not likely to have any effect on cultural resources. There is also the potential for unknown or currently unidentified sacred sites. Intensive cultural resource surveys and site monitoring have been implemented since the 1980s. The Petersburg Ranger District's current archaeological research and survey designs are based on the results of this work as well as more modern methods and technology. These methods are designed to preserve and protect significant sites and provide information that will help guide future research and cultural 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 cultural sites. Overall, the action Alternatives 2, 3, and 4 have the potential to incrementally add to the cumulative effects of past and reasonably foreseeable projects discussed in the Introduction to Chapter 3.

The Kake road project has the potential to affect cultural resources in the analysis area for Alternatives 2 and 3. The Kake road project would disturb an estimated 120 acres of land outside the 300-foot-wide KPI corridor, including 114 acres of NFS lands. The Kake road project has the potential to affect cultural resources through ground compaction and other construction-related disturbance, and by increasing access. In addition to the above acres, it is assumed that quarries for the Kake road project would be developed every 2 miles, with up to 500 feet of access road to each site, if needed, which could result in up to 50 acres of rock pit–related disturbance as part of the Kake road project. The KPI Project would not contribute to these long-term, road-related changes were they to occur.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the cultural resources analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of Forest 6040, if any, are unknown. However, improvements, were they to occur, would likely be centered on the existing road bed reducing the potential for additional effects to cultural resources.

Forest Plan Consistency

The proposed alternatives meet standards and guidelines regarding cultural resources and sacred sites. Obligations are met regarding Section 106 of the NHPA and its implementing regulations. The eligible sites or sites recommended as eligible that are located in the vicinity of Alternative 3 could potentially be avoided by selecting one of the other alternatives, rerouting the project, or by placement of poles spaced to avoid directly impacting the sites. However, until precise locations of the various water crossings are identified, determinations of effect on cultural resources cannot be made.

Mitigation and Monitoring

The Tongass Forest Plan (USDA Forest Service 2008a) addresses the desired future condition of cultural resources through a monitoring and evaluation plan. As specified in the Programmatic Agreement (2010), selected areas of direct impact during and/or after the actual ground disturbance are monitored. If inadvertent discoveries are made during project implementation, the Forest Service shall fulfill its consultation requirements in accordance with 36 CFR 800.13. Additional mitigation measures would be agreed upon and implemented before project activities may continue. The effects of the KPI Project on cultural resources would be limited through the site-specific application of Forest Plan Standards and Guidelines and project-specific mitigation measures (see Chapter 2). If mitigation through data recovery to cultural resource sites is required, collections of recovered cultural material will be curated in accordance with 36 CFR 79.

Socioeconomics

Introduction

This section provides an overview of the current social and economic conditions in the project area and assesses the potential effects of implementing the proposed action and the alternatives, including the No Action Alternative, on the social and economic environment. The analysis concentrates on the potential effects associated with construction and operation of the proposed transmission line, as well as the potential impacts of not proceeding with the proposed project (i.e., the no action alternative).

Analysis Area

The primary social and economic area of influence, or analysis area, for socioeconomics includes the three communities located within the project area: Kake, Petersburg, and Kupreanof. Data are also presented for the Petersburg Census Area (CA) and the Southeast Alaska region. Community profiles are presented for the three communities in the project area at the beginning of this chapter.

Petersburg Borough

In 2012, Southeast Alaska was divided into seven boroughs and three CAs. The seven boroughs correspond with the county governments found elsewhere in the United States, but unlike counties in other states, the boroughs in Alaska do not cover the entire state. The remaining unorganized areas are allocated to CAs, which are statistical units that are generally recognized as county equivalents from a data reporting standpoint. In 2012, the unorganized areas in Southeast Alaska were allocated to three CAs: Hoonah-Angoon, Petersburg, and Prince of Wales-Hyder. At that time, the entire KPI project area was located in the Petersburg CA, which included Mitkof, Kupreanof, and Kuiu Islands and the communities of Kake, Petersburg, and Kupreanof.

This changed in January 2013 when the city of Petersburg's voter-approved petition to incorporate as a borough was certified. The city of Petersburg was subsequently dissolved becoming part of the new home-rule Petersburg Borough. The new borough includes the former city and the rest of Mitkof Island, part of Kupreanof Island, and the mainland coastline north to Endicott Arm. The city of Kake is located on northwest Kupreanof Island, which is not part of the new borough, and although it is located within the boundary established for the new borough, the city of Kupreanof continues to exist as a separate municipality (Miller 2012).

The following section presents data for the Petersburg CA and Petersburg city because the most recent available data is compiled for these geographic areas.

Methodology

Current social and economic conditions are characterized using existing data from the Alaska DOL, the U.S. Census Bureau, and others. Potential impacts to other natural resource-based industries (recreation and tourism and commercial fishing) are assessed qualitatively using existing data and other resource-specific analyses developed for this Project, including the Recreation Resource Report and the Aquatics Resource Report. The following sections address demographic characteristics and trends, economic conditions, and non-market values. The discussion and analysis presented in these sections tiers to the detailed socioeconomic information and analysis presented in Chapter 3 of the 2008 Forest Plan EIS (USDA Forest Service 2008c).

3 Environment and Effects

Affected Environment

Demographic Trends and Overview

Southeast Alaska had an estimated population of 74,423 in 2013, with slightly more than two-thirds (67 percent) of that total concentrated in three cities: Juneau, Ketchikan, and Sitka (Alaska DOL 2013b). The remaining population is distributed throughout the region in more than 30 small communities, most with populations of less than 1,000 residents. Petersburg and Wrangell are the closest of the larger population centers to the project area.

The Petersburg CA encompasses approximately 5,684 square miles of land and water, including 3,282 square miles of land, with an average population density of 1.2 persons per square mile (U.S. Census Bureau 2011b). The Petersburg CA includes the communities of Petersburg, Kake, and Kupreanof, as well as the small city of Port Alexander, which is located on the southeastern corner of Baranof Island. In 2012, the Petersburg CA had a total population of 3,937, with three-quarters of this total, 2,972 people, residing in the city of Petersburg. Kake was the second largest community in the Petersburg CA, with a total estimated population of 598, 15 percent of the total. Kupreanof had a total estimated population of 34; Port Alexander had an estimated population of 66; and 267 individuals lived elsewhere in the CA (Table SOC-1).

Table SOC-1. Population, 2000 and 2012

			2000 to 2012		
Geographic Area	**2000**	**2012**	**Net Change**	**Percent Change**	**Average Annual Growth Rate (Percent)**
Alaska	626,932	732,298	105,366	16.8	1.3
Southeast Alaska	73,082	74,423	1,341	1.8	0.2
Petersburg CA	4,260	3,937	-323	-7.6	-0.7
Kake	710	598	-112	-15.8	-1.4
Kupreanof	23	34	11	47.8	3.3
Petersburg	3,224	2,972	-252	-7.8	-0.7
Port Alexander	81	66	-15	-18.5	-1.7
Balance	222	267	45	20.3	1.5

Notes:
CA –Census Area
1/ In addition to the communities of Kake, Kupreanof, and Petersburg, the Petersburg CA also includes the city of Port Alexander and individuals living elsewhere in the CA. People living outside the four communities (i.e., elsewhere in the CA) are referred to as "Balance" in this table.
Sources: Alaska DOL 2013a, 2013b, 2013c, 2013d

Total population increased by 16.8 percent in Alaska between 2000 and 2012, with much of this increase due to natural increase (more births than deaths in the existing population). The state also saw small gains in population through net in-migration (more people moving to the area than leaving). Population in Southeast Alaska experienced a much smaller increase over this period, increasing by just 1.8 percent. Population gains in Southeast Alaska were entirely due to natural increase, as the region experienced net out-migration between 2000 and 2012, with 4,654 more people leaving the region than moving to it. The Petersburg CA also experienced net out-migration over this period, with a net loss of 480 residents, 11 percent of the population in 2000. The CA did gain some population through natural increase, but these gains were exceeded by the net out-migration, which resulted in a total net loss of 323 residents or 7.6 percent of the 2000 population (Table SOC-1).

The population of Kake also decreased over this period, dropping from 710 residents in 2000 to an estimated 598 in 2012, a net decrease of 112 residents, 15.8 percent of the 2000 population (Table SOC-1). A detailed summary of population trends in Kake is presented in Figure SOC-1. In a recent survey, community leaders indicated that the population of Kake fluctuates during the year, mostly driven by employment in the fishing sectors, with the population peaking during the summer months (June through August) when seasonal workers are present (AFSC 2013).

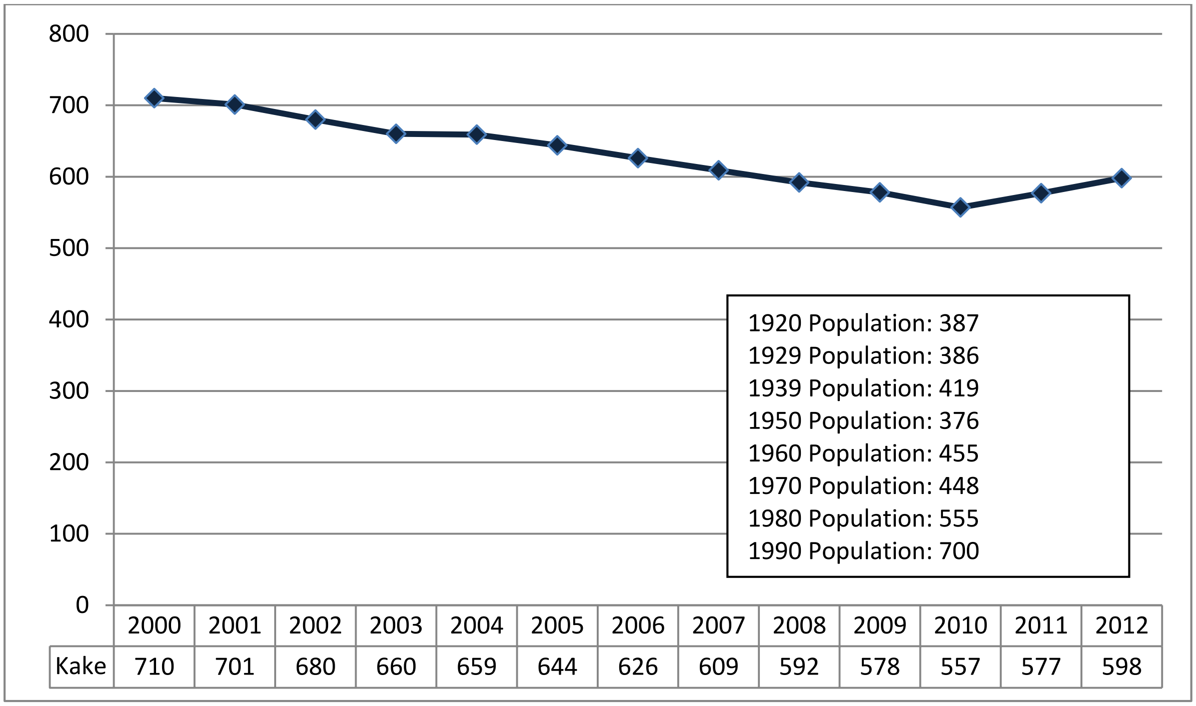


Figure SOC-1. Kake Population 1920 to 2012

Sources: Alaska DOL 2013a, 2013b; U.S. Census Bureau 1940, 1960, 1980, 1990

The population of Petersburg city also declined between 2000 and 2012, with a net loss of 252 residents, 7.8 percent of the 2000 population (Table SOC-1). Population in Kupreanof remained relatively constant through 2011, with the total number of residents increasing from 23 to 27. Total estimated population for 2012 increased to 34 residents, a net gain of 7 people, which is equivalent to 26 percent of the total community population in 2011.

Population Projections

Population projections developed by the State of Alaska anticipate continued population growth statewide, but expect population to decline in the boroughs and CAs of Southeast Alaska, including the Petersburg CA (Alaska DOL 2013e). Southeast Alaska is the only region in Alaska where population is expected to decline over the forecast period (2010 to 2035). The State anticipates that population will decline because low birth rates and the highest median age in the state mean that a sharp rise in net in-migration would be required for growth to occur in the future (Mercer 2010). Projections for the forecast period anticipate that the population of Alaska will increase by 28.2 percent between 2010 and 2035, while the populations of Southeast Alaska and the Petersburg CA are expected to decrease by 4.6 percent and 17.7 percent, respectively (Alaska DOL 2013e). Among the 10 boroughs and CAs that comprised Southeast Alaska in 2012, only the Hoonah-Angoon CA (-35.6 percent) and Prince of Wales-Outer Ketchikan CA (-20.5 percent) are projected to experience larger relative decreases in population than the

Petersburg CA over the forecast period (Alaska DOL 2013e). Projected percent change in population is shown for Alaska, Southeast Alaska, and the Petersburg CA in 5-year increments in Figure SOC-2.

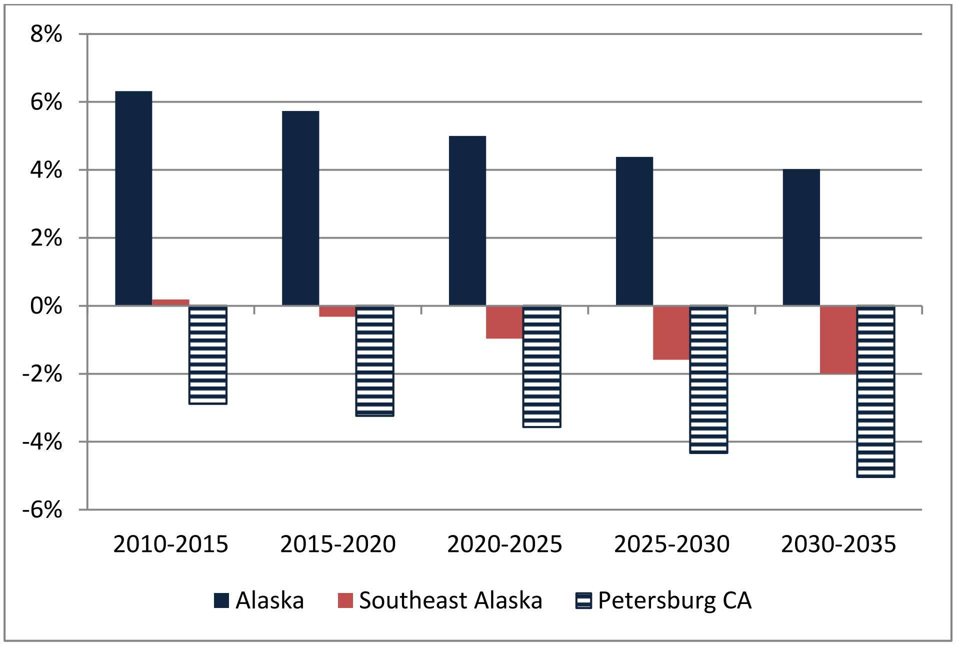


Figure SOC-2. Projected Percent Change in Population, 2010–2035

Source: Alaska DOL 2013e

Race and Ethnicity

The majority of the population in Alaska, almost two-thirds, identified as White in the 2010 Census. Alaska Natives were the largest minority group, accounting for 14 percent of the total population (Table SOC-2). The share of total population that identified as White in Southeast Alaska (65 percent) and the Petersburg CA (69 percent) was similar to the State overall (64 percent), with Alaska Natives accounting for a similar share of the total population (16 percent in Southeast Alaska and the Petersburg CA versus 14 percent, statewide) (Table SOC-2).

More than two-thirds (68 percent) of the population in Kake identified as Alaska Native in the 2010 Census, with just 17 percent identifying as White (Table SOC-2). The populations of the cities of Petersburg and Kupreanof were, in contrast, primarily White, accounting for 78 percent and 89 percent of their respective total populations. According to the 2010 Census, Alaska Natives accounted for just 7 percent of the population in Petersburg city, compared to 16 percent for the Petersburg CA as a whole, and no Alaska Natives were identified in Kupreanof city (Table SOC-2).

Table SOC-2. Race and Ethnicity 2010

Geographic Area	Total Population	Percent of Total Population				
		White[1/]	American Indian and Alaska Native[1/]	Hispanic or Latino	Some Other Race[1/2/]	Two or More Races[1/]
Kake city	557	17	68	2	2	11
Kupreanof city	27	89	0	0	7	4
Petersburg city	2,948	78	7	4	4	7
Petersburg CA	3,815	69	16	3	3	8
Southeast Alaska	**71,664**	**65**	**16**	**4**	**6**	**8**
Alaska	710,231	64	14	6	10	6

Notes:
CA – Census Area
1/ Non-Hispanic only. The Federal Government considers race and Hispanic/Latino origin (ethnicity) to be two separate and distinct concepts. People identifying as Hispanic or Latino origin may be of any race. In this table people identifying as Hispanic or Latino are included in the Other Race category only.
2/ The "Other Race" category presented here includes census respondents identified as Black or African American, Asian, Native Hawaiian and Other Pacific Islander, or Some Other Race.
Source: U.S. Census Bureau 2011a

Economic Conditions

Employment

A total of 1,667 non-agricultural wage and salary (NAWS) jobs were identified in the Petersburg CA in 2011, with a total combined payroll of $59.6 million (Table SOC-3). These data are compiled from unemployment insurance coverage data and do not include self-employed workers. The government sector accounted for 37 percent of total NAWS employment and 44 percent of total annual earnings (Table SOC-3). These totals include Federal, State, and local jobs, with most of this employment concentrated in the local government sector, which accounted for 28 percent of annual employment and 27 percent of wages in 2011. These data indicate that compared to Southeast Alaska as a whole the Petersburg CA is relatively specialized in the manufacturing sector. The concentration of employment and wages in this sector—18 percent and 20 percent of the total, respectively—reflects the important role the commercial fishing sector plays in the local economy.

As noted in the Kake community profile at the beginning of this chapter, the economy of Kake is dependent on logging, fishing, ecotourism, and sport hunting and fishing, and subsistence is an essential part of the local way of life. The city of Kake, the school district, and Kake Tribal Corporation are the largest employers in the community. Employment data for 2011 indicate that 92 people or 38 percent of total employment was in local government (Table SOC-4), compared to 28 percent in the Petersburg CA as a whole (Table SOC-3). Educational and health services accounted for 29 jobs, 12 percent of total employment compared to 4 percent in the Petersburg CA (Tables SOC-3 and SOC-4).

Table SOC-3. Annual Employment and Earnings in the Petersburg CA, 2011[1/]

Economic Sector	Annual Average Employment		Annual Earnings		Average Monthly Earnings ($)
	Number of Jobs	Percent of Total	Millions of Dollars	Percent of Total	
Natural Resources and Mining	76	5	4.3	7	4,704
--Forestry and Logging[2/]	25	1	0.9	2	3,088
Construction	32	2	1.2	2	3,258
Manufacturing	303	18	12.0	20	3,306

Table SOC-3. Annual Employment and Earnings in the Petersburg CA, 2011[1/] (continued)

Economic Sector	Annual Average Employment		Annual Earnings		Average Monthly Earnings ($)
	Number of Jobs	Percent of Total	Millions of Dollars	Percent of Total	
Services Providing	637	38	15.9	27	2,087
Trade/Transportation/Utilities	273	16	7.2	12	2,202
--Retail Trade[3/]	216	13	4.7	8	1,821
Information	42	3	1.1	2	2,133
Financial Activities	39	2	1.4	2	2,905
Professional & Business Services	61	4	2.6	4	3,523
Educational & Health Services	67	4	1.7	3	2,073
Leisure & Hospitality	79	5	1.3	2	1,369
Other Services	77	5	0.8	1	849
Total Private Ownership	**1,049**	**63**	**33.5**	**56**	**2,664**
Federal Government	108	6	7.5	13	5,775
State Government	47	3	2.3	4	3,980
Local Government	465	28	16.4	27	2,935
Total Government	**620**	**37**	**26.1**	**44**	**3,508**
Overall Total	**1,669**	**100**	**59.6**	**100**	**2,978**

Notes:
1/ These data are compiled from unemployment insurance coverage data and exclude self-employed workers because they are not covered by unemployment insurance. Occupations with relatively high shares of self-employment include the fish harvesting, logging, and construction sectors.
2/ Forestry and logging is part of the Natural Resources and Mining sector.
3/ Retail Trade is part of the Trade/Transportation/Utilities sector.
Source: Alaska DOL 2012

Table SOC-4. Employment by Industry and Community, 2011

Industry[1/]	Kake		Petersburg		Kupreanof	
	Number Employed	Percent of Total	Number Employed	Percent of Total	Number Employed	Percent of Total
Natural Resources and Mining	19	8%	25	2%	0	0%
Construction	8	3%	68	6%	0	0%
Manufacturing	28	12%	149	13%	0	0%
Trade, Transportation and Utilities	34	14%	260	22%	2	22%
Information	0	0%	29	2%	0	0%
Financial Activities	8	3%	25	2%	0	0%
Professional and Business Services	13	5%	27	2%	0	0%
Educational and Health Services	29	12%	156	13%	3	33%
Leisure and Hospitality	2	1%	76	6%	0	0%
State Government	2	1%	73	6%	0	0%
Local Government	92	38%	282	24%	4	44%
Other	7	3%	22	2%	0	0%
Total	**242**	**100%**	**1,192**	**100%**	**9**	**100%**

Note:
1/These data are compiled from unemployment insurance coverage data and do not include self-employed workers.
Source: Alaska DOL 2013g

Petersburg is primarily a fishing community that also attracts tourists (Cannon and Wilkinson 2010). Several fish processors operate cold storage, canneries, and custom packing services in Petersburg.

Although not evident in Table SOC-4, seafood product preparation and packaging is an important source of local employment in Petersburg, accounting for an estimated 22 percent of total employment in 2008 (Cannon and Wilkinson 2010). Other important employers include the Petersburg School District, the City of Petersburg, Petersburg Medical Center, the State of Alaska, and Petersburg Indian Association (ASFC 2013). Local and state government accounted for about 31 percent of total employment in 2011 (Table SOC-4).

The majority of Kupreanof's working residents are self-employed although some commute by boat to jobs in Petersburg. This is reflected in the data presented in Table SOC-4, which identify nine jobs held by Kupreanof residents, four in local government, three in educational and health services, and two in trade, transportation, and utilities.

The annual, seasonally unadjusted, unemployment rate in Alaska was lower than the national average in 2012, 7.0 percent versus 8.1 percent. The corresponding rate for Southeast Alaska was 6.8 percent, lower than the state and national averages. The unemployment rate in the Petersburg CA was, however, 10.5 percent, higher than the regional, state, and national averages (Alaska DOL 2013h).

Data compiled for 2010 as part of the U.S. Census Bureau's American Community Survey (ACS) indicated that the unemployment rate in Kake in 2010 was more than three times the average for the Petersburg CA and four times the rate in Petersburg city, 19.6 percent versus 6.2 percent and 4.8 percent, respectively.[6] Although very high, this estimate for Kake was much lower than the rate reported by the Alaska DOL, which identified an unemployment rate of 54.7 percent in Kake in 2010, compared to 10.2 percent in Petersburg city and 11.5 percent statewide (cited in AFSC 2013).

In 2012, Alaska DOL identified 253 employed residents in Kake and 104 insurance claimants (Alaska DOL 2013i). As part of the same dataset, 1,146 employed residents and 223 insurance claimants were identified in Petersburg. Insurance claimants in Kake were equivalent to 41 percent of the employed residents. The corresponding ratio in Petersburg was 19 percent. These numbers are not unemployment rates, but provide some indication of the relative unemployment in the respective communities.

Commercial Fishing

The commercial fishing industry is a significant part of Alaska's economy, and this is also the case for Southeast Alaska. Seafood processing employed 1,450 in Southeast Alaska in 2010, and an estimated 9,182 were employed in fish harvesting (Alaska DOL 2013f; Warren and Kreiger 2011). This combined total (10,632 jobs) was equivalent to about 30 percent of total covered employment in Southeast Alaska in 2010.[7] In 2010, 530 residents in the Petersburg CA held commercial fishing permits. The majority of these permits (468 permits, 88 percent) were held by Petersburg residents. A total of 45 permits were held by Kake residents. In addition, 455 residents in the Petersburg CA held crew member licenses in 2010, including 408 residents in Petersburg and 36 residents in Kake. According to the ACFEC, no residents held commercial fishing permits in Kupreanof in 2010 (ACFEC 2011). Several residents in Kupreanof are believed to be commercial fishermen. However, permit counts provided by ACFEC are likely based on mailing addresses, with any Kupreanof residents holding fishing permits included in the Petersburg totals.

[6] These ACS data are 12-month estimates based on data compiled from 2006 to 2010. While the ACS can provide a good snapshot of larger populations, smaller populations can be misrepresented if demographic information is not collected from a representative sample of the population (AFSC 2013). The AFSC notes this is a problem for smaller Alaskan communities, which have a low probability of being adequately sampled.
[7] Total covered employment estimates prepared by the Alaska DOL do not include the majority of fish harvesting jobs because most of these jobs are exempt from state unemployment insurance laws.

Recreation and Tourism

Recreation and tourism in Southeast Alaska and the Petersburg area is discussed above in the *Recreation* section. As indicated in that section, an estimated 29,000 out-of-state residents visited Petersburg in summer 2006, and an estimated 13,000 visitors participated in nature-based tourism from Petersburg (McDowell Group 2007; Dugan et al. 2009). The nature-based tourism study estimated that these visitors brought in an estimated $2.7 million in gross revenues, with most of this revenue related to fishing lodges and charters (Dugan et al. 2009). Outfitter/guides reported a total of 1,407 service days at various locations in the KPI project area in 2013 (see the *Recreation* section).

Forest Products

The timber industry in Southeast Alaska employed an estimated total of 262 people in 2011, with 109 of these jobs supported by harvest on the Tongass (USDA Forest Service 2012f). An estimated total of 112 MMBF of timber was harvested in Southeast Alaska in 2011, with harvest on the Tongass National Forest accounting for 29 percent (32.6 MMBF) of this total, and 56 percent (63.1 MMBF) of the total provided by Native Corporation lands (USDA Forest Service 2012f).

The wood products industry in Southeast Alaska in its current form consists of individual- and family-owned sawmills and independent logging businesses. The Tongass Sawmill Capacity and Production Report for calendar year 2011 identified 10 active and 3 inactive sawmills in Southeast Alaska, with a total installed production capacity of 160.0 MMBF (Parrent 2012).[8] One of the active mills included in this survey is located in Petersburg. Falls Creek Forest Products (formerly Southeast Alaska Wood Products) was identified as active with a processing capacity of 3 MMBF and one employee. Review of the forestry-related businesses in the Alaska Department of Commerce's business license database identified an additional six forestry-related businesses with mailing addresses in the analysis area communities, two in Kake and four in Petersburg (ADCCED 2012b).

A total of 25 jobs in the forestry and logging sector were identified in the Petersburg CA (Table SOC-3). This likely underestimates the number of forest products-related jobs in the area because it does not include sawmill- or log transportation-related employment and the NAWS dataset does not include self-employed workers (see Table Soc-3, footnote 1).

Income and Poverty

Median household income in Alaska was $65,699 in 2011, 1.3 times the national median of $50,502. Median household incomes in Southeast Alaska boroughs/CAs ranged from 62 percent of the state median in the Hoonah-Angoon CA to 113 percent of the state median in Juneau. The Petersburg CA had a median household income of $54,434 in 2011, which was equivalent to 83 percent of the state median (U.S. Census Bureau 2012).

Per capita income estimates developed for the ACS for the affected communities in 2010 ranged from $22,657 in Kupreanof to $32,156 in Petersburg city, with per capita income estimated to be $24,413 in Kake (ADCCED 2013). Alternative estimates developed by the AFSC (2013), suggest these estimates might overstate per capita income in these communities. Using data compiled by the Alaska DOL, they estimate that per capita incomes in Kake and Petersburg city in 2010 were $9,582 and $10,862, respectively (AFSC 2013).

[8] The mills included in the survey were those assessed in previous survey years. The original list of mills to be surveyed, initially identified in 2001, consisted of the 20 largest and/or most active sawmills at that time. Of these 20 mills (increased to 22 in 2007), 10 were active in 2011, 3 were inactive, and the other 9 had been decommissioned or were no longer in production (Parrent 2012).

An estimated 10.8 percent of the population was below the poverty line in Alaska in 2011. In Southeast Alaska, the percent of the population in boroughs/CAs below the poverty line ranged from just 4.6 percent in the Skagway Municipality to 18.5 percent in the Hoonah-Angoon CA. The poverty rate in the Petersburg CA was very similar to the state average, 10.6 percent versus 10.8 percent (U.S. Census Bureau 2012). An estimated 18.9 percent of the population in Kake was below the poverty level in 2010, more than twice the amounts estimated for Kupreanof, Petersburg city, and the Petersburg CA (ADCCED 2013).

Electric Power

Regional Context

Southeast Alaska consists of a 500-mile-long stretch of mainland and densely forested coastal islands and peninsulas, approximately 120 miles across at its widest point. The region includes approximately 29,000 square miles of land (16.1 percent of the total U.S. land area) and over 11,000 miles of coastline. Islands make up about 40 percent of the region's total land area. The region is sparsely populated, with an approximate population density of 2 persons per square mile. As noted above, slightly more than two-thirds of the population total (estimated to be 74,423 in 2012) is concentrated in just three cities: Juneau, Ketchikan, and Sitka, with the remaining population distributed throughout the region in more than 30 small communities, most with fewer than 1,000 residents. Viewed from an electric generation and transmission perspective, the region consists of multiple, small load centers, separated from one another by mountainous terrain and marine waters. The 2012 Southeast Alaska Integrated Resource Plan describes the region's electric transmission grid as limited in terms of the number of communities connected and notes that the grid is very different from the integrated, interconnected, and redundant grids that are in place throughout the lower 48 states (Black & Veatch 2012).

Southeast Alaska has a wet, relatively temperate climate, and the combination of high precipitation rates and mountainous terrain provides considerable opportunity for hydroelectric generation. In 2011, hydroelectric power accounted for 96 percent of the region's net power generation, with diesel supplying the other 4 percent. Statewide, hydropower accounted for just 20 percent of net generation, with natural gas accounting for more than half (59 percent) of net generation (Fay et al. 2013).

Although it accounts for most of the region's net power generation, hydroelectric power is not evenly distributed among the region's communities. As communities moved toward electrification, hydropower projects were developed in locations near the region's main load centers (i.e., the larger communities). Diesel generation was developed to supplement and backup hydroelectric generation, where it existed, and for communities that could not economically access hydroelectric power. Diesel generation is the main alternate source of energy because of the availability of diesel fuel, the ease of installing diesel generators in a wide range of capacities, and relatively low initial costs. Today, the power requirements of the region's larger communities, including Juneau, Ketchikan, Sitka, Petersburg, Wrangell, Skagway, and Haines, as well as some smaller communities are met by relatively low cost hydroelectric generation. While considerable hydroelectric power is available in some locations, the lack of power transmission facilities prevents its distribution to the region as a whole (Black & Veatch 2012).

Although relatively easy and inexpensive to install, high fuel costs and the operations and maintenance expenses associated with diesel generators make them expensive to operate. As a result, in communities where hydroelectric power is not available (which includes 13 of the region's 23 incorporated communities), the reliance upon diesel generation has contributed to very high electric rates. The 2012 Southeast Alaska Integrated Resource Plan indicated that with "the increasing cost of fuels, the cost of diesel generation in Southeast Alaska is not conducive to economic development" (Black & Veatch 2012, p. 4-1). Alexander et al. (2010, p. 8), stated that "the high cost of energy in the communities that rely on diesel generation impedes economic development, as decisions to locate new commercial and industrial developments are influenced by the availability of reliable low-cost power."

The existing transmission system in Southeast Alaska is limited, but the electric systems in a few communities are currently interconnected. These may be summarized by region, as follows:

- SEAPA Region—The existing SEAPA system connects Ketchikan, Petersburg, and Wrangell.
- Juneau Area—The Alaska Electric Light & Power system connects Juneau, Douglas Island, Auke Bay, and Greens Creek.
- Prince of Wales Island—The Alaska Power & Telephone (AP&T) system connects the communities of Coffman Cove, Craig, Hollis, Hydaburg, Kasaan, Klawock, and Thorne Bay.
- Upper Lynn Canal Region—A separate AP&T system connects Haines and Skagway in the Upper Lynn Canal Region and is connected via an intertie to the existing IPEC system that serves Klukwan and Chilkat Valley.

Southeast Alaska Power Agency

SEAPA began as the Four Dam Pool. The Four Dam Pool Project began in the early 1980s with the State's construction and acquisition of four hydroelectric facilities: Terror Lake, Solomon Gulch, Swan Lake, and Tyee Lake. These facilities and related transmission lines were placed into service between 1981 and 1985 and a long-term power sale agreement was signed in 1985 between the state of Alaska and the five member utilities receiving power from these state-owned hydro facilities. The member utilities were Kodiak Electric Association, Copper Valley Electric Association, and the cities of Ketchikan, Wrangell, and Petersburg.

In 2002, the five member utilities purchased the four hydroelectric facilities from the State and created the Four Dam Pool Power Agency. The State used the proceeds from the sale to establish the PCE Endowment, which is used to partially offset the very high electricity rates in many of the smaller communities in the state. In 2009, the Four Dam Pool Power Agency restructured and sold or transferred the Terror Lake project to Kodiak Electric Association and the Solomon Gulch project to Copper Valley Electric Association. Following this restructuring, the Four Dam Pool Power Agency changed its name to SEAPA to better reflect the geographic location of the remaining projects (the Swan Lake and Tyee Lake projects). The three remaining member utilities (the cities of Ketchikan, Wrangell, and Petersburg) provide electric utility services to their respective service areas utilizing power generated by SEAPA's facilities and purchased from SEAPA under a Power Sales Agreement that was executed in February 2009 as part of the restructuring transaction.

SEAPA's principal facilities are the Tyee Lake and Swan Lake projects and approximately 175 miles of transmission lines spanning from Ketchikan to Petersburg. Located approximately 40 miles southeast of Wrangell, the Tyee Lake project was constructed in 1981 and provides power to Wrangell and Petersburg. Surplus power is transferred to Ketchikan via the recently completed Swan Lake-Lake Tyee Intertie, a 57-mile-long, 138 kV transmission line (presently operated at 69 kV) that connects the Tyee-Wrangell transmission line to the Swan Lake project. As a result of the Swan Lake-Lake Tyee Intertie, the three member utilities (Ketchikan, Wrangell, and Petersburg) are interconnected. This allows more efficient operation of the hydroelectric projects and surplus power from the Tyee Lake project can now be used to displace diesel generation in Ketchikan. The Swan Lake project is located on Revillagigedo Island about 22 miles northeast of Ketchikan and provides power to Ketchikan and Saxman. Power and energy generated by SEAPA's hydroelectric projects are dedicated to Ketchikan, Wrangell, and Petersburg pursuant to conditions in the 2009 Power Sales Agreement.

Inside Passage Electric Cooperative

IPEC is a non-profit, independent electric utility that is locally owned by the members it serves. IPEC was formed in 2004 when the Tlingit & Haida Regional Electric Authority was re-organized into an electric cooperative. IPEC provides electric service to the communities of Kake, Hoonah, Angoon, and Klukwan/Chilkat Valley. These four areas are not interconnected to one another. IPEC operates diesel generating units in all four areas and also purchases hydroelectric power in the Klukwan/Chilkat Valley area.

IPEC owns and operates three diesel generators in Kake that supply the full power supply requirement of the community. Installed in 1981 (one unit) and 1993 (two units), the three generators have a total installed generation capacity of 2,585 kW. The primary operating cost for these generators is the cost of fuel, which represents well over half of the total power production costs in IPEC's system (Hittle et al. 2010).

Electric Rates

Residents in communities in Southeast Alaska that rely primarily on hydroelectric power to generate electricity have the lowest residential rates in the State, with rates as low as 10 cents/kWh in 2011. Residents of Anchorage and other places in Southcentral Alaska that rely mostly on natural gas for generation also have low rates, paying around 13 cents/kWh in 2011. Rates are much higher in smaller, more remote communities that rely on diesel, with rates ranging from about 50 cents to more than $1.50/kWh. The State helps to lower the price of electricity for residential customers and community facilities in most of these communities through the PCE program. However, residents in these communities still pay higher rates even after the receipt of PCE payments (Fay et al. 2013).

In Southeast Alaska in 2011, electric rates for residential customers ranged from 9 cents to 73 cents/kWh (Table SOC-5). The lowest rates were in Metlakatla and Sitka (9 cents/kWh), Petersburg and Ketchikan (10 cents/kWh), Wrangell (11 cents/kWh), and Juneau (12 cents/kWh). The rate in the communities served by IPEC, including Kake, was 62 cents/kWh. The highest rates were in Pelican (69 cents/kWh), Tenakee Springs (69 cents/kWh), and Elfin Cove (73 cents/kWh). Rates for commercial and other users in each community are generally the same or very similar to residential rates (Table SOC-5).

As noted above, the effective rate to residential customers in qualifying communities is lowered by the State of Alaska's PCE program. In Southeast Alaska, PCE reimbursement rates in 2011 ranged from 7 cents/kWh in Haines and Skagway to 40 cents/kWh in the communities served by IPEC, including Kake (Table SOC-5). Disbursements from the PCE program substantially reduced the cost of electricity for residential customers in participating communities, with rates in Southeast communities after the PCE program ranging from 15 cents to 36 cents/kWh. These rates were still higher than those in non-PCE communities, and more than twice as high in some communities, including Kake, which had a residential rate of 22 cents/kWh after receipt of the PCE payment (Table SOC-5).

PCE disbursements per customer are limited to a 500 kWh/month for residential customers and 70 kWh/month per resident for community facilities. This limitation coupled with comparatively high electricity rates even after the PCE program, resulted in average residential electricity consumption of 358 kWh/month in Southeast Alaska PCE communities in 2010—less than half the non-PCE average consumption of 978 kWh/month (Fay et al. 2012a).

