Kosciusko Vegetation Management and Watershed Improvement Project

Environmental Assessment, Final Decision Notice, and Finding of No Significant Impact
Cover Photo: Young-growth forest along National Forest System road 1525000 near Edna Bay on Kosciusko Island. Photograph by Erin Stevens.

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Kosciusko Vegetation Management and Watershed Improvement Project

Decision Notice and Finding of No Significant Impact

FINAL

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Abstract
The responsible official selects a modified version of Alternative 3 as described in the Kosciusko Project Environmental Assessment as the Selected Alternative to best meet the purpose and need, addressing a variety of objectives. Young-growth harvest – using even-aged, two-aged, and uneven-aged management combined – with precommercial thinning treatments and stream restoration, helps move Tongass National Forest forward in transitioning to young-growth management while improving wildlife habitat and providing long-term benefit to multiple resources on Kosciusko Island. The old-growth harvest analyzed in Alternative 3, and road actions associated with those units, are not components of the Selected Alternative.

The Selected Alternative includes harvesting approximately 29.9 million board feet of young-growth timber on about 1,461 acres of National Forest System land. The units comprise a variety of silvicultural prescriptions, are designed for ground-based logging, and can be packaged as both small and large sales. Full implementation of the Selected Alternative requires an estimated 1 mile of new temporary road construction, 4.9 miles of new temporary road construction on existing road prism, 4.7 miles of road reconditioning, and 17 miles of road maintenance. The Selected Alternative also includes precommercial thinning (PCT) on about 1,695 acres with another 170 acres of PCT in riparian areas, improvements to karst systems, invasive plant treatments, and in-stream restoration activities, including improvements to fish passage.
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Introduction

This Final Decision Notice (DN) contains a brief summary of the environmental analysis completed for the Kosciusko Vegetation Management and Watershed Improvement Project (Kosciusko Project) Environmental Assessment (EA), my decision regarding which alternative to implement, and the rationale for that decision. It also contains findings required by various laws, and information concerning the right to a pre-decisional Administrative Review of this decision. The EA completed for this project is incorporated by reference and is included with this document.

The Kosciusko Project area is in Southeast Alaska approximately 48 air miles northwest of Thorne Bay, Alaska (see EA Figure 1 on page 4), and is about 56,063 acres in size, roughly the southern half of Kosciusko Island. There are approximately 37,202 acres of National Forest System (NFS) land in the project area, with approximately 3,326 of those acres authorized for various treatments in this Decision. Kosciusko Island is situated along the northern west side of Prince of Wales Island and includes the community of Edna Bay. The project area includes lands in all ownerships.

Decision

Based upon my review of the analysis, comments from the public, and other documents provided for the Kosciusko Project EA, I am selecting Alternative 3 as modified (Selected Alternative).

The Selected Alternative includes young-growth stands for timber harvest, which is comprised of about 396 acres of even-aged management, 856 acres of two-aged management, and 209 acres of uneven-aged management producing a total timber harvest volume of approximately 29.9 million board feet (MMBF). Two marine access facilities (MAFs), East Edna Bay or the West Edna Bay MAF, would be utilized for this project. There will be approximately 1 mile of new temporary road construction, 4.9 miles of new temporary road construction on existing road prism, 4.7 miles of road reconditioning, and up to 17 miles of road maintenance to support the management activities in this alternative. Existing rock quarries be further utilized as needed and approximately 5 new rock quarries will be developed. The temporary roads will be decommissioned upon completion of the management activities.
Figure 1: Selected Alternative Map for the Kosciusko Project.
Precommercial thinning will occur on about 1,695 acres of young-growth stands, and in an additional 170 acres of young-growth in riparian management areas (RMA). Karst systems may be improved, such as by removing blockages and remediing diverted water flow. Invasive plant infestations may be treated manually or mechanically, or monitored. In-stream restoration activities may occur on up to one mile of stream segments. “Red” culverts, which do not provide fish passage at all flows, will be removed or replaced in the project area as funding becomes available.

The map on the previous page (Figure 1) depicts the Selected Alternative.

**Decision Rationale**

My selection of Alternative 3, as modified, for the Selected Alternative considers how best to meet the purpose and need for this project, the existing conditions within the project area, environmental effects, relevant issues and concerns, and public comments. My rationale is based on the project-specific environmental analysis included in the EA and corresponding resource reports, as well as a review of the record, which shows a thorough analysis using the best available science.