Table SOC-5. Electric Rates in Southeast Alaska Communities, 2011

Community	Utility	Residential				Commercial		Other[1/]	
		Customers (Number of Accounts)	Rates ($/kWh)	PCE Rate ($/kWh)[2/]	Residential Rate after PCE ($/kWh)	Customers (Number of Accounts)	Rates ($/kWh)	Customers (Number of Accounts)	Rates ($/kWh)
Metlakatla	Metlakatla Power & Light	641	0.09	0.00	0.09	210	0.12	67	0.18
Sitka	Sitka, City & Borough of	3,682	0.09	0.00	0.09	1,603	0.09	16	0.09
Petersburg	Petersburg, City of	1,367	0.10	0.00	0.10	713	0.12	37	0.11
Ketchikan	Ketchikan Public Utilities	6,208	0.10	0.00	0.10	1,223	0.10	12	0.08
Wrangell	Wrangell, City of	1,050	0.11	0.00	0.11	578	0.11	0	0.00
Juneau	AEL&P	13,842	0.12	0.00	0.12	2,166	0.10	94	0.09
Haines[3/]	AP&T	1,054	0.22	0.07	0.15	329	0.22	49	0.22
Skagway[3/]	AP&T	579	0.22	0.07	0.15	435	0.22	88	0.22
Klawock	AP&T	368	0.24	0.08	0.16	114	0.24	35	0.24
Hollis	AP&T	114	0.24	0.08	0.16	14	0.24	8	0.24
Thorne Bay	AP&T	285	0.24	0.08	0.16	104	0.24	54	0.24
Craig	AP&T	655	0.24	0.08	0.16	293	0.24	73	0.24
Hydaburg	AP&T	123	0.24	0.08	0.16	35	0.24	20	0.24
Gustavus	Gustavus Electric Company	429	0.45	0.17	0.28	120	0.45	30	0.45
Coffman Cove	AP&T	148	0.47	0.29	0.18	29	0.47	13	0.47
Yakutat	Yakutat Power Inc.	275	0.50	0.33	0.17	85	0.50	60	0.50
Naukati Bay	AP&T	60	0.55	0.37	0.18	7	0.55	1	0.55
Whale Pass	AP&T	60	0.60	0.34	0.26	9	0.60	5	0.60
Chilkat Valley	IPEC	201	0.62	0.40	0.22	29	0.62	9	0.62
Kake	IPEC	224	0.62	0.40	0.22	49	0.62	21	0.62
Hoonah	IPEC	358	0.62	0.40	0.22	57	0.62	43	0.62
Klukwan	IPEC	47	0.62	0.40	0.22	7	0.62	8	0.62
Angoon	IPEC	197	0.63	0.40	0.23	27	0.63	14	0.63
Pelican	Pelican Utility	68	0.69	0.38	0.31	14	0.69	27	0.69
Tenakee Springs	Tenakee Springs, City of	123	0.69	0.38	0.31	21	0.69	14	0.69
Elfin Cove	Elfin Cove Utility Commission	41	0.75	0.37	0.36	31	0.75	7	0.73

AEL&P – Alaska Electric Light and Power Company; AP&T – Alaska Power and Telephone; IPEC – Inside Passage Electric Cooperative
PCE rates were not provided for Pelican
1/ Other includes sales to community and governmental facilities and industrial customers.
2/ PCE Rate is the reimbursement amount paid by the state per kilowatt-hour.
3/ PCE Rates and Residential Rates after PCE data for Haines and Skagway are from Fay et al. (2012b). All other data are from Fay et al. (2013).
Source: Fay et al. 2012b, 2013

Commercial and other customers, as defined in the footnotes to Table SOC-5, are not eligible to participate in the PCE program and there is no comparable program for these customers. These customers pay the full retail cost for power in communities like Kake where residential rates are lowered by the PCE program. As noted above and shown in Table SOC-5, the full retail cost of power in Kake in 2011 was 62 cents/kWh, six times the rate in Petersburg and other larger communities in Southeast Alaska. As noted above with respect to the region as a whole, these high costs are not conducive to economic development and may in fact impede economic development in Kake as the availability of reliable low-cost power strongly influences decisions to locate new commercial and industrial developments in Southeast Alaska (Alexander et al. 2010; Hittle et al. 2010; Black & Veatch 2012).

Electric Customers

Between 2000 and 2013, the number of electric customers in Kake dropped by approximately 16.7 percent. Total annual energy sales have increased over the past few years mostly due to interruptible sales; however, energy sales to residential customers have remained relatively constant since 2008. In 2004, the closure of Kake Seafoods, a seafood processing facility, contributed to an overall 32 percent drop in energy sales in that year. Kake Seafoods restarted operations briefly in 2006. Attempts to sell the plant to an outside company in recent years failed, but the plant reopened in 2011, with long-time owner, Kake Tribal Corporation, partnering with the Sealaska Corporation (Forgey 2011). The plant is not currently in operation (Hittle 2014). While in operation, Kake Seafoods purchased a significant amount of interruptible energy from IPEC.[9] Other interruptible sales have increased over time. Annual energy sales by customer class for the period 2000 through 2013 are shown in Figure SOC-3.

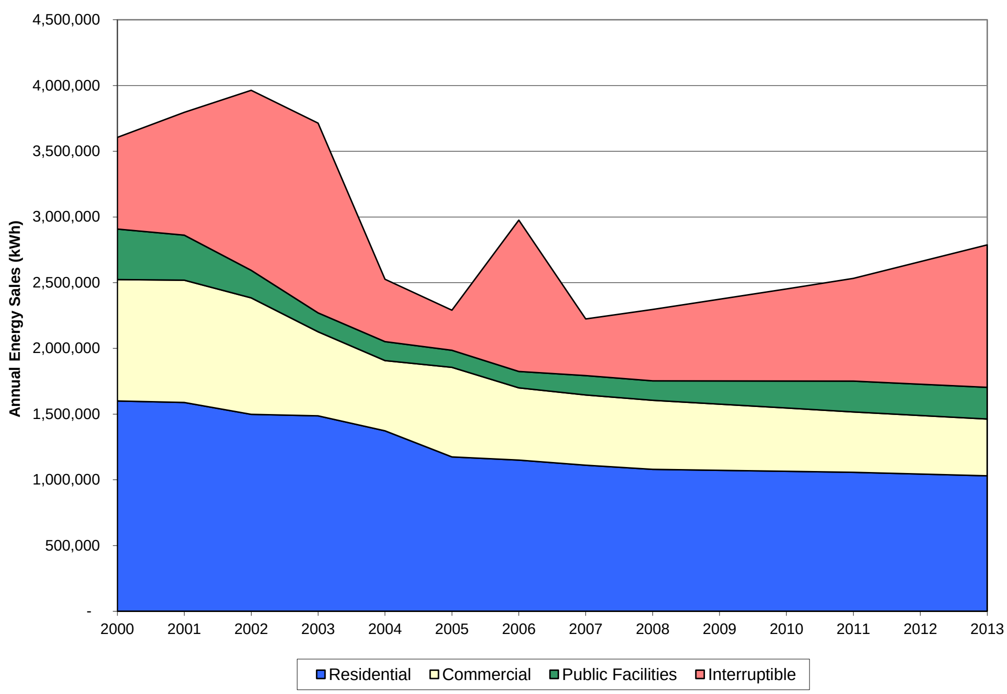


Figure SOC-3. Annual Energy Sales in Kake by Customer Class (kWh)

Source: Hittle 2014

[9] Interruptible or non-firm energy sales can be curtailed under certain circumstances and interruptible sales rates are typically less than the normal commercial energy rate (Hittle 2014).

In the past few years, the high price of fuel oil has encouraged residential, commercial and government facilities in Petersburg, Wrangell and Ketchikan to convert to electric space heating systems. This has resulted in higher electric loads in these communities, a trend that is expected to continue in the near future (Hittle 2014). Recognizing this trend, SEAPA issued a Request for Offers of Power and Energy in January 2013 noting that they expected the current regional hydroelectric power surplus to dwindle over the next few years. The Request for Offers is open to all classes of generation resources, including offers based on output from thermal, geothermal, wind, tidal, hydropower, or any mixture of resource types. In addition to the Request for Offers, SEAPA is currently engaged in a *Regional Hydrosite Evaluation Project*, which is a multi-year effort designed to catalog critical information to determine the highest value hydropower projects that could be developed to meet growing demand. Near-term solutions to the anticipated decline in the current power surplus include the expansion of existing infrastructure (SEAPA 2015). These activities will affect the future availability of relatively low cost power that could be transmitted to Kake.

Environmental Consequences

Effects Common to All Alternatives

Population

Construction of the proposed project is expected to extend for two or three construction seasons. A generalized schedule for a three-year project is presented in Chapter 2 in the *Construction Schedule* section. The major activities to be undertaken in the first year include surveying the centerline, right-of-way clearing and removal of danger trees, identification and preparation of laydown and staging areas, including helicopter pads, and construction of shovel trails and temporary access spurs. These activities are expected to employ approximately 25 workers, with the majority expected to be employed from within the local region.

The overhead portions of the transmission line would be constructed during the second year. Major activities to be undertaken in this year include laying temporary matting panels where needed, assembling, delivering, and installing poles, and constructing the transmission line. An estimated total of 75 workers would be employed during this phase. The majority of these workers would be technical specialists who would likely come from outside the local region and possibly from outside of Southeast Alaska. Other workers, primarily those involved in transporting workers and equipment and supplies, would be more likely to be employed from within the local region.

Overhead transmission line construction would be completed during the third year. The proposed marine crossing or crossings (depending on the selected alternative) would be installed and substation and switchyard construction would also take place, as appropriate. Equipment and materials would be demobilized and disturbed areas would be restored. Specialist labor from outside the local area would be required to complete the overhead transmission line construction, install the marine crossing or crossings, and install the new substation and switchyard facilities. An estimated total of 50 workers would be employed in these activities. Workers employed in demobilization and site restoration would be more likely to be employed from within the local region, with an estimated 10 workers expected to be employed in these activities.

The number of workers temporarily relocating to the project area during construction is, therefore, expected to peak during the second year, with an estimated 60 non-local workers employed on the project. Very few, if any, of the non-local workers employed during the construction phase of the project would be expected to permanently relocate to the area. None of the workers temporarily relocating would be expected to be accompanied by their families. The total influx of workers during the second year of construction would be equivalent to less than 1 percent of the total population in the Petersburg CA in 2012 (see Table SOC-1).

Existing SEAPA staff would be responsible for operation and maintenance of the new transmission line and associated facilities. Regular inspection and maintenance activities would be conducted on a similar schedule to those currently conducted on SEAPA's existing transmission lines. No new staff would be employed and none of the existing workforce would be required to relocate to the local region.

Property Values

All three action alternatives primarily cross NFS lands, with the share of each line on NFS lands ranging from 82 percent of the total for Alternative 2 to 88 percent for Alternative 4 (Table 2-1). All three alternatives do, however, cross some privately owned lands and would follow roads in the vicinity of private residences. The effect that a transmission line may have on property value is a damage-related issue that would be negotiated between the applicant and the affected landowner during the easement acquisition process. This process is designed to provide just compensation to the landowner for the right to use their property. In theory, the value of each easement should be equal to the difference in value of the affected property before and after easement acquisition and construction of the facilities.

Changes in land use often raise concerns about the potential effect these changes may have on nearby property values. This was the case with this project, with one person commenting on the Draft EIS expressing concern about the impacts of the proposed transmission line on nearby property values. Research conducted since the 1980s has tended to support the idea that proximity to transmission lines may affect the desirability and, therefore, the value of residential property (Bottemiller et al. 2000; Colwell 1990; Cowger et al. 1996; Delaney and Timmons 1992; Des Rosiers 2002; Hamilton and Schwann 1995). Some observers linked this general finding to increased concerns regarding potential EMF-related health effects, but a nationwide survey of real estate appraisers suggests that, for the most part, potential negative effects on property values tend to be related to the visual impact of transmission line facilities (Delaney and Timmons 1992).

The results of the studies cited above suggest that proximity to electric transmission lines can have negative effects on residential property values, with average impacts ranging from less than 1 percent to about 10 percent. The findings of these studies also suggest that this impact decreases with distance and tends to decline over time. A detailed literature review conducted by Chalmers and Voorvaart (2009) supported these conclusions, finding that in studies where depreciation was found, the typical change ranged from 3 percent to 6 percent within a few hundred feet and tended to decrease with distance and over time.

Studies of property-value impacts during periods of physical change, such as new transmission line construction or structural rebuilds, have generally revealed greater short-term impacts than long-term effects. Most studies have concluded that other factors, such as the general location, the size of property, improvements, conditions, amenities, and supply and demand factors in a specific market area are more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Some short-term adverse impacts on residential property values (and salability) might occur on an individual basis as a result of the KPI Project. However, these impacts would be highly variable, individualized, and are difficult to predict. Unique Project characteristics that need to be taken into consideration when assessing the potential effects of transmission line structures on residential property values include the type and height of the structures, the distance and view from the potentially affected property, intervening topography and vegetation, and the property market and type of landscape involved.

Economic Conditions

Employment and the Economy

The proposed project would have a positive impact on the regional economy during construction through the local procurement of materials and equipment and spending by construction workers. These direct expenditures generate economic activity in other parts of the economy through what is known as the multiplier effect, with direct spending generating indirect economic impacts. Indirect effects include jobs and income associated with industries that supply inputs to the construction process, as well as those supported by spending elsewhere in the local economy. Indirect effects are not estimated because while indirect employment coefficients can be estimated and are applicable at large scales, such as regional or statewide assessments, they are less useful at small local scales and can be misleading.

The total construction cost is expected to range from $57 million (Alternative 4) to $65 million (Alternative 3), with a total estimated construction cost of $60 million for Alternative 2 (Hittle 2014). These total estimates include the costs of constructing the proposed transmission line, shovel trails, helicopter pads, and right-of-way clearing, marine crossings, tap/switchyard construction in Petersburg, and a new substation in Kake. The totals also include indirect costs (construction management and owner's administration) and a 15 percent contingency. Local purchases under all of the action alternatives would likely include fuel for vehicles and equipment, some equipment rentals, and other incidental materials and supplies. Local purchases, employment of local residents, and the temporary relocation of construction workers to the project area would have small, but positive impacts on local businesses.

Construction employment would peak at approximately 75 workers during the second year of construction, with approximately 15 workers expected to be hired from within the region. Although fewer total workers would be employed in Year 1, a larger share would be hired locally, with the majority of the estimated 25 workers expected to be hired from within the region. There were an estimated 1,667 jobs in the Petersburg CA in 2011, including 32 construction jobs (Table SOC-3). Total employment also included 25 jobs in the forestry and logging sector (Table SOC-3). Total annual average employment in Southeast Alaska was 36,600 jobs in 2011, including 1,450 jobs in construction (Alaska DOL 2013f). Annual unemployment rates in the Petersburg CA and Southeast Alaska in 2012 were 10.5 percent and 6.8 percent, respectively (Alaska DOL 2013h).

The total labor construction payroll, including per diem payments and other allowances, is expected to range from $12.7 million (Alternative 4) to $15.2 million (Alternatives 2 and 3) (Hittle 2014). Based on average earnings in 2011 in the construction and forestry and logging sectors in the Petersburg CA (Table SOC-3), total earnings by local workers would likely range from about $380,000 to $950,000, which is equivalent to 0.6 percent to 1.6 percent of total earnings in the Petersburg CA in 2011.

Operation of the project would have limited direct impacts in the local area under all of the action alternatives. Existing SEAPA staff would be responsible for operation and maintenance of the new facilities, with regular inspection and maintenance activities conducted on a similar schedule to those currently employed for SEAPA's existing transmission lines. No new staff would be employed and local expenditures on project-related goods and services would be limited.

Commercial Fishing

Potential impacts to fish are assessed in the *Aquatic Resources* section of this EIS. Implementation of the applicable Forest Plan Standards and Guidelines and best management practices would mitigate potential impacts to fisheries. As a result, none of the action alternatives are expected to have measurable effects on fish habitat and are, therefore, unlikely to affect the commercial fishing or fish processing sectors. Potential impacts to commercial fishing and fish processing from timber harvest at the forest planning level are discussed in the 2008 Forest Plan EIS (USDA Forest Service 2008c).

Recreation and Tourism

A recent study estimated that nature-based tourism brought in an estimated $2.7 million in gross revenues to Petersburg in 2007, with most of this revenue related to fishing lodges and charters (Dugan et al. 2009). Other nature-based tourism activities identified in the study included whale watching in Frederick Sound, LeConte Glacier tours, and flightseeing and air services, including wilderness drop-offs. As noted with respect to commercial fishing, the Aquatic Resources analysis prepared for this project found that none of the alternatives are expected to have measurable effects on fish habitat and are, therefore, unlikely to affect businesses that focus on sport fishing.

Under Alternatives 2 and 3, the proposed transmission line would likely be visible as a linear break in the forest pattern when viewed from Frederick Sound, with individual structures partially visible from some locations. The transmission line could be visible from whale watching vessels depending on their movement in Frederick Sound, but would not be expected to affect the demand for whale watching activities. Alternatives 2 and 3 would cross Wrangell Narrows and Frederick Sound, respectively. Alternative 2 would cross the Wrangell Narrows via HDD bore or a buried submarine cable. Alternative 3 would cross Frederick Sound via a submarine cable crossing. Short-term disturbance associated with project construction in these and other locations would be visible to boats traveling the Wrangell Narrows and Frederick Sound, but would likely be limited in duration as the respective vessels pass these specific locations.

None of the proposed alternatives cross designated wilderness and none are expected to affect wilderness experiences in the Petersburg Creek/Duncan Salt Chuck Wilderness. The proposed transmission line right-of-way would be visible from air services dropping clients at remote locations on Kupreanof Island, but would not be expected to affect the demand for these types of services.

Several commercial outfitters/guides are authorized to use the analysis area for a variety of uses, including fishing, sightseeing, and hunting. Outfitter/guides reported a total of 1,407 service days at various locations in the KPI project area in 2013 (see the *Recreation* section). Increased traffic and temporary road closures could have an impact on the locations that outfitter/guides choose for access. These impacts would be localized and temporary. None of the proposed alternatives are expected to result in long-term impacts to the ability of outfitter/guides to use these areas. The distant sound of construction equipment may be occasionally apparent in some locations, but would not be expected to noticeably change the recreation experience in areas away from the road systems and the transmission line right-of-way.

Potential impacts to recreation and tourism from timber harvest at the forest planning level are discussed in the 2008 Forest Plan EIS (USDA Forest Service 2008c).

Forest Products

Construction and operation of the proposed transmission line would disturb between 739 acres and 891 acres, depending on the alternative. These totals include both NFS and non-NFS lands, with the majority of the affected NFS lands classified as forest land (see Table TBR-3 in the *Timber* section of this EIS). Total suitable acres that would be removed from the regional database range from 69 acres (Alternatives 2 and 3) to 87 acres (Alternative 4) (Table TBR-5). These acres would be removed from the regional timber base for the life of the transmission line. These totals represent a very small share of the suitable land base identified in the 2008 Forest Plan, which includes a total of 773,000 acres of suitable lands. Under the Timber Sale Program Adaptive Management Strategy, operation of the timber sale program is implemented in three phases, with 537,000 suitable acres available in Phase 1 (USDA Forest Service 2008c).

Estimates of the net sawlog volume that would be removed from the regional timber base for the duration of the project are presented by alternative in Table TBR-5. These general estimates are based on the suitable acres that would be removed and are mainly useful for comparison of alternatives. The estimated volumes that would be removed range from 1.5 MMBF (Alternatives 2 and 3) to 1.7 MMBF (Alternative 4). These estimates potentially understate the amount of timber that could be available for processing from initial project clearing because they are based only on lands classified as suitable. Timber would be cleared along the entire right-of-way, not just in areas classified as suitable. Timber felled during right-of-way clearing would be cruised and valued and sold to the applicant. The applicant would be required to remove trees with commercial value as timber (i.e., merchantable timber) on lands that are either 0.75 mile from saltwater or a road network that leads to a community or LTF would be removed, with the exception of timber located in stream buffers (see the *Timber* section, above). Timber removed and utilized would include young growth of commercial size, as appropriate.

While there is some uncertainty regarding the amount of timber that would be available for processing or export, it is possible to provide some context. An estimated total of 112 MMBF of timber was harvested in Southeast Alaska in 2011, with harvest on the Tongass National Forest accounting for 29 percent (32.6 MMBF) of this total, and 56 percent (63.1 MMBF) of the total provided by Native Corporation lands (USDA Forest Service 2012f). Context is also provided by the selected alternative for the Tonka Timber Sale, which authorized the harvest of approximately 38.5 MMBF of timber from a 2,085-acre project area (USDA Forest Service 2012g).

The timber industry in Southeast Alaska employed an estimated total of 262 people in 2011, with 109 of these jobs supported by harvest on the Tongass (USDA Forest Service 2012f). Assuming projected harvest levels of 1.5 MMBF and 1.7 MMBF for the purposes of comparison, vegetation clearing associated with the proposed project would support between 8 and 9.5 annualized jobs in logging, sawmilling, and transportation. Annualized jobs are employment estimates adjusted to be based on a full year even though the employment may be seasonal. The resulting employment estimates would not all occur in one year and estimated jobs do not directly translate into numbers of affected workers. These estimates are approximate numbers based on average jobs per MMBF ratios that were estimated using harvest and employment data from 2007 to 2010 (Alexander 2012).

Electric Power

The power supply evaluation and economic analysis prepared as part of KPI Project feasibility study (Hittle et al. 2010; subsequently updated in 2014) assessed whether the benefits that would be realized with the proposed transmission line in service would be greater than the costs of operating the proposed line and purchasing power from hydroelectric resources. Benefits would primarily be achieved through the offset of diesel generation costs at Kake. Costs that would be incurred by IPEC include the direct costs of operations and maintenance, certain incremental administrative and general costs, equipment renewals and replacements, and the costs of purchasing power from SEAPA. The results of this evaluation are summarized in Table SOC-6. The results of this feasibility study, which was developed on behalf of the applicant, are provided here for informational purposes only.

The evaluation presented in Table SOC-6 incorporates the following assumptions:

- The capital cost of building the proposed transmission line and associated facilities would be grant-funded and there would be no capital recovery component associated with the project.
- The cost of purchased power from SEAPA would include all transmission and delivery charges to the point of delivery.
- The existing diesel generators would be maintained for emergency backup in Kake and the resulting net operations and maintenance costs would be significantly lower than if the generating units were operated to supply full load.

- SEAPA would be responsible for operating and maintaining the proposed transmission line and the administrative costs associated with ownership and operation of the project would be minimal for IPEC.

Table SOC-6. Projected Production Cost Savings with KPI in Operation, 2016 to 2020

	2016	2017	2018	2019	2020
Existing Condition					
Total Production Cost ($000)[1/]	1,394	1,469	1,543	1,957	2,084
Cost/kWh (cents/kWh)	35.5	36.5	37.5	38.5	40.2
With KPI					
Total Production Cost ($000)[2/]	535	546	558	630	642
Cost/kWh (cents/kWh)	13.6	13.6	13.6	12.4	12.4
Change from Existing Condition					
Total Production Cost ($000)	859	923	985	1,327	1,442
Cost/kWh (cents/kWh)	21.9	22.9	23.9	26.1	27.8

Notes:
1/ Total cost under the existing condition assumes that Kake's power needs would continue to be met by the existing diesel generation. Total production costs are primarily fuel costs and variable operations and maintenance costs.
2/ Total cost assuming the proposed transmission line is in-service by 2016. Total production costs include the cost of the power purchased from SEAPA and KPI Project-related operations and maintenance, administrative and general, and equipment renewal and replacement costs.
Source: Hittle 2014, Tables 5-3 and 5-6.

The proposed transmission line was assumed for the purposes of the Hittle analysis to be placed in service in 2016. Total production cost savings for 2016 are estimated to be $859,000, with the cost per kilowatt-hour expected to drop by 22 cents/kWh[10], from 36 cents/kWh to 14 cents/kWh (Table SOC-6). This potential reduction in cost would not necessarily result in a reduction in the amount paid by residential customers because the rate charged to residential customers is subsidized through the PCE program. Rather, the amount of the PCE subsidy provided to IPEC would be reduced and commercial rates could be lowered. Further, IPEC presently charges the same rates for all of its service areas based on the combined costs of the entire system, which could also affect the extent of a potential reduction in rates for Kake residential customers (Hittle 2014).[11]

Annual savings with the proposed transmission line in place are expected to increase each year primarily due to assumed increases in the cost of diesel fuel that would be offset by the proposed project, with savings per kilowatt-hour expected to be 28 cents/kWh by 2020 (Table SOC-6). The net present value savings to IPEC are estimated to be approximately $20.4 million over the first 20 years of operation, assuming a 4 percent discount rate (Hittle 2014).

If other utilities or power producers were to use the proposed transmission line, the cost to IPEC could be substantially reduced. If operating costs were allocated proportionate to the total kWh transmitted over the proposed transmission line, use of the line by other utilities or power producers would reduce the share paid by IPEC. In addition, costs to IPEC would be reduced if SEAPA were to bundle the operating costs of the proposed project into their overall operating costs. If all the costs of operating and maintaining the proposed intertie were paid by others, the estimated net present value savings to IPEC from the proposed project over its first 20 years of operation would be approximately $25.4 million,

---

[10] A kWh is a unit of energy equivalent to 1 kilowatt (kW) expended for one hour of time. A heater or air conditioner rated at 1,000 watts (1 kilowatt) operated for 1 hour will, for example, consume 1 kWh. Similarly, a 100 watt light bulb left on for 1 hour will consume 0.1 kWh.
[11] IPEC has, however, indicated that it may need to establish rates in each service area based on the cost of service in the respective areas, at the request of the Alaska Energy Authority (Hittle 2014).

approximately 25 percent greater than under the base case ($25.4 million versus $20.4 million) (Hittle 2014).

If the KPI Project were to be built, IPEC would have the ability to establish economic incentive rates for new large commercial/industrial electric consumers. As long as regular retail energy sales remain relatively stable in Kake, the fixed costs of IPEC's distribution system and the new transmission line would be recovered through normal rates. This would provide the opportunity for an economic incentive rate based on the incremental cost of purchased power plus a nominal margin. This would result in commercial energy rates substantially lower than they would otherwise be and could help attract new investment to the community. Further, if surplus hydroelectric generation capability is available, an interruptible energy sales rate could be offered to commercial customers to encourage greater electricity sales.

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, the Forest Service would not provide authorization for the proposed project and a new electric transmission line would not be built. This alternative would not meet the Purpose and Need for the project, which is to connect Kake to SEAPA's interconnected network and provide access to relatively low cost electricity. Kake would continue to be served by the existing, isolated electric system that depends upon high-cost diesel generation. In 2011, the full retail cost of power in Kake was 62 cents/kWh, more than five times the rate in the larger communities of Petersburg, Ketchikan, and Wrangell (Table SOC-5). This disparity would continue and could potentially increase if diesel costs continue to rise in the future (Hittle 2014).

If the State of Alaska's PCE program continues to be funded, the cost of electricity would continue to be subsidized for residential customers and rates would still continue to be higher than those in the communities that are currently part of SEAPA's interconnected network (Petersburg, Ketchikan, and Wrangell). The PCE program is currently funded on an annual basis by the State legislature. Commercial customers are not eligible to participate in the PCE program and there is no comparable program for commercial customers, who pay the full retail cost for power in Kake. Commercial rates would continue to be extremely high and likely discourage future investments in the community by commercial and industrial developments that are influenced by the availability of reliable, low cost energy.

Cumulative Effects

There would be no new transmission line under this alternative and the retail cost of electricity in Kake would continue to be substantially higher than it is in Petersburg, Ketchikan, and Wrangell, the communities that are currently part of SEAPA's interconnected network. The relatively high cost of electricity would continue to combine with other constraints that presently limit investment and development in the community.

Alternatives 2, 3, and 4

Direct and Indirect Effects

The proposed transmission and associated facilities would be built under Alternatives 2, 3, and 4. Construction of the proposed transmission line would have a positive impact on the regional economy during construction through the local procurement of materials and equipment and spending by construction workers. Project construction would provide employment for local workers. Local employment is expected to peak during the first year of construction for all of the alternatives, with the majority of the estimated 25 workers employed that year expected to be hired from within the region.

Right-of-way and danger tree clearing would likely generate merchantable timber that would provide a modest contribution to the local timber supply.

Assuming that the capital cost of building the proposed project would be grant-funded and SEAPA would be responsible for operating and maintaining the proposed transmission line and associated facilities, total energy production cost savings in the first year of operation are estimated to be $1.16 million, with the cost per kilowatt-hour expected to drop by 28 cents/kWh, from 41 cents/kWh to 13 cents/kWh. These savings would occur under all three alternatives and would be expected to increase over time, with net present savings to IPEC estimated to be approximately $20.4 million over the first 20 years of operation (Hittle 2014). If the KPI Project were built under any of the alternatives, IPEC would have the potential ability to establish economic incentive rates for new large commercial/industrial electric consumers. These rates could be substantially lower than they would otherwise be and could help attract new investment to the community. Further, if surplus hydroelectric generation capability is available, an interruptible energy sales rate could be offered to commercial customers to encourage greater electricity sales (Hittle 2014).

Cumulative Effects

Local project-related expenditures, employment, and construction-related earnings would have a positive impact on the local economy for the duration of construction. Right-of-way and danger tree clearing would provide a modest contribution to the local timber supply, including jobs and income. These benefits would be increased if construction of the proposed project were to coincide in time with implementation of proposed timber sales in the analysis area. Development of the Kake road project would also result in benefits associated with construction employment and spending, and could potentially improve Kake’s ability to compete with other communities and locations for commercial investment.

Environmental Justice

Background and Affected Environment

Environmental justice refers to the fair treatment of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The CEQ's (1997) *Environmental Justice: Guidance under the National Environmental Policy Act* indicates that environmental justice concerns may arise from impacts on the natural or physical environment, such as human health or ecological impacts on minority and low-income populations, or from related social or economic impacts.

The following environmental justice assessment considers whether there is a disproportionately high and adverse effect from any of the alternatives on low-income and minority populations in communities near the project area, and tiers to the analyses presented in the Wildlife and Subsistence, Aquatics, and Cultural Resource Reports prepared for this project (Tetra Tech 2014f; Tetra Tech 2014b; Greiser and Carlson 2013).

The guidelines provided by the CEQ (1997) and similar direction provided by the EPA (1998) indicate that a minority community may be defined where either 1) the minority population comprises more than 50 percent of the total population, or 2) the minority population of the affected area is meaningfully greater than the minority population in the general population of an appropriate benchmark region used for comparison. Minority communities may consist of a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals who experience common conditions of environmental effect.

With more than two-thirds (68 percent) of the population in Kake identified as Alaska Native in the 2010 Census and just 17 percent identifying as White, Kake meets the CEQ definition of a minority community (Table SOC-2). The other communities in the KPI project area—Petersburg city and Kupreanof—and the Petersburg Census Area (CA), as a whole, are predominantly White, with the share of the population identifying as White ranging from 69 percent for the Petersburg CA to 89 percent for the city of Kupreanof (Table SOC-2).[12]

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

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Construction of the proposed transmission line has the potential to affect subsistence use in the project area, which could disproportionately affect Alaska Native subsistence users. Potential impacts to

[12] As discussed in the *Socioeconomics* section, in January 2013, the city of Petersburg's voter-approved petition to incorporate as a borough was certified. The city was subsequently dissolved becoming part of the new home-rule Petersburg Borough. Data are, however, presented for the Petersburg CA and Petersburg city because the most recent available data are compiled for these geographic areas.

subsistence resources are discussed in detail in the section of this document that evaluates wildlife and subsistence use. As discussed in that section, none of the alternatives are expected to affect subsistence use of fish and marine invertebrates, plants, or timber and firewood for personal use.

Impacts to the wildlife component of subsistence food resources are addressed in terms of potential impacts to Sitka black-tailed deer, the largest component of wildlife subsistence resources in the project area. None of the action alternatives would result in increased competition for deer because the existing level of access to the analysis area would be maintained over the long term (no new roads are proposed under any of the alternatives) and deer population levels would not change (the minor reduction in habitat capability under all action alternatives would not be expected to reduce the number of deer available to hunters). As discussed in the *Wildlife and Subsistence* section of this EIS, development of the Kake road project would likely provide increased access to and competition for subsistence resources. The 2015 Kake Access Transportation Needs Assessment conducted as part of the KAP found that the main source of activity on a new year-round road would be “partial use trips” for recreation and subsistence (FHWA 2015). The KPI Project would not contribute to this increase in access were it to occur.

Air Quality and Climate Change

Introduction

This section addresses the potential effects of the proposed project on air quality and climate change.

Affected Environment

Air Quality

The air quality of Southeast Alaska and the Tongass National Forest is generally good. The prevalent airflow from the Pacific Ocean, the relatively small amount of industrial development and lack of large population centers in the region, and the absence of slash burning following timber harvest, along with the implementation of environmental regulations all contribute to maintaining air quality. Current sources of air pollution in Southeast Alaska include stationary sources that require air quality control permits, such as diesel power plants, asphalt plants, incinerators, mining operations, and other facilities. Other sources of air pollution in Southeast Alaska include mobile sources, such as cars, trucks, boats, cruise ships, airplanes, and helicopters, and area sources, which include home furnaces, wood stoves, and open burning. Under certain weather conditions, wildfires in Canada can affect air quality and visibility (i.e., regional haze) in parts of Southeast Alaska (USDA Forest Service 2008c).

Climate Change

The EIS prepared for the 2008 Tongass Forest Plan Amendment discusses several issues related to climate change (USDA Forest Service 2008c). These include the considerable uncertainty concerning specific predictions of how the climate may change, and the uncertainty regarding the effects of climate change on the resources of the Tongass. To deal with this uncertainty, 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.

The 2008 Forest Plan EIS contains an extensive discussion of climate change related to management activities (see pages 3-11 to 3-20, 3-50 to 3-51, 3-77, 3-92 to 3-93, 3-116 to 3-117, 3-125 to 3-126, 3-203, 3-250, 3-296, 3-340, 3-351, 3-401 of the 2008 Forest Plan EIS). Models available for estimating climate change are designed to predict changes on a regional scale and are not detailed enough to predict changes to the Tongass National Forest specifically. Furthermore, existing models do not entirely agree on how global warming will affect Southeast Alaska. The variation and possibilities are discussed extensively in the 2008 Forest Plan EIS.

The 2008 ROD for the Tongass Plan Amendment concludes that because of the uncertainty related to the specific effects of climate change on the resources of the Tongass, the uncertainty about how activities on the Forest affect climate change, and the predicted small magnitude of these effects, the best course of action is continued management of the Tongass for resiliency in ecosystem functions. This will be accomplished primarily by management of the Tongass as a mostly intact ecosystem with a robust monitoring plan that will allow for adaptive management intervention if and when effects of climate change are more certain. Important components of the 2008 Tongass Forest Plan include:

- A conservation strategy that includes an extensive reserve system in non-development land use designations and standards and guidelines where active management is minimized that protect over 90 percent of the existing productive old-growth habitat.
- Standards and guidelines that include specific protection measures for soils on slopes that are greater than 67 percent and greater than 72 percent. These measures help retain carbon stored as organic material in soils where timber harvest and road building occur.

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

Even at the Forest Plan level, differences between alternatives in terms of the effects of climate change on the Tongass—and in the effects of land management activities on climate change—are uncertain, unquantifiable, and likely to be small (especially when compared to other routine human activities). For these reasons, information on climate change was deemed not essential to a reasoned choice among the alternatives considered in the 2008 Forest Plan EIS (Kimbell 2009), and therefore for these same reasons, would not be essential to a reasoned choice among alternatives for the KPI Project.

The Tongass National Forest is currently adjusting management in relation to climate change. Based on ongoing research and scientific recommendations (Hennon et al. 2012), and in response to the public's concern about cedar decline, the regeneration of yellow-cedar is being more closely monitored and efforts made to influence species composition to include more Alaska yellow-cedar in regenerating stands. This will allow managers the ability to maintain or increase yellow-cedar on sites judged to be suitable for the species long-term survival (i.e., not prone to future yellow-cedar decline due to climate change) using future intermediate treatments such as pre-commercial thinning.

The Tongass National Forest held a workshop in the spring of 2012 with key stakeholders, relevant scientists and other agency personnel, business/community leaders, and internal personnel to identify key resources at risk and to set priorities for a climate vulnerability assessment. Information gathered through this workshop does not suggest that climate change is currently producing strong negative effects for most resources on the Tongass. Based on the current understanding of climate change in Southeast Alaska and action alternatives associated with the KPI Project, specific adaptation actions are not necessary to meet Forest Plan objectives at this time.

The Tongass National Forest has also collaborated with EcoAdapt to produce a concise assessment of climate vulnerability addressing topics related to management decisions faced by the Tongass. These assessments have address the topics of ice, snow, and fisheries. Additional topics will be addressed as collaborations are developed and topics become ripe for assessment.

Environmental Consequences

No Action Alternative

Under the no action alternative, the proposed project would not be approved or built. There would be no project-related activities contributing to air quality or climate change effects. Kake would continue to be served by the existing, isolated electric system that depends upon diesel generation. The existing impacts to air quality and climate change resulting from the use of the three existing diesel generators that serve the community (i.e., the burning of fossil fuels) would continue to occur. This would result in the continued release of air pollutants from these diesel generators, as well as the conversion of stored/sequestered carbon (in the form of diesel fuels) to atmospheric carbon. Atmospheric carbon, primarily in the form of carbon dioxide, is one of the major greenhouse gases being released into the atmosphere (McPherson and Simpson 1999).

Action Alternatives

Air Quality

All of the action alternatives would have limited adverse 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, and marine traffic. The action alternatives could result in supplies of raw wood products to local mills (as a result of timber clearing within the project's right-of-way); however, it is the responsibility of the mill owner or sort-yard operator to ensure that mill emissions are within legal limits.

The action alternatives would have a long-term beneficial effect to ambient air quality. As described in Chapter 1, Kake currently obtains its electricity from three diesel generators. The negative effects of diesel generation include air pollution issues inherent in the burning of diesel fuels. The proposed project would most likely replace this diesel-generated power sources with power derived from hydroelectric sources, which has a much lower impact on air quality. Once the proposed project is operational, the three existing diesel generators located near the Kake substation would serve as a backup to the power provided via the proposed transmission line. The existing generators would be used much less frequently under this scenario, thereby reducing the impacts of these diesel generators on the local air quality.

Climate Change

For the KPI Project, the amount of vegetation cleared or timber harvested is an important indicator of the likely contribution of the action alternatives to climate change. Carbon sequestration, the flow of carbon into aquatic or terrestrial systems from the atmosphere, is difficult to evaluate. Mature forests in Alaska are considered to be carbon "sinks," meaning that these forest stands accumulate more carbon than they release (USDA Forest Service 2008c, p. 3-17). Where allowed, the regeneration of trees that follows vegetation clearing or timber harvest has rapid growth relative to old growth and also accumulates carbon into the system.

When considering the varying degrees of forest site conditions, the lifecycle of wood products, and the substitution effect of using wood products over other materials, the point of equilibrium in the loss or gain of carbon following old-growth harvest is subject to much uncertainty. The regeneration of new trees in the areas that have been harvested or cleared contributes carbon and factors into the debate surrounding the balance. The action alternatives would all involve the long-term maintenance of a cleared right-of-way where new trees would not be able to grow. Therefore, the following analysis assumes that harvesting forest with high biomass reduces overall carbon stocks more in the near term than if the forest were retained, even counting the carbon storage in harvested wood products, snags, and logs.

The action alternatives propose varying levels of vegetation clearing, and would result in an initial net release of CO_2 into the atmosphere above that of No Action. Alternatives 2 and 3 would involve slightly more clearing of forested vegetation than Alternative 4, an estimated 677 acres under Alternatives 2 and 3 compared to 630 acres under Alternative 4, and would, therefore, be expected to have very slightly larger effects on carbon sequestration.

Using USDA Forest Service Forest Inventory and Analysis (FIA) data, Barrett (2014) estimated that aboveground average carbon density on the Tongass was 72 tons per acre for unmanaged forests and 45 tons per acre for managed forest, with varying shares divided between live tress, logs, and snags. Using per-acre values by forest type from the same data set and extrapolating to include wilderness areas (which are not represented in the FIA data set), Barrett (2014) developed a rough total estimate of about 650 million tons in aboveground tree carbon stored on the Tongass, the equivalent of about 2.4 billion tons of CO_2.

It is estimated that the forests of the Tongass represent approximately one quarter of 1 percent of the stored carbon in forests worldwide (USDA Forest Service 2008c, p. 3-19). Carbon stored in forests, including forest soils, represent a small portion of total global carbon storage (terrestrial, ocean, atmospheric, and fossil carbon pools); for example, the oceans store approximately 20 times as much carbon as all terrestrial systems (Intergovernmental Oceanographic Commission 2007). Therefore, it is reasonable to conclude that small, if even measurable, changes in carbon sequestration under any of the action alternatives, whether positive or negative, would not be a relevant factor for choosing among alternatives. Additionally, as described above and in the Forest Plan, the task of understanding all the factors that influence climate change and how carbon is sequestered contains substantial uncertainty and for these reasons is not essential to a reasoned choice among alternatives.

Under all action alternatives, the primary form of power generation for the community of Kake would change from diesel fuel generation to an alternate source or sources of power delivered via the SEAPA network and the new KPI transmission line. Assuming for the purposes of analysis that the new source of power would be hydroelectric power, all three action alternatives would result in a reduction in power-related greenhouse gas emissions. The feasibility study completed for the project (Hittle et al. 2010; subsequently updated in 2013) estimated that Kake uses approximately 226,000 gallons of diesel fuel each year for electricity generation. Applying the CO_2e coefficient for diesel fuel (EIA 2013), this results in annual emissions of approximately 2,296 metric tons of CO_2e[13]. By comparison, emissions from hydropower are considered negligible because no fuels are burned. However, if vegetation was growing along the riverbed or banks when the dam was built, the vegetative decay in the reservoir can cause a buildup and release of methane, a potent greenhouse gas (EPA 2013).

The annual kWh used in Kake from Figure SOC-3 can be used to generally compare the potential emissions from hydropower electricity use in Kake to diesel fuel generation. In 2013, a total of approximately 2,750,000 kWh were sold. One conservative estimate of average hydroelectric emissions due to methane release is 30 grams of CO_2e per kWh (POST 2006). At this level, hydropower use in Kake would result in annual emissions of approximately 82 metric tons CO_2e**.** This would represent a reduction of about 96 percent (2,214 metric tons) in annual emissions of CO_2e from electricity use in Kake. According to the EPA, this potential reduction in emissions is roughly equivalent to the annual greenhouse gas emissions from 466 passenger vehicles or 305 homes’ electricity use for one year (EPA 2014).

None of the action alternatives are predicted to measurably contribute to cumulative effects on climate change.

[13] CO_2e = carbon dioxide equivalent. Carbon dioxide equivalent is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential.

Health and Safety, including Noise

Introduction

Reliable power sources can contribute to the health and safety of communities in a variety of ways, such as providing dependable heating sources for homes and businesses, or maintaining vital public services (such as providing electricity to hospitals). However, the construction and operation of the electric transmission lines necessary to provide this reliable power can also have some potentially adverse impacts to the public's health and safety. The following sections address noise, electric and magnetic fields, and aircraft safety.

Analysis Area

The analysis area for the noise and electric and magnetic fields portion of the health and safety assessment includes the proposed right-of-way, assumed to be 300-feet-wide in all locations for the purposes of this analysis, and a 1,000-foot buffer from either side the outer edge of this right-of-way.

The analysis area used for the aircraft safety assessment includes airports located within 5 miles of the proposed project, as well as waterways used by floatplanes where the flight path of a floatplane could potentially bring the craft into contact with the project during take-offs or landings.

Methodology

The information sources used for this analysis include aerial photography, estimated noise levels associated with construction activities (Thalheimer 1996; BPA 2003), publicly available flight data (FAA 2013), and current research regarding electric and magnetic fields and public health (NIEHS 1999; NAS 1999; HCN 2001, 2004; NRPB 2001, 2004; IARC 2002).

Affected Environment

Noise

Sound can be described as a rapid fluctuation of air pressure that occurs above or below the existing atmospheric pressure, which subsequently creates a sound wave. The term "noise" is highly subjective and is dependent on the detector's state and point-of-view; however, noise can be generally defined as any unwanted sound.

The intensity of noise is typically described using the decibel (dB) scale, which is a logarithmic rating system that accounts for the large differences in audible intensities. Using this scale, an increase of 10 A-weighted decibels (dBA) corresponds to the perception that the loudness of a noise has doubled. For example, a 70-dBA sound level would be perceived by the average human as being twice as loud as a 60-dBA sound level. Table NPHS-1 identifies typical noise levels associated with common sound sources; Table NPHS-2 identifies typical noise levels associated with construction equipment.

Table NPHS-1. Common Noise Sources and Sound Levels

Noise Source or Effect	Sound Level, dBA
Threshold of pain	128
Rock-and-roll band	108
Truck at 50 feet	80
Gas lawnmower at 100 feet	70
Normal conversation indoors	60
Moderate rainfall on foliage	50
Refrigerator	40
Bedroom at night	25
Hearing threshold	0

Source: BPA 2003

Table NPHS-2. Noise Levels Produced by Typical Construction Equipment

Type of Equipment	Maximum Level (dBA) at 50 Feet
Road Grader	85
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Crane	85
Combined Equipment	89

Source: Thalheimer 1996

The majority of the proposed project crosses through a relatively undeveloped area, with few sensitive noise receptors, such as homes or businesses, located within the analysis areas for the proposed alternatives. Sensitive noise receptors in the analysis areas for Alternatives 2 and 3, include Sandy Beach Park (both alternatives), private residences and a Church of Jesus Christ of Latter-day Saints along Sandy Beach Road (Alternative 2), and Outlook Park (Alternative 2). Alternatives 2 and 3 would also cross four recreation trails on NFS lands: the Colp Lake, Goose Lake, Portage Mountain Loop, and Raven trails (see the *Recreation* section of this EIS).

Sensitive noise receptors in the analysis area for Alternative 4 include private residences located between the point where the alternative connects to the Tyee-Wrangell-Petersburg transmission line and the proposed Wrangell Narrows crossing location. Alternative 4 would cross one recreation trail on NFS lands: the Hamilton Creek Trail (see the *Recreation* section).

All three alternatives would follow Keku Road to the existing substation in Kake and pass sensitive noise receptors located along this road.

Electric and Magnetic Fields

Electric and magnetic fields are produced by both natural as well as anthropogenic processes. The earth's natural magnetic field is thought to result from the rotation of the earth's molten iron core; while the earth's natural electrical field is primarily caused by the charge separation that occurs between the earth and the ionosphere (König et al. 1981). Anthropogenic induced fields are produced through the use of any electrical devices. Electric and magnetic fields are found around any electrical wiring, including household wiring, electrical appliances and equipment, and electric transmission lines.

The strength of the electric field around a transmission line depends primarily on the line's voltage, with higher electric fields correlated to higher voltages; however, little variation is expected with a transmission line's electric field as the line's voltage does not vary significantly. Furthermore, any object that can conduct electricity (e.g., trees, buildings, metal objects) will block this electric field. The strength of the magnetic field, however, depends primarily on the current flowing through the line; therefore, as electricity demand increases and the current on the line increases, the magnetic field levels associated with the line generally increases. The strength of these fields is reduced substantially as the distance from the power source increases.

The standard unit for measuring the strength of an electric field is volts per meter. Magnetic field levels are typically measured is milligauss (mG). A typical home has a background magnetic field (in areas away from electrical appliances) that ranges from 0.5 mG to 4 mG (with an average of 0.9 mG); however, fields around electric home appliances can be 100s of mGs (USDA Forest Service 1997a).

There has been public concern regarding the effects of electric and magnetic fields on the health and safety of the public. The assessments by International Agency for Research on Cancer, the National

Institute of Environmental Health Sciences, the National Academy of Science, the National Radiological Protection Board of Great Britain, and the Health Council of the Netherlands agree that there is little evidence to suggest low levels of electric and magnetic fields are directly associated with adverse health effects, including most forms of adult and childhood cancer, heart disease, Alzheimer's disease, depression, and reproductive effects. However, all of the assessments concluded that epidemiology studies in total suggest that there is at least some association between magnetic fields at higher time-weighted average exposure levels (greater than 4 mG) and childhood leukemia (NIEHS 1999; NAS 1999; HCN 2001, 2004; NRPB 2001, 2004; IARC 2002). For example, the National Radiological Protection Board of Great Britain (NRPB 2004) found that: "Laboratory experiments have provided no good evidence that extremely low frequency [ELF] electromagnetic fields are capable of producing cancer, nor do human epidemiological studies suggests that they cause cancer in general. There is, however, some epidemiological evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukemia in children."

The federal government performed an extensive review of electric and magnetic field related issues in the 1990s, which resulted in the decision that federal regulatory actions were not warranted (NIEHS 1999). Although there are no federal regulations on low frequency electric and magnetic fields in the United States, recommendations and guidelines exist within the international community. Table NPHS-3 lists electric and magnetic field guidelines recommended by the European Union, the International Committee on Electromagnetic Safety, and the International Commission on Non-Ionizing Radiation Protection, an affiliate of the World Health Organization (ICES 2002; ICNIRP 1998). Table NPHS-4 lists electric and magnetic field level regulations that have been set in other states.

Table NPHS-3. International Guidelines for AC Electric and Magnetic Field Levels

Agency	Location	Electric Field	Magnetic Field
European Union General Public Exposure	Edge of ROW	4.2 kilovolt per meter (kV/m)	0.833 G
International Committee on Electromagnetic Safety (ICES) Occupational Exposure 1/	Within ROW	10 kV/m	27.1 G
General Public Exposure	Edge of ROW	5 kV/m	9.04 G
International Commission on Non-Ionizing Radiation Protection (ICNIRP) Occupational Exposure	Within ROW	8.3 kV/m	4.17 G
General Public Exposure	Edge of ROW	4.2 kV/m	0.833 G

Notes:
1/ 20 kV/m in controlled occupation setting
Magnetic fields are measured in Gauss (G) and milligauss (mG). Please note that 1 G = 1,000 mG.
ROW = right-of-way

Table NPHS-4. State Regulated AC Electric and Magnetic Field Levels

State	Location	Electric Field	Magnetic Field
Florida	Within ROW Within ROW, Edge of ROW	10 kV/m 2 kV/m 8 kV/m 2 kV/m	NA 200 mG 250 mG NA 150 mG
Minnesota	Within ROW	8 kV/m	NA
Montana	Within ROW – road crossing Edge of ROW	7 kV/m 1 kV/m1/	NA
New Jersey	Within ROW, Edge of ROW	NA 3 kV/m	NA
New York	Within ROW – open Within ROW – public road Edge of ROW	11.8 kV/m 7 kV/m 1.6 kV/m	NA 200 mG
North Dakota	Within ROW, Edge of ROW	9 kV/m NA	NA
Oregon	Within ROW, Edge of ROW	9 kV/m NA	NA

1/ Can be waived by landowner.
NA = Not Applicable. No requirements; ROW = right-of-way

Seven states have adopted limits for electric field strength either at the edge or within the right-of-way of the transmission line corridor. Only Florida and New York currently limit magnetic fields levels from transmission lines. The magnetic field levels set in those two states only apply at the edge of the right-of-way and were based on an objective of preventing field levels from increasing beyond levels currently experienced by the public.

As a result, there are no federal regulations or guidelines that directly apply to electric and magnetic fields. The State of Alaska has also not established electric or magnetic field standards.

Aircraft Safety

As road densities are typically low in Southeast Alaska, the region depends heavily on aircraft for local transportation. This is especially true along the islands found in the Tongass, which rely heavily on floatplanes that can take-off and land along the many waterways. As a result, overhead transmission lines can pose a threat to the safety of these aircraft. The magnitude of the threat depends on multiple factors, including the type of aircraft utilizing the area, where the aircraft take-off and land, aircraft flight paths, local weather conditions, and the height and location of the overhead transmission line.

Helicopters, floatplanes, and commercial aircraft all fly in and around Mitkof and Kupreanof Islands. Helicopters are used to transport goods and people, and support commercial activities such as timber harvesting and construction. Floatplanes are used by both private pilots for individual transportation, as well as by commercial companies that run transportation, recreation, and sightseeing businesses. Alaska Airlines is the primary large-scale commercial airline serving the area, which providing flights in and out of the Petersburg Airport.

Areas used by aircraft in and around the project area include:

- The Petersburg Airport is located on Mitkof Island, just south of Petersburg (at 1504 Haugen Drive, Petersburg, AK 99833). There are 15 planes (all single engine) based at this airport. A total of 13,492 aircraft operations occurred at this airport during 2011, with an average of 37 planes either taking-off or landing each day (FAA 2013).

- The Kake Airport is located about 1 mile south of Kake, on Kupreanof Island. A total of 4,600 aircraft operations occurred at this airport during 2006 year, with an average of 13 planes either taking-off or landing each day (FAA 2013).
- Floatplanes regularly take-off from and land along waterways near the project area, including Portage Bay and Duncan Canal.
- There are no established helicopter pads in the analysis area; however, helicopters can take-off and land from any stable/clear area that can support the weight of the craft.

Although most of the airspace in Southeast Alaska is uncontrolled, inferences can be made about the typical flight paths taken by aircraft in the area. The Petersburg airport runway is situated in a northeast to southwest direction, indicating that aircraft would be traveling in a northeast-southwest direction when taking-off or landing at this airport. Similarly, the Kake airport is situated in a southeast to northwest direction, indicating that aircraft would be traveling in these directions when taking-off or landing at this airport. Helicopters and floatplanes (which do not require an airport for take-offs/landings) could take-off and land in varying directions or orientations; however, floatplanes would likely travel lengthwise along a waterway (e.g., north-south in Portage Bay) when taking-off or landing from these areas.

Weather conditions can affect the likelihood of planes colliding with overhead transmission lines, due to reduced visibility as well as high wind events. The climate of Southeast Alaska is moderated by the marine influences of the Pacific Ocean. Summer temperatures are cooler and winter temperatures are warmer than are expected for other areas at the same latitude. However, the marine influence combined with the presence of large mountains produces relatively heavy precipitation in the region. October and November are typically the wettest months in this area. Strong winds are frequent, and occur most often between October and March. The low clouds and continuous rain in this area often prevent pilots from flying under visual flight rules.

Commercial aircraft, small private aircraft and floatplanes, and helicopters all fly at different altitudes. Commercial aircraft are expected to maintain a minimum altitude of 500 feet above ground level. In general, commercial aircraft do not fly below 500 feet in good weather, except for takeoffs and landings. Private aircraft may fly at any altitude, generally flying at an average altitude of 1,500 feet in the summer months. However, they can remain at altitudes lower than 100 feet during the winter months, due to severe weather constraints. Also, private aircraft are known to fly just above the water to get under low clouds in this area. Helicopters in this area will fly at altitudes ranging from just above the ground to 200 feet.

Environmental Effects

Effects Common to All Action Alternatives

Noise

Construction

The use of heavy equipment (including ground-based equipment as well as helicopters) to prepare construction sites, prepare shovel trails and temporary access spurs, transport and install temporary matting panels, set transmission structures, string lines, and clean-up/restore disturbed areas would generate noise at a level above ambient conditions. This could disturb any sensitive noise receptors (e.g., homes, businesses) located near these locations. However, the vast majority of the project crosses through undeveloped areas that do not contain sensitive noise receptors. Sensitive noise receptors along each of the action alternatives are mainly limited to the portions of the project located near Petersburg and Kake. Table NPHS-5 identifies the anticipated noise levels that could occur during construction. These noise-related disturbances would be short-term in nature, and would only last as long as construction is taking place in the affected area.

Table NPHS-5. Construction Noise in the Vicinity of a Construction Site

Distance from Construction Site (feet)	Hourly Median Noise (dBA)[1/]
50	89
100	83
200	77
400	71
800	65
1,600	59

Note:
1/ The following assumptions were used to develop the above estimates:
(1) Equipment used were 1 each grader, bulldozer, heavy truck, backhoe, Pneumatic tools, concrete pump, crane.
(2) Reference level noise: 89 dBA (L_{eq}).
(3) Distance for the reference noise level: 50 feet.
(4) Noise attenuation rate: 6 dBA/doubling of distance; this calculation does not include effects of local shielding or atmospheric attenuation.
Source: BPA 2003

Operation

The proposed transmission line would require limited maintenance. Routine annual inspections would be conducted via helicopter to ensure that the transmission line is in fully operational condition. Helicopters would be needed to support substantial repairs, such as pole replacements. The right-of-way would also require regular maintenance clearing. This clearing would occur at 10-year intervals and would be expected to restore the original clearing boundaries.

As sensitive noise receptors along each of the action alternatives are mainly limited to the portions of the project located near Petersburg and Kake, noise resulting from routine operation and maintenance is not expected to impact residents, as inspection and maintenance crews would be able to use existing state and municipal road networks in these locations. If major repairs are required in these locations, noise impacts would be similar to those during construction and short-term in nature.

The transmission line itself could generate some noise as a result of the line's corona, which is the particle electrical breakdown of the insulating properties of the air around the conductors. This can produce an audible noise level, which is often described as a hissing or crackling noise around the line. This corona noise is most noticeable when conductors are wet, which is likely to be often due to the wet weather conditions in the area. For transmission lines of 138 kV and less, the corona noise level at the edge of a right-of-way is usually less than 40 dBA (Louden 2011); or equivalent to the noise level generated by a refrigerator (see Table NPHS-1).

Electric and Magnetic Fields

Scientific evidence has not established a definitive cause-and-effect relationship between electric and magnetic fields and any adverse health effects (NIEHS 1999; NAS 1999; HCN 2001, 2004; NRPB 2001, 2004; IARC 2002). As a result, it is not possible to predict any specific health risks or a specific potential level of any disease that could occur to local residents due to exposure to project-related electric and magnetic fields. However, it is possible to estimate the magnetic field levels that would likely occur around the proposed project, as well as the rate in which the field would degrade as distance from the line increases. As shown in Figure NHPS-1, the anticipated magnetic field, from the proposed project operated at either 69 kV or 138 kV, would degrade to low levels within 100 feet of the project's centerline. The potential impacts of project-related magnetic fields on public health and safety are expected to be negligible.

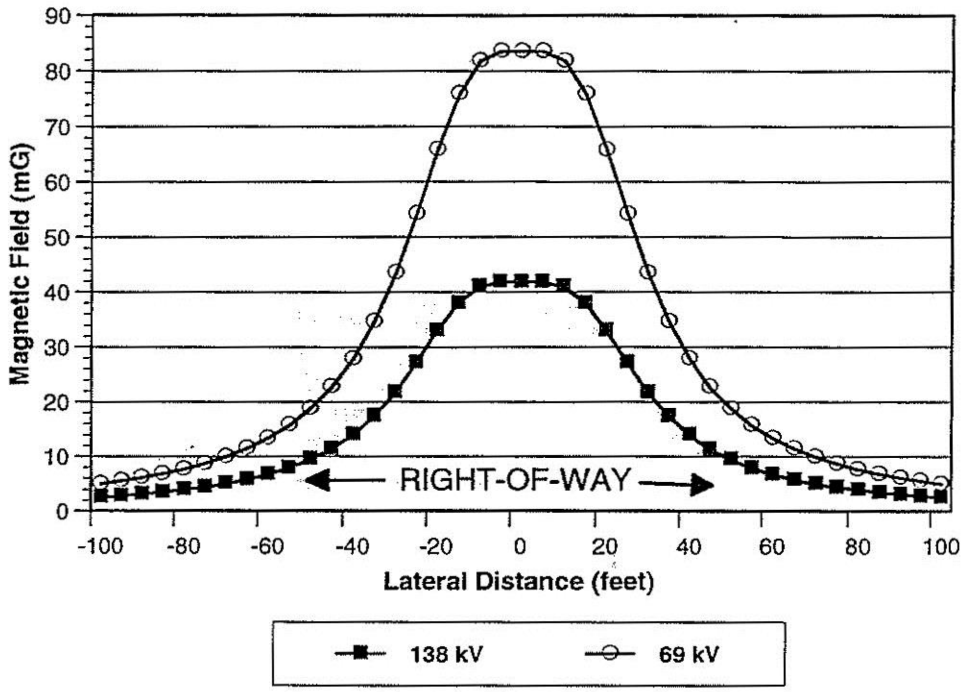


Figure NPHS-1. Estimated Magnetic Field Strength for the KPI Project

Electric and Magnetic Field Effects

The interaction of electric and magnetic fields with humans or animals near or underneath high-voltage lines can be categorized as short-term or long-term effects. Short-term effects can generally be perceived and may be considered a nuisance, such as induced currents or shocks. Long-term effects for EMF generally relate to health concerns.

Short-Term Electric Field Effects

Short-term electric field effects involve potentials and currents that may be induced on objects such as conductive roofs or buildings, fences, vehicles, or agricultural equipment near high-voltage lines. These potentials and currents may result in perceptible shocks or current flow if sufficiently large. The magnitude of induced currents and potentials on objects or equipment under the proposed lines would depend on the magnitude of the electric field, the size and shape of the object, and the object's connection (resistance) to ground. Grounding the object would reduce the induced potential to essentially zero and eliminate the object as a source of shocks or currents. Objects that are not grounded or poorly grounded may be a source of currents or shocks. Fences or metal objects that are within the right-of-way should be grounded. Grounding would eliminate induced currents or potentials on these objects as a concern.

Long-Term Effects Electromagnetic Fields

For more than 30 years, questions have been asked about the potential effect of EMF from powerlines on people. Early studies focused on electric fields. Magnetic fields began receiving increased attention in the late 1970s. A substantial amount of research has been conducted in the United States and around the world over the past several decades examining whether exposures to power frequency EMF have health or environmental effects.

Epidemiology studies have addressed many of the issues raised about EMF and health. Multidisciplinary reviews express the consensus in the scientific community that the epidemiologic evidence is insufficient to demonstrate a causal relationship between extremely low frequency (ELF; pertaining to power frequency), EMF, and any health effect (NIEHS 1998, 1999; HCN 2001; NRPB 2001, 2004; IARC 2002; HCN 2004).

Several organizations responsible for health decisions including national and international organizations have convened groups of scientists to review the body of EMF research. These expert groups, including the National Institute of Environmental Health Sciences, the International Agency for Research on Cancer, the National Radiological Protection Board of Great Britain, and the Health Council of the Netherlands, have included dozens of scientists with diverse skills that reflect the different research approaches required to answer questions about health.

The assessments by International Agency for Research on Cancer, the National Institute of Environmental Health Sciences, the National Academy of Science, the National Radiological Protection Board of Great Britain, and the Health Council of the Netherlands agree that there is little evidence to suggest EMF is associated with adverse health effects, including most forms of adult and childhood cancer, heart disease, Alzheimer’s disease, depression, and reproductive effects. However, all of the assessments concluded that epidemiology studies *in total* suggest an association between magnetic fields at higher time-weighted average exposure levels (greater than 4 mG) and childhood leukemia. Nevertheless, all agree that the experimental laboratory data do not support a *causal* link between EMF and any adverse health effect, including leukemia, and have not concluded that EMF is, in fact, the cause of any disease. The scientific consensus is that there is little evidence suggesting that EMF is associated with adverse health effects, and no exposure standards have been recommended.

Aircraft Safety

The proposed project would comply with all applicable Federal Aviation Administration requirements to ensure aircraft safety in the project area.

Power lines that span water bodies used by floatplanes can provide an obstacle to floatplane landings. However, none of the proposed alternatives span these types of water bodies. Major water crossings would be via submarine cable or HDD boring under all action alternatives, as described in Chapter 2 of this EIS. Further, as described in Chapter 2, the proposed transmission line structures would be on average 55 feet tall, which is lower than many of the trees in this area. As a result, the forests located either side of the cleared right-of-way would likely be taller than the proposed structures along much of the proposed alternative routes.

Alternative 1 – No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative and is analyzed to provide a baseline for evaluation of the impacts associated with the action alternatives. Under this alternative, the Forest Service would not provide authorization for the proposed project and there would be no direct or indirect effects on health and safety, including noise, because there would be no transmission line construction or associated activities.

Cumulative Effects

The no action alternative would not contribute to cumulative effects on health and safety, including noise, because there would be no transmission line construction or associated activities under this alternative.

Alternatives 2 and 3

Direct and Indirect Effects

Potential noise and electric and magnetic field impacts under Alternatives 2 and 3 are described above in the *Effects Common to all Alternatives* section. Sensitive receptors located near the proposed alternatives would be exposed to noise during construction, but impacts are expected to be short-term and limited in duration. Project-related magnetic fields are expected to have a negligible effect on public health.

No aerial crossings are proposed for major waterways in the project under these alternatives. The proposed transmission line would, however, extend east-west on land approximately 0.4 mile south of Portage Bay, which is used by floatplanes for take-offs and landings. The proposed transmission line could potentially cross the pathway used by these planes in this location. However, the line in this area would be approximately 55 feet above the ground, lower than the surrounding vegetation. As a result, the risk of floatplanes colliding with the proposed transmission line in this location is expected to be negligible.

Cumulative Effects

Reasonably foreseeable projects in the analysis area are discussed at the beginning of this chapter and mainly consist of timber sales, activities associated with timber management or sales, and road construction and maintenance activities. Construction of the Kake road project would likely involve equipment similar to that expected to be used during construction of the KPI Project and would, therefore, be expected to operate in similar impacts. These impacts are not, however, expected to coincide in time and would therefore not combine to result in cumulative impacts. Operation-related impacts would be expected to be higher for the Kake road project, which would be used by motor vehicles on a regular basis. The incremental addition of the operation of Alternatives 2 and 3 to the Kake road project and other reasonably foreseeable projects is not expected to result in noise, electric and magnetic field, or aircraft safety impacts substantially greater than those disclosed in the preceding section.

The proposed project could, however, affect aircraft operations related to future timber harvests. Future timber operations would need to consider the presence of the transmission line during logging and transportation planning.

Alternative 4 – Center-South Route

Direct and Indirect Effects

Potential noise and electric and magnetic field impacts under Alternative 4 are described above in the *Effects Common to all Alternatives* section. Sensitive receptors located near the proposed alternative would be exposed to noise during construction, but impacts are expected to be short-term and limited in duration. Project-related magnetic fields are expected to have a negligible effect on public health. No aerial crossings are proposed for major waterways in the project under this alternative.

Cumulative Effects

Reasonably foreseeable projects in the analysis area are discussed at the beginning of this chapter and mainly consist of timber sales, activities associated with timber management or sales, and road construction and maintenance activities.

With the exception of the section of FR 6040 that both Alternative 4 and the Kake road project would follow, the health and safety, including noise analysis area for Alternative 4 does not coincide in space with the Kake road project. In the absence of a road design or related analysis, Kake road project-related impacts to this stretch of FR 6040, if any, are unknown. However, improvements, were they to occur, would not be expected to coincide in time with construction of the KPI Project. Operation of the new road could result in increased motor vehicle traffic on this section of FR 6040 with a commensurate increase in motor vehicle-related noise. The incremental addition of Alternative 4 to these projects is not expected to result in noise, electric and magnetic field, or aircraft safety impacts substantially greater than those disclosed in the preceding section.

The proposed project could, however, affect aircraft operations related to future timber harvests. Future timber operations would need to consider the presence of the transmission line during logging and transportation planning.

Other Environmental Considerations

Relationship between Short-term Uses 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 NFMA, all renewable resources are to be managed in such a way that they are available for future generations. Both short-term and long-term impacts are disclosed by resource in the following sections.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term productivity of the project area through the use of specific standards and guidelines, mitigation measures, and BMPs.

The intensity and duration of the effects described in this EIS depend on the alternative and the mitigation measures applied to protect the resources. Most unavoidable effects are expected to be short-term. Short-term effects usually last less than 2 to 5 years. Effects would be managed to comply with established legal limits in all cases. Monitoring procedures and mitigation measures have been planned for those areas that may be affected to reduce these effects. Specific mitigation measures are documented at the end of each applicable resource section in Chapter 3 and summarized in Chapter 2.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected under all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the project area may fluctuate as a result of short-term uses, but no substantial long-term effects to the water resource are expected to occur as a result of the project.

Construction of temporary shovel trails and temporary access spurs and the use of temporary matting in wetland areas would constitute a short-term use of wetland resources. Timber removal within the right-of-way and along temporary access spurs is expected to slightly alter the hydrology of affected wetlands for several years after impact. Soil moisture levels are expected to rise slightly following initial impact due to the loss of canopy interception. Soil moisture levels are anticipated to return to near pre-cut levels as second-growth establishes and provides canopy cover across temporarily impacted areas (e.g., along temporary access spurs outside the cleared right-of-way); however, clearing within the right-of-way would be maintained, resulting in a long-term change in wetland productivity in these areas.

Project activities are expected to disturb soils. These small-scale disturbances do not pose adverse effects to long-term soil productivity. Due to the thick organic mat covering most mineral soils, surface erosion would be limited to detrimentally displaced areas, areas associated with temporary shovel trails, temporary matting, and temporary access spurs, windthrow, stream banks, and recent landslide tracks.

All alternatives would provide the habitat necessary to contribute to the maintenance of viable, well-distributed populations of existing native and desired non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. MIS are used to represent the habitat requirements of all fish and wildlife species found in the project area. All alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity.

Opportunities for developed and dispersed recreation use including fishing, hunting, OHV use, hiking and wildlife viewing, and camping would be maintained. The long-term potential for the project area, to provide a spectrum of recreation opportunities would be maintained under all alternatives.

Irreversible and Irretrievable Commitments of Resources

“Irreversible commitments” is a term that describes the loss of future options. It applies primarily to the effects of the use of non-renewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are only renewable over long periods of time. Once these resources are gone, they cannot be replaced. Potential irreversible commitments related to the KPI Project are as follows:

- Loss of soil due to erosion and mass failures is an irreversible commitment of resources. The loss of soil resources has been minimized to the extent feasible in all action alternatives by following R10 Soil Quality Standards, incorporating BMPs, and applying mitigation measures specified in this document.
- Loss of cultural resource sites resulting from accidental damage or vandalism would be an irreversible commitment of resources. Standards and guidelines, survey methodology prior to activities, and mitigation measures specified in this document provide reasonable assurance that no irreversible loss of cultural resources would occur.

“Irretrievable commitments” is a term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production. Potential irretrievable commitments related to the KPI project area:

- Timber productivity would be lost within the permanently cleared right-of-way.
- Although vegetation would be restored in some temporarily disturbed areas (e.g., along temporary access spurs outside the cleared right-of-way), old-growth forest structure would be converted to even-aged young forest structure.
- IRAs are defined as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act and were inventoried during the Forest Service’s RARE II process and during subsequent updates and forest planning analyses. No new roads are proposed under the action alternatives, but loss of timber due vegetative clearing and maintenance in the right-of-way within IRAs would have irretrievable effects to the character of the affected IRA, as would the presence of an electric transmission line in these areas.

Unavoidable Adverse Environmental 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 multiple resources. Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of an activity. The route selection process for the proposed alternatives was designed to minimize adverse consequences by following existing infrastructure wherever possible. The application of Forest Plan Standards and Guidelines, best management practices, and project-specific mitigation measures are all intended to further limit the extent, severity, and duration of potential effects; however, some adverse effects that cannot be completely mitigated would still occur. The specific environmental effects of the alternatives were discussed earlier in this chapter; mitigation measures are documented at the end of each applicable resource section in Chapter 3 and summarized in Chapter 2.

Unavoidable adverse impacts would include the loss of old-growth habitats for wildlife and plants that prefer these habitats over other habitats for some component of their life histories.

Chapter 4
REFERENCES AND LISTS

References

ACFEC (Alaska Commercial Fisheries Entry Commission). 2011. Permit Holder and Crew Member Counts by Census Area & City of Residence. Available online at: http://www.cfec.state.ak.us/cpbycen/2010/Mnu.htm

ADCCED (Alaska Department of Commerce Community and Economic Development). 2013. Alaska Community Database. Available online at: http://commerce.alaska.gov/cra/DCRAExternal

ADCCED. 2012a. Community Information System. Available online at: http://www.commerce.state.ak.us/dca/commdb/CIS.cfm (accessed April 24, 2012).

ADCCED. 2012b. Southeast Alaska Timber Industry Businesses Database. Email communication between C. Pinkel, Development Specialist II and M. Dadswell, Tetra Tech. February 22.

ADEC (Alaska Department of Environmental Conservation). 2011. Water Quality Standards, amended as of May 26, 2011. 18 AAC 70. 59 pages. Retrieved on January 31, 2012 from: http://www.dec.state.ak.us/water/wqsar/wqs/pdfs/18_AAC_70_as_Amended_Through_May_26_2011.pdf

ADEC. 2013. Spill Prevention and Response. Contaminated Sites Database. Cleanup Chronology Report for Portage Bay LTF and Camp. http://dec.alaska.gov/Applications/SPAR/CCReports/Site_Report.aspx?Hazard_ID=3870

ADF&G (Alaska Department of Fish and Game). 2006. Wolf management report of survey and inventory activities 2002-2005.

ADF&G. 2008. Black Bear Management Report of Survey-Inventory Activities 1 July 2004–30 June 2007. P. Harper (ed.). Alaska Department of Fish and Game, Juneau, AK.

ADF&G. 2009. Wolf management report of survey and inventory activities 2005 – 2008.

ADF&G. 2012a. Alaska's Game Species. Alaska Department of Fish and Game, Hunting. Available online at: http://www.adfg.alaska.gov/index.cfm?adfg=hunting.species (Accessed April 19, 2012).

ADF&G. 2012b. Status of wolves in southeast Alaska.

ADF&G. 2013a. Fish Resource Monitor. Interactive mapping data base. Accessed October 2013 at: http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=awc

ADF&G. 2013b. PowerPoint regarding feasibility assessment for intensive management, GMU 3. 124 pp.

ADNR (Alaska Department of Natural Resources). 2000. Central/Southern Southeast Area Plan. Alaska Department of Natural Resources Division of Mining, Land and Water. Resource Assessment and Development Section.

ADOT&PF (Alaska Department of Transportation and Public Facilities). 2016. Letter from Michael J. Coffey, Director, Southcoast Division, ADOT&PF to Maria Lisowski, Director, Ecosystem Planning and Budget, USDA Forest Service, Region 10. May 16.

4 References and Lists

AFSC (Alaska Fisheries Science Center). 2013. Community Profiles for North Pacific Fisheries – Alaska. National Oceanic and Atmospheric Administration. Available online at: http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/CPU.php

AKNHP (Alaska Natural Heritage Program). 2012. Alaska Natural Heritage Program Rare Vascular Plant Tracking List. Available online at: http://137.229.141.57/wp-content/uploads/2010/11/Rare-Plant-List-2008.pdf

Alaback, P.B. 1982. Dynamics of understory biomass in Sitka spruce-western hemlock forest of southeast Alaska. *Ecology* 63:1932–1948.

Alaska Commercial Fisheries Entry Commission. 2011. Permit Holder and Crew Member Counts by Census Area & City of Residence. Available online at: http://www.cfec.state.ak.us/cpbycen/2010/Mnu.htm

Alaska DOL (Alaska Department of Labor). 2012. Preliminary Annual Employment and Earnings – 2011. Data Revised: 6/6/2012. Available online at: http://labor.alaska.gov/research/qcew/qcew.htm

Alaska DOL. 2013a. Alaska Population Estimates by Borough, Census Area, City and Census Designated Place (CDP), 2000-2010. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013b. Alaska Population Estimates by Borough, Census Area, City and Census Designated Place (CDP), 2010-2012. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013c. Population of Alaska by Economic Region, Borough and Census Area, 2010-2012. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013d. Population of Alaska by Economic Region, Borough and Census Area, 2000-2010. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013e. Alaska Population Projections, 2010 to 2035. Alaska Department of Labor and Workforce Development, Research and Analysis Section. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013f. Southeast Economic Region. Monthly Employment Statistics. Available online at: http://laborstats.alaska.gov/index.htm

Alaska DOL. 2013g. Online databases with employment and earnings information for regions and communities. Available at: http://live.laborstats.alaska.gov/alari/. Accessed March 27, 2013

Alaska DOL. 2013h. Not Seasonally Adjusted Monthly and Annual Unemployment Rates for the U.S., Alaska and Boroughs and Census Areas, 1994-2013. Available online at: http://live.laborstats.alaska.gov/labforce/index.cfm

Alaska DOL. 2013i. Online databases with employment and earnings information for regions and communities. Available at: http://live.laborstats.alaska.gov/alari/. Accessed October 28, 2013

Alexander, S. J. 2012. Employment Coefficients and Indirect Effects, for NEPA Planning: 2012 Update Memo. Regional Economist, USFS Alaska Region. August 9.