Though all three action alternatives meet the purpose and need of the project, they each do so to varying extents, with tradeoffs between timber and other resources benefits. I have evaluated these trade-offs, and both the beneficial and adverse environmental effects of all three action alternatives are documented in the environmental analysis. I believe that the Selected Alternative provides the best mix of treatments across the landscape that will meet multiple objectives with consideration for near-term and long-term management goals. The Selected Alternative is within the framework of existing laws, regulations, policies, and the capabilities of the land, while meeting the stated purpose and need for this project. The Selected Alternative best addresses the relevant issues and concerns raised during public comment periods. My authorization to implement the Selected Alternative conforms to the Forest Plan and National Forest Management Act (NFMA). I considered the effects of this project on other resources, including soils; wetlands; watersheds; fisheries; scenery; recreation; rare, sensitive, and invasive plants; climate change; and heritage. These resources were analyzed for this project, and results can be found in the Kosciusko Project EA, summarized in Table 3 (beginning on page 18) or in the respective environmental effects sections and reports.

My modification for the Selected Alternative is the deletion of the old-growth harvest units and associated road building from Alternative 3. Even though the reconsideration of the cumulative effects analysis did not find any significant effects for productive old-growth, I decided not to include the old-growth harvest to address concerns raised during public comment periods and objections regarding the old-growth harvest on non-National Forest land. With the omission of the old-growth harvest there would be no direct or indirect effects on productive old growth and therefore there would be no cumulative effects. The purpose of including the old-growth timber in the proposal was to provide an economic timber supply that could be purchased by the local mills on Kosciusko Island and to provide building material for local residents. This need could still be met through the existing Roadside Environmental Assessment for microsales, future NEPA analysis for timber projects, and 36 CFR 223.10 (Free use to Alaskan settlers, miners, residents, and prospectors).
Since actions like precommercial thinning, improvement of karst systems, and restoration and improvement of riparian areas are the same for Alternatives 2, 3, and 4, and all meet the purpose and need of the project, they do not factor in to my decision for which action alternative to select. Actions related to the management of the transportation system only vary slightly between alternatives, with differences related to access of the different stands proposed in their respective alternatives. The primary difference between action alternatives is in the location and extent of young-growth units proposed for treatments, and the type of management prescribed.

I considered both the young-growth volume proposed currently in this project, as well as the future implications of volume capabilities of the stands, by alternative. The Tongass National Forest is directed to transition to a predominately young-growth industry (from the July 2, 2013 Secretary’s Memorandum 1044-009), and H.R.3979 relaxed CMAI requirements to aid with transition objectives (see EA page 1 for further explanation). The importance of the Kosciusko Project area for the Tongass transition is due to it having some of the most advanced and accessible young-growth on the Forest at this time. The residents of Edna Bay value the sustainability and productivity of the surrounding forest, with more consistent harvest activities in the area, so young-growth volume production both now and in the long term is important to my decision. Future volume is affected by the age of the stand at the time of harvest and whether even-aged, two-aged, or uneven-aged management is prescribed. The Selected Alternative results in similar young-growth volume harvested as Alternative 2, and so meets transition objectives. The Selected Alternative uses less intensive management over more acreage, attaining a similar volume as Alternative 2 but also allowing for a more consistent harvest of volume long term. Volume projections for this project and for up to 50 years in the future were analyzed; Tables 5, 6, and 7 in the Silviculture section of the EA (pages 34 and 35) display this information.

The purpose and need of the project also focuses heavily on enhancement of wildlife habitat and maintenance of the function of high-vulnerability karst areas, and these ecological functions are also quite important to local residents. To meet the purpose and need of the project, alternatives were developed based on a strategy that considered resource concerns like wildlife travel corridors, riparian areas, and high-vulnerability karst areas that coincide or were concentrated, and areas where resource concerns are minimal and timber production can be the major focus of future management. The proposed activities in the Kosciusko Project are a mix of treated and untreated acres thereby providing a mosaic of habitat across the landscape that should benefit a variety of wildlife and bird species. To this point, prescribing even-aged, two-aged, or uneven-aged management and the orientation of these treatments across the landscape influences those other resources within the project area. Young-growth treatments were designed to help mitigate the potential long-term effects from land management activities on lands in other ownerships. The proposed young-growth treatments would provide additional foraging opportunities for multiple wildlife species (see EA pages 66, 80, and 82), improve prey habitat (see EA pages 63 and 77), improve connectivity (see EA pages 77, 86, and 88) and increase structural diversity and heterogeneity across the landscape (see EA page 67). Alternative 4 has the greatest ability of the action alternatives to mitigate potential long-term effects to other resources that may result from the land conveyance in the project area and other timber harvests that have or are expected to occur on non-NFS lands, with the Selected Alternative also being
particularly responsive to this objective. The effects of the action alternatives are documented in their respective resource sections in the EA.