Alexander, S. J., E.B. Henderson, and R. Coleman. 2010. Economic Analysis of Southeast Alaska: Envisioning a Sustainable Economy with Thriving Communities. Forest Service, Alaska Region Publication R10-MB-725, Juneau, AK, 93 p.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. http://www.aplic.org/

Banner A., P. LePage, J. Moran, and A. de Groot. 2005. Hyp3 Project: Pattern, Process, and Productivity in Hypermaritime Forests of Coastal British Columbia: A Synthesis of 7-year Results. Ministry of Forests, BC. Special Report Series 10.

Banner, A., P. LePage, J.R. Moran, and A. de Groot. 2005. HyP3 Project: Pattern, Process, and Productivity in Hypermaritime Forests of Coastal British Columbia: A Synthesis of 7-year Results. Ministry of Forests, BC. Special Report Series 10.

Barrett, T.M. 2014. Storage and Flux of Carbon in Live Trees, Snags, and Logs in the Chugach and Tongass National Forests. USDA Forest Service. Pacific Northwest Research Station. General Technical Report PNW-GTR-889. January.

Beaudry, P.G., and R.M. Sagar. 1995. The Water Balance of a Coastal Cedar Hemlock Ecosystem. Presented at a joint meeting of the Canadian Society for Hydrological Sciences and the Canadian Water Resources Association: Mountain Hydrology, Peaks and Valleys in research and applications May 17-19, 1995.

Beechie, T. J., and T. H. Sibley, 1997. Relationships between channel characteristics, woody debris, and fish habitat in Northwestern Washington streams. Transactions of the American Fisheries Society 126:217-229.

Benda, L., N.L. Poff, D. Miller, T. Dunne, G. Reeves, G. Pess, and M. Pollock. 2004. The network dynamics hypothesis: How channel networks structure riverine habitats. *Bioscience* 54(5): 413-427.

Ben-David, M., R.T. Bowyer and J.B. Faro. 1996. Niche Separation by Mink and River Otters: Coexistence in a Marine Environment. *Oikos* 75(1):41-48.

Ben-David, M., R.W. Flynn, and D. M. Schell. 1997. Annual and seasonal changes in diets of martens: evidence from stable isotope analysis. *Oecologia* 111:280-291.

Berg, H.C., and D. Grybeck. 1980. Upper Triassic Volcanogenic Zn-Pb-Ag (-Cu-Au) Mineral Deposits near Petersburg, Alaska. U.S. Geological Survey Open-File Report 80-527.

Beschta, R.L., M.R. Pyles, A.E. Skaugset, C.G. Surfleet. 2000. Peakflow responses to forest practices in the western cascades of Oregon. *USA Journal of Hydrology* 233: 102-120.

Betts, M.F., A.M. Victor, R.F. Schroeder, and T.F. Thornton. 1992. Subsistence resource use patterns in Southeast Alaska: A summary of 15 communities. Alaska Department of Fish and Game, Division of Subsistence, Juneau.

Bilby, R.E. 1984. Removal of woody debris may effect stream channel stability. *Journal of Forestry* 82(10). 609-613.

Black & Veatch. 2012. Southeast Alaska Integrated Resource Plan. Prepared for the Alaska Energy Authority. Available online at: http://www.akenergyauthority.org/southeastIRP.html

Boreal Partners in Flight Working Group. 1999. Landbird Conservation Plan for Alaska Biogeographic Regions, Version 1.0. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, Alaska. 116 pages.

4 References and Lists

Bormann, B.T., H. Spaltenstein, M. McClellan, F. Ugolini, K. Cromack Jr., and S. Nay. 1995. Rapid Soil Development After Windthrow Disturbance in Pristine Forests. *Journal of Ecology* 83(5): 756.

Bosakowski, T., B. McCullough, F.J. Lapsansky, and M.E. Vaughn. 1999. Northern goshawks nesting on a private industrial forest in western Washington. *Journal of Raptor Research* 33:240–244.

Bosch, J.M., and J.D. Hewlett. 1982. A review of catchment experiments to determine the effect of vegetation changes on water yield and evapotranspiration. *Journal of Hydrology* 55: 3-23.

Bottemiller, S.C., J.M. Cahill, and J.R. Cowger. 2000. Impacts on Residential Property Values along Transmission Lines. An Update of Three Pacific Northwest Metropolitan Areas Right of Way. July/August.

Bowyer, R.T., G.M. Blundell, M. Ben-David, S.C. Jewett, T.A. Dean, and L.K. Duffy. 2003. Effects of the Exxon Valdez oil spill on river otters: injury and recovery of a sentinel species. *Wildlife Monographs* 153:1–53.

Boyce, D.A. Jr.; R.T. Reynolds, and R.T. Graham. 2006. Goshawk status and management: What do we know, what have we done, where are we going. In: Michael Morrison (ed.), *The northern goshawk: a technical assessment of its status, ecology and management.* Cooper Ornithological Society: 312–325.

BPA (Bonneville Power Administration). 2003. Kangley – Echo Lake Transmission Line Project Supplemental Draft Environmental Impact Statement. January 2003.

Brinkman, T.J., T. Chapin, G. Kofinas, and D.K. Person. 2009. Linking hunter knowledge with forest change to understand changing deer harvest opportunities in intensively logged landscapes. *Ecology and Society* 14:1

Bryant, M.D., J. Caouette, and B. Wright. 2004. Evaluating Stream Habitat Survey Data and Statistical Power Using and Example from Southeast Alaska. *North American Journal of Fisheries Management* 24:1353-1362.

Bryant, M.D., M.D. Louke, J.P. McDonell, R.A. Gubernick, and R.S. Aho. 2009. Seasonal movement of Dolly Varden and cutthroat trout with respect to stream discharge in a second-order stream in Southeast Alaska. *North American Journal of Fisheries Management* 29: 1728-1742

Burnett, KM., G.H. Reeves, D.J. Miller, S. Clarke, K. Vance-Borland, and K. Christiansen. 2007. Distribution of salmon habitat-potential relative to landscape characteristics and implications for conservation. *Ecological Applications* 17(1): 66-80.

Buskirk, S.W., and W.J. Zielinski. 1997. American marten (Martes americana) ecology and conservation. Pages 17-22 in J.E. Harris, and C.V. Ogan, (eds.), Mesocarnivores of northern California: biology, management, and survey techniques, workshop manual. August 12-15, 1997, Humboldt State University, Arcata, CA. The Wildlife Society, California North Coast Chapter, Arcata, CA.

Cannon, J. and J. Wilkinson. 2010. Petersburg. The story of a 100-year-old fishing community. Alaska Economic Trends. May. 13-16.

Caouette, J.P., and E.J. DeGayner. 2005. Predictive Mapping for Tree Sizes and Densities in Southeast Alaska. J. Land. Urban Plan. 72(1-3):49-63.

Carls, M.G., P.M. Harris, S.W. Johnson, M.R. Lindeberg, A.D. Neff, and R. Waples. 2008. Status Review of Lynn Canal Herring (*Clupea pallasii*). National Marine Fisheries Service, Juneau, AK. 154 p.

Carstensen, R., J. Schoen, and D. Albert. 2007. Overview of the biogeographic provinces of southeastern Alaska. Chapter 4.1, Pages 1-4 in, J. Schoen and E. Dovichin (eds.). The coastal forests and mountains ecoregion of southeastern Alaska and the Tongass National Forest: A conservation assessment and resources synthesis. Audubon and Nature Conservancy, Special Publication

Causey, J.D. 2007. Mining Claim Activity on Federal Land in the United States: U.S. Geological Survey Data Series Report DS-290.

Cederholm, C.J., L.M. Reid, and E.O. Salo.1980. Cumulative Effects of Logging Road Sediment On Salmonid Populations In The Clearwater River, Jefferson County, Washington. Presented to the conference Salmon-Spawning Gravel: A Renewable Resource in the Pacific Northwest? Seattle, Washington, October 6-7, 1980. Contribution No. 543, College of Fisheries, University of Washington, Seattle, Washington 98195.

CEQ (Council on Environmental Quality). 1997. Environmental Justice Guidance under the National Environmental Policy Act. Executive Office of the President. Washington, D.C. December 10. Available online at: http://www.epa.gov/compliance/resources/policies/ej/index.html

Chalmers, James A. and Frank Voorvart. 2009. *High Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects*. The Appraisal Journal. Summer, 2009. Pp 227-245.

Christensen, B. 2013. Kake Wood Supply for Biomass Assessment. Available online at: http://sustainablesoutheast.net/publications/

Christensen, B., and A. Davis. 2014. Hydropower Reconnaissance Report for Kake, Alaska –Updated January 2014. Available online at: http://sustainablesoutheast.net/publications/

Coldwell, J.R. 2002. Economic Prefeasibility Studies of Mining in the Stikine Area, Southeast Alaska. Bureau of Land Management. Technical Report 52.

Colwell, P.F. 1990. Power Lines and Land Value. *Journal of Real Estate Research* 5(1):117–127.

Cook, J.A., N.G. Dawson, and S.O. MacDonald. 2006. Conservation of highly fragmented systems: the north temperate Alexander Archipelago. *Biological Conservation* 133:1–15.

Cooke. 2005. Cooke Scientific Services, Inc. Pacific Northwest Forested Wetland Literature Survey Synthesis Paper. April 2005.

Cowger, J.R., S.C. Bottemiller, and J.M. Cahill. 1996. Transmission Line Impact on Residential Property Values. A Study of Three Pacific Northwest Metropolitan Areas. Right of Way. September/October.

Croke, J., S. Mockler, P. Fogarty, and I. Takken. 2005. Sediment concentration changes in runoff pathways from a forest road network and the resultant spatial pattern of catchment connectivity. *Geomorphology* 68: 257-268.

D. Hittle & Associates. 2010. Kake-Petersburg Intertie Study Update. Final Draft Report. Prepared for Southeast Conference, Juneau, Alaska. Prepared in association with Commonwealth Associates, Inc. and Tetra Tech EC, Inc. January 10.

D. Hittle & Associates. 2014. Kake–Petersburg Intertie Study Update. Revised Route Options and Estimated Costs of Construction. Final Report. October 20.

Dahlheim, M.E., and P.A. White. 2010. Ecological aspects of transient killer whales Orcinus orca as predators in southeastern Alaska. Wildlife Biology. 16: 308-322

Darimont, C.T., and T.E. Reimchen. 2002. Intra-hair stable isotope analysis implies seasonal shift to salmon in gray wolf diet. *Canadian Journal of Zoology* 80:1638–1632.

Davis, H., A.N. Hamilton, A.S. Harestad, and R.D. Weir. 2012. Longevity and reuse of black bear dens in managed forests of coastal British Columbia. *The Journal of Wildlife Management* 76: 523–527.

Dawson, N.G., S.O. MacDonald, and J.A. Cook. 2007. Endemic mammals of the Alexander Archipelago. Chapter 6.7, Pages 1–11 in J. Schoen and E. Dovichin (eds). *The Coastal Forests and Mountains Ecoregion of Southeastern Alaska and the Tongass National Forest: A Conservation Assessment And Resource Synthesis.* Audubon and Nature Conservancy, Special Publication.

Deal, R.L., and J.C. Tappeiner. 2002. The effects of partial cutting on stand structure and growth in western hemlock-Sitka spruce stands in Southeast Alaska. Forest Ecology and Management 159:173–186.

Delaney, C.J., and D. Timmons. 1992. High Voltage Power Lines: Do They Affect Residential Property Value? *Journal of Real Estate Research* 7(3):315–329.

Dellasala, D.A., J.C. Hagar, K.A. Engel, W.C. McComb, R.L. Fairbanks, and E.G. Campbell. 1996. Effects of silvicultural modifictions of temperate rainforest on breeding and wintering bird communities, Prince of Wales Island, Southeast Alaska. *The Condor* 98:706–721.

Demboski, J.R., B.K. Jacobsen, and J.A. Cook. 1998. Implications of cytochrome b sequence variation for biogeography and conservation of the northern flying squirrel (*Glaucomys sabrinus*) of the Alexander Archipelago, Alaska. *Canadian Journal of Zoology* 76:1771–1776.

Demboski, J.R., K.D. Stone, J.A. Cook. 1999. Further perspectives on the Haida Gwaii glacial refugium hypothesis. *Evolution* 53:2008–2012.

Des Rosiers, F. 2002. Power Lines, Visual Encumbrance and House Values: A Microspatial Approach to Impact Measurement. *Journal of Real Estate Research* 23(3):275–301.

Dillman, K.L., P.C. Krosse, and C. Sever. 2009. Tongass National Forest-Guidance for Biological Evaluations: Sensitive Plants. USDA Forest Service. Tongass National Forest. March.

Dingman S.L. 2002. *Physical Hydrology*. Second edition. Prentice Hall, Inc. New Jersey. 646 pages.

Doerr, J.G., E.J. Degayner, and G. Ith. 2005. Winter Habitat Selection by Sitka Black-tailed Deer. *Journal of Wildlife Management* 69:322–331.

Dose, J.J., and B.B. Roper. 1994. Long-term Changes in Low Flow Channel Widths Within the South Umpqua Watershed, Oregon. Water Resources Bulletin. 30: 993-1000.

Dugan, D., G. Fay, H. Griego, and S. Colt. 2009. Nature-Based Tourism in Southeast Alaska. ISER Working Paper 2009.1. March. Institute of Social and Economic Research, University of Alaska Anchorage. Available online at: www.iser.uaa.alaska.edu

EIA (U.S. Energy Information Administration). 2013. Carbon Dioxide Emissions Coefficients. Available online at: http://www.eia.gov/environment/emissions/co2_vol_mass.cfm

EPA (U.S. Environmental Protection Agency). 1997. EPA Responses to Comments Concerning the Draft NPDES General Permits: The proposed permit for log transfer facilities in Alaska that received a Section 404 permit prior to October 22, 1985. Permit number AK-G70-0000 and the proposed permit for log transfer facilities in Alaska, permit number AK-G70-1000. Accessed at: http://dec.alaska.gov/Water/WPSDocs/AKG700000_rtc.pdf

EPA. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses. April. Available online at: http://www.epa.gov/compliance/resources/policies/ej/index.html

EPA. 2011. Environmental Protection Agency. Wetland Types. Available online at: http://water.epa.gov/type/wetlands/bog.cfm

EPA. 2013. Clean Energy - Hydroelectricity. Available online at: http://www.epa.gov/cleanenergy/energy-and-you/affect/hydro.html

EPA. 2014. Greenhouse Gas Equivalencies Calculator. Available online at: http://www.epa.gov/cleanenergy/energy-resources/calculator.html

Everest, F., and G.H. Reeves. 2007. Riparian and aquatic habitats of the Pacific Northwest and southeast Alaska: ecology, management history, and potential management strategies. General Technical Report PNW-GTR-692. Portland, OR. U.S. Department of Agrigulture, Forest Service, Pacific Northwest Research Station. 130 p.

Executive Order 13112. 1999 Feb 3. Invasive Species. Available online at: http://www.invasivespecies.gov/laws/execorder.shtml

FAA (U.S. Department of Transportation Federal Aviation Administration). 2013. Airport Master Records; Form 5010. Petersburg James A. Johnson Airport. Available online at: http://www.gcr1.com/5010web/

Faris, T.L., and K.D. Vaughan. 1985. Log transfer and storage facilities in Southeast Alaskan: A review. United States Department of Agriculture Forest Service. Pacific Northwest Forest and Range Experimental Station. General Technical Report. PNW-1974

Farmer, C.J., D.K. Person, and R.T. Bowyer. 2006. Risk factors and mortality of black-tailed deer in a managed forest landscape. *Journal of Wildlife Management* 70:1403–1415.

Fay, G., A. V. Meléndez and T. Schwörer. 2012a. *Power Cost Equalization Funding Formula Review*. Report prepared for the National Renewable Energy Laboratory. Institute of Social and Economic Research, University of Alaska Anchorage. March.

Fay, G., A. V. Meléndez, and C. West. 2012b. Alaska Energy Statistics 1960-2011 Preliminary Report. Prepared by the Institute of Social and Economic Research, University of Alaska Anchorage in collaboration with Alaska Energy Authority. November.

FHWA (Federal Highway Administration). 2015. Kake Access Public Informational Meeting Presentation. Alaska Department of Transportation & Public Facilities (ADOT&PF) Southcoast Region and the Federal Highway Administration (FHWA) Western Federal Lands Highway Division (WFLHD). September. Available online at: http://flh.fhwa.dot.gov/projects/ak/kake/ Accessed on September 24, 2015.

Firman, A.S., and R.G. Bosworth. 1990. Harvest and use of fish and wildlife by residents of Kake, Alaska. Alaska Department of Fish and Game, Division of Subsistence. Juneau, AK. Technical Paper No. 145.

Fisheries Center. 2005. Food web models and data for studying fisheries and environmental impacts on Eastern Pacific ecosystems. Sylvie Guenette and Villy Christiensen (eds). Fisheries Center Research Reports. 13(1). Fisheries Center. University of British Columbia, Canada.

Flatten, C., K. Titus, and R. Lowell. 2001. Northern goshawk monitoring, population ecology and diet on the Tongass National Forest. Alaska Department of Fish and Game, Final Research Performance Report, Endangered Species Conservation Fund Grant SE-4-2-6:33, Studies 2-6, Juneau, USA.

Flynn, R.W., and T. Schumacher. 2001. Ecology of Martens in Southeast Alaska, 1 July 2000–30 June 2001. Alaska Department of Fish and Game. Federal aid in wildlife restoration final research performance report, grants W-23-4 to W-27-4. Study 7.16. Juneau, AK.

Flynn, R., S.B. Lewis, L.R. Beier, and G.W. Pendleton. 2007. Brown bear use of riparian and beach zones of northeast Chichagof Island: implications for streamside management in coastal Alaska. Alaska Department of Fish and Game, Wildlife Research Final Report.

Flynn, R., T.V. Schumacher, and M. Ben-David. 2004. Abundance, Prey Availability, and Diets of American Martens: Implications for the Design of Old-growth Reserves in Southeast Alaska. Wildlife Research Final Report. Alaska Department of Fish and Game.

Forgey, P. 2011. Challenging year for reopened Kake Seafoods. Juneau Empire. August 30. Available online at: http://juneauempire.com/local/2011-08-29/challenging-year-reopened-kake-seafoods

Franklin, J.F., D.R. Berg, D.A. Thornburgh, and J.C. Tappeiner. 1997. Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. Pages 111–140 in K.A. Kohm and J.F. Franklin (eds). *Creating a Forestry for the 21st Century*. Island Press, Washington, D.C.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. In: Influences Of Forest and Rangeland Management On Salmonid Fishes and Their Habitats. American Fisheries Society (Special Publication). 297-323.

Gehrels, G.E., and H.C. Berg. 1992. Geologic Map of Southeastern Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map 1867, 24 p., 1 sheet, scale 1:600,000.

Gehrels, G.E., and H.C. Berg. 1992. Geologic Map of Southeastern Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map 1867, 24 p., 1 sheet, scale 1:600,000.

Glaser, P.H. 1999. The Impact of Forestry Roads on Peatlands Within the Tongass National Forest, Southeast Alaska. Unpublished white paper.

Gomi, T., R.D. Moore, and A.S. Dhakal. 2006. Headwater stream temperature response to clear-cut harvesting with different riparian treatments, coastal British Columbia, Canada. *Water Resources Research* 42, W08437, doi:10.1029/2005WR004162.

Gomi, T., R.C. Sidle, R.D. Woodsmith, and M.D. Bryant. 2001. The characteristics of woody debris and sediment distribution in headwater streams, southeast, Alaska. Can. J For. Res. 31 1386-1399. NRC Canada. 2001.

Gomi, T., R.D. Moore, and M. Hassan. 2005. Suspended sediment dynamics in small forest streams of the Pacific Northwest. *Journal of the American Water Resources Association* 41(4):877-898.

Grant, G.E., and F.J. Swanson. 1990. Implications of Timber Harvest Pattern on Hydrologic and Geomorphic Response of Watersheds. *Eos, Transactions, American Geophysical Union* 71: 1321.

Grant, G.E.; S.L. Lewis, F.J. Swanson, J.H. Cissel, and J.J. McDonnell. 2008. Effect of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. General Technical Report. PNW-GTR-760. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station. 76p.

Greiser, W., and E. Carlson. 2013. Cultural Resources Report for the Kake-Petersburg Intertie Project. Prepared for the USDA Forest Service. Historic Research Associates, Inc.

Haggit, S. 2002. Little Hamilton Bay Log Transfer Facility Bark Monitoring Survey – 303(d) list transects. Survey date June 6, 2002. Submitted to United States Department of Agriculture, United States Forest Service, region 10, Tongass National Forest. Ketchikan, Alaska. USFS contract number 53-0116-2-00486

Hamilton, S.W., and G.M. Schwann. 1995. Do High Voltage Electric Transmission Lines Affect Property Value? *Land Economics* 71(4):436–44.

Hanley, T.A., and C.L. Rose. 1987. Influence of Overstory on Snow Depth and Density in Hemlock-spruce Stands: Implications for Management of Deer Habitat in Southeastern Alaska. Res. Note PNW-RN-459. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Hanley, T.A., C.T. Robbins, and D.E. Spalinger. 1989. Forest Habitats and the Nutritional Ecology of Sitka Black-Tailed Deer: A Research Synthesis with Implications for Forest Management. USDA Forest Service Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-230.

Hanley, T.A., M.H. McClellan, J.C. Barnard, and M.A. Friberg. 2013. Precommercial Thinning: Implications of Early Results From the Tongass-Wide Young-Growth Studies Experiments for Deer Habitat in Southeast Alaska. Pacific Northwest Research Station, PNW-RP-593. May 2013. 72 pages.

Hargis C.D., J.A. Bissonette, and D.L. Turner. 1999. The Influence of Forest Fragmentation and Landscape Pattern on American Martens. *Journal of Applied Ecology* 36:157–172.

Harr, R.D. 1986. Effects of clearcutting on rain-on-snow runoff in Western Oregon: a new look at old studies. *Water Resources Research* 22(7): 1095-1100.

Harris, A.S. 1989. Wind in the forests of southeast Alaska and guides for reducing damage. General Technical Report. PNW-GTR-244. Portland OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 63 p.

HCN (Health Council of the Netherlands). 2001. ELF Electromagnetic Fields Committee. Electromagnetic fields: Annual Update 2001. No. 2001/14.

HCN. 2004. ELF Electromagnetic Fields Committee. Electromagnetic fields: Annual Update 2003. The Hague: Health Council of the Netherlands. Publication No. 2004/1.

Heilman, P.E., and C. Gass. 1972. Parent Materials and Chemical Properties of Mineral Soils in Southeast Alaska. *Soil Science* 117(1): 21 – 27.

Heithecker, T., and C. Halpern. 2007. Edge-related Gradients in Microclimates in Forest Aggregrates Following Structural Retention Harvests in Western Washington. *Forest and Ecology Management* 248 (2007) 163-173. May 8, 2007.

Hennon, P.E., D.V. d'Amore, P.G. Schaberg, D.T. Wittwer, and C.S. Shanley. 2012. Shifting climate, altered niche, and a dynamic conservation strategy for yellow-cedar in the North Pacific Coastal Rainforest. *Bioscience* 62(2):147-158.

Hetrick N.J., M.A. Brusven, W.R. Meehan, and T.C. Bjornn. 1998. Changes in solar input, water temperature, periphyton accumulation, and allochthonous input and storage after canopy removal along two small salmon streams in southeast Alaska. *Transactions of the American Fisheries Society* 127: 859-875.

Hicks, B.J., et al. 1991. Long-term Changes in Streamflow Following Logging in Western Oregon and Associated Fisheries Implication. *Water Resources Bulletin* 27(2): 217-226.

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press, Seattle and London.

Hittle (D. Hittle & Associates) in association with Commonwealth Associates, Inc. and CH2M Hill, Inc. 2005. Kake-Petersburg Transmission Intertie Study. Final Report. Prepared for Southeast Conference, Juneau, Alaska. July 29.

Hittle, in association with Commonwealth Associates, Inc. and Tetra Tech EC, Inc. 2010. Kake-Petersburg Intertie Study Update. Final Draft Report. Prepared for Southeast Conference, Juneau, Alaska. January 10.

Hittle. 2014. Kake-Petersburg Intertie Study Update. Revised Route Options and Estimated Costs of Construction. Final Report. Prepared for Southeast Alaska Power Agency, Ketchikan, Alaska.

Hodges, J.I. 2011. Bald Eagle Population Surveys of the North Pacific Ocean, 1967-2010. *Northwestn Naturalist* 92:7-12.

Hubbart, J.A., T.E. Link, J.A. Gravelle, and W.J. Elliot. 2007. Timber harvest impacts on water yield in the continental/maritime hydroclimatic region of the United States. *Forest Science* 53(2): 169–180.

Hulten, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, California.

Hupp, J.W., J.I. Hodges, Jr., B.P. Conant, B.W. Meixell, and D.J. Groves. 2010. Winter Distribution, Movements, and Annual Survival of Radiomarked Vancouver Canada Geese in Southeast Alaska. *Journal of Wildlife Management* 74:274–284.

IARC (International Agency for Research on Cancer). 2002. IARC Monographs on the evaluation of carcinogenic risks to humans. Volume 80: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields. IARC Press. Lyon, France.

ICES (International Committee on Electromagnetic Safety). 2002. IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95. 6-2002. Piscataway, NJ: IEEE.

ICNIRP (International Commission on Non-Ionizing Radiation Protection). 1998. Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). *Health Phys* 74:494–522.

Intergovernmental Oceanographic Commission. 2007. Ocean Carbon Sequestration: A Watching Brief of the Intergovernmental Oceanographic Commission of UNESCO and the Scientific Committee of Ocean Research. Version 2. January.

ISLES. 2013 ISLES program website http://www.msb.unm.edu/mammals/ISLES_ website_final_20091028/ isles_home.html. Accessed March 2013.

Iverson, G.C., G.D. Hayward, K. Titus, E. DeGayner, R.E. Lowell, D.C. Crocker-Bedford, P.F. Schempf, and J. Lindell. 1996. Conservation assessment for the Northern Goshawk in southeast Alaska. USDA Forest Service Publication PNW-GTR-387

James, A.R.C., and A.K. Stuart-Smith. 2000. Distribution of Caribou and Wolves in Relation to Linear Corridors. Journal of Wildlife Management 64:154–159.

Johnson, A., D. Swanston, and K. McGee. 2000. Landslide Initiation, Runout, and Deposition within Clearcuts and Old-growth Forests of Alaska. *Journal of the American Water Resources Association* 36(1): 17-30.

Johnson, J., and P. Blanche. 2010. Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes – Southerneastern Region, Effective June 1, 2010. ADF&G, March 2010. 503 pp.

Jones, J.A. 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 10 small experimental basins, western Cascades, Oregon. *Water Resources Research* 36 (9): 2621-2642.

Jones, J.A., and G.E. Grant. 1996. Peak Flow Responses to Clear-cutting and Roads in Small and Large Basins, western Cascades, Oregon. *Water Resources Research* 32(4): 595-974.

Jones, S.H., and C.B. Fahl. 1994. Magnitude and Frequency of Floods in Alaska and Conterminous Basins of Canada: U.S. Geological Survey Water-Resources Investigations Report 93-4179, 122p.

Julin, K.R. 1997. Assessments of Wildlife Viability, Old-Growth Timber Volume Estimates, Forested Wetlands, and Slope Stability. General Technical Report PNW-GTR-392. U.S. Department of Agriculture, Pacific Northwest Research Station, Portland, OR.

Kahklen and Hartsog. 1999. Results of Road Erosion Studies on the Tongass National Forest. USDA Forest Service, Juneau Forestry Sciences Lab. 47 pp.

Kahklen, K., and J. Moll. 1999. Measuring the Effects of Roads on Goundwater: Five Case Studies. USDA FS Tech. and Devel. Program. 9977 1801-SDTDC. January 1999.

Kimbell, A. 2009. Climate Change Considerations in Project Level NEPA Analysis. Forest Service Chief's letter to the Forest Service National Leadership Team.

Kissling, M.L. 2003. Effects of Forested Buffer Width on Breeding Bird Communities in Coastal Forests of Southeast Alaska with a Comparison of Avian Sampling Techniques. Thesis, University of Idaho, Moscow.

Kissling, M.L., and E.O. Garton. 2008. Forested Buffer Strips and Breeding Bird Communities in Southeast Alaska. Journal of Wildlife Management 72:674–681.

Koeneman, T., and C.A. Botelho. 2000. Report to the Board of Fisheries, Southeast Alaska Shrimp Beam Trawl Fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Alaska. Regional Information Report No. 1J99-47. January 2000

König, H.L., Krueger, A.P., Lang, S. and Sönning, W. (1981). *Biological Effects of Environmental Electromagnetism.* New York: Springer-Verlag.

Kreutzweiser, D.P., and S.S. Capell. 2001. Fine sediment deposition in streams after selective forest harvesting without riparian buffers. *Canadian Journal of Forest Research* 31(1): 2134-2142.

Kruse, J., and R. Frazier. 1988. Report to the Community of (Kake): Tongass Resource Use Cooperative Study (TRUCS). A Report Series Prepared for 31 Communities in Southeast Alaska. Institute of Social and Economic Research, University of Alaska Anchorage in cooperation with the USDA Forest Service and the Alaska Department of Fish and Game. Division of Subsistence, Juneau.

Kruse, J.A., and R.M. Muth. 1990. Subsistence use of renewable resources by rural residents of Southeast Alaska. A final report series prepared for the USDA Forest Service. Institute of Social and Economic Research, University of Alaska Anchorage.

Landwehr, D. 1998. The Effectiveness of Standards and Guidelines in Preventing Additional Mass Movement. Ketchikan Area Watershed Group. An 89-94 KPC FEIS Monitoring Report. February.

Landwehr, D. 2014. Soil Scientist. USDA Forest Service, Region 10. Personal communication with David Cox, Tetra Tech. June 2.

Landwehr, D. J., and G. Nowacki. 1999. Statistical Review of Soil Disturbance Transect Data Collected on the Ketchikan Area, Tongass National Forest. Unpublished Monitoring Report. February, 1999.

Landwehr, D.J. 2008. Implementation and Effectiveness Monitoring of Wetland Best Management Practices on The Tongass National Forest. Unpublished Monitoring Report. November 2008.

Larsen, D.N. 1984. Feeding Habits of River Otters in Coastal Southeastern Alaska. Journal of Wildlife Management 48:1446–1452.

Louden, J. 2011. Noise Assessment. Borrego 1 Solar Project MUP 3300-10-026 Environmental Review Number 10-050-01. APN 140-290-12

Lowell, R.E. 2004. Letter to Patricia Grantham, District Ranger, Petersburg Ranger District. ADF & G Dept. of Wildlife Conservation. Petersburg, AK. March 3, 2004.

Lowell, R. 2006. Comment on wolf and marten population viability on Kuiu, Kupreanof and Mitkof Islands. ADF & G Dept. of Wildlife Conservation. Petersburg, AK. October 16, 2006.

Lowell, R.E. 2010. Unit 3. Pages 59-75 in P. Harper, editor. Furbearer Management Report of Survey and Inventory Activities 1 July 2006-30 June 2009. Alaska Department of Fish and Game. Project 7.0. Juneau, AK.

Lowell, R.E. 2011. Unit 3 Deer Management Report. Pages 45-57 in P. Harper, editor. Deer Management Report of Survey and Inventory Activities 1 July 2008-30 June 2010. Alaska Department of Fish and Game. Juneau, AK.

Luiken, M. 2016. Letter from Commissioner Marc Luiken, Office of the Commissioner, ADOT&PF to the Honorable Christine Bitterman, Mayor of Kake. February 18.Maas, K.M., J.C. Still, and P.E. Bittenbender. 1992. Mineral Investigations in the Ketchikan Mining District, Alaska, 1991 : Prince of Wales Island and vicinity. OFR 81-92. Juneau, AK: U.S. Bureau of Mines.

Madej, M.A. 1999. Temporal and Spatial Variability in Thalweg Profiles of a Gravel Bed River. *Earth Surface Processes and Landforms* 24: 1153-1169.

Manuwal, D.A., and N.J. Manuwal. 2002. Effects of Habitat Fragmentation on Birds in the Coastal Coniferous Forests of the Pacific Northwest. *Studies in Avian Biology* 25:103–112.

May, C. 2007. Sediment and Wood Routing in Steep Headwater Streams: An Overview of Geomorphic Processes and Their Topographic Signatures. *Forest Science* (53)2: 119-130.

May, C.L., and R.E. Gresswell. 2003. Large wood recruitment and redistribution in headwater streams in the southern Oregon Coast Range, U.S.A. *Canadian Journal of Forest Research* 33 (8): 1352-1362.

McClaren, E. 2004. "Queen Charlotte" Goshawk. In: Accounts and Measures for Managing Identified Wildlife - Accounts V. 2004. BC Ministry of Water, Land and Air Protection.

McDowell Group. 2005. Juneau Cruise Visitor Profile 2005. Alaska Travelers Survey. Prepared for the City and Borough of Juneau. Available online at: http://www.traveljuneau.com/downloads/ATSJuneauCruiseFinal.pdf

McDowell Group. 2007. Alaska Visitors Statistics Program. Alaska Visitor Volume and Profile. Summer 2006. April.

McDowell Group. 2013. Economic Impact of Alaska's Visitor Industry 2011-2012. Prepared for the State of Alaska, Department of Commerce, Community, & Economic Development, Division of Economic Development. February.

McGee, K. 2000. Effects of Forest Roads on Subsurface and Subsurface Flow in Southeast Alaska. Thesis submitted to Oregon University.

McPherson, E., and R. Simpson. 1999. Carbon Dioxide Reduction through Urban Forests. GSW 171 January 1999.

Melquist, W.E., and M.G. Hornocker. 1983. Ecology of River Otters in West Central Idaho. Wildlife Monographs 83.

Mercer, E. 2010. Population Projections, 2010 to 2034. Alaska by Age, Sex, and Race. Alaska Economic Trends. December. Pages 4-11.

Miller, M.D. 2012. Petersburg Borough approved by voters. Voters choose to dissolve city, incorporate as borough. Juneau Empire. Posted: December 18, 2012. Updated: December 19, 2012. Available online at: http://juneauempire.com/local/2012-12-18/petersburg-borough-approved-voters

Miller, M.D. 2012. Petersburg Borough approved by voters. Voters choose to dissolve city, incorporate as borough. Juneau Empire. Posted: December 18, 2012. Updated: December 19, 2012. Available online at: http://juneauempire.com/local/2012-12-18/petersburg-borough-approved-voters

Montgomery, D.R., Collins, B.D., Buffington, J.M., Abbe, T.B. 2003. Geomorphic effects of wood in rivers. American Fisheries Society Symposium, 2003.

Moore, R., and S.M. Wondzell. 2005. Physical hydrology and the effects of forest harvesting in the Pacific Northwest: A review. *Journal of the American Water Resources Association* 41(4):763-784.

Murphy, M.L., and A.M. Milner. 1997. Timber harvest and fish habitat. In: A.M. Milner and M.W. Oswood (Eds). *Freshwaters of Alaska: ecological syntheses*. Pp 229-263 Springer.

Nagorsen, D.W. 1996. Opossums, Shrews and Moles of British Columbia. Royal British Columbia Museum Handbook. Extracted from E-Fauna BC: Electronic Atlas of the Wildlife of British Columbia UCB Press, Vancouver BC. Available online at: http://linnet.geog.ubc.ca/efauna/Atlas/Atlas.aspx?sciname=Sorex%20monticolus

NAS (National Academy of Sciences). 1999. Research on POWER-FREQUENCY FIELDS, Completed Under the Energy Policy Act of 1992, Committee to Review the Research Activities Completed Under the Energy Policy Act of 1992, Commission on Life Sciences, National Research Council, National Academy Press, Washington, D.C.

Neal, E.G., M. Walter, and C. Coffeen. 2002. Linking the Pacific decadal oscillation to seasonal stream discharge patterns in Southeast Alaska. *Journal of Hydrology* 263:188–197.

NESC (National Electric Safety Code). 2007. National Electrical Safety Code. 2007 ed. Institute of Electrical and Electronics Engineers, Inc., New York, NY. 287 pages.

NIEHS (National Institute of Environmental Health Sciences). 1998. Assessment of health effects from exposure to power-line frequency electric and magnetic fields: Working Group Report. NIH Publication No. 98-3981. Research Triangle Park, NC: National Institute of Environmental Health Sciences of the U.S. National Institutes of Health.

NIEHS (National Institute of Environmental Health Sciences). 1999. Health effects from exposure to power line frequency electric and magnetic fields. NIH; National Institute of Health; NIH No. 99-4493; Research Triangle Park, NC.

NMFS (National Marine Fisheries Service). 2004. Fishery Management Program for the Scallop Fishery off Alaska. (2004) National Marine Fisheries Service. North Pacific Fishery Management Council. Alaska Department of Fish and Game

NMFS. 2005. Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska. US Department of Commerce, National Oceanographic and Adminstrative Administration, National Marine Fisheries Service. Alaska Region.

NOAA (National Oceanographic and Atmospheric Administration). 1972a. Survey H09343. 127 samples: November 7, 1972 through November 8, 1972. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1972b. Survey H09483. 6 samples: October 19, 1972. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1972c. Survey H097343: 127 Samples November 3 through November 8, 1972. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1974. Survey H09333, 106 samples: October 27 through November 3, 19728. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1978a. Survey H09792: 11 Samples September 29 through October 11, 1978. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1978b. Survey H09791: 11 Samples September 29 through October 24, 1978. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1978c. Survey H09795: October 5 through October 25, 1978. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center. http://maps.ngdc.noaa.gov/viewers/sample_index/

NOAA. 1987. Survey H10256: 84 Samples. October 3 through October 16, 1987. Seabed descriptions from NOAA/NOS and USCGS Hydrographic Surveys. . NOAA National Geophysical Data Center. http://www.ngdc.noaa.gov/geosamples/survey.jsp

NOAA. 1988a. Survey H010265: 26 Samples April 28 through April 29, 1988. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1988b. Survey H010269: 40 Samples April 29 and May 12, 1988. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center.

NOAA. 1988c. Survey H010272: 45 Samples May 13 through May 18, 1988. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center

NOAA. 1988d. Survey H010288: 76 Samples October 20 through October 25, 1988. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center

NOAA. 1988e. Survey H010289: 81 Samples October 10 through November 3, 1988. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center

NOAA. 1989. Survey H010295: 86 Samples March 21 through March 31, 1989. Seabed Descriptions from NOAA/NOS and USCGS Hydrographic Surveys. NOAA National Geophysical Data Center

NOAA. 1998. Chart 17367; US Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service. Coast Survey. 1998. www.oceangrafix.com/chart/zoom?chart=17367

NOAA. 2013. Chart 17360 corrected through march 2013; US Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service. Coast Survey. www.oceangrafix.com/chart/zoom?chart=17360.

NPFMC (North Pacific Fisheries Management Council). 2010. Fishery Management Plan for Groundfish of the Gulf of Alaska. http://www.fakr.noaa.gov/npfmc/fmp/goa/goa.htm.

NRCS (USDA Natural Resources Conservation Service). 2009. Huc_12.gdb. National Cartography and Geospatial Center. Fort Worth, TX. Accessed at: http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/index.html

NRCS. 2010. Soil Survey Staff. United States Department of Agriculture. Official Soil Series Descriptions. Available online at http://soils.usda.gov/technical/classification/osd/index.html. Accessed April 2012.

NRPB (National Radiological Protection Board). 2001. Response statement of the NRPB: ELF electromagnetic fields and the risk of cancer. National Radiological Protection Board, Chilton, Dicot, Oxon, Volume 12, No.1, ISNB 0-859951-456-0.

NRPB. 2004. Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0-300 GHz) National Radiological Protection Board, Volume 15, No 3.

Opolka, T. 2012a. Kake-Petersburg Intertie Transmission Line Project Invasive Plant Risk Assessment. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. May.

Opolka, T. 2012b. Kake-Petersburg Intertie. Transmission Line Project Wetlands Resource Report. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. May.

Parrent, D.J. 2012. Tongass Sawmill Capacity and Production Report for CY 2011. Final Report. October 16. State & Private Forestry, USDA Forest Service, Alaska Region.

Patric, J.H. 1966. Rainfall Interception by Mature Coniferous Forests of Southeast Alaska. J. of Soil and Water Conservation. November-December Issue, 1966.

Paustian, S.J. 2004. Development and Implementation of a Riparian Conservation Strategy for the Tongass National Forest. Paper Presented at: American Water Resources Association Conference: Riparian Ecosystems and Buffers: Multi-Scale Structure, Function and Management, June 28-30, 2004, Olympic Valley, CA. Available in Logjam planning file.

Person, D. 2001. Alexander Archipelago Wolves: Ecology and Population Viability in a Disturbed, Insula Landscape. Doctoral dissertation, University of Alaska Fairbanks, AK.

Person, D.K., and A.L. Russell. 2008. Correlates of Mortality in an Exploited Wolf Population. *Journal of Wildlife Management* 72:1540–1549.

Person, D.K., and B.D. Logan. 2012. A Spatial Analysis of Wolf Harvest and Harvest Risk on Prince of Wales and Associated Islands, southeast Alaska. Final Wildlife Research Report, ADF&G/DWC/WRR-2011-1. Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK.

Petersburg Borough. 2013. Parks and Recreation. Parks and Trails. Available online at: http://www.ci.petersburg.ak.us

Pollock, M.M., T.J. Beechie, M. Liermann, and R.E. Bigley. 2009. Stream Temperature Relationships to Forest Harvest in Western Washington. *Journal of the American Water Resources Association* 45(1):141-156.

Poole, G., J. Dunham, M. Hicks, D. Keenan, J. Lockwood, E. Materna, D. McCullough, C. Mebane, J. Risley, S. Sauter, S. Spalding, and D. Sturdevant. 2001. Scientific issues relating to temperature criteria for salmon, trout, and charr native to the Pacific Northwest. U.S. Environmental Protection Agency, EPA 910-R-01-007, Seattle

Porter, B. 2008. Black Bear Management Report of Survey-Inventory Activities 1 July 2004–30 June 2007. P. Harper, editor. Alaska Department of Fish and Game, Juneau, AK.

POST (Parliamentary Office of Science and Technology). 2006. Carbon Footprint of Electricity Generation. October 2006, Number 268.

Prussian, K. 2010. Throughfall Monitoring – Prince of Wales Island, Alaska. Tongass National Forest. Unpublished Paper. Accessed at: http://www.fs.fed.us/r10/tongass/projects/tlmp/2010_monitoring_report/1021PrussianThroughfall.pdf

Ralph, S.C., G.C. Poole, L.L. Conquest, and R.J. Naiman. 1994. Stream channel morphology and woody debris in logged and unlogged basins of Western Washington. *Canadian Journal of Fisheries and Aquatic Science* 51:37-51.

Ratner, NC., and M.F. Turek. 2009. Customary and Traditional Use Worksheet: Shellfish in Districts 6A, 8, and 10, Southeast Alaska. Special Publication No. BOP 2009-01. Alaska Department of Fish and Game. Division of Subsistence

Reid, L.M., and T. Dunne. 1984. Sediment Production From Forest Road Surfaces. *Water Resources Research* 20(11): 1753-1761.

Renewable Energy Alaska Project. 2013. Renewable Energy Atlas of Alaska. A Guide to Alaska's Clean, Local, and Inexhaustible Energy Resources. May. Available online at: www.akenergyauthority.org

Reynolds, R.T., J.D. Wiens, and S.R. Salafsky. 2006. A Review and Evaluation of Factors Limiting Northern Goshawk Populations. *Studies in Avian Biology* 31

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwind, R. Smith, and E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. USDA Forest Service, Fort Collins, CO. Gen. Tech. Rep. RM-217.

Robinson, S.K., F.R. Thompson III, T.M. Donovan, D.R. Whitehead, and J. Faaborg. 1995. Regional Forest Fragmentation and the Nesting Success of Migratory Birds. *Science* 267:1987–1990.

Schmeige, D.C., A.E. Helmers, and D.M. Bishop. 1974. The Forest Ecosystem of Southeast Alaska. Series 8. Pacific Northwest Forest and Range Experiment Station. Portland, OR.

Schoen, J. and L. Peacock. 2007. Black bear (Ursus americanus). Chapter 6.3, Pages 1-10 in, J. Schoen and E. Dovichin (eds). *The Coastal Forests and Mountains Ecoregion of Southeastern Alaska and the Tongass National Forest: A Conservation Assessment and Resources Synthesis.* Audubon and Nature Conservancy, Special Publication.

Schoen, J.W., and M.D. Kirchhoff. 1990. Seasonal habitat use by Sitka black-tailed deer on Admiralty Island. *Journal of Wildlife Management* 54:371–378.

Schoen, J.W., M.D. Kirchhoff, and O.C. Wallmo. 1984. Sitka Black-tailed Deer/Old-growth Relationships in Southeast Alaska: Implications for Management. Pages 315–319 in W.R. Meacham, T.R. Merrell, and T.A. Hanley (eds). *Proceedings of the Symposium on Fish and Wildlife relationships in Old Growth Forests.* American Institute of Fisheries Research Biologists, Juneau, AK.

SEAPA (Southeast Alaska Power Agency). 2015. Planning. Available online at: http://www.seapahydro.org/planning.php

Shor, S. 2014. In Kake, Sun Provides Light at the end of the Tunnel. Juneau Empire. December 28. Available online at: http://juneauempire.com/local/2014-12-28/kake-sun-provides-light-end-tunnel

Skousen, J.G., A. Sexstone, and P.F. Ziemkiewicz. 2000. Acid Mine Drainage Control and Treatment. American Society of Agronomy and American Society for Surface Mining and Reclamation. Agronomy No. 41.

Skud, B.E. 1959. Herring spawning Surveys in Southeastern Alaska. United States Fish and Wildlife Service. Special Scientific Report – Fisheries No. 321

Smith, M., and M. Belk. 1996. *Sorex monticolus*. Mammalian species, No. 528: 1-5. As cited in: Banasiak, K. 2001. “Sorex monticolus” (Online), Animal Diversity Web. May 17. Available online at: http://animaldiversity.ummz.umich.edu/accounts/Sorex_monticolus/ (Accessed October 29, 2013).

Smith, WP. 2012. Big Thorne Project – Comments.

Smith, WP. 2013. Spatially Explicit Analysis of Contributions of a Regional Conservation Strategy Toward Sustaining Northern Goshawk Habitat. Wildlife Society Bulletin DOI: 10.1002/wsb.271. Accepted January 2013. 10 pages.

Soil Survey Division Staff. 1993. Soil Survey Manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Southeast Alaska GIS Library 2010. Tongass National Forest Soil Inventory. Available at http://seakgis.alaska.edu/home/

Sperry, D.M. 2006. Avian Nest Survival in Post-logging Coastal Buffer Strips on Prince of Wales Island, Alaska. Thesis. Humboldt State University, Arcata, CA.

Spies, T.A. 2004. Ecological Concepts and Diversity of Old-growth Forests. *Journal of Forestry* April/May:14–20.

SSSA (Soil Science Society of America). 2011. Glossary of Soil Science Terms. Available online at: https://www.soils.org/publications/soils-glossary (Accessed October 2011).

Stangl, J.T. 2009. Tongass National Forest Project Level Goshawk Inventory Protocol. USDA Forest Service, Sitka, AK. 9 pp.

Still, J.C., P.E. Bittenbender, K.W. Bean, and E.G. Gensler. 2002. Mineral Assessment of the Stikine Area, Central Southeast Alaska. Bureau of Land Management. Technical Report 51.

Stone, K.D., and J.A. Cook. 2000. Phylogeography of black bears (*Ursus americanus*) of the Pacific Northwest. *Canadian Journal of Zoology* 78:1218–1223.

Sustainable Southeast. 2014. Kake Hydroelectrical Reconnaissance in the Gunnuk Watershed. January 17. Available online at: http://sustainablesoutheast.net/kake-hydro-recon/

Swanston, D. 1969. Mass Wasting in Coastal Alaska. USDA Forest Service, Pacific Northwest Forest and Range Experiment Stations, USDA Institute of Northern Forestry, Juneau, Alaska. Research Paper PNW-83.

Swanston, D.N., and D.A. Marion, 1991. Landslide Response to Timber Harvest in Southeast Alaska. In: *Proceedings of the Fifth Federal Interagency Sedimentation Conference*, S.S. Fan and Y.H. Kuo (editors).

Swanston, D.N., and F.J. Swanson. 1976. Timber harvesting, mass erosion and steepland forest geomorphology in the Pacific Northwest. Pages 199-221 in *Geomorphology and Engineering*, Coates, D.R. (ed.). Dowden, Hutchinson and Ross, Stroudsburg, PA.

Szepanski, M.M., M. Ben-David, and V. Van Ballenberghe. 1999. Assessment of anadromous salmon resources in the diet of the Alexander Archipelago wolf using stable isotope analysis. *Oecologia* 120:327-335.

Taylor, P.D., L. Fahrig, K. Henein, and G. Merriam. 1993. Connectivity is a Vital Element of Landscape Structure. *Oikos* 68:571–573.

Tetra Tech. 2010. Ocean Discharge Criteria Evaluation: APDES General Permit. Small publicly owned treatment works (POTWs) and other small treatment works providing secondary treatment of domestic sewage discharging to marine waters in Alaska. APDES General Permit No. AKG-57-M000. Prepared for Alaska Department of Environmental Conservation, Domestic Wastewater Discharge Program

Tetra Tech. 2011. Pre-Field Review Worksheet for Sensitive Plants. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District by Teresa Opolka, Tetra Tech, Inc. July.

Tetra Tech. 2012. Scenery Resource Report. Kake-Petersburg Intertie Project. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. Tetra Tech, Inc. May.

Tetra Tech. 2014a. Kake-Petersburg Intertie Transmission Line Project Soils and Geology Resource Report. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. September.

Tetra Tech. 2014b. Kake-Petersburg Intertie Transmission Line Project Aquatics Resource Report. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. I September.

Tetra Tech. 2014c. Kake-Petersburg Intertie Transmission Line Project Combined Biological Assessment and Biological Evaluation. Prepared for Petersburg Ranger District, Tongass National Forest. September.

Tetra Tech. 2014d. Kake-Petersburg Intertie Transmission Line Project Botany Resource Report. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. September.

Tetra Tech. 2014e. Kake-Petersburg Intertie Transmission Line Project Biological Evaluation for Plants. Prepared for the USDA Forest Service, Tongass National Forest, Petersburg Ranger District. September.

Tetra Tech. 2014f. Kake-Petersburg Intertie Transmission Line Project Wildlife and Subsistence Use Resource Report. Prepared for Petersburg Ranger District, Tongass National Forest. September.

Tetra Tech. 2015. Kake to Petersburg Transmission Line Intertie Project Biological Assessment. Prepared for the USDA Forest Service, Petersburg Ranger District, Tongass National Forest. November 2015. 31 pp.

Thalheimer, E. 1996. Construction noise control program and mitigation strategy at the central artery tunnel project. INCE Noise Control Conference. Seattle, WA.

Tucker, E., and Thompson, J. 2010. Effectiveness of Best Management Practices for Water Quality, Forest Plan Monitoring –Tongass National Forest. July 2010. Available on Forest Service FTP site: ftp://ftp2.fs.fed.us/incoming/chugtong_r10/watershed/SWCA/TongassBMPEffectiveness/TuckerThompson2010.pdf

U.S. Census Bureau. 2011a. QT-PL - Race, Hispanic or Latino, Age, and Housing Occupancy: 2010. Available online at: www.census.gov

U.S. Census Bureau. 2011b. State & County QuickFacts. Available online at: http://quickfacts.census.gov/qfd/index.html

U.S. Census Bureau. 2012. Table 1: 2011 Poverty and Median Income Estimates – Counties. Small Area Estimates Branch. December. Available online at: http://www.census.gov/did/www/saipe/

USDA Forest Service (U.S. Department of Agriculture Forest Service). No date. Visual Priority Routes and Use Areas Seen / Unseen & Visibility Analysis Criteria

USDA Forest Service. 1974. National Forest Landscape Management, Volume 2, Chapter 1, the Visual Management System. USDA Agriculture Handbook Number 462.

USDA Forest Service. 1982. ROS Users Guide. U.S. Government Printing Office. Available online at: http://www.fs.fed.us/cdt/carrying_capacity/rosguide_1982.pdf

USDA Forest Service. 1993. Stikine Area Soil Survey Users Guide. Tongass National Forest. Ketchikan, AK.

USDA Forest Service. 1995. Landscape Aesthetics – A Handbook for Scenery Management. USDA Agriculture Handbook Number 701.

USDA Forest Service. 1997a. Swan Lake – Tyee Lake Intertie Final Environmental Impact Statement. Volume 1. USDA Forest Service. Alaska Region, Alaska. Ketchikan and Wrangell Ranger Districts.

USDA Forest Service. 1997b. Tongass Land Management Plan Revision, Final Environmental Impact Statement. R10-MB-338b. Forest Service, U.S. Department of Agriculture. January.

USDA Forest Service. 2000. Forest Service Roadless Area Conservation, Final EIS. Volume 2. November.

USDA Forest Service. 2001a. Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada. USDA Forest Service, Alaska Region, R10-TP-75. October 2001.

USDA Forest Service. 2001b. Aquatic Habitat Management Handbook. U.S. Forest Service. Alaska Region: FSH 2090.21.

USDA Forest Service. 2001c. 36 CFR Part 294 Special Areas; Roadless Area Conservation; Final Rule. Washington, DC.

USDA Forest Service. 2003. Tongass Land Management Plan Revision, Final Supplemental Environmental Impact Statement Roadless Area Evaluation for Wilderness Recommendations. Available at http://www.tongass-seis.net/seis/index.html

USDA Forest Service. 2005a. Tongass National Forest Annual Monitoring and Evaluation Report for Fiscal Year 2005. Retrieved on April 24, 2008 from http://www.fs.fed.us/r10/tongass/projects/tlmp/2005_monitoring_report/index.shtml

USDA Forest Service. 2005b. Landscape Character Types of the Tongass National Forest. Prepared for Tongass National Forest by Tetra Tech. CD Manual.

USDA Forest Service. 2006. FSH 2509.22 – Soil and Water Conservation Handbook. Forest Service Handbook. Alaska Region (Region 10). Juneau, Alaska.

USDA Forest Service. 2008a. Land and Resource Management Plan, Tongass National Forest, Alaska Region, R10-MB-603b.

USDA Forest Service. 2008b. Tongass Land and Resource Management Plan. Final Environmental Impact Statement. Plan Amendment. Record of Decision. R10-MB-603a.

USDA Forest Service. 2008c Tongass Land and Resource Management Plan. Final Environmental Impact Statement. Plan Amendment. Volume 1. R10-MB-603c.

USDA Forest Service. 2009a. Access and Travel Management Plan Environmental Assessment. Petersburg Ranger District, Tongass National Forest.

USDA Forest Service. 2009b. Access Travel Management Plan. Decision Notice and Finding of No Significant Impact. Prince of Wales and Surrounding Islands. Craig and Thorne Bay Ranger Districts, Tongass National Forest.

USDA Forest Service. 2009c. Central Kupreanof Timber Harvest Final Environmental Impact Statement. Volume A. USDA Forest Service, Petersburg Ranger District. Tongass National Forest. R10-MB-633a

USDA Forest Service. 2009d. Forest Service Alaska Region Sensitive Species List, Assessment and Proposed Revisions to the 2002 List. Tongass National Forest, Alaska.

USDA Forest Service. 2010a. Forest Service Watershed Condition Classification Technical Guide. Updated October 25, 2010.

USDA Forest Service. 2010b. GIS Data provided for Goshawk Surveys.

USDA Forest Service. 2011a. FSM (Forest Service Manual) 2900 Invasive Species Management. Washington DC

USDA Forest Service. 2011b. Central Kupreanof Timber Harvest Record of Decision. USDA Forest Service, Petersburg Ranger District. Tongass National Forest. R10-MB-704.

USDA Forest Service. 2011c. Watershed Condition Framework. FS-977. May 2011

USDA Forest Service. 2011d. Aquatics Resource Report for Tonka Timber Sale, Draft EIS. Tongass National Forest.

USDA Forest Service. 2012a. National Best Management Practices for Water Quality Management on National Forest System Lands. FS-990a. April.

USDA Forest Service. 2012b. Tonka Timber Sale Change Analysis Exhibit 1. August 23.

USDA Forest Service. 2012c. Tonka Timber Sale. Final Environmental Impact Statement. Petersburg Ranger District. Petersburg, Alaska. USDA Forest Service, Tongass National Forest. R10-MB-705c. March 2012.

USDA Forest Service. 2012d. Transportation System. 2012 Tongass Monitoring and Evaluation Report. USDA Forest Service. Tongass National Forest. Region 10. Alaska.

USDA Forest Service. 2012e. Seal Point Recreation Enhancement Project Environmental Assessment. R10-MB-735a. Petersburg Ranger District, Tongass National Forest. March.

USDA Forest Service. 2012f. Timber Supply and Demand: 2011. Alaska National Interest Lands Conservation Act, Section 706(a) Report to Congress; Statistical Appendix. USDA Forest Service, Alaska Region. Draft. November 16.

USDA Forest Service. 2012g. Regional Forester Affirms Tongass Record of Decision for Tonka Timber Sale near Petersburg. News Release. USDA Forest Service. Alaska Region. August 1. Available online at: http://www.fs.usda.gov/detail/r10/news-events/?cid=STELPRDB5387314

USDA Forest Service. 2013a. Region 10 – Alaska. Tongass National Forest Five Year Timber Sale Schedule and Contract Plan – FSM 2431.21.

USDA Forest Service. 2013b. Region 10 – Alaska. Tongass National Forest. Forest Precommercial Thinning Plan - Service Contracts. September 6.

USDA Forest Service. 2013c. Wildlife 5-year Integration Plan FY-2014 - FY-2018. Petersburg Ranger District, Tongass National Forest. November 6.

USDA Forest Service. 2013d. 2012 Tongass Monitoring and Evaluation Report. Stream-Fish Habitat Question 3 – Riparian Vegetation. Available online at: http://www.fs.usda.gov/detail/tongass/landmanagement/planning/?cid=stelprdb5396825

USDA Forest Service. 2014a. Petersburg Ranger District Cabin Use Data, 2002-2013.

USDA Forest Service. 2014b. Motor Vehicle Use Map. Tongass National Forest Petersburg Ranger District. January. Available online at: http://www.fs.usda.gov/detail/tongass/maps-pubs/?cid=stelprdb5430063

USDA Forest Service. 2014c. Special Use Permit Information. Petersburg Ranger District. Tongass National Forest. May 20.

USFWS (U.S. Fish and Wildlife Service). 2002. Birds of Conservation Concern 2002. 105 pp.

USFWS (U.S. Fish and Wildlife Service). 2006. Recommended Time Periods for Avoiding Vegetation Clearing in Alaska in order to Protect Migratory Birds. 2pp.

USFWS. 2007. Queen Charlotte Goshawk Status Review. U.S. Fish and Wildlife Service, Alaska Region, Juneau Fish and Wildlife Field Office.

USFWS. 2009. Eagle Permits; Take Necessary to Protect Interests in Particular Localities. 74 Federal Register 175:46836-46879; September 11, 2009.

USGS (U.S. Geological Survey). 2000. Correspondence to Mr. Steve Paustian by Ed Neal, Hydrologist. July 28, 2000. Available in the Logjam Timber Sale planning record.

USGS (U.S. Geological Survey). 2008. Alaska Resource Data File (ARDF): U.S. Geological Survey Open-File Report 2008-1225.

V3 Energy, LLC. 2012. Kake, Alaska Wind Resource Report. Prepared by D. Vaught, P.E. January.

Wallmo, O.C., and J.W. Schoen. 1980. Responses of Deer to Secondary Forest Succession in Southeast Alaska. *Forest Science* 26:448–462.

Warren, J., and R. Kreiger. 2011. Fish Harvesting in Alaska. *Alaska Economic Trends*. November.

Washington Natural Heritage Program. 2012. List of Vascular Plants Tracked by the Washington Natural Heritage Program. Available online at: http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html (Accessed April 2012).

Weckworth, B.V., S. Talbot, G.K. Sage, D.K. Person, and J. Cook. 2005. A Signal for Independent Coastal and Continental Histories Among North American Wolves. *Molecular Ecology* 14:917–931.

Wemple, B.C., et al. 1996. Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. Water Resources Bulletin. American Water Resources Association V 32 NO.6. Western Federal Lands Highway Division (WFLHD). 2008. Phase I Site Assessment Data Report – FS 3030 Road. Water Quality Assessment. Project number 14481. Federal Highway Administration, Vancouver, Washington. 137 pp.

Wemple, B.C., and J.A. Jones. 2003. Runoff production on forest roads in a steep, mountain catchment. *Water Resources Research* 39(8): 1220, doi: 10.1029/2002WR001744

Whitacre, H., and C. Harlan. 2009. Aquatics Resource Report for Central Kupreanof Timber Harvest, Final EIS. USDA Forest Service, Tongass National Forest.

Whitacre, H., and H. Lombard. 2011. Aquatics Resource Report for Tonka Timber Sale, DEIS. USDA Forest Service, Tongass National Forest.

White, K.S., G.W. Pendleton, and E. Hood. 2009. Effects of Snow on Sitka Black-Tailed Deer Browse Availability and Nutritional Carrying Capacity in Southeastern Alaska. *Journal of Wildlife Management* 73:481–487.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat Fragmentation in the Temperate Zone. Pages 237-256 in M. E. Soulé (ed). *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates, Inc., Sunderland, Massachusetts.

Wilson, B.L., R.E. Brainerd, D. Lytjen, B. Newhouse, and N. Otting. 2008. *Field Guide to the Sedges of the Pacific Northwest*. Oregon State University Press, Corvallis, Oregon.

Woodsmith, R.D., J.R. Noel, and M.L.Dilger. 2005. An approach to effectiveness monitoring of floodplain channel aquatic habitat: channel condition assessment. *Landscape and Urban Planning* 72: 177-204.

Yahner, R.H., and D.P. Scott. 1988. Effects of Forest Fragmentation on Depredation of Artificial Nests. *Journal of Wildlife Management* 65:915–925.

Yeo, J.J., and J.M. Peek. 1992. Habitat selection by female Sitka black-tailed deer in logged forests of southeastern Alaska. *Journal of Wildlife Management* 56:253–261.

Zedler, J., and S. Kercher. 2004. Causes and Consequences of Invasive Plants in Wetlands: Opportunities, Opportunists, and Outcomes. *Critical Reviews in Plant Sciences* 23(5): 4431-4452.

List of Preparers

This chapter identifies the preparers and major contributors/reviewers for this EIS and summarizes their education and experience levels.

Preparers:

Steve Negri, IDT Leader/Tetra Tech Project Manager
Education: M.S. Wildlife Ecology, Michigan State University, 1995
B.S. Business Finance, University of Missouri, 1985
Professional Experience: 18 years

Matt Dadswell, Tetra Tech EIS Manager
Education: Ph.D. studies, Geography, University of Washington
M.A. Geography, University of Cincinnati, 1990
B.A. Economics and Geography, Portsmouth Polytechnic, 1988
Professional Experience: 20 years

Kathryn Beck, Botanist
Education: B.S. Environmental Sciences, Western Washington University, 1982
B.A. Biology, Western Washington University, 1982
Professional Experience: 31 years

Karen Brimacombe, Botanist
Education: M.S. Botany, University of Hawaii, 2003
B.A. Psychology, Miami University, 1992
Professional Experience: 14 years

David Cox, Geologist/Hydrologist
Education: B.S. Geology, Western Washington University, 2000
Professional Experience: 11 years

John Crookston, Ecologist
Education: M.S. Ecology, San Diego State University, 2007
B.S. Biology, University of California San Diego, 2002
Professional Experience: 12 years

Weber Greiser, Archaeologist
Education: Graduate coursework in Anthropology, University of Colorado
M.A. Anthropology, University of New Mexico
B.A. Anthropology, University of New Mexico
Professional Experience: 41 years

Jennifer Hawkins, Environmental Scientist
Education: B.S. Environmental Science, Marist College, 1994
Professional Experience: 16 years

Chris James, Hydrologist
Education: M.S. Forest Hydrology, University of Washington, 2007
Graduate studies in Environmental Management and Engineering, Portland State University

B.A. Environmental Resources (Chemistry minor), Lewis and Clark College, 1999
Professional Experience: 7 years (including 2 years with the Forest Service and BLM)

Rachael Katz, Environmental Planner
Education: M.P.A. Environmental Policy and Natural Resource Management, University of Washington, 2011
B.A. Political Science and German Studies, New York University, 2005
Professional Experience: 10 years

John Knutzen, Fish Biologist
Education: M.S. Fisheries, University of Washington, 1977
B.A. Biology, Western Washington State College, 1972
Professional Experience: 34 years

Sierra Marrs, GIS Analyst
Education: Certificate, GIS, Green River Community College, 2005
B.S. Environmental Geology, Western Washington University, 2003
Professional Experience: 8 years

Teresa Opolka, Ecologist
Education: B.S. Biology, Seattle University, 1998
Professional Experience: 13 years

MaryJo Watson, GIS Analyst
Education: B.S. Computer Information Systems, Menlo College
Professional Experience: 19 years

Brita Woeck, Wildlife Biologist
Education: M.S. Wildlife Ecology and Management, University of Missouri, 2003
B.S. Wildlife Science, University of Washington, 1999
Professional Experience: 12 years

Major Contributors/Reviewers:

Jason C. Anderson, District Ranger
Education: B.A. Biological Sciences, California State University - Stanislaus, 1997
Forest Service experience: 18 years

Tom Parker, Supervisory Resource Staff
Education: B.S. Natural Resource Management, Sheldon Jackson College
Forest Service experience: 26 years

Karen Iwamoto, NEPA Coordinator
Education: B.A. Anthropology & History, Oregon State University
Forest Service experience: 32 years

Mary Clemens, Botanist
Education: B.S. Forest Management, Washington State University
Forest Service experience: 32 years

Jason D Dungan, Wildlife Biologist
Education: B.S. Wildlife Biology, Southwest Missouri State University; MS Wildlife Resources, University of Idaho
Forest Service experience: 4 years

Patricia Krosse, Tongass National Forest, Ecology, Botany and Invasive Species Program Manager
Education: B.S. Soil Science, California Polytechnic State University, San Luis Obispo
Forest Service experience: 30 years

Rodd Kubitza, Transportation Planner
Education: B.S. Forest Engineering Oregon State University
Forest Service experience: 38 years

Heidi Lombard, Fisheries Biologist
Education: B.S. Fisheries Biology, Humboldt State University
Forest Service experience: 12 years

Steven Lombard, Timber
Education: B.S. Forestry, Texas A&M
Forest Service experience: 12 years

Gene Primaky, GIS Analyst
Education: Bemidji State University; Certificate of Forestry, Alaska Vocational Technical College
Forest Service experience 21 years

Becki Reynold, Soil Scientist
Education: B.S. Soil and Land Resources, University of Idaho
Forest Service experience: 8 years

Jane Smith, Archaeologist
Education: B.S. Socio-Anthropology, Radford University
Forest Service experience: 22 years

Julianne Thompson, Forest Hydrologist
Education: B.S. Natural Resources Management, California Polytechnic State University, 1985
Graduate studies in Wildland Hydrology, Colorado State University 1985-1988
Forest Service experience: 20 years

Heath Whitacre, Hydrologist
Education: B.S. Environmental Biology, Fort Lewis College; M.S. Watershed Science, Utah State University
Forest Service experience: 12 years

Marina Whitacre, Writer-Editor
Education: B.A. Biology, Colorado College; MS Range Science, Utah State University
Forest Service experience: 10 years

Distribution List

A copy of this Draft EIS or an electronic or hard copy letter with a link to the online copy was sent to the following parties. These parties either commented on the project, requested a copy of the Draft EIS during scoping or at some other time during the NEPA process, or are part of the Tongass National Forest mandatory mailing list (Forest Service Handbook 1909.15, Sections 23.2 and 63.1).

Agencies

State of Alaska, Department of Environmental Conservation

State of Alaska, Department of Fish and Game (Division of Habitat; Division of Wildlife Conservation)

State of Alaska, Department of Natural Resources (Division of Coastal and Ocean Management; Division of Forestry; Office of Project Management and Permitting; Office of History and Archeology; Trust Land Office)

US Advisory Council on Historic Preservation

US Air Force 611th

US Army Corps of Engineers, Juneau Regulatory Field Office

US Army Engineer District

US Army Engineers, Pacific Ocean Division

US Coast Guard, Environmental Management

US Department of Commerce, NOAA, National Marine Fisheries Service, Protected Resources Management Division

US Department of Commerce, NOAA, Office of Policy and Strategic Planning

US Department of Energy, Office of NEPA Policy and Compliance

US Department of Transportation, Federal Aviation Administration

US Department of Transportation, Federal Highway Administration

USDA Animal and Plant Health Inspection Service (APHIS), Policy and Program Development (PPD) and Environmental Analysis Development (EAD)

USDA Forest Service, Alaska Region

USDA Forest Service, National Director of Ecosystem Management Coordination

USDA Forest Service, Tongass National Forest, Supervisor’s Office

USDA Forest Service, Tongass National Forest (Craig Ranger District; Ketchikan-Misty Ranger District; Petersburg Ranger District; Thorne Bay Ranger District; Wrangell Ranger District)

USDA Natural Resources Conservation Service

USDA Office of Civil Rights

USDI Bureau of Land Management, BLM Alaska State Office

USDI Fish and Wildlife Service

USDI National Park Service, Alaska Area Region

USDI Office of Environmental Policy and Compliance

USDI Office of the Secretary

US Environmental Protection Agency, Alaska Operations Office

US Environmental Protection Agency, EIS Review Coordinator

US Environmental Protection Agency, Office of Federal Activities

US Government Printing Office

US Navy, Office of Chief of Navy Operations

Libraries

Craig Public Library

Kake Public Library

Ketchikan Public Library

Library of Congress

Petersburg Public Library

Quinney Library, Utah State University

University of Minnesota Forestry Library

USDA National Agricultural Library

Irene Ingle Public Library, Wrangell

Organizations and Business

Alaska Charters and Adventures

Alaska Fibre

Alaska Forest Association

Alaska Peak and Seas

Alaska Sea Adventures

Alaska Wilderness League

Alaska Wildlife Alliance

Alcan Forest Products

Alder Woodshop

Big ‘R’ Manufacturing

Bluewater Adventures, Ltd.

Cascadia Wildlands

Center for Biological Diversity

Concerned Alaskans for Resources and Environment (C.A.R.E)

Concrete Connection

Earth Justice Legal Defense

Falls Creek Forest Products

Forest Service Employees for Environmental Ethics

Friends of the Forest

Glacier Guides, Inc.

Greater Southeast Alaska Conservation Community (GSACC)

Greenpeace

Juneau Group of the Sierra Club

Mike Allen Enterprises

The Mill

National Audubon Society

Natural Resource Defense Council

The Nature Conservancy of Alaska

Parker Guide Services, Inc.

Petersburg Chamber of Commerce

Petersburg Economic Development Council

Rain Forest Wood Products

Reid Brothers Construction, Inc.

Robotic Cuts

Rock N Road Construction, Inc.

Sitka Conservation Society

Southeast Alaska Conservation Council (SEACC)

Southeast Alaska Subsistence Regional Advisory Council

Southeast Conference

Tongass Conservation Society

Tongass Futures Roundtable

Tongass Kayak Adventures, Ltd.

Trout Unlimited

University of Alaska Land Management

The Woodshed

Public Officials and Offices

Bert Stedman, Alaska State Senator

Butch Anderson, Kupreanof Council

John Coghill, Alaska State Senator

City of Kake

Ketchikan Gateway Borough

City of Kupreanof

Petersburg Borough

City of Port Alexander

City and Borough of Sitka

Don Young, United States Congressman

Lisa Murkowski, United States Senator

Mark Begich, United States Senator

Peggy Wilson, Alaska State Representative

Sean Parnell, Alaska Governor

Tribal Governments/Officials

Central Council of the Tlingit and Haida Indian Tribes of Alaska

Kake Tribal Corporation

Organized Village of Kake

Petersburg Indian Association

Sealaska Corporation, President

Sealaska Heritage Institute, President

Wrangell Cooperative Association

Media

KFSK Public Radio

Petersburg Pilot

Individuals

Richard Artley

Dave Beebe

Mike Bell

Hilary Burgess

Jim Cariello

Mary Ellen Clark

Marlene Cushing

Kevin Doerty

Susan Erickson

Kate Ericsson

Marjorie File

Mary Harrop

Molly Hogan

Frank Hughes

Brad Hunter

Deborah Hurley

Greg Katason

Joan Kautzer

Don Koenigs

Pauline Lee

Eric Lee

Doug Leen

Emma Llewellyn

Sigurd Mathisen

Karin McCullough

Harold Medalen

George Meintal

Kevin Merry

Isabel Mills

Joel Mullen

Luke Mullen

Craig Olson

Jeremy Parker

Wayne Parks

Tyrone Paul

Ned Pence

Tim Piazza

Jay and Carolyn Pritchett

David B. Randrup

Becky Regula

Hal Rhodes

Allison Rice

Beverly Richardson

David and Sally Riemer

Ruth Sandvik

Homer and Myra Sarber

Carol Schaake

Michael Schaake

Forest Sebastian

Joseph Sebastian

Marja Smets

Michael Stainbrook

Leslie Stancliff

Samual Stancliff

Jim Steward

Teresa Streuli

Shannon Sullivan

Vaughn Thomas

Russell Thymes

Dana Thynes

Bill Tremblay

Emil Tucker

Greg Turcott

Sarah Wagstaff

Suzanne West

John Wigren

Candace Williams

Linda Williams

Charles Wood

Emily Yates-Doerr

Alice Young

Butch Young

Glossary

Abiotic: Non-living. Climate is an abiotic component of ecosystems.

Access: The opportunities to approach, enter, and make use of public lands.

Access management: Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands (physical attributes).

Active channel: As defined for purposes of the riparian standards and guidelines includes stream channels, secondary channels, and braided channels. For the Alluvial Fan Process Group, it also includes gravel outwash lobes.

Adfluvial fish: Species of populations of fish that do not go to sea, but live in lakes and enter streams to spawn.

Affected environment: The natural environment that exists at the present time in an area being analyzed.

Age class: A distinct aggregation of trees originating from a single natural even or regeneration activity, or a grouping of trees, e.g., 10-year age class, as used in inventory or management.

Alaska Heritage Resource Survey (AHRS): The official list of cultural resources in the State of Alaska, maintained by the Office of History and Archaeology, Alaska Division of Parks and Outdoor Recreation.

Alaska National Interest Lands Conservation Act (ANILCA): Passed by Congress in ecosystem 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA): Public Law 92-203, 92nd Congress, 85 Stat. 2371-2551. Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

All-terrain vehicle (ATV): A gasoline powered, off-road vehicle used for accessing rote areas for recreational and work related activities: note all-terrain vehicles generally have high clearance, high traction, high maneuverability and low speed. See Off-road vehicle

Alluvial fan: A cone-shaped deposit of organic and mineral material made by a stream where it runs out onto a level plain or meets a slower stream.

Alluvium: Recent soil deposits resulting from modern rivers, including the sediment laid down in river beds, flood plains, lakes and at the foot of mountain slopes and estuaries.

Alpine: Parts of mountains above tree growth.

Amphipods: Any member of the invertebrate order Amphipoda (class Crustacea) inhabiting all parts of the sea, lakes, rivers, sand beaches, caves, and moist (warm) habitats on many tropical islands.

Anadromous fish: Fish which mature and spend much of their adult life in the ocean, returning to inland waters to spawn. Salmon and steelhead are examples of anadromous species of fish.

Anadromous Fisheries Habitat Assessment: An assessment conducted in 1994 within the Tongass National Forest (published in 1995) to study the effectiveness of current procedures for protecting anadromous fish habitat and to determine the need for any additional protection.

Aquatic ecosystem: A stream, channel, lake or estuary bed, the water itself, and the biotic communities that occur therein.

Aquatic Habitat Management Unit class: See stream classes

Aquifer: A saturated, permeable geologic unit of sediment or rock that can transmit significant quantities of water under ordinary hydraulic gradients.

Aspect: The direction a slope faces. A hillside facing east has an eastern aspect.

Average-snow deer habitat: POG forest below 1,500 feet. POG is defined as all seven-size classifications including SD-4H, SD-4N, SD-4S, SD-5H, SD-5N, SD-5S, and SD-67 in the SDM GIS data. It is considered in reference to deer winter habitat. Also called average-snow deer winter range.

Background: The distant part of a landscape. The seen or viewed area located from 3 or 5 miles to infinity from the viewer (see also "Foreground" and "Middleground").

Bankfull width: The width of the wetted channel when the water surface is at the same elevation as the active floodplain.

Basal area: The area of the cross section of a tree trunk near its base, usually 4 1/2 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.

Beach fringe: The area inland from salt water shorelines that is typically forested.

Bedload: Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Benthic: Pertaining to the sea bottom or to organisms that live on the sea bottom.

Best management practice (BMP): Land management methods, measures or practices selected by an agency to meet its non-point source control needs. BMPs include, but are not limited to structural and non-structural controls and operation and maintenance procedures. BMPs can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. BMPs are found in Forest Service Handbook (FSH) 2509.

Biogeographic provinces: Twenty-one ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiogeographic, and biogeographic features. Plant and animal species composition, climate, and geology within each province are generally more similar within than among adjacent provinces. Historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province.

Biological assessment: A biological analysis conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under Section 7 of the Endangered Species Act (16 U.S.C. 1536). The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect a species that has been listed or proposed as an endangered or threatened species.

Biological diversity: The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and the ecological processes that connect everything in a common environment.

Biological evaluation: A documented USDA Forest Service review of programs and activities that contains sufficient detail to determine how an action or proposed action may affect any species that has been listed or proposed as threatened, endangered, or sensitive.

Biomass: The total weight of all living organisms in a biological community.

Biotic: Living. Green plants and soil microorganisms are biotic components of ecosystems.

Blowdown: See Windthrow.

Board foot: A measurement term for lumber or timber. It is the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

Braided streams or channels: A stream flowing in several dividing and reuniting channels resembling the strands of a braid, the cause of division being the obstruction by sediment deposited by the stream. FP 7-5

Browse: Twigs, leaves, and young shoots of trees and shrubs that animals eat. Browse is often used to refer to the shrubs eaten by big game, such as elk and deer.

Buffer: A vegetative strip or management zone of varying size, shape, and character maintained along a stream, lake, road, recreation site, or different vegetative zone to mitigate the impacts of action as on adjacent lands.

Canopy: The part of any stand of trees represented by the tree crowns. It usually refers to the uppermost layer of foliage, but it can be use to describe lower layers in a multi-storied forest.

Capability: The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity.

Carrying capacity: The estimated maximum number of animals that can be sustained over the long-term in an area.

Cavity: A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

CFR: Code of Federal Regulations

Channel: A natural waterway of perceptible extent that periodically or continuously contains moving water. It has a definite bed and banks which serve to confine the water.

Channel type: A means of distinguishing parts of a stream system into segments that have fairly consistent physical and biological characteristics. For descriptions, see "Channel Type Field Guide," Forest Service publication R10-MB-6.

Clearcut: Harvesting method in which essentially all trees are cleared in one cut. It prepares the area for a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning.

Climax: The culminating stage in plant succession for a given site. Climax vegetation is stable, self-maintaining, and self-reproducing.

Coarse Canopy Old-growth Forest: Old-growth forest that has lower crown density (number of trees) and non-uniform crown sizes and heights including large crowns and many canopy gaps.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

Commercial forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

Composition: What an ecosystem is composed of. Composition could include water, minerals, trees, snags, wildlife, soil, microorganisms, and plant species,

Conifer: A tree that produces cones, such as a pine, spruce, or fir tree.

Connectivity (of habitats): A measure of the extent that forest areas between or outside reserves provide habitat for breeding, feeding, dispersal, and movement.

Corridor: Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

Cover: Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut stream banks. Animals use cover to escape from predators, rest, or feed.

Critical habitat: Specific areas designated as critical by the Secretary of Interior or Commerce for the survival and recovery of species listed as threatened or endangered pursuant to the Endangered Species Act.

Crown (of a tree): The tree canopy; the upper part of a tree or woody plant that carries the main branch system and foliage.

Cultural resources: Cultural resources on the Tongass National Forest include a diverse array of historic properties that represent ancient and historic sites and artifacts.

Cumulative effects: Effects on the environment that result from separate, individual actions that, collectively, becomes significant over time.

Decommissioning: To remove those elements of a road or buildings that reroute hillslope drainage and present slope stability hazards. For NFS roads, decommissioning removes the road from the long-term forest road transportation system. Otherwise, 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). See also Road Decommissioning.

DBH: See diameter at breast height.

Deep-snow winter range: HPOG is forested habitat below 800 feet on south- and west-facing aspects (HPOG is equivalent to SD-5S, SD-5N and SD-67), and is considered in reference to deer and marten winter habitat.

Deer winter range (Habitat): An area, usually at lower elevation, used by big game during the winter months; usually smaller and better-defined than summer ranges.

Developed recreation: That type of recreation that occurs where modifications (improvements) enhance recreation opportunities and accommodate intensive recreation activities in a defined area.

Development LUDs: Land use designations that permit commercial timber harvest (Timber Production, Modified Landscape, and Scenic Viewshed) and convert some of the old-growth forest to early-to-mid-successional, regulated forests.

Diameter at breast height (DBH): The diameter of the stem of a tree measured at breast height 4.5 feet from the ground. Note: on sloping ground the measure is taken from the uphill side.

Direct employment: The jobs that are immediately associated with a given activity.

Dispersed recreation: That type of recreation use that requires few, if any, improvements and may occur over a wide area. This type of recreation involves activities related to roads, trails and undeveloped waterways and beaches. The activities do not necessarily take place on or adjacent to a road, trail, or waterway, only in conjunction with it. Activities are often dayuse oriented and include hunting, fishing, boating, off-road vehicle use, hiking and among others.

Distance zones: Areas of landscapes denoted by specified distances from the observer (foreground, middleground or background). Used as a frame of reference in which to discuss landscape characteristics of Management activities.

Disturbance: A force that results in changes in the structure and composition through natural events such as wind, fire, flood, avalanche, or mortality caused by insect or disease outbreaks or by human caused events (e.g., timber harvest)

Draft Environmental Impact Statement (Draft EIS): The version of the statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act (NEPA) and released to the public and other agencies for review and comment.

Early forest succession: The biotic (or life) community that develops immediately following the removal or destruction of vegetation in an area. For instance, grasses may be the first plants to grow in an area that was burned.

Ecological subsections: Eighty-five terrestrial ecosystems mapped and described for Southeast Alaska and adjourning areas of Canada (Nowacki et al. 2001). These mid-sized terrestrial ecosystems body similar ecological characteristics including landforms, streams, vegetation, soils, and wetlands. They provide a practical basis for ecosystem management, planning, and research.

Ecology: The interrelationships of living things to one another and the environment, or the study of these interrelationships.

Edge: The more or less well defined boundary between two or more elements of the environment, e.g., a field adjacent to a woodland or the boundary of different silvicultural treatments.

Effects: Effects, impacts, and consequences as used in this Environmental Impact Statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social, and may be direct, indirect, or cumulative.

Direct effects: Results of an action occurring when and where the action takes place.

Indirect effects: Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.

Cumulative effects: Results of collective past, present and reasonably foreseeable future actions.
Element (of ecosystems): An identifiable component, process, or condition of an ecosystem.

Endangered species: Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Endemic: Restricted to a particular locality. For example, a particular species or subspecies may occur on only one or a very few islands.

Environmental analysis: An analysis of alternative actions and their predictable short and long-term environmental effects, incorporating the physical, biological, economic, social and environmental design arts and their interactions.

Environmental Impact Statement (EIS): A document prepared by a federal agency in which anticipated environmental effects of a planned course of action or development are evaluated. A federal statute (Section 102 of the National Environmental Policy Act of 1969) requires that such statements be prepared. It is prepared first in draft or review form, and then in a final form. An impact statement includes the following pints: (1) the environmental impact of the proposed action, (2) any adverse impacts which cannot be avoided by the action, (3) the alternative courses of actions, (4) the relationships between local short-term productivity, and (5) a description of the irreversible and irretrievable commitment of resources which would occur if the action were accomplished

Erosion: The wearing away of the land surface by running water, wind, ice, gravity or other geological activities.

Escape cover: Vegetation of sufficient size and density to hide an animal, or an area used by animals to escape predators.

Estuary: An ecological system at the mouth of a stream where fresh water and salt water mix, and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.

Even-aged Management: The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees in forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, shelter wood, or seed tree cutting methods produce even-aged stands.

Executive Order: An order or regulation issued by the President or some administrative authority under his or her direction.

Existing Scenic Integrity (ESI): Describes the visual appearance of the landscape at the time the project area scenery assessment in conducted. ESI is measured by the following condition types, as described in the Forest Plan:

Type I: Landscapes where only ecological change has occurred, except for trails needed for access. Landscapes appear to be untouched by human activities.

Type II: Landscapes where change is not noticed by the average forest visitor unless pointed out. These landscapes have been altered but changes are not perceptible.

Type III: Landscapes where changes are noticeable by the average forest visitor, but they do not attract attention. Changes appear to be minor disturbances.

Type IV: Landscapes where changes are easily noticed by the average forest visitor and may attract attention. Changes appear as disturbances but resemble natural patterns in the landscape.

Type V: Landscapes where changes are very noticeable and would be obvious to the average forest visitor. Changes tend to stand out, dominating the view of the landscape, but are shaped to resemble natural patterns.

Type VI: Landscapes where changes are in glaring contrast to the landscape's natural appearance. Changes appear as dramatic, large scale disturbances that strongly affect the average forest visitor.

Felling: The cutting down of trees.

Final Environmental Impact Statement (FEIS): The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the Draft Environmental Impact Statement (DEIS) to include public and agency responses to the draft. The decision maker chooses which alternative to select from the FEIS, and subsequently issues a Record of Decision (ROD).

Fiscal year (FY): October 1 through September 30. The Fiscal Year is referred to by the calendar year which begins on January 1. For example, October 1, 1996, through September 30, 1997 is referred to as Fiscal Year 1997.

Fisheries habitat: Streams, lakes, and reservoirs that support fish, or have the potential to support fish.

Fish passage barrier: A point in a stream which presents a barrier to some life stage of a fish species, also called “red pipes” in some Agency documents; e.g. barriers may be the lip of a culvert placed too high for juvenile fish, or a series of natural falls that do not allow any fish passage.

Floodplain: That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages in response to a 100 year storm event.

Fluvial: Of, or pertaining to streams and rivers.

Forage: All browse and non-woody plants that are eaten by wildlife and livestock.

Forb: A grouping/category of herbaceous plants which are not included in the grass, shrub or tree groupings/categories; generally smaller flowering plants.

Foreground: A term used in visual management to describe the stand of trees immediately adjacent to a scenic area, recreation facility or forest highway. The area is located less than 1/4 mile from the viewer. (See Background and Middleground.)

Forest health: An expression of the relationship among biotic and abiotic influences on the forest (i.e., insects, diseases, atmospheric deposition, silvicultural treatments, harvesting objectives for a given forest unit now or in the future and sustain long-term site productivity.

Forest Road or Trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources. (36 CFR 212.1)

Forested land: Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use.

Forest Plan: Source of management direction for an individual Forest specifying activity and output levels for a period of 10-15 years. Management direction in the Plan is based on the issues identified at the time of the Plan’s development.

Forest Road or Trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources (36 CFR 212.1).

Forest Supervisor: The official responsible for administering National Forest lands on an administrative unit, usually one or more National Forests. The Forest Supervisor reports to the Regional Forester.

Forest Transportation Atlas: A display of the System of roads, trails, and airfields of an administrative unit.

Forest Transportation Facility: A forest road or trail or an airfield that is displayed in a forest transportation atlas, including bridges, culverts, parking lots, marine access facilities, safety devices, and other improvements appurtenant to the forest transportation system (36 CFR 212.1).

Forest Transportation System: The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands (36 CFR 212.1).

Forest-wide Standards and Guidelines (S&Gs): A set of rules and guidance that directs management activities and establishes the environmental quality, natural renewable and depletable resource requirements, conservation potential, and mitigation measures that apply to several land use designations.

Fragmentation: An element of biological diversity that describes the natural condition of habitats in terms of the size of discrete habitat blocks or patches, their distribution, the extent to which they are interconnected, and the effects of Management on these natural conditions. Also the process of reducing the size and connectivity of stands within a forest.

FSH: Forest Service Handbook

FSM: Forest Service Manual

Fuels: Plants and woody vegetation, both living and dead, that is capable of burning.

Fuelwood: Wood cut into short lengths for burning.

Function: All the processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

Game species: Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

Geographic Information System (GIS): Information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps

Geomorphology: The study of the forms of the land surface and the processes producing these surfaces. Also the study of the underlying rocks or parent materials and the landforms present that were formed in geological time.

Ground water: Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where openings in soils and rocks are filled; the upper surface level forms the water table.

Guideline: A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Habitat: The sum total of environmental conditions of a specific place occupied by wildlife or plant species or a population of each species.

Habitat capability: The estimated maximum number of fish or wildlife that can be supported by the amount and distribution of suitable habitat in an area.

Habitat diversity: The number of different types of wildlife habitat within a given area.

Habitat Suitability Index (HSI): A measure of the capability of the habitat to support deer, based on a variety of environmental factors, for example, slope, elevation, aspect, and forest type.

Habitat type: A way to classify land area. A habitat type can support certain climax vegetation, both tree and undergrowth species. Habitat typing can indicate the biological potential of a site.

Historic properties: The physical rains of districts, sites, structures, buildings, networks, events, or objects used by humans in the past. They may be historic, prehistoric, architectural, or archival in nature. Heritage properties are non-renewable aspects of our national heritage.

Hydric soil: A soil that is wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.

Hydrologic cycle: The complete cycle, through which water passes, commencing as atmospheric water vapor, passing into liquid and solid form as precipitation, thence along or into the ground surface, and finally again returning to the form of atmospheric water vapor, by means of evaporation and transpiration. Also called Water Cycle.

Hydrologic recovery: A return to natural conditions of water collection, storage, and discharge.

Hydrology: The science dealing with the study of water on the land, in the soil and underlying rocks, and in the atmosphere.

Individual tree selection: See regeneration method.

Interception: The process where precipitation is caught and held by foliage and lost by evaporation before it reaches the ground.

Interdisciplinary Team (IDT): A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem

Intermediate cut: The removal of trees from a stand sometime between the beginning or formation of the stand and the regeneration cut. Types of intermediate cuts include thinning, release, and improvement cuttings.

Intermittent stream: A stream that flows only at certain times of the year when it receives water from streams or from some surface source, such as melting snow.

Inventoried Roadless Area (IRA): An undeveloped area typically exceeding 5,000 acres that meets the minimum criteria for Wilderness consideration under the Wilderness Act and that was inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE II) process, subsequent assessments, or forest planning.

Irretrievable commitment: Applies to losses of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription. If the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible commitments: Decisions causing changes which cannot be reversed. For example, if a roadless area is allocated to allow timber harvest and timber is actually harvested, that area generally cannot, at a later date, be allocated to Wilderness. Once harvested, the ability of that area to meet Wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

Issue: A point, matter, or section of public discussion or interest to be addressed or decided.

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

Land and Resource Management Plan: Also called the Forest Plan or just the Plan, this document guides the Management of a particular National Forest and establishes management standards and guidelines for all lands of that National Forest.

Land Use Designation (LUD): A defined area of land specific to which management direction is applied.

Landing: A cleared area to which logs or trees are transported for loading onto trucks for transport to a mill or log transfer facility. Barges are sometimes used for landings in Southeast Alaska.

Landscape: A large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.

Large woody debris (LWD): Any large piece of relatively stable woody material having a diameter of at least 4 inches and a length greater than 3 feet that intrudes into the stream channel.

Litter (forest litter): The freshly fallen or only slightly decomposed plant material on the forest floor. This layer includes foliage, bark fragments, twigs, flowers, and fruit.

Log transfer facility (LTF): Formerly referred to as terminal transfer facilities, log transfer facilities include the site and structures used for moving logs and timber products from land-based transportation forms to water-based transportation forms (or vice versa).

MBF: Thousand board feet (see board feet)

Management action: Any activity undertaken as part of the administration of the National Forest.

Management direction: A statement of multiple-use and other goals and objectives, the associated land use prescriptions, and standards and guidelines for attaining the desired condition of the Forest Plan.

Management indicator species (MIS): Plant or animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.

Marine Access Facility (MAF): An area used by humans to transfer items from land to saltwater or vice versa, that contains a structure such as a mooring buoy, dock, LTF, boat ramp, or a combination of these.

Mass movement or mass wasting: The down-slope movement of large masses of earth material by the force of gravity. Also called a landslide.

Mass movement index (MMI): Rating used to group soil map units that have similar properties with respect to the stability of natural slopes.

Matrix: The least fragmented, most continuous pattern element of a landscape; the vegetation type that is most continuous over a landscape.

Mature timber: Trees that have attained full development, especially height, and are in full seed production.

Memorandum of Understanding (MOU): An agreement between the Forest Service and others agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project. A memorandum of understanding is not a fund obligating document.

Microclimate: The climate of a small site. It may differ from the climate at large of the area due to aspect, tree cover (or the absence of tree cover), or exposure to winds.

Middleground: The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the landscape; area located from 1/4 mile to 3-5 miles from the viewer. (See "Foreground" and "Background.")

Mineral soil: Soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.

Mitigation: Actions taken to avoid, minimize, or rectify the impact of land management activities.

Model: An idealized representation of reality developed to describe, analyze, or understand it; a mathematical representation of the relationships under study (e.g., FORPLAN, wildlife habitat capability models).

Monitoring and evaluation: The periodic evaluation of forest management activities to determine how well objectives were met and how management practices should be adjusted. See "adaptive management."

Mortality: Trees dying from natural causes, usually by size class in relation to sequential inventories or subsequent to incidents such as storms or insect and disease epidemics. The term mortality can also refer to the rate of death of a species in a given population or community.

Mosaic: Areas with a variety of plant communities over a landscape, such as areas with trees and areas without trees occurring over a landscape.

Motor Vehicle Use Map: A map that reflects designated roads, trails, and areas on an administrative unit or a Ranger District of the National Forest System.

Multiple-use management: The management of all the various renewable surface resources of National Forest lands for a variety of purposes such as recreation, range, timber, wildlife and fish habitat, and watershed.

Muskeg: Muskeg is a wetland type (also called "peatland") in Southeast Alaska that has developed over thousands of years in depressions, or flat areas on gentle to steep slopes. These bogs have poorly drained; acidic, organic soils materials that support vegetation that can be either sphagnum moss or herbaceous plants. These vegetation types may have a lesser abundance of shrubs and stunted trees.

National Environmental Policy Act (NEPA): Congress passed NEPA in 1969 to encourage productive and enjoyable harmony between people and their environment. One of the major tenets of NEPA is its emphasis on public disclosure of possible environmental effects of any major action on public lands. Section 102 of NEPA requires a statement of possible environmental effects to be released to the public and other agencies for review and comment.

National Forest Management Act (NFMA): A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Forest Plans.

National Forest System Road: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

National Forest System Trail: A forest trail other than a trail that has been authorized by a legally documented right-of-way held by a state, county or other local public road authority.

National Register of Historic Places: A register of cultural resources of national, state, or local significance, maintained by the Department of the Interior.

National Wild and Scenic River System: Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values, designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition. May be classified and administered under one or more of the following categories: Wild, Scenic, and Recreational.

Natural resource: A feature of the natural environment that is of value in serving human needs.

Net sawlog volume: Trees suitable in size and quality for producing logs that can be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No action alternative: The most likely condition expected to exist in the future if current proposed action or alternatives were not selected for the Logjam Timber sale.

Non-game: Wildlife species that are not hunted for sport, or subsistence.

Notice of Intent (NOI): A notice in the federal register of intent to prepare an environmental impact statement on a proposed action.

Off-highway vehicle: Any vehicle which is restricted by law from operating on public roads for general motor vehicle traffic; includes: motorbikes, mini-bikes, trail bikes, snowmobiles, dune buggies, all-terrain vehicles, and four-wheel drive, high clearance vehicles (FSM 2355.01).

Old growth: Old forests often containing several canopy layers, variety in tree sizes and species, decadent old trees, and standing and dead woody material.

Old-growth reserve (OGR): A contiguous unit of old-growth habitat to be managed to maintain the integrity of the old growth forest ecosystem.

Open road density: The length of forest development roads open for public access and use per unit area of land; usually expressed as miles of open road per square mile of land.

Organic soil: Soils that contain a high percentage (greater than 15 percent) of organic matter throughout the soil depth.

Overstory: The upper canopy layer; the plants below comprise the understory.

Parent material: The unconsolidated, and more or less chemically weathered, mineral or organic matter from which soils develop.

Partial cut: Any cutting in which only part of the stand is harvested. This may include thinning, selection, shelterwood, or an overstory removal.

Partial retention: A visual quality objective which, in general, means man's activities may be evident but must rain subordinate to the characteristic landscape.

Patch: An area of homogeneous vegetation, in structure and composition.

Personal use: The use of a forest product, such as firewood, for home use and not for commercial use.

Planning area: The area of National Forest System controlled by a decision document.

Plant communities: An assemblage of plants that, in general, occur together on similar site conditions.

Population viability: Probability that a population will persist for a specified period of time across its range. In reference to the Alaska Coastal Management Program, consistent with enforceable policies of approved management programs unless compliance is prohibited based upon the requirements of existing law applicable to the Federal agency's operations.

Precommercial thinning: Removing some of the trees from a stand that is too small to be sold for lumber or house logs, so the raining trees will grow faster.

Predator: An animal that lives by preying on other animals. Predators are at or near the tops of food chains.

Prescribed fire: Fire set intentionally in wildland fuels under prescribed conditions and circumstances. Prescribed fire can rejuvenate forage for livestock and wildlife or prepare sites for natural regeneration of trees.

Prescription: A planned series of treatments designed to change current stand structure to one that meets management goals taking in consideration ecological, economic and societal constraints.

Process group: A combination of similar stream channel types based on major differences in landform, gradient, and channel shapes.

Productive: The ability of an area to provide goods and services and to sustain ecological values.

Productive old growth (POG): Old-growth stands capable of producing 20 cubic feet per acre per year with 8,000 or more board feet per acre.

Public participation: Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning.

Public land: Land for which title and control rests with a government: Federal, state, regional, county, or municipal.

Qualitative: Relating to or involving comparisons based on individual qualities.

Ranger district: The administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

Raptor: A bird of prey, such as an eagle or hawk.

RARE II: Roadless Area Review and Evaluation. The national inventory of roadless and undeveloped areas, within the National Forests and Grasslands.

Recharge: The addition of water to ground water by natural or artificial processes.

Record of Decision (ROD): A public document separate from be associated with and environmental impact statement that identifies all alternatives, provides the agency's final decision, the rationale behind the decision, and the agency's commitments to monitoring and mitigating.

Recreation Opportunity Spectrum (ROS): A system for planning and managing recreation resources that categorizes recreation opportunities into seven classes; each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use.

The seven classes are:

<u>Primitive</u>: An unmodified environment generally greater than 5,000 acres in size and located generally at least 3 miles from all roads and other motorized travel routes. A very low interaction between users (generally less than 3 group encounters per day) results in a very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge, and risk. Evidence of other users is low. Restrictions and controls are not evident after entering the land unit. Motorized use is rare.

<u>Semi-Primitive Non-motorized</u>: A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located at least 1/2 mile (greater or less depending on terrain and vegetation, but no less than 1/4 mile) but not further than 3 miles from all roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness of nature, tranquility, self-reliance, challenge, and risk. There is a minimum of subtle on-site controls. No roads are present in the area.

<u>Semi-Primitive Motorized</u>: A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located within 1/2 mile of primitive roads and other motorized travel routes used by motor vehicles; but not closer than 1/2 mile (greater or less depending on terrain and vegetation, but no less than 1/4 mile) from better-than primitive roads and other motored travel routes. Concentration of users is low (generally less than 10 group encounters per day), but here is often evidence of other users. There is a moderate probability of experiencing solitude, closeness to nature, and tranquility along with a high degree of self-reliance, challenge, and risk in using motorized equipment. Local roads may be present, or along saltwater shorelines there may be extensive boat traffic.

<u>Roaded Natural</u>: Resource modification and utilization are evident, in a predominantly naturally-appearing environment generally occurring within 1/2 mile (greater or less depending on terrain and vegetation, but no less than 1/4 mile) from better-than-primitive roads and other motorized travel routes. Interactions between users may be moderate to high (generally less than 20 group encounters per day), with evidence of other users prevalent. There is an opportunity to affiliate with other users in developed sites but with some chance for privacy. Self-reliance on outdoor skills is only of moderate importance with little opportunity for challenge and risk. Motorized use is allowed.

Roaded Modified: Vegetative and landform alterations typically dominate the landscape. There is little onsite control of users except for gated roads. There is moderate evidence of other users on roads (generally less than 20 group encounters per day), and little evidence of others or interactions at campsites. There is opportunity to get away from others but with easy access. Some self-reliance is required in building campsites and use of motorized equipment. A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities.

Rural: The natural environment is substantially modified by land use activities. Opportunity to observe and affiliate with other users is important as is convenience of facilities. There is little opportunity for challenge and risk and self-reliance on outdoor skills is of little importance. Recreation facilities designed for group use are compatible. Users may have more that 20 group encounters per day.

Urban: Urbanized environment with dominant structures, traffic lights and paved streets. This class may have natural appearing backdrop. Recreation places maybe city parks and large resorts. Opportunity to observe and affiliate with other users is very important as is convenience of facilities and recreation opportunities. Interaction between large numbers of users is high. Outdoor skills, risk, and challenge are unimportant except for competitive sports. Intensive on-site controls are numerous.

Recreation places: Identified geographical areas having one or more physical characteristics that are particularly attractive to people in recreation activities. They may be beaches, streamside areas, roadside areas, trail corridors, hunting areas, or the immediate area surrounding a lake, cabin site, or campground.

Recreation site: A specific site and/or facility occurring within a Recreation Place. Examples of recreation sites include: recreation cabins, trailheads, picnic areas, and wildlife viewing blinds.

Red pipes: Passage barriers to various life stages of fish, generally culverts place improperly.

Reforestation: The reestablishment of forest cover either naturally or artificially (by direct seeding or planting).

Regeneration: The renewal of a tree crop by either natural or artificial means. The term is also used to refer to the young crop itself.

Regional Forester: The official of the USDA Forest Service responsible for administering an entire region of the Forest Service.

Reserve trees: Live or dead trees that are retained for various resource objectives such as wildlife, structural diversity, etc.

Resident fish: Fish that are not migratory and complete their life cycles in fresh water.

Responsible official: The Forest Service employee who has been delegated authority to make a specific decision.

Restoration (of ecosystems): Actions taken to modify an ecosystem to achieve a desired, healthy, and functioning condition.

Retention: The amount of commercial forest land removed from the timber base to protect other resources.

Riparian area: The area including a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Riparian Management area (RMA): Land areas delineated in the Forest Plan to provide for the Management of riparian resources. Specific standards and guidelines, by stream process group, are associated with riparian management areas. Riparian Management areas may be modified by watershed analysis

Road: A motor vehicle route over 50 inches wide, unless identified and managed as a trial (36 CFR 212.1).

Road decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state. The term generally refers to temporary roads constructed for timber harvests that have has stream courses restored, culverts removed, waterbars added where needed, and cut and fill slopes revegetated (36 CFR 212.5).

Road construction or reconstruction: Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road.

Road density: The number of road miles per square mile of land area (miles per square mile)

Roadless area: An area of undeveloped public land where there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Road maintenance: The ongoing upkeep of a road, necessary to retain or restore the road to the approved road management objective (FSM 7712.3).

Road maintenance level: The level of service maintained for a specific road, consistent with road management objectives and maintenance criteria (FSH 7709.58, section 12.3)

Maintenance Level 1: Assigned to intermittent service roads during the time they are closed to vehicle traffic. The closure period is one year or longer. Basic custodial maintenance is performed.

Maintenance Level 2: Assigned to roads open for use by high clearance vehicles.

Maintenance Level 3: Assigned to roads maintained for passenger car use but not for comfort and convenience.

Maintenance Level 4: Assigned to roads that provide moderate comfort and convenience at moderate speeds. Maintenance Level 5 – Assigned to roads that provide a high degree of comfort and convenience. Normally roads are double-laned and paved or aggregate surfaced with dust abetment.

Road management objective (RMO): Defines the intended purpose of an individual road based on management area direction and access management directives. Road management objectives contain design criteria, operation criteria and maintenance criteria.

Road storage: Storage is a term used only for NFS roads. The physical on-the-ground changes are similar to a decommissioned road; however, roads in storage are considered part of the long-term forest road transportation system and may be opened to vehicular traffic in the future. The process/action of storage involves closing a road to vehicle traffic and placing it in a condition that requires minimum maintenance to protect the environment and preserve the facility for future use. Drainage structures in live drains are completely removed to restore natural patterns. Ditch relief culverts may be left in place and supplemented with deep water bars in order to minimize the cost of reusing the road in the future.

ROD: See record of decision

ROS: See recreation opportunity spectrum.

Rotation: The number of years required to establish and grow timber crops to a specified condition of maturity.

Sawtimber (sawlog): Trees that are 9 inches in diameter at breast height or larger that can be made into lumber.

Scale: In ecosystem management, it refers to the degree of resolution at which ecosystems are observed and measured.

Scoping: The ongoing process to determine public opinion, the agency receives comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

Sedge: A family of plants with solid stems found in marshy areas.

Seen landscape: Those areas visible from the most frequently used travel ways (boat route, recreation road, or trail), or use area (recreation cabin or anchorage).

Sensitive species: Plant or animal species which are susceptible to habitat changes or impacts from activities. The official designation is made by the USDA Forest Service at the Regional level and is not part of the designation of Threatened or Endangered Species made by the US Fish and Wildlife Service.

Seral: The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.

Shell midden: A term referring to shell and bone that have been discarded after harvest and processing for subsistence use.

Shovel trail: Temporary trails used for short-term access during project construction**.** Shovel trails would be up to 16-feet-wide and use native materials (logs and slash) to allow the passage of vehicles.

Silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests to meet the diverse needs and values of landowners and society on a sustainable basis.

Silvicultural system: A planned series of treatments whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the process.

Size class: One of the three intervals of tree stem diameters used to classify timber in the Forest Plan data base. The size classes are: Seedling/Sapling (less than 5 inches in diameter); Pole Timber (5 to 9 inches in diameter); Sawtimber (greater than 9 inches in diameter)

Slash: The residue left on the ground after timber cutting or left after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, branches, bark, etc.

Snag: A standing dead tree. Snags are important as habitat for a variety of wildlife species and their prey.

Soil compaction: The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

Soil productivity: The capability of a soil, in its normal environment, to produce a specific plant or sequence of plants under a specific sequence of management.

Sortyard: A location used to sort grades, types, and size of logs.

Special use permit: A permit issued to an individual or group by the USDA Forest Service for use of National Forest System land for a special purpose. Examples might be a Boy Scout Jamboree or a mountain bike race.

Stand: A group of trees that occupies a specific area and is similar in species, age, and condition.

Standards and guidelines: Standard: A course of action or level of attainment required by the forest plan to promote achievement of goals and objectives.

State Historic Preservation Office (SHPO): The official appointed or designated pursuant to Section 10 1(b) (1) of the National Historic Preservation Act of 1966, as amended, to administer the State Historic Preservation Program.

Stream classes: A means to categorize stream channels based on their fish production values. There are four stream classes on the Tongass National Forest. They are:

Class I: Streams and lakes with anadromous or adfluvial fish habitat; or high-quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.

Class II: Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams from 0-5 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.

Class III: Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sufficient sediment and debris to have an immediate influence on downstream water quality or fish habitat capability. These streams generally have bank-full widths greater than 5 feet and are highly incised into the surrounding hill slope.

Class IV: Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hill slope.

Non-streams: Rills and other watercourses, generally intermittent and less that 1 foot in bankfull width, little or no incision into the surrounding hill slope, and with little or no evidence of scour.

Stumpage: The value of the timber as it stands uncut in terms of an amount per unit area; synonym stumpage value.

Subsistence: Section 803 of the Alaska National Interest Lands Conservation Act defines subsistence use as "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

Subspecies: An aggregate of similar populations of a species generally inhabiting a geographic subdivision of the range of the species and differing taxonomically (e.g. different size or color) from other populations of the species.

Subwatershed: A subdivision of a *watershed*. A *subwatershed* is the 6th-level, 12-digit unit and smallest of the hydrologic unit hierarchy. Subwatersheds generally range in size from 10,000 to 40,000 acres.

Succession: The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

Successional stage: A stage of development of a plant community as it moves from bare ground to climax. The grass-forb stage of succession precedes the woody shrub stage.

Suitable forest land: Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions, and for which there is reasonable assurance that such lands can be adequately restocked, and for which there is management direction that indicated that timber production is an appropriate use of that area.

Surface resources: Renewable resources that are on the surface of the earth, such as timber and forage, in contrast to ground water and minerals which are located beneath the surface.

Sustainable: The yield of a natural resource that can be produced continually at a given intensity of management is said to be sustainable.

Sustained yield: The amount of renewable resources that can be produced continuously at a given intensity of management.

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 included in a forest transportation atlas (36 CFR 212.1)

Terrestrial ecosystems: Plant communities that are not dependent on a perpetual source of water to grow.

Thinning: The practice of removing some of the trees in a stand, in a manner that the remaining trees will grow faster. The remaining trees grow faster because of reduced competition for nutrients, water, and sunlight. Thinning may also be done to change the characteristics of a stand for wildlife or other purposes. Thinning may be done at two different stages:

> Precommercial thinning – Removing trees that are too small to make a merchantable product to improve tree spacing and promote more rapid growth.
>
> Commercial thinning – Removing trees that have reached sufficient size to be manufactured into a product to improve tree spacing and promote more rapid growth.

Threatened species: A listed plant or animal species likely to become an endangered species within the foreseeable future, throughout all or a significant portion of its range. Threatened species are identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Threshold: The point or level of activity beyond which an undesirable set of responses begins to take place within a given resource system.

Timber classification: Forested land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

Nonforest: Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

Forest: Land at least 10 percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Suitable: Land to be managed for timber production on a regulated basis.

Unsuitable: Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.

Thermoregulation: Ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different.

Timber stand improvement (TSI): All non-commercial intermediate cuttings and other treatments to improve composition, condition, and volume growth of a timber stand.

Tongass Timber Reform Act (TTRA): This Act (1990) requires annual appropriations for timber management on the Tongass National Forest, with a provision providing for the multiple use and sustained yield of all renewable resources.

Tractor logging: A logging method that uses tractors to carry or drag logs from the stump to a collection point.

Trail: A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

Turbidity: An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a water sample; turbidity in water is caused by the presence of suspended matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms.

Two-aged management: A regeneration method in which a portion of the trees in a harvest unit are cut in one entry, and the rest are left as residual trees, either singly or in patches resulting in the creation of two separate age classes within the stand. The residual trees remain unharvested to provide structural diversity or other attributes to the developing new stand.

Unauthorized road or trail: A road or trail that is not a forest road or trail; or a temporary road or trail; and is not included in a forest transportation atlas.

Understory: The trees and woody shrubs growing beneath the overstory in a stand of trees.

Unsuitable lands: Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture, or economics

Utility volume: Logs that do not meet minimum requirements for sawtimber but are suitable for the production of usable chips.

Value comparison unit (VCU): First developed for the 1979 Tongass Land Management Plan as distinct geographic areas that generally encompass a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. There are 926 units established to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

Variety class: A way to classify landscapes according to their visual features. This system is based on the premise that landscapes with the greatest variety or diversity have the greatest potential for scenic value.

Vegetation management: Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

Viable population: The numbers of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations that are adequately distributed throughout their range.

Viewshed: An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

Visual Absorption Capacity (VAC): The capability of the landscape to visually absorb management activities. Landscapes are rated with high, moderate or low abilities to absorb management activities. These ratings reflect the degree of landscape variety in an area, viewing distance and topographic characteristics. As an example, steep, evenly sloped landscapes viewed in the foreground to middle ground are typically given a low VAC rating.

Visual resource: A part of the landscape important for its scenic quality. It may include a composite of terrain, geologic features, or vegetation.

Volume strata: Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan.

Water table: The upper surface of ground water or that level below which the soil is saturated with water.

Water yield: The runoff from a watershed, including groundwater outflow.

Watershed: The entire region drained by a waterway, or into a lake or reservoir. More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

Wetlands: Those areas that are inundated or saturated by surface water or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.

Wild and Scenic River: Rivers or sections of rivers designated by congressional actions under the 1968 Wild and Scenic Rivers Act. Wild and scenic rivers may be classified and administered under one or more of the following categories:

Wild river areas: Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic river areas: Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas: Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness: Areas designated by congressional action under the 1964 Wilderness Act or subsequent Acts. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historic value as well as ecologic and geologic interest. On the Tongass National Forest, Wilderness has been designated by ANILCA and TTRA.

Wildlife Analysis Area (WAA): A division of land used by the Alaska Department of Fish and Game for wildlife analysis.

Windfirm: Trees not likely to be blown over by the wind. These are usually trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features or other trees.

Windthrow: The act of trees being uprooted by the wind. In Southeast Alaska, Sitka spruce and hemlock trees are shallow rooted and susceptible to windthrow. There are generally three types of windthrow:

- Endemic, where individual trees are blown over;
- Catastrophic, where a major windstorm can destroy hundreds of acres; and
- Management related, where the clearing of trees in an area make the adjacent standing trees vulnerable to windthrow.

Winter Range: An area, usually at lower elevation, used by big game during the winter months; usually smaller and better defined than summer ranges.

Yarding: Moving cut trees from where they fell to a centralized place (landing) for hauling away from the stand.

Young growth: Forest growth that has regenerated naturally or has been planted after some drastic interference (for example, clearcut harvest, serious fire, or insect attack) with the previous forest growth.

Index

Appendix A
Response to Comments

APPENDIX A – RESPONSE TO COMMENTS

Introduction

This appendix presents the Forest Service response to public comments received during the 45 day comment period for the Kake to Petersburg Transmission Line Intertie (KPI) Project Draft Environmental Impact Statement (Draft EIS). The Council on Environmental Quality (CEQ) regulations provide clear guidance on both the intent of soliciting public comment and how comments should be used. These regulations require agencies to "assess and consider comments both individually and collectively" (40 Code of Federal Regulations [CFR] § 1503.4).

Analysis and Incorporation of Public Comment

Agencies, organizations, and individuals submitted written comments on the KPI Draft EIS; the interdisciplinary team (IDT) read and analyzed all the comment letters received. Letters from individuals and organizations were considered both individually and collectively, as many of the letters had the same or similar concerns. The comments were annotated and sorted by topic. The IDT completed responses to the annotated comments. Review of those draft responses showed there was some repetition between and among the comments. In order to avoid repetition and extensive cross-referencing, and to provide a more comprehensive response, we have categorized concerns by topic and offered a consolidated response. Comments fell into two broad categories:

Those within the scope of the project: Comments within the scope of this project have been incorporated into the Final EIS or analysis for the Final EIS to the extent possible. Some comments ask for clarification or additional information in the Final EIS. Other comments requested certain information be considered, pointed out errors, or requested modification to an alternative.

Those outside the scope of the project: Some comments are addressed through Forest Plan or other direction. Some comments disagreed with Forest Plan direction and other regulations decided at a different level, which makes them outside the scope of this document. Comments that involve issues beyond the project area or speculation that does not involve reasonably foreseeable future actions are also outside the scope of this document.

Letters received during the 45-day comment period from federal and state agencies and municipalities are published here individually. All comment letters received, including those from organizations and individuals, are in the project record and available online at: http://www.fs.usda.gov/project/?project=31761.

The Forest Service received timely comments from the federal and state agencies, organizations, and individuals listed Table A-1. Table A-2 lists the comment categories and subcategories as well as the pages where the responses can be found.

Table A-1. Individuals, Organizations, and Agencies Submitting Comments on the KPI Draft EIS

Letter Number	Name	Agency/Organization	City	State
1	Joseph Sebastian	Individual	Petersburg	AK
2	Gary Williams	Kake First Nation	Kake	AK
3	Gary Williams	Individual	Kake	AK
4	Christine Reichgott	US Environmental Protection Agency	Seattle	WA
5	David Randrup	Individual	Petersburg	AK
6	Mike Stainbrook	Individual	Petersburg	AK
7	Phillip Johnson	U.S. Department of the Interior	Anchorage	AK
8	Buck Lindekugal	Southeast Alaska Conservation Council	Juneau	AK
9	Cynthia Lagoudakis	Individual	Petersburg	AK
10	David Beebee	Individual	Petersburg	AK
11	Heath and Marina Whitacre	Individuals	Petersburg	AK
12	Jerry Medina	Inside Passage Electric Cooperative	Auke Bay	AK
13	Kyle Moselle	Alaska Department of Natural Resources	Juneau	AK
14	Paul Olson	On Behalf of the City of Kupreanof	Sitka	AK
15	Jodi Mitchell	Inside Passage Electric Cooperative		AK
16	Karin McCullough	Individual	Petersburg	AK
17	Marja Smets	Individual	Petersburg	AK
18	Daniel Varsano	Individual	Petersburg	AK
19	Suzanne Wood	Individual	Petersburg	AK
20	Marcia Heer	U.S. Army Corps of Engineers	JBER	AK

Table A-2. Comment Categories and Response Page Numbers

Comment Category	Comment Subtopic	Page
Aquatic Resources	ADF&G Fish Habitat Permit	A-4
	Construction General Permit	A-4
	Fish Passage	A-4
	Mitigation	A-4
	Stream Surveys	A-5
	Water Quality / Sedimentation	A-5
Climate Change		A-7
Health and Safety	Electric and Magnetic Fields	A-8
Inventoried Roadless Areas	Significant Issue	A-9
	Inventoried Roadless Areas and ANILCA	A-9
Kake Access Project	Connected Action	A-10
	Cumulative Impacts	A-10
Lands	Easements	A-12
Marine Crossing	Commercial Fisheries	A-13
	Directional Boring	A-13
	Prolewy Point Termination Point	A-14
National Environmental Policy Act	Alternatives	A-15
	Federal Land Policy and Management Act	A-16
	General	A-17
	Issues	A-18
	Project Description	A-19
	Purpose and Need	A-19
Project Feasibility	Funding	A-20
	Hydropower Availability	A-20
	Project Costs	A-20
	Significant Issue	A-21
Socioeconomics	Employment	A-22
	Property Values	A-22
Subsistence	Subsistence Hearings under ANILCA	A-23
	Impacts to Subsistence Communities	A-23
Timber		A-24
Vegetation	Windthrow	A-25
Visual		A-26
Wetlands		A-27
Wildlife	Bald Eagles	A-29
	Black Bear Habitat	A-30
	Connectivity	A-30
	Deer and Restoration Activities	A-31
	Kake Access Project	A-31
	Non-Reflective Wire	A-32
	Marten	A-32
	Old-growth Reserves	A-32
	Queen Charlotte Goshawk	A-33
	Sensitive Species	A-34
	Wolves and Deer	A-35
Wilderness		A-37

Aquatic Resources

ADF&G Fish Habitat Permit

Comment: One comment identified the potential need for fish habitat permits:

> SEAPA will need to obtain fish habitat permits from Alaska Department of Fish and Game (ADF&G) Habitat Division for structures placed below ordinary high water in either resident or anadromous fish streams. Alternatively, the USFS may obtain permission for these structures through their concurrence process."

Forest Service Response: The applicant will be responsible for obtaining all appropriate permits, including fish habitat permits from ADF&G for crossing any fish bearing streams with temporary structures and for all activities within or across a stream used by anadromous fish.

Construction General Permit

Comment: One comment stated that a Construction General Permit authorization would be required from the Alaska Department of Environmental Conservation (ADEC) for project implementation. In addition, if dewatering needs to occur within 1,500 feet of a documented contaminated site, a general permit will be required for excavation dewatering activity.

Forest Service Response: The applicant will be responsible for obtaining all appropriate permits and authorizations, including a Construction General Permit authorization, if required.

Fish Passage

Comment: One comment was concerned that the Draft EIS failed to identify existing streams with fish passage problems in the analysis area, disclose whether these problems have been fixed, provide a detailed evaluation of crossings, or include a plan to fix existing culvert problems.

Forest Service Response: Fish passage is discussed in Chapter 3 of the Draft EIS in the *Aquatic Resources* section (see the *Fish Passage* subsection, p. 3-36). This section discusses the different culvert categories (green, gray, and red) and identifies the number of red fish crossings by alternative and refers the reader to the Aquatics Resource Report prepared for the project, which provides a detailed listing of existing red fish crossings by watershed and milepost (Tetra Tech 2014b, Appendix A). Table WAT-11 represents the number of proposed stream crossings by alternative and type (shovel trail/temporary matting panel or temporary access spur). Estimated stream crossings by stream class and crossing type (embedded pipe arch, bridge, circular pipe, modular bridge, and stringer bridge) are identified for unroaded areas in Tables WAT-13 and WAT-16. These are temporary crossings and would be removed after the transmission line construction is completed. All fish stream crossings, including those considered temporary, will be designed to meet Forest Service standards.

Developing plans to fix existing fish passage problems is outside the scope of this project. Red culverts on existing Forest Roads are being addressed by the Forest Service. Limited funds are allocated by Congress for this purpose, and will be appropriated according to priorities across the forest.

Mitigation

Comment: One comment noted that the Draft EIS indicated that in more rugged terrain where the transmission line spans from ridge-to-ridge trees growing in v-notches between ridges may be left standing (Draft EIS, p. 2-15), and provided the following recommendation:

> "Apply these clearing guidelines to environmentally sensitive areas as well, including but not necessarily limited to, riparian areas, where ever possible."

Forest Service Response: Mitigation measures that would apply to all action alternatives are presented in Table 2-3. Measures F-4 and F-10 under Soils/Aquatic Resources are as follows:

- Span, without clearing, steep v-notch streams with high erosion potential. (Draft EIS, p. 2-35)
- Instream protection notwithstanding, where clearing is necessary within 100 feet of anadromous streams and their resident fish tributaries (Class I and II) leave felled trees in place but not blocking the stream channel (Draft EIS, p. 2-35).

In addition to resource specific mitigation measures, all standard BMPs will also be applied to reduce impacts to streams and riparian areas (Draft EIS, p. 2-39 to 2-41). General clearing criteria for the right-of-way are discussed in Chapter 2 of the Draft EIS and include the following:

> "Leave trees and brush wherever possible to reduce the impact on the environment, especially in sensitive areas such as riparian zones, erosion prone areas, sensitive wildlife habitat, and visually sensitive areas."

Stream Surveys

Comment: One comment was concerned that the Draft EIS failed to fully discuss the stream surveys that were conducted in support of this project. In addition, the author referenced comments they made during scoping requesting that the Draft EIS:

> "provide a map that displays color-coded stream classes with units and roads so the public can review impacts upon water quality and fish habitat and requested updated stream utilization surveys, including the acquisition of population data for all species."

Forest Service Response: Stream surveys conducted in support of this project are described in Chapter 3 of the Draft EIS in the *Aquatic Resources* section (see the *Methodology* subsection, p. 3-23). This section includes the following overview:

> "Field reconnaissance surveys were conducted in 2010 and 2011 and included mapping of Class I, II, III, and IV streams within a 300-foot-wide (150 feet either side of the transmission line centerline) corridor for each of the proposed action alternatives.
>
> District-wide road condition surveys (RCS) were used in conjunction with GIS to identify the number of stream crossings, number of red fish crossings, and streams requiring additional information or field verification."

The information collected at each stream crossing is provided in the project record and is commensurate with the level of expected project disturbance. A map set showing the streams by class and suggested crossing method for unroaded areas crossed by the proposed alternatives has been added to the project record. In addition, a map indicating red fish crossings along existing roads has also been added to the project record. They are available for inspection or upon request at the Petersburg Ranger District office.

Water Quality / Sedimentation

Comment: One comment stated that the water quality analysis presented in the Draft EIS was incomplete. The comment author repeated their scoping comment which requested that the Forest Service acquire "baseline data on stream flow, sedimentation, turbidity and stream temperature" and "disclose the costs of mitigation measures that provide greater protections to water quality and fish habitat." They also state that the Draft EIS fails to consider road-stream connectivity, Class IV headwaters streams, sediment delivery over time, and inappropriately relies on BMPs to mitigate adverse impacts.

Forest Service Response: Conducting a comprehensive watershed analysis is outside the scope of this project and not necessary to adequately assess the potential impacts of the action alternatives. Existing watershed conditions are discussed in detail in Chapter 3 of the Draft EIS in the *Aquatic Resources* section (see the *Affected Environment* section). As noted on page 3-37 of the Draft EIS additional detail is provided at the subwatershed level in the Aquatic Resources Resource Report prepared for the project (Tetra Tech 2014b), which is available in the project record. The Draft EIS and Resource Report both discuss existing conditions with respect to stream flow, sedimentation, turbidity and stream temperature.

The effects analysis addresses potential impacts on sedimentation and turbidity by alternative. Proposed stream crossings are identified by stream class, type of access (shovel trail/temporary matting panel or temporary access spur), and crossing type (embedded pipe arch, bridge, circular pipe, modular bridge, and stringer bridge) (see Tables WAT-11, WAT-13, and WAT-16). Proposed mitigation measures are discussed in Chapter 2 and summarized in Table 2-3 in the Draft EIS.

Climate Change

One comment noted that the climate change analysis presented in the Draft EIS was not an appropriate approach for the KPI Project and provided the following suggestions:

> "The climate change analysis should compare the greenhouse gas emissions from diesel generated power vs. power from the SEAPA network, and should address any reasonably foreseeable growth inducing effects, such as commercial or other development, which would potentially result from providing relatively low cost electricity."

Forest Service Response: The climate change section in the Final EIS has been expanded to include a discussion of greenhouse gas emissions from different forms of power generation.

The availability of relatively low-cost electricity in Kake could potentially influence the location decisions of new commercial and industrial developments, but no "reasonably foreseeable" projects are known at this time.

Health and Safety

Electric and Magnetic Fields

Comment: One comment expressed concern about the potential effects of electric and magnetic fields:

> "Additionally, it would introduce electrical safety hazards related to shock and potential negative health effects due to living in close proximity to a high voltage power line, especially for young children. Though we recognize the jury is still out on this particular topic, an exhaustive list of studies citing negative effects of electrical and magnetic fields (EMFs) such as those generated by high voltage power lines is widely available. The potential for these negative effects leaves us concerned for the health of our children and the many others in the area. How will SEAPA ensure the safety/health of landowners, especially children, living near the power line?"

Forest Service Response: Potential effects related to EMF are discussed in Chapter 3 of the EIS, in the *Health and Safety, including Noise* section. As discussed on page 3-264 of the Draft EIS, scientific evidence has not established a definitive cause and effect relationship between electric and magnetic fields and any adverse health effects; however, additional supporting text has been added. While it is not possible to predict specific health outcomes or disease levels that would likely occur with the proposed project, it is possible to estimate magnetic field levels and the rate at which they decrease with distance. The anticipated magnetic field from a 69 kV or 138 kV line would degrade within 100 feet of the project's centerline to ambient levels. The majority of the proposed alternatives cross undeveloped areas. As a result, the potential impacts of project-related magnetic fields on public health and safety are expected to be negligible.

Inventoried Roadless Areas

Significant Issue

Comment: Two commenters requested that Inventoried Roadless Areas (IRAs) be evaluated in the EIS as a significant issue:

> "IRAs are a significant issue for the simple reason they are an important component of an already severely debilitated project area. The project Alternatives have significant differences in impacts to IRAs and should therefore factor into selection criteria."

Forest Service Response: The rationale for not evaluating potential impacts to IRAs as a significant issue is explained on pages 1-14 and 1-15 of the Draft EIS. Although not a significant issue, potential impacts to IRAs are evaluated in Chapter 3 of the Draft EIS.

Inventoried Roadless Areas and ANILCA

Comment: One comment was concerned about how IRAs were described in the Irreversible and Irretrievable Commitments of Resources section. This description includes the following statement: "IRAs are set aside to determine their eligibility for inclusion into the National Wilderness Preservation System." The comment recommended that we delete:

> "bullet 5 (page 3-268) as it does not accurately describe the purpose of IRAs, pursuant to the Final Rule and Record of Decision (Special Areas; Roadless Area Conservation, 66 FR 3244-3272, January 12, 2001), or how they are administered in Alaska under provisions of ANILCA."

Forest Service Response: We have revised the general description of IRAs in the discussion of Irreversible and Irretrievable Commitments of Resources to more accurately reflect current conditions as follows:

> "IRAs are defined as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act and were inventoried during the Forest Service's RARE II process and during subsequent updates and forest planning analyses."

Vegetative clearing and maintenance along a transmission line right-of-way within an IRA would have the potential to have irretrievable effects to the character of that IRA, as would the presence of an electric transmission line in these areas.

Kake Access Project

Connected Action

Comment: Several comments requested that the Kake Access Project be evaluated as a "connected action" under NEPA:

> "The potential environmental impacts of the Kake Access Project would be substantially greater than those described in the Draft EIS for the transmission line, yet the decision on this project is expected to influence the other."

> "The relationship between the Proposed Action and Kake-Access Project requires a community impact analysis that includes an evaluation of the impacts of the Kake Access project, including the short-term impacts from road and shuttle terminal construction, and long-term impacts from increased traffic."

Forest Service Response: The Federal Highway Administration (FHWA) and ADOT&PF have provided no indication that the alternative selected for KPI would have any influence on the Kake Access Project. The relationship between the KPI and Kake Access Projects is discussed in Chapter 1 of the Draft EIS in the section entitled: *Relationship to the Kake Access Project*. Since the Draft EIS for KPI was published, the FHWA and ADOT&PF have conducted two additional studies – the Kake Access Transportation Survey and the Kake Access Transportation Needs Assessment Study – and held additional public meetings in Petersburg and Kake (March 10 and 11, 2015, respectively) to discuss the findings of these studies and solicit input to refine the Purpose and Need statement for the Kake Access Project EIS (FHWA 2015). The Draft EIS for the Kake Access Project is now scheduled for release in Spring 2016. The *Relationship to the Kake Access Project* has been revised in the Final EIS to include this information.

Cumulative Effects

Comment: Two of the commenters requesting that the Kake Access Project be treated as a "connected action" under NEPA, also requested that the Kake Access Project be assessed in the Cumulative Impacts analysis for KPI.

> "In the Final EIS, acknowledge and discuss the nature, extent, and intensity of impacts that would potentially occur if the Northern Route or the Center-South Route are also used in the Kake Access Project."

> "The KPI and Kake Access Project will have significant cumulative impacts, requiring detailed analysis in each resource section of the DEIS."

One of these commenters cites a number of documents in support of their assertion that a road built along the Northern corridor is "reasonably foreseeable" and should therefore be analyzed in detail in the cumulative effects analysis for the KPI Project. These documents include the Access and Travel Management Environmental Assessment (EA) for the Petersburg Ranger District (USDA Forest Service 2009) and the Southeast Alaska Transportation Plan 2014 Draft (ADOT&PF 2014).

Forest Service Response: As discussed at the beginning of Chapter 3 (page 3-5) of the Draft EIS, given the current status of the Kake Access Project, it is not possible to fully assess the potential cumulative effects of the Kake Access Project in conjunction with the KPI Project. This discussion has been updated to reflect the current status of the Kake Access Project. Additional discussion of potential cumulative effects related to the Kake Access Project has been added to the resource-specific cumulative effects analyses presented in Chapter 3. As discussed in the updated section at the beginning of Chapter 3, limited information has been developed for the Kake Access Project to date. The lack of available information is reflected in the additions to the resource-specific cumulative effects analyses.

Lands

Easements

Comment: One comment noted the following with respect to easements:

> "All of the alternatives evaluated in the DEIS follow portions of road alignments that fall into easements granted to the Alaska Department of Transportation and Public Facilities (DOT&PF) under Section 4407 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Where the transmission line falls within these DOT&PF easements, a utility permit will be required from the DOT&PF."

Forest Service Response: This information has been added to the Other Agency Involvement section in Chapter 1 of the EIS.

Marine Crossing

Commercial Fisheries

Comment: One commenter expressed concern about the potential for proposed submarine cable marine crossings to conflict with existing commercial fishing activities:

> "Alternative 4 proposes an approximately one-mile-long submarine cable in Duncan Canal. There is a commercial beam fishery in Duncan Canal that could damage submerged lines."

> "ADF&G Region I Shellfish Biologists provided data regarding the commercial Dungeness fishery for the project area. … The commercial Dungeness crab fishery currently occurs annually between June 15 and August 15 and again between October 1 and November 30. It is not clear from the description in the DEIS if laying a submarine cable will conflict with this local fishery."

The second comment above includes commercial Dungeness crab pot numbers for areas in the vicinity of proposed submarine crossings by alternative.

Forest Service Response: Additional information regarding the location of the referenced fisheries from ADF&G has been added to the *Marine Environment* section of Chapter 3 in the Final EIS. Potential impacts to the marine environment from the proposed submarine crossings are discussed in Chapter 3 of the Draft EIS in the *Marine Environment* section.

It is noted that there is a commercial beam trawl fishery in Duncan Canal in the vicinity of the 0.9-mile-long submarine crossing proposed as part of Alternative 4. This fishery, the comment notes, could damage an exposed submarine cable and/or fishing gear. In addition, there is also a commercial Dungeness crab fishery in Duncan Canal. No commercial fisheries would be disrupted, including the commercial Dungeness crab fishery provided installation of the submarine cable occurs outside of the annual fishery dates. Based on geotechnical studies that would need to be conducted for this crossing, the KPI Project would determine whether this area could be directional bored, which would eliminate the possibility of damage from commercial fishery activities. Other options would include trenching and signage indicating the location of the submarine cable crossing.

Directional Boring

Comment: One comment requested more information about the proposed horizontal directional bore beneath the mouth of the Wrangell Narrows that is part of Alternative 2, the proposed action. Specific concerns included potential noise and vibration from directional boring. The Draft EIS identifies the potential for temporary impacts to marine organisms in the form of disturbance due to vibrations and noise from drilling operations, but does not identify the duration or potential severity of these impacts. The Draft EIS is also "unclear whether the impacts from a directionally bored cable would potentially be less than from a submarine cable or why it is preferred."

In summary, the commenter provides the following recommendation:

> "In the Final EIS, disclose the timing, duration, and severity of noise and vibration effects from directional boring, why it is the approach used in the Preferred Alternative, and whether this approach is applicable to other alternatives."

Forest Service Response: Additional information regarding the duration and severity of potential noise and vibration impacts associated with horizontal directional drilling has been added to Chapter 3 of the Final EIS in the *Marine Environment* section.

According to the feasibility study (Hittle 2014) prepared on behalf of the project applicant, the proposed horizontal directionally drilled (HDD) bore approach that would be employed under Alternative 2 is less expensive than the 3.1-mile-long submarine cable proposed as part of Alternative 3. The Wrangell Narrows entrance – the area that would be crossed by the 3.1-mile-long submarine cable under Alternative 2 – is a busy channel with potential issues related to anchor areas, fishing grounds, and dredging activities. The Final EIS also describes an option for a buried submarine cable in the same location as the proposed HDD bore should the results of the geophysical surveys indicate it is possible.

Note: Alternative 2 is the proposed action (i.e., the action proposed by the project proponent). The Draft EIS did not identify a "preferred alternative" because the Forest Service did not have a preferred alternative at that time. This is discussed further below in the National Environmental Policy Act section under Alternatives, below.

The Final EIS will address the use of directional boring for the two marine crossing associated with Alternative 4 (center-south route). This type of crossing method was not specifically proposed or costed out under Alternative 4; however, the KPI Project would consider this method depending on the results of initial geotechnical studies that would need to be conducted; particularly for the crossing at Duncan Canal.

Prolewy Point Termination Point

Comment: One comment raised the issue of an alternative crossing location near Prolewy Point for Alternative 3:

> "For Alternative 3, a study conducted in 2010 suggested that the beach conditions at Prowley Point (sic) may require moving the termination area north to the vicinity of Fivemile Creek. The DEIS does not address impacts associated with a more northerly termination location."

Forest Service Response: The cited report is presumably the Hittle et al. (2010) report cited in the Draft EIS. We have corrected the text in the Final EIS to match the final version of that report (Hittle 2014), which describes the termination point for the submarine cable proposed as part of Alternative 3 as follows:

> "The cable would terminate on Kupreanof Island in the general vicinity of Prolewy Point. An underwater survey will be needed to determine the best location for the submarine cables." (Hittle 2014, p. 2-14)

The general locations of the marine crossings proposed for Alternatives 2 and 3 are shown in Figure 2-2 in the Draft EIS. These are the locations evaluated in the Draft and Final EIS documents. As discussed in Chapter 2 of the Final EIS, if one of the action alternatives is the selected alternative, a thorough submarine topographical survey and subsurface profile would be completed to determine the best routes for the submarine cables for the selected alternative, as well as associated terminal locations. The submarine topographical survey will identify areas to be avoided, such as shipwrecks, large rocks, and rock outcroppings, that could cause suspensions and damage to the cable.

National Environmental Policy Act

Alternatives

Preferred Alternative

Comment: Several comments addressed issues surrounding a preferred alternative for the project. One commenter stated that they have:

> "concerns with the identification of Alternative as the Preferred Alternative. We believe Alternative 4 would meet the purpose and need with fewer impacts to all resources of concern."

Another commenter expressed concern that the Draft EIS "failed to identify an environmentally preferred alternative" and cited 40 Code of Federal Regulations (CFR) 1505.2(b) as a requirement supporting their request.

Forest Service Response: To clarify: Alternative 2 is the proposed action (i.e. the action proposed by the project proponent). In this case, the action proposed by SEAPA is construction and operation of an electric transmission line from Petersburg to Kake. The Draft EIS did not identify a "preferred alternative" because the Forest Service did not have a preferred alternative, at this time. For more information on the difference between the proposed action and preferred alternative see Question 5 of CEQ NEPA's 40 Most Asked Questions (see https://ceq.doe.gov/nepa/regs/40/40p3.htm).

The CEQ does not require that an environmentally preferred alternative be identified in a Draft EIS. The code cited in the comment summarized above requires that each agency in cases requiring environmental impact statements prepare a concise public record of decision that identifies "all alternatives considered by the agency in reaching its decision, specifying the alternative or alternatives which were considered to be environmentally preferable" (40 CFR 1505.2(b)). Forest Service Handbook 1909.15 Section 16 also states a preferred alternative need not be identified in a Draft EIS if the responsible official does not have one at that stage. The Forest Service will include this information in the Record of Decision for the KPI Project per CEQ requirements.

Alternative Energy Sources

Comment: Several comments requested that the Final EIS develop and evaluate an action alternative that considers the development of local alternative energy sources near Kake in place of the KPI Project.

> "In a project with a stated purpose and need for bring more affordable power to Kake, an action alternative considering the use of alternative energy seems appropriate."

> "Clearly 'Alternative Energy Sources' need to be included as another alternative in the KPI Project to fully evaluate ways to 'provide access to relatively low cost electricity.'"

Several comments referenced a recent newspaper article from the Juneau Empire (Shor 2014) about the use of solar power in Kake. The Organized Village of Kake installed 24 solar panels on its tribal government building in 2012 as part of a U.S. Department of Energy (DOE) demonstration solar project.

Forest Service Response: The idea that the Forest Service should develop and evaluate an alternative that involves the development of alternative energy sources near Kake rather than the proposed action was raised during public scoping for the KPI Project and is discussed in detail in Chapter 2 of the Draft EIS in the *Alternatives Considered but Eliminated from Detailed Study* section under *Alternative Energy Sources*. As discussed in this section of the Draft EIS (p. 2-33), the "purpose of this EIS is for the Forest Service to decide whether to authorize the applicant to construct, operate, and maintain the proposed KPI Project across NFS lands." The Purpose and Need for the Forest Service is not to evaluate different ways to provide access to relatively low cost electricity, but to decide whether to authorize the KPI Project across NFS lands.

Potential sources of renewable energy in the vicinity of Kake continue to be evaluated, as discussed in the Alternative Energy Sources section of the Draft EIS. SEAPA and others have indicated that the KPI Project and energy development in the vicinity of Kake are not mutually exclusive, and studies related to renewable energy projects continue. If No Action is the selected alternative, future efforts to provide access to relatively low cost energy to Kake will be limited to alternative energy development in the vicinity of Kake. This information has been added to Chapter 2 of the Final EIS in the *Alternatives Considered but Eliminated from Detailed Study* section under *Alternative Energy Sources*. Reference to the U.S. DOE demonstration solar project has also been added to this section, and the information on other potential renewable energy projects in the vicinity of Kake has been updated, as appropriate.

No Action Alternative

Comment: One comment stated that the discussion of the No Action Alternative in the Draft EIS is misleading because it states that under the No Action Alternative, the "City of Kake would continue to be served by the existing, isolated electric system, which depends upon high-cost diesel generation." The commenter stated that this ignores ongoing progress toward other renewable energy options and offers a different characterization of No Action:

> "A no-action alternative could evaluate maintaining the status quo under the Power Cost Equalization Program (PCE) while Kake awaits further development smaller scale projects that entail substantially fewer capital and environmental risks and would provide a more certain and stable power supply for Kake residential and commercial users over the long-term. The no action alternative also should have considered meaningful energy efficiency measures, such as conversions to LED lights, which could reduce electricity costs by more than half."

Forest Service Response: In the short-term, the city of Kake would continue to be served by the existing system. In the absence of the KPI Project, future efforts to reduce the cost of electricity would be limited to small-scale renewable energy projects in the immediate vicinity and distributed power options, such as solar panels. The No Action alternative description has been revised to include this statement. Energy efficiency measures alone would be unlikely to reduce the cost of electricity for commercial customers and the current structure of the PCE program serves to limit demand by residential customers as explained in the Socioeconomics Section of Chapter 3 of the Draft EIS (Page 3-244).

Federal Land Policy and Management Act (FLPMA)

Comment: One comment author was concerned that the Draft EIS does not include FLPMA in its partial list of applicable federal laws (see Chapter 2, Applicable Laws and Executive Orders) "despite its application to an issuance of a right-of-way within the National Forest System."

Forest Service Response: FLPMA has been added to the partial list of federal laws in the Final EIS.

Comment: The same comment author states that:

> "FLPMA independently requires an analysis of many of the issues described in the preceding points. For example, a community impacts analysis for Kupreanof is needed to ensure consideration of whether the Forest Service decision to grant the right-of-way will "protect the interests of individuals living in the general area traversed by the fight-of-way (sic) who rely on the fish, wildlife and other biotic resources of the area for subsistence purposes." [43 U.S.C. § 1765(b)(iv)]."

Forest Service Response: The Draft EIS evaluates the potential environmental impacts of the Proposed Action and alternatives and is consistent with FLPMA. Subsistence is addressed in Chapter 3 of the Draft EIS in the *Wildlife and Subsistence* section.

Comment: The commenter also states that:

> "The statute also requires an analysis of the project feasibility concerns because the right-of-way cannot be issued unless the applicant has the "technical and financial capability to construct the project" in accord with requirements to minimize damage to scenery, fish and wildlife habitat and other environmental qualities. [43 U.S.C. § 1764(j); 1765(a)]."

Forest Service Response: The full text from the FLPMA citation is as follows:

> **(j) Criteria for grant, issue, or renewal of right-of-way**
> The Secretary concerned shall grant, issue, or renew a right-of-way under this subchapter only when he is satisfied that the applicant has the technical and financial capability to construct the project for which the right-of-way is requested, and in accord with the requirements of this subchapter.

Prior to issuing a special use permit for transmission line construction (should one of the action alternatives be selected) the Forest Service will require that the applicant meet a number of requirements, including demonstrating technical and financial capability. This process meets all the applicable requirements of FLPMA and is separate from the environmental impact analysis required under NEPA.

Comments by this comment author and others that relate to project feasibility are addressed below in the Project Feasibility section.

General

Comment: One comment author has expressed concern about the role of Tetra Tech, the contractor that assisted the Forest Service with preparation of the Draft and Final EIS documents.

> "When confronted with its peculiar dual role as steering committee member and EIS contractor, Tetra Tech issued a formal disclosure stating it had no financial conflict of interest in this arrangement. Such a claim however belies the fact that it has produced a document which will inevitably have to be revised to correct its intentional shortcomings in violation of NEPA. Unless Tetra Tech intends to accomplish these revisions free of charge, a financial conflict of interest becomes inescapably apparent."

Forest Service Response: As specified in 40 CFR 1506(c), contractors preparing an EIS with a federal agency shall execute a disclosure statement specifying that they have no financial or other interest in the outcome of the project. Tetra Tech executed a standard disclosure statement in accordance with this requirement. This disclosure statement is included in the project record.

The requirements of 40 CFR 1506(c) further specify that:

> "If the document is prepared by contract, the responsible Federal official shall furnish guidance and participate in the preparation and shall independently evaluate the statement prior to its approval and take responsibility for its scope and contents."

The EIS for the KPI Project has followed these requirements with the Forest Service actively participating in preparation of the EIS documents and conducting independent evaluation and review prior to releasing the EIS documents to the public.

Comment: One comment stated that the steering committee for the KPI Project includes Tetra Tech and the mayors of Kake and Petersburg but "deliberately excluded any form of representation from the city of Kupreanof."

Forest Service Response: Neither the Forest Service nor the EIS contractor, Tetra Tech, are members of the KPI Steering Committee. In addition, neither the Forest Service nor Tetra Tech were involved in the selection of Steering Committee members. Project information including minutes from Steering

Committee meetings are available for review on SEAPA's web site: http://www.seapahydro.org/Kake-Petersburg-Intertie.php#div4

Comment: One comment author stated that Tetra Tech failed to follow NEPA:

> "There is little left to conclude other than Tetra Tech has failed to follow the letter and intent of NEPA, while excluding many cost effective alternatives to address the Purpose and Need statement with. These failures are inexcusable and justify termination of Tetra Tech as a contractor overseeing this project."

Another comment author asserts that:

> "the DEIS was "so inadequate as to preclude meaningful analysis" and a revised DEIS should be prepared and circulated prior to any further planning on this project. [40 C.F.R. § 1502.9(a)]."

Forest Service Response: In accordance with the requirements of 40 CFR 1506(c) and standard practice in Region 10 and other regions of the Forest Service, the Forest Service actively participated in preparation of the KPI EIS documents and conducted independent evaluation and review prior to releasing the EIS documents to the public. We disagree with the assertions that the EIS fails to follow the letter and intent of NEPA or is "so inadequate as to preclude meaningful analysis." The comment authors' more specific concerns are addressed elsewhere in this comment response document.

Comment: One comment was concerned that the community profile in the Draft EIS failed to adequately characterize the role of commercial fishing to the residents of the city of Kupreanof:

> "Chapter 3-9 "Environment and Effects on Kupreanof is striking for its failure to get the facts straight. Several commercial fishermen holding several limited entry permits each, reside in Kupreanof, and always have. Apparently no one in Tetra Tech thought to consider how unlikely such a "fact" could be true. A likely explanation is that permits are associated with mailing addresses and Kupreanof uses Petersburg postal facilities and addresses."

Forest Service Response: We agree that this does seem like a reasonable explanation and have clarified in the Final EIS that permit and crew member counts provided by ACFEC are likely based on mailing addresses. Any Kupreanof residents holding permits or employed as crew members are, as a result, likely included in the Petersburg totals. This and other general community information is provided to characterize the communities in the vicinity of the project. The number of fishing permits held by Kupreanof residents has no bearing on the analyses presented in this EIS.

Issues

Comment: Several commenters felt that the Draft EIS inappropriately eliminated the "unroaded character of the city of Kupreanof" as significant issue under NEPA. According to one commenter:

> "Despite the concurrent, 'coordinated' and connected project areas and routes shared between the KPI EIS and the Kake Access Project EIS, the KPI DEIS Summary erroneously concludes: 'the unroaded character of the city of Kupreanof is no longer a key or significant issue.'"

Another comment stated:

> "The DEIS asserts that the 'unroaded character of the city of Kupreanof is no longer a key or significant issue' because of the elimination of Northern Alternative, Option 2. [DEIS at 1-15] It appears to justify this approach because action alternatives will no longer cross behind Petersburg Creek or pass behind the city of Kupreanof. [*Id*. at 2-33] Kupreanof objects to this approach because it ignores the significant impacts associated with construction activities, development of northern

Kupreanof Island through shovel trail construction, right-of-way clearing, and associated impacts to adjacent fish and wildlife populations."

Forest Service Response: The potential impact of the Northern Alternative, Option 2 was identified as a significant concern by residents of the city of Kupreanof during the initial scoping for this project and was, therefore, identified as a potentially significant issue under NEPA. However, as explained in the Draft EIS, this issue was addressed through the alternative development process and the Northern Alternative, Option 2 was dropped from further consideration. None of the other alternatives propose roads or temporary access trails in close proximity to the city of Kupreanof or have the potential to affect its unroaded character. Therefore, the potential for impacts to the unroaded character of the city of Kupreanof is no longer considered a significant issue.

Concerns regarding the relationship between the KPI and Kake Access projects are addressed above in the *Kake Access Project* section of this comment response document. Impacts to northern Kupreanof Island, fish and wildlife, and other environmental resources are addressed in detail throughout the Draft EIS.

Project Description

Comment: One comment requested that the Forest Service provide a "more detailed description of the potential ground disturbance, proposed infrastructure, and potential effects in the ROW. How big is the footprint? How wide a swath of trees will be cleared to install the line down to the water? What are the locations of above-ground structures?"

Forest Service Response: The above comment specifically relates to Alternative 4 and the proposed Wrangell Narrows crossing location from Mitkof Island to the existing Tonka MAF. Information based on preliminary project design is presented in Chapter 2 of the EIS, which describes among other things right-of-way clearing, access, marine crossings, and proposed structures.

More detailed maps showing approximately structure and crossing locations are available for review at the Petersburg Ranger District. These maps are the result of an indicative engineering process, which provides a representative profile of the project and an adequate level of detail for analysis under NEPA. Structure locations shown on these maps are subject to change. Exact locations will not be identified until an alternative is selected and the applicant has completed detailed engineering for that alternative.

Purpose and Need

Comment: One comment author felt that the document Purpose and Need should be revised to emphasize that the intent of the project is to lower commercial electric rates, and not residential electric rates.

Forest Service Response: The Forest Service Purpose and Need is described in Chapter 1 of the Draft EIS.in the *Purpose and Need* section under *Forest Service Purpose and Need*. The purpose and need is to decide whether to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. The preceding subsection entitled *Background* provides a brief overview of the background for the project and emphasizes that commercial customers are not eligible to participate in the PCE program, which may have the effect of impeding economic development in Kake.

Project Feasibility

Funding

Comment: One comment author felt that more information needed to be presented about the grants that would be required to build the project, "as it speaks to the financial feasibility of this project." Another comment author asserted that "the DEIS needs to be updated to reflect the effect of fluctuating fuel prices on the project's underlying assumption that funding is available."

Forest Service Response: Evaluating potential sources of funding for the KPI Project is outside the scope of this EIS. As described in the EIS, the Forest Service purpose and need is to decide whether to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. Securing funding is the responsibility of the applicant.

Prior to issuing a special use permit for power line construction (should one of the action alternatives be selected) the Forest Service will require that the applicant meet a number of requirements, including demonstrating technical and financial capability. If the applicant is unable to demonstrate technical and financial capability, the special use permit will not be issued.

Hydropower Availability

Comment: A number of comments were concerned about the availability of surplus hydropower that could be used to supply relatively low-cost power to the city of Kake and felt that the EIS should consider and disclose uncertainties surrounding this supply. One comment author felt that the Draft EIS should account for the potential effects of climate change on hydropower projects in Southeast Alaska.

Forest Service Response: The trend toward higher electric loads in the communities served by SEAPA is noted in the *Socioeconomics* section of Chapter 3 of the Draft EIS. This discussion has been expanded in the Final EIS to address the future availability of power to Kake. Examining the impact of climate change on hydropower projects in Southeast Alaska is outside the scope of this project.

Project Costs

Comment: Several comments expressed concern about the project cost information provided in the Draft EIS.

> "Further NEPA analysis needs to disclose, update and fully account for project costs. The DEIS omits critical information needed to compare the alternatives, such as the costs of the respective routes or that the northern route is the most expensive."

> "The DEIS Fails to provide an objective analysis of risks and uncertainties related to the economics of the project."

One commenter expressed concerns about the project feasibility study prepared on behalf of the project applicant by D. Hittle & Associates (2014), claiming that the projected cost savings are unrealistic and based on unsupported assumptions. Concerns the commenter felt needed to be addressed included potential power outage costs and uncertainty about construction costs, sales of merchantable timber, electricity rate projections, and projected long-term electricity consumption

Forest Service Response: The estimated costs of the alternatives (as provided by the project applicant) are identified on page 3-248 of the Draft EIS.

Assessing the economic feasibility of the overall project is the responsibility of the applicant. The EIS summarizes the findings of the feasibility analysis prepared for the project on behalf of the project applicant in the socioeconomics section. Additional information has been added to the Final EIS to clarify that this is for informational purposes only.

Prior to issuing a special use permit for power line construction (should one of the action alternatives be selected), the Forest Service will require that the applicant meet a number of requirements, including demonstrating technical and financial capability. If the applicant is unable to demonstrate technical and financial capability, the special use permit will not be issued.

Comment: Two comment authors raised concerns about the ability of electric rate payers in Kake to pay project-related operations and maintenance costs. One of these commenters also noted that "the Petersburg Borough has been working toward restricting or eliminating the use of herbicides for clearing rights-of-way, and this could affect projected maintenance costs."

Forest Service Response: As noted on page 3-247 of the Draft EIS, existing SEAPA staff would be responsible for operation and maintenance of the new transmission line and associated facilities, with regular inspections and maintenance activities conducted on a similar schedule to those currently conducted on SEAPA's existing transmission lines. SEAPA estimates that electric rates paid by customers in Kake would be sufficient to cover these costs. Operating costs are also discussed on page 3-251 of the Draft EIS.

Significant Issue

Comment: One comment requested that project feasibility be considered in the EIS as a significant issue under NEPA.

Forest Service Response: Assessing the feasibility of the overall project is the responsibility of the applicant. The Forest Service purpose and need is to decide whether to authorize the construction, operation, and maintenance of the proposed KPI Project across NFS lands. Prior to issuing a special use permit for power line construction (should one of the action alternatives be selected), the Forest Service will require that the applicant meet a number of requirements, including demonstrating technical and financial capability. If the applicant is unable to demonstrate technical and financial capability, the special use permit will not be issued.

Socioeconomics

Employment

Comment: One comment was concerned that the project is not expected to produce more local employment.

Forest Service Response: Construction employment estimates developed by the proponent's consulting engineer (D. Hittle & Associates) are presented in the Socioeconomics section of the EIS. These estimates are preliminary and based on experience with similar projects. Workers with specialized transmission line construction expertise are expected to mainly come from outside the region. Local workers are expected to be hired for non-specialized tasks such as right-of-way clearing.

Property Values

Comment: One comment was concerned that the introduction of an electric transmission line near the Wrangell Narrows crossing location proposed as part of Alternative 4 would affect surrounding property values.

Forest Service Response: A section that discusses the potential effects of the alternatives on private property values has been added to the Socioeconomics section in the Final EIS.

Subsistence

Subsistence Hearings under ANILCA

Comment: Noting that formal subsistence hearings have not been held for the project, one comment expressed concern that the Forest Service does not appear to have met the full requirements of ANILCA Section 810:

> "Section 810(a) of ANILCA (Public Law 96-487) requires that the federal agency notices and holds a hearing "in the vicinity of the area involved" and makes specific findings related to subsistence uses. ANILCA Sec. 810 (b) states, "If the Secretary is required to prepare an environmental impact statement pursuant to section 102(2)(C) of the National Environmental Policy Act, he shall provide the notice and hearing and include the findings required by subsection (a) as part of such environmental impact statement. … The DEIS includes a discussion on subsistence in Chapter 3 (pages 3-125 and 3-126); however, it does not appear to meet the full requirements of ANILCA Section 810, including providing a subsistence hearing and incorporating subsistence findings into the EIS."

Forest Service Response: The Draft EIS meets the requirements of ANILCA Section 810. Section 810(a) of ANILCA outlines three conditions that should be met, including holding a hearing in the vicinity of the area involved, if a proposed action would "significantly restrict subsistence uses." The exact language is as follows:

> "No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would *significantly restrict subsistence uses* shall be effected until the head of such Federal agency …" (meets three conditions, including holding a hearing). (emphasis added)

As discussed on page 3-151 of the Draft EIS:

> None of the proposed alternatives would present "a significant possibility of a significant restriction" of subsistence uses for any subsistence resources (fish and marine invertebrates, food plants, personal use timber, upland game birds and waterfowl, furbearers, big game, and marine mammals).

None of the alternatives would "significantly restrict subsistence use" and, therefore, the requirement to hold a hearing does not apply.

Impacts to Subsistence Communities

Comment: Several commenters expressed concern about the subsistence analysis in the Draft EIS. One commenter stated that the Draft EIS failed to disclose impacts to subsistence use by community. The comment also stated that insufficient knowledge exists about wildlife biology to assess impacts on subsistence use. Two other comments stated that the wildlife analysis that supports the conclusions presented with respect to subsistence was inadequate.

Forest Service Response: The effects analysis for subsistence applies to all three communities in the vicinity of the project. None of the alternatives are "expected to affect subsistence use of fish and marine invertebrates, plants, or timber and firewood for personal use" (Draft EIS, p. 3-255). Additional summary discussion of potential impacts to wildlife is also provided on the cited page, with a detailed assessment presented in the *Wildlife and Subsistence* section of the Draft EIS. Specific concerns regarding the wildlife analysis are discussed below in the Wildlife section of this appendix.

Timber

Comment: One comment noted that the Draft EIS states that timber cleared in a Non-Development LUD and used would not count toward the Allowable Sale Quantity, and provided the following recommendation:

> "In the Final EIS, discuss in the mitigation commitments whether it is feasible to reduce logging in other areas of the Forest to offset losses incurred when proposed projects would result in the unavoidable removal of marketable timber from Non-Development LUDs."

Forest Service Response: The Forest Plan management prescriptions for the Transportation and Utility System LUD states the following with respect to Timber:

> Timber Resource Planning: TIM4
>
> C. For initial LUDs that do not allow timber harvest, forested land is classified as unsuitable for timber production and withdrawn from the timber base. Any timber harvest associated with facility development will not count toward the Allowable Sale Quantity. (USDA Forest Service 2008a, p. 3-132)

Counting trees that would be removed from Non-Development LUDs and used toward the ASQ would be inconsistent with this requirement.

Vegetation

Windthrow

Comment: One comment requested a more detailed description of potential project-related ground disturbance with specific reference to windthrow:

> "Will any measures be taken to mitigate increased vulnerability to wind damage due to tree clearing, such as the application of a buffer or use of feathering techniques?"

Forest Service Response: Mitigation measures related to windthrow are presented in Table 2-3 in the Draft EIS under Vegetation and Timber and include the following:

T1 Where practicable, locate right-of-way edges perpendicular to the prevailing winds to minimize windthrow.

T2 Use feathered right-of-way edges to minimize vegetation removal, windthrow, and visual impacts.

For portions of the project located on non-NFS lands, SEAPA would work with affected land managers and land owners to minimize site-specific impacts, as appropriate.

Visual

Comment: Several comments expressed concern about the potential visual impacts of the project. Several commenters stating their opposition to the Northern Route (Alternatives 2 and 3) felt that visual impacts to tourism would be greater for this route. One comment requested more detailed information about the mitigation of visual impacts.

Forest Service Response: Visual impacts are assessed in Chapter 3 of the Draft EIS in the *Scenery* section. This analysis includes views from visual priority routes and use areas (VPRs) that are identified in Appendix F of the Forest Plan as Alaska Marine Highway Route/Tour Ship Routes, specifically the Wrangell Narrows and Frederick Sound. Alternatives 2 and 3 would both extend along the shoreline of the Lindenberg Peninsula, which borders Frederick Sound to the west. Views from selected viewpoints along Frederick Sound are assessed for these alternatives in the Draft EIS. From 7 to 15 structures would likely be visible in the middleground (0.5 to 5 miles from the viewer), depending on the viewpoint. The proposed transmission line would also likely be visible as a linear break in the forest pattern when viewed from Frederick Sound, and where it would span the larger creeks that incise this stretch of shoreline. Views of the proposed project for ferry and cruise ship passengers would likely be limited in duration as their respective vessels pass these specific locations.

Mitigation measures for visual resources are presented in Table 2-3 under Visual Resources. For portions of the project located on non-NFS lands, SEAPA would work with affected land managers and land owners to minimize site-specific impacts, as appropriate.

Wetlands

Comment: One comment stated that additional analysis is required to demonstrate that the KPI Project would comply with Clean Water Act requirements and requested that the EIS: "describe all Clean Water Act discharge permit requirements and provide a preliminary 404(b)(1) evaluation under the Clean Water Guidelines." The comment author was specifically concerned that the Draft EIS "failed to demonstrate an effort to avoid wetland impacts."

Another comment provided the following summary with respect to the Draft EIS and the Clean Water Act:

> "The DEIS adequately describes the direct, indirect, and cumulative impacts associated with each alternative and includes a robust list of mitigation measures to be implemented for each impact category, including numerous erosion and sediment control measures. The DEIS (page 1-17) acknowledges that a Section 404 permit would be required for the wetland fill, which will also require a 401 Certification of Reasonable Assurance issued by the Alaska Department of Environmental Conservation (DEC). Generally, the U.S. Army Corps of Engineers (USACE) will coordinate with DEC for the 401 Certification when the applicant files for an individual 404 permit with the USACE."

Forest Service Response: Federal and state permits, licenses, and certifications that would be required for the project are listed in Chapter 1 of the Draft EIS (page 1-17). As indicated in the Draft EIS (and noted in the comment above), a Section 404 permit would be required for the wetland fill, which will also require a 401 Certification of Reasonable Assurance issued by the ADEC. These permits will be developed during the final design of the selected alternative and permit approval will be a condition of obtaining a special use permit from the Forest Service.

Potential impacts to wetlands are evaluated by alternative in Chapter 3 of the Draft EIS in the section entitled *Wetlands*. This section evaluates the direct, indirect, and cumulative impacts associated with each alternative and describes the mitigation measures that would be employed to limit potential effects on wetlands. Mitigation measures are also summarized in Chapter 2 of the Draft EIS, with additional detail provided in Table 2-3 under "Wetlands, Floodplains, and Riparian Management Areas." Mitigation measure RMA 1 directly speaks to the comment author's concern as follows: "To the extent practicable, avoid siting transmission line structures in wetlands, floodplains, and riparian areas. Where this is not possible, BMPs and Forest Service Standards and Guidelines will be implemented to reduce overall disturbance."

Comment: One commenter noted that while the Draft EIS provides detailed information on the type and acres of wetlands and other waters of the U.S. that could be potential affected by alternative, the Draft EIS did not "clearly differentiate acreage of temporary versus permanent impacts" of wetlands. The commenter requested that this information along with "wetland delineation information that utilizes methodologies required by the Corps of Engineers 1987 Wetlands Delineations Manual and the 2007 Alaska Regional Supplement" be included in the Final EIS and application to the Corps for a Section 404 Permit. The commenter further noted that a "functional assessment of the aquatic resources would be useful to help us in our evaluation of these alternatives." Another commenter requested that a functional assessment be conducted to help identify appropriate compensatory mitigation. (Comments 4-8, 20-1, 20-2, 20-3).

This commenter and another also provided information regarding compensatory mitigation as it relates to the Section 404 Permit process.

Forest Service Response: As noted in the comment, the *Wetlands* section in Chapter 3 of the Draft EIS provides detailed estimates of impact by project component and wetland type (see Tables WET-2 and

WET-3). Impacts are not divided into temporary versus permanent impacts but for the purposes of comparison, permanent impacts are likely to be limited to the footprints of the transmission line structures and helicopter pads, which would be placed permanently on the landscape. Impacts related to the other project components (shovel trails, temporary access spurs, and temporary matting panels) would be temporary. Right-of-way clearing for the proposed action alternatives would primarily affect wetlands with a forested vegetation class, with future maintenance expected to prevent trees from growing to maturity in these areas. This information has been added to the *Wetlands* section in Chapter 3 of the Final EIS.

As indicated in Table WET-1 in the Draft EIS, wetlands range from about half (49 percent; Alternative 4) to two-thirds (65 percent and 64 percent, Alternatives 2 and 3) of total acres in the analysis area for each alternative. This reflects the nature of the landscape in Southeast Alaska. Given the prevalence of wetlands in the analysis areas and general vicinity, delineating individual wetland areas is not necessary for the purposes of evaluating the action alternatives under NEPA. This is also the case with functional assessments, which is why they were not conducted as part of this analysis.

The applicant, SEAPA, will be required to obtain all necessary federal and state permits to construct, operate and maintain the transmission line prior to project construction. SEAPA will work directly with the Corps to ensure that all concerns related to wetlands are addressed.

Comment: One comment stated that under Section 404 of the Clean Water Act the Corps' substantive evaluation criteria is the EPA 404(b)(1) Guidelines (Guidelines), and noted that:

> "The Guidelines only allow the Corps to issue a permit for the discharge of dredged and/or fill material into waters of the United States, including wetlands, for the least environmentally damaging practicable alternative. An alternative is practicable if it is available and capable of being done by the applicant after considering technology, costs, and logistics."

Forest Service Response: SEAPA (the applicant) is responsible for obtaining all necessary federal and state permits to construct, operate and maintain the transmission line. SEAPA will work directly with the Corps to ensure that all concerns related to wetlands are addressed.

Wildlife

Bald Eagles

Comment: One comment stated that the Draft EIS "failed to fully disclose KPI risks to bald eagles or explain how the KPI could be constructed without violated the Bald Eagle Protection Act." Specific concerns raised by the comment author with respect to the Draft EIS include:

- Does not allow meaningful comparison between alternatives because impacts to bald eagle are discussed together for the action alternatives and do not identify differences between the action alternatives.
- Does not show that the Forest Service surveyed for bald eagles at an appropriate scale, which the comment believes should be 0.5 mile from the project.
- Does not "adequately analyze potential disruptions to eagles during sensitive stages of their life cycle" or impacts to foraging and roosting areas.
- Arbitrarily relies on Forest Plan standards and guidelines and protections to bald eagle nesting habitat from OGRs, non-development LUDs, and the 1,000-foot beach and estuary buffer without disclosing the extent to which the project alternatives would affect these areas.
- Fails to disclose or analyze mortality risks associated with overhead electric transmission lines
- Proposes inadequate mitigation measures because there is no record that SEAPA has developed a comprehensive Avian Protection Plan and the proposed mitigation measures do not include a plan for constant monitoring during construction.

Forest Service Response: As required by the Forest Plan, all action alternatives would be conducted in accordance with the Bald and Golden Eagle Protection Act, including maintaining appropriate distances from active bald eagle nests. The most current guidelines (National Bald Eagle Management Guidelines, U.S. Fish and Wildlife Service, May 2007) for bald eagles on all lands (e.g. federal lands, state lands, private lands) are intended to help minimize impacts to bald eagles, particularly where activities may constitute "disturbance," which is prohibited by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), and will be followed as appropriate. To avoid activities and minimize disturbance to bald eagles, bald eagle surveys would be conducted for the selected alternative prior to project implementation. Active nests will receive buffers as suggested by guidelines. During project implementation, repeated helicopter flights within ¼ mile of active bald eagle nests, particularly for large helicopters that may be used for yarding timber, should be avoided. Furthermore, clearing, external construction, and landscaping within 660 feet of nest should be done outside the breeding season (March 1st to October 31st). If prior to project implementation, it is determined that a "disturbance" is not avoidable, the appropriate "take permit" will be attained from the U.S. Fish and Wildlife Service. Current Guidelines (i.e. National Bald Eagle Management Guidelines, U.S. Fish and Wildlife Service, May 2007) may be viewed at http://alaska.fws.gov/eaglepermit/pdf/national_guidelines.pdf.

The EIS does note that all construction components would meet the Avian Power-Line Interaction Committee (APLIC) standards, which are designed to reduce the potential for avian electrocutions. In addition, any areas that are identified as high use would require some type of bird flight diverter to reduce the potential for collisions. Additional text and reference to the amount of POG that would be removed from the beach fringe has been added to the discussion on impacts to bald eagles in the Wildlife and Subsistence section of Chapter 3 of the Final EIS.

The Forest Service disagrees that the Forest Plan Standards and Guidelines are arbitrary in terms of providing protection to eagles and other raptors, and in accordance with current guidelines, all alternatives would be consistent with Forest Plan standards and guidelines for Bald Eagles and with the Bald and Golden Eagle Protection Act. Given that the project will be designed to meet APLIC standards, there is no need to provide exhaustive detail related to the risks of electrocution.

Black Bear Habitat

Comment: The same comment author stated that the Draft EIS "fails to provide baseline information about black bear habitat conditions and vulnerabilities in the project area." The comment stated that the Draft EIS fails to disclose that the project is located in a biogeographic province that has already lost over a third of its habitat value for black bears. In addition, the comment author states that the Draft EIS does not disclose that substantial hunting pressure is exerted on black bears in the project area, or that Kupreanof Island typically supports more than 40 percent of black bear harvest in GMU 3.

The comment author is also concerned that the Draft EIS does not identify where proposed stream crossings coincide with key bear foraging areas, does not specifically address impacts to black bears in beach fringe buffers, or identify black bear-specific mitigation measures.

Forest Service Response: Direct and Indirect impacts to black bears are addressed in the *Wildlife and Subsistence* section in Chapter 3 of the Draft EIS. As noted in the EIS (Page 3-134) road building associated with past timber harvest in the analysis area WAAs has resulted in a limited number of road systems available for use by hunters in the vicinity of Kake, Petersburg, and Kupreanof.

No new roads would be developed under any of the alternatives and motorized access to temporary shovel trails and temporary access spurs used during construction would be prohibited, with non-motorized access discouraged. As a result, the development of these shovel trails and temporary access spurs is unlikely to result in substantial change to hunter access or measurably increase black bear susceptibility to harvest over the long term.

Class I stream crossings and impacts to riparian areas are addressed in more detail in the *Aquatics* section of Chapter 3. Effects to black bear habitat are addressed on page 3-133 of the Draft EIS under *Effects Common to All Alternatives*. Mitigation measures are addressed in Chapter 2 of the Draft EIS.

Connectivity

Comments: Two commenters identified the existence of a "pinch-point" between Portage Bay and Duncan Canal. One comment was concerned about potential impacts to resident and migratory waterfowl:

> "An important wildlife corridor pinch point connecting Lindenberg Peninsula with Kupreanof Island exists between the northernmost reaches of the Petersburg Lake drainage to the southernmost headwaters of Portage Bay. This is an important flyway for migratory and resident waterfowl which get flushed from one area to the other. A high voltage line is a significant hazard for a flyway corridor, and the associated strong EMF generated needs to be studied to determine its impact on resident and migratory waterfowl species."

The other comment was concerned about impacts to wildlife habitat in this area and felt that the Draft EIS "failed to provide an appropriate level of analysis including a graphical display of current and future wildlife corridors."

Forest Service Response: The Draft EIS addresses landscape connectivity and fragmentation in Chapter 3 in the *Wildlife and Subsistence* section under *Landscape Connectivity/Fragmentation* and *Old-growth Forest Ecosystem and Landscape Connectivity/Fragmentation*. The narrow area of land between Portage Bay and Duncan Canal is identified as a pinch point that may restrict dispersal or migration for some species (see Draft EIS, p. 3-112). Alternatives 2 and 3 are identified in the Draft EIS as having moderate effects to connectivity in this area, with potential impacts reduced because both alternatives follow an existing road in this area. Viewed in terms of productive old-growth removed, the cumulative impact of these alternatives, including productive old-growth that has already been removed is less than one percent. The VCUs crossed by the KPI route corridors currently include approximately 141,673 acres of

POG forest (Table WILD-1). Under Alternatives 2 and 3, approximately 464 and 461 acres of POG would need to be cleared, respectively (Table WILD-15).

EMF is discussed in Chapter 3 of the Draft EIS in the *Health and Safety, including Noise* section. The proposed transmission line is not expected to have EMF-related effects on resident or migratory waterfowl species.

Potential risks of bird collision are addressed in mitigation measure W1: Provide line markers on transmission line to minimize the risk of bird collision at any known areas of concern (see Table 2-3 in Chapter 2 of the Draft EIS). Areas of known concern will be identified during final engineering design for the selected alternative. Conductors and/or guy wires in these areas may require bird flight diverters to reduce the likelihood of bird collisions.

Deer and Restoration Activities

Comment: One comment expressed concern about programs designed to improve deer habitat:

> "The description of Restoration Activities in the Project Area (Page 3-6) are based on the assumption that past, current, and future improvement projects will enhance deer habitat but without proof. Currently the TWYGS (Tongass-Wide Young-Growth Studies) Program (upon which you base your many decisions) is incomplete and dependent upon future funding for accomplishments."

Forest Service Response: Comment noted. Hanley et al. (2013) summarize the preliminary (i.e., 4-8 years post treatment) results of experimental young-growth treatments conducted to improve deer habitat as part of the TWYGS program. The commenter is correct that the information presented is presently incomplete. Continued monitoring over time will provide more robust data that will be valuable for planning and conducting long-term young-growth forest management programs. However, it is clear that young clearcuts provide highly productive and suitable deer habitat, particularly in summer and snow-free conditions. Over time and without silvicultural manipulation, the resulting young-growth stands become very poor, sparse habitat for deer, as evidenced by the strongly decreasing values of the untreated control stands with increasing stand age in this study and in the studies that were reviewed.

Results of the TWYGS study included: 1) all treatments in all TWYGS experiments and all other studies reviewed yielded higher quality habitat for deer than that of their untreated, closed-canopy controls, 2) understory response is stronger with earlier treatment (younger stand age), mostly because there is more understory vegetation already present to serve as nurse stock in younger stands, and 3) pre-commercial thinning may maintain the favorable conditions of young clearcuts for probably an additional decade beyond normal canopy crown closure, possibly much longer if repeated again and coupled with pruning.

Research is ongoing but all potential effects are assessed based on best available science. Wildlife habitat improvement projects located within the VCUs crossed by the KPI Project include the Mitkof, Tonka, and Central Kupreanof restoration projects to improve and enhance predominately available forage for deer through thinning. Combined, the three projects would restore/treat approximately 800 acres.

Kake Access Project

Comment: One commenter felt that the wildlife analysis was insufficient because it failed to evaluate the cumulative impacts of the Kake Access Project:

> "The analysis needs to be completely redone to account for direct and indirect effects of KPI construction and cumulative effects of the Kake Access Project on wolves, black bear, deer and marten."

The comment author believes that the Draft EIS analysis needs to be redone because it fails to evaluate potential increases in road density resulting from the KPI Project and Kake Access Project.

Forest Service Response: The Kake Access Project and the reasons why it is not feasible or appropriate to analyze the potential impacts of a year-round road are discussed in Chapter 1 of the Draft EIS in the *Relationship to the Kake Access Project* subsection (page 1-8). This section has been updated in the Final EIS to reflect the current status of the Kake Access Project. None of the action alternatives for the KPI Project involve the construction of new roads and would, therefore, not result in an increase in road density in the analysis area.

Non-Reflective Wire

Comment: Noting that the applicant proposes to use non-reflective wire for overland sections of the transmission line to reduce line visibility, one commenter requested that the Final EIS discuss the potential impacts of low visibility conductors and/or guy wires to wildlife.

Forest Service Response: The reference in the Draft EIS to non-reflective wire is a mitigation measures designed to reduce potential visual impacts (see Mitigation Measure V1, Table 2-3 in Chapter 2 of the Draft EIS). As noted above with respect to connectivity and waterfowl, potential risks of bird collision are addressed in mitigation measure W1: Provide line markers on transmission line to minimize the risk of bird collision at any known areas of concern (see Table 2-3 in Chapter 2 of the Draft EIS). Areas of known concern will be identified during final engineering design for the selected alternative. Conductors and/or guy wires in these areas may require bird flight diverters to reduce the likelihood of bird collisions.

Marten

Comment: One commenter was concerned that the Draft EIS "failed to accurately describe existing conditions and risks to project area martens" because the Draft EIS does not disclose that the project area has "lower than anticipated densities [Exh. 20]" or disclose that "ADF&G recommended restrictions on trapping efforts in portions of GMU 3 because (of) habitat loss and mortality risks caused by the Forest Service's timber program and associated transportation system [Exh. 8]". The references to Exh. 8 and Exh. 20 are to ADF&G (2013b) and Flynn et al. (2005), respectively.

Forest Service Response: Direct and Indirect impacts to marten are assessed in detail in the *Wildlife and Subsistence* section of Chapter 3 of the Draft EIS. No new roads would be constructed under any of the action alternatives. Mitigation measures are addressed in Chapter 2 beginning on page 2-34.

The references cited in the above comments – ADF&G (2013b) and Flynn et al. (2005) – have very limited applicability to the KPI Project analysis and are, therefore, not included in the overview of existing conditions provided in the Draft EIS. ADF&G (2013b) consists of the slides from a PowerPoint presentation that, among other things, summarizes a marten telemetry study on Kuiu Island and includes a proposal to establish a controlled use area prohibiting the use of motorized land vehicles for marten trapping on the Tonka road system. Bulleted issue statements offered in support of this proposal are as follows: continued reductions in old-growth forest, increasing road density, increasing trapper access, little refugia for marten, and the potential for overharvest. Flynn et al. (2005) summarizes the abundance, prey availability and diets of martens from eight study sites. One site was located near Portage Bay on the northern end of Kupreanof Island and surveyed in the fall of 2002 and 2003.

Old-growth Reserves

Comment: One comment expressed concern about old-growth reserves (OGRs), stating that:

> "The analysis of impacts to old-growth reserves is misleading, and project level review of the modifications is required."

As described in the Draft EIS (p. 3-130), situations in which modifications of OGRs may require completion of a project-level review are described in Appendix K of the Forest Plan (USDA Forest Service, 2008b, p. K-1). These include if:

- Actions are proposed within the OGR that will reduce the integrity of the old-growth habitat in the OGR, and
- The OGR will be affected by a land conveyance, power line, mine or other project that was not considered in the Forest Plan.

The comment author believes that Alternatives 2 and 3 would reduce the integrity of the old-growth habitat in the small OGRs in VCUs 4440 and 4460 and states that the Northern Route (Alternatives 2 and 3) was not considered in the 2008 Forest Plan.

Forest Service Response: Under Alternatives 2 and 3, the reduction of 13 acres of POG in VCU 4440 and 6 acres in VCU 4460 is not expected to reduce the integrity of the old-growth forest within the OGRs. Both OGRs will continue to meet the minimum acreage requirements outlined in Appendix K (see Table WILD-14 in the Draft EIS, page 3-132).

The Northern Route (Alternatives 2 and 3) is identified as a Potential Power Transmission Corridor in the 2008 Forest Plan. This is discussed in a number of locations in the Draft EIS. See, for example, the section entitled *Relationship to the Forest Plan* in Chapter 1.

The referenced OGRs (4440 and 4460) were subject to interagency review as part of the 2008 Forest Plan Amendment process, as outlined in Appendix K of the Forest Plan. The purpose of both small OGRs is to improve and maintain connectivity, low elevation productive old-growth habitat, south facing slopes, and connectivity to the beach fringe at Twelvemile Creek. No boundary modifications would occur as a result of the KPI project. As stated in the EIS, no new roads would be constructed in these small OGRs.

Queen Charlotte Goshawk

Comment: One comment expressed concern that the Draft EIS failed to adequately assess potential impacts to Queen Charlotte goshawks:

> "The effects conclusions for Queen Charlotte goshawks arbitrarily rely on an analysis that ignores consider (sic) existing conditions and viability risks in the project area."

The comment author was specifically concerned that the Draft EIS did not:

> "provide useful analysis of impacts from specific past, present, and ongoing timber projects, particularly in light of the importance of individual goshawks in the project area to the broader persistence of the species."

The same comment author also stated that the Draft EIS "arbitrarily relies on Forest Plan direction to mitigate impacts to goshawks." The comment author felt that the Draft EIS should disclose that there is "considerable uncertainty" about whether the Forest Plan standards and guidelines and conservation strategy "effectively sustain goshawk viability." The comment author also found the analysis deficient because the Draft EIS failed to "discuss goshawk habitat utilization and the difficulty of detecting goshawks."

Forest Service Response: The 2008 Tongass Forest Plan Standards and Guidelines build on previous and ongoing research. The nest protection measures and maintaining a large buffer around nests is critical. No clearing is allowed within the buffer and removal of nest trees is prohibited. The Forest Service believes that the level of detail provided in the EIS is sufficient to determine potential impacts to the species and has identified the protection measures that would be in place for the project. The cumulative effects analysis takes into account past, present, and reasonably foreseeable future actions within the analysis area, which encompasses portions of Kupreanof and Mitkof islands, and found that sufficient habitat (similar habitat elements to the nest stand) would remain within a larger post-fledging and foraging area.

The commenter cited a number of documents that were reviewed to determine if additional information and/or analysis should be conducted, specifically Smith (2012, 2013) and Flatten et al. (2001). Previous studies, including the 1996 Conservation Assessment and Risk Assessment (Iverson et al. 1996) analyzed potential impacts to goshawks based on a number of assumptions. Specifically, the 1996 risk assessment analysis assumed that the Forest would be managed under the then current Forest Plan which projected a maximum average annual timber harvest of approximately 450 million board feet (MMBF). The 2008 Forest Plan estimated far less annual harvest with an annual sale quantity of 267 MMBF, and annual harvest to date has averaged less than 35 MMBF. Annual harvest volumes identified in the 5-year Timber Sale Schedule and Contract Plan (2015 through 2019) range from 40 MMBF to 53 MMBF, with approximately half of that volume coming from harvest of young-growth stands scheduled in 2018 and 2019.

Smith's (2012) comments on the Big Thorne Timber Sale and Smith (2013) were reviewed and determined not to be applicable to the KPI Project since none of subwatersheds on Kupreanof or Mitkof islands are close to the 33 percent harvesting threshold on National Forest System lands or expected to be in the foreseeable future. Table WAT-2 (page 3-26) provides a summary of acres of timber harvested within the KPI analysis area by subwatershed. Total harvest by subwatershed since 1984 ranges from 0.1 percent to 9.5 percent of the affected subwatersheds (Table WAT-2). The KPI Project would incrementally increase the amount harvested within the Fivemile Creek-Frontal Frederick Sound subwatershed from approximately 0.1 to 1.5 percent harvested since 1984 under Alternatives 2 and 3 (Table WAT-9; page 3-38). All other incremental increases in harvest are below 1 percent for all alternatives.

Flatten et al. (2001) was also reviewed. We agree that goshawk surveys may not locate all active goshawk nests and fully understand the difficultly in conducting surveys in Southeast Alaska. However, the protocols used are effective in documenting use. Further, the Tongass has adopted a landscape approach to providing sufficient nesting and foraging habitat. The Forest Service also understands that a nest may be used for 2 to 3 consecutive years and then remain vacant for several years. For any project, including the KPI Project, which may impact goshawk habitat or occur near a known nest site, project-related impact analysis versus forest-wide landscape assessments is the appropriate method under NEPA.

Sensitive Species

Comment: According to one commenter, "(t)he DEIS does not show that the KPI will meet TLMP standards and guidelines for sensitive species." The comment specifically requested that the Final EIS:

> "consider additional measures, including increased and enduring buffers for nests and ways to avoid disturbances associated with construction and right-of-way clearing, including adjustments to both routes in order to provide greater protection to the Scott Peak, Mitchell Creek, and newly documented nest areas."

Forest Service Response: Forest-wide Standards and Guidelines will apply for all raptor nests (USDA Forest Service 2008a, Chapter 4, WILD 1, p. 4-94). Goshawk nest trees, bald eagle nest trees, and all known nest trees other raptors will be retained. If re-alignment is needed, it will be addressed during the final design of the selected alternative. Mitigation measures are addressed in Chapter 2 beginning on page 2-34. Measures specific to raptors include W1, W4, W8, W10, and W12. These measures are in addition to and complement the existing Forest-wide Standards and Guidelines.

Wolves and Deer

Comment: One comment felt that the Draft EIS "failed to provide adequate baseline information about deer and wolves, including existing population risks." According to this commenter, baseline information should include a discussion of "conservation-based measures to minimize deer harvests in the project area" and disclose that listing of wolves under the Endangered Species may be warranted. Further, the commenter believes that the EIS should "analyze (and) disclose the precarious state of deer populations in the project area and their relation to the viability of an unknown and potentially endangered wolf population." With these concerns in mind, the commenter believes that the Final EIS should revisit the direct, indirect, and cumulative effects analyses presented in the Draft EIS.

The commenter also stated that while the Draft EIS notes that deer use in the cleared right-of-way for the selected alternative could increase exposure to wolf predation, it "never considers how this risk could create additive adverse impacts given the precarious status of both populations."

Forest Service Response: The Draft EIS analyzes the potential impacts to wolves and Sitka black-tailed deer in the *Wildlife and Subsistence* section of Chapter 3. The clearing of a right-of-way and construction and operation of the proposed transmission line, is not expected to incrementally add to current road densities under any of the alternatives because none of the alternatives involve new road construction (see the Draft EIS, p. 3-139). Viewed by WAA, Alternatives 2, 3, and 4 would maintain between 53 and 97 percent of the original (1954) deer habitat capability, the same as the existing levels (Table WILD-20; page 3-140). Therefore, the action alternatives would make a negligible contribution to impacts to the wolf prey base. No roads would be constructed under the KPI project (see Table WILD-7 on page 3-118 of the Draft EIS for existing road densities within the various WAAs that make up the analysis area). As the comment states, the Draft EIS does consider the fact that there may be an increased exposure to wolf predation. Additional information is provided for Sitka Black-tailed Deer in the *Wildlife and Subsistence* section in Chapter 3 under *Effects Common to All Alternatives*.

Comment: One commenter stated that: "(t)he cumulative effects analysis fails to consider plans to remove wolves under the state of Alaska's intensive management program." This commenter felt that the Final EIS should include an analysis of this program.

Forest Service Response: ADF&G works cooperatively with the Alaska Board of Game and with Federal land managers, including the Forest Service, to identify and address conservation concerns for all wildlife in Southeast Alaska, including wolves. Through this effort revisions are proposed to regulatory entities as needs are identified. The Alaska Board of Game has made modifications to wolf hunting and trapping seasons over the years in response to information provided by agencies and the public. These regulations are intended to help ensure sustainable wolf populations and are an important part of the Forest Plan wolf standard and guideline. Harvesting of wolves is regulated by the Federal Subsistence Board and the Alaska Board of Game. Intensive management (IM) programs are authorized under a specific procedure where the Alaska Board of Game determines a particular ungulate population important for human harvest and sets population and harvest objectives for deer, caribou, or moose in those specific areas.

In March 2013, ADF&G submitted a proposed operational plan to the Alaska Board of Game for intensive management of Sitka black-tailed deer within GMU 3. Within the KPI Project Area, the experimental treatment program included Mitkof Island and the northern and eastern potions Kupreanof Islands for treatment (i.e., wolf removal). However, a predator control program authorized under intensive management regulations is currently considered inactive within GMU 3.

A number of exhibits submitted by the commenter were reviewed. These exhibits primarily related to road densities, wolf mortality, wolf management reports covering 2002 through 2008, and other projects (e.g., Scott Peak, Big Thorne). The exhibits included Lowell 2004, Lowell 2006, ADF&G 2006, 2009, 2012, and 2013.

As described in the Draft EIS, no new roads would be constructed or maintained under any of the proposed action alternatives for the KPI Project.

New References:

Exh. 14. Lowell, R. 2006. Comment on wolf and marten population viability on Kuiu, Kupreanof and Mitkof Islands. ADF & G Dept. of Wildlife Conservation. Petersburg, AK: October 16, 2006.

Exh. 15. Lowell, R.E. 2004. Letter to Patricia Grantham, District Ranger, Petersburg Ranger District. ADF & G Dept. of Wildlife Conservation. Petersburg, AK: March 3, 2004.

Exh. 16. ADF&G. 2013. PowerPoint re feasibility assessment for intensive management, GMU 3.

Exh. 17. ADF&G. 2012. Status of wolves in southeast Alaska.

Exh. 18. ADF&G. 2009. Wolf management report of survey and inventory activities 2005 – 2008.

Exh. 19. ADF&G. 2006. Wolf management report of survey and inventory activities 2002-2005.

Wilderness

Comment: One comment was concerned that the summary of the 2005 feasibility analysis presented in Chapter 2 of the Draft EIS implied that a transmission line could not go through a designated wilderness area. The commenter recommended that the Final EIS recognize that ANILCA Title XI

> "allows for consideration of transportation and utility systems in Conservation System Units in Alaska (including designated wilderness) in the discussion of the elimination of the Center-North Alternative."

Forest Service Response: The discussion presented in the Draft EIS characterizes the route selection process based on information provided in the 2005 Feasibility Report (Hittle et al. 2005). Title XI of ANILCA does allow "for consideration of transportation and utility systems through conservation system units in Alaska, including designated wilderness" as noted in the comment. It does, however, require consideration of other factors including "whether there are alternative routes or modes which would result in fewer or less severe adverse impacts upon the conservation system unit." In addition, under the Forest Plan, Wilderness is a TUS Avoidance Area and transportation and utility systems may only be located in this LUD if no feasible alternatives exist outside this LUD. The 2005 Feasibility Report concluded that feasible alternatives did exist (the Center-South route) and recommended against pursuing the Center-North route.

Cover Photo: Kake, Alaska

For more information contact: Tom Parker
Tongass National Forest, Petersburg Ranger District
12 N. Nordic Drive
Petersburg, AK 99833
907-772-5974
tparker02@fs.fed.us