Public Involvement

This action was originally listed as a proposal on the Tongass National Forest Schedule of Proposed Actions and updated periodically during the analysis. Public Involvement is detailed in the Kosciusko Project EA (on pages 6 to 8) and documented in the project record. Scoping was initiated on August 1, 2014, with request for comments by August 18, 2014. Individuals who requested more information on the project as well as adjacent landowners, local community members and leaders, affected special use permittees; those representing local conservation organizations, partner groups, community organizations; and various tribal associations and corporations were mailed the scoping letter, scoping document, and a proposed action map for review. Within the scoping letter, all aforementioned groups and individuals were also invited to public meetings and subsistence hearings scheduled in the communities of Thorne Bay, Naukati, and Edna Bay in August 2014. Tongass National Forest issued a press release to further inform the public on the scoping period and the associated public meetings. The scoping documents were posted to the project webpage at: [http://www.fs.usda.gov/goto/R10/Tongass/Kosciusko](http://www.fs.usda.gov/goto/R10/Tongass/Kosciusko). Fourteen letters were received during the scoping period. Comments received from the public are located in the project record and are also accessible on the project webpage. Responses to comments are located in the project record, and helped form the basis for alternatives to the Proposed Action that were displayed in the Public Comment Period Document in November 2014.

Additionally, after the scoping period, Sealaska Corporation requested a consultation meeting with Tongass National Forest in regards to the project being within areas they were pursuing under, what was called at the time, the Southeast Alaska Native Land Entitlement Finalization and Jobs Protection Act, a proposed bill that identified lands they were requesting be transferred to Sealaska Corporation.

A second opportunity for public involvement was provided beginning November 24, 2014 when the Public Comment Period Document was sent to all groups and individuals previously involved, as well as to those who had since provided input or requested to be on the mailing list for the project. The documents were posted to the project webpage at that time as well. This additional 30-day comment period provided the public a chance to review the alternatives developed by the Interdisciplinary Team in response to issues raised during the scoping period. Fourteen letters were received during the comment period; these are located in the project record and are also accessible on the project webpage. Comments received were reviewed to identify concerns the public had with the project; most were consistent with the previous list of issues raised. H.R.3979 finalizing the Sealaska Land Entitlement was passed before this comment period ended; this new information formed the basis of nearly all new concerns submitted from the public.

The Draft EA was released to the public on August 6, 2015 with a request for comment by September 8, 2015. The document was sent to all groups and individuals previously involved, as well as to those who had since provided input or requested to be on the mailing list for the project; in all, 75 copies were mailed and it was provided electronically by email notification to 143 individuals at that time. During the designated comment period, three
public meetings were scheduled to present the assessment and provide subsistence hearing opportunities to interested community members: in Naukati on August 12, Thorne Bay on August 18, and Edna Bay on Kosciusko Island on August 25. Further consultation with Tribal entities occurred during this time frame as well: with the Organized Village of Kasaan on August 20, and both the Craig Tribal Association and Klawock Cooperative Association on September 8. The cover letter, Draft EA, and Draft Unit Cards were all posted to the project webpage, available for public viewing. Nine letters from individuals, organizations, and state agencies were received during the comment period and are also available to view on the project webpage. Comments received assisted in refining the project and the resource reports for the Final EA. Responses to comments are available in the project record.

The Final EA and Draft DN/FONSI was released to the public on December 1, 2015 with a 45-day objection period. The document was sent to all groups and individuals the Draft EA was sent to; there were no requests for additions to the mailing list since that part of the process. Subscribers to email notification had increased to 200 individuals. The cover letter, Final EA, DN/FONSI, and Final Unit Cards were all posted to the project webpage for public viewing. One objection was received during the objection period, submitted timely on January 15, 2016, collectively from the following groups: Greater Southeast Alaska Conservation Community, Greenpeace, Cascadia Wildlands, Center for Biological Diversity, and Alaska Wildlife Alliance.

Throughout the span of the Kosciusko Project, the District Ranger and archaeologists communicated with Sealaska Corporation, Craig Tribal Association, Hydaburg Cooperative Association, Klawock Cooperative Association, Organized Village of Kasaan, The Central Council of Tlingit & Haida Indian Tribes of Alaska, Wrangell Cooperative Association, Klawock Heenya Corporation, and Shaan Seet, Inc., as documented in the project record.

**Administrative Review and Objection Rights**

A Draft Decision Notice, Finding of No Significant Impact, and Environmental Assessment were made available to the public on December 1, 2015 in accordance with the objection process described in 36 CFR 218. One objection was received. The Reviewing Official offered to meet to attempt resolution with the objector; however, that meeting offer was declined. At the conclusion of the Objection Resolution period, the Reviewing Official issued me a letter of instruction, with the following directions:

1. Clarify the effects of the proposed young growth management and confirm that the supporting information is in the project record.
2. Further explain the relevancy of comments previously submitted by ADF&G as identified by the objector in relation to deer winter habitat and using a different deer multiplier in the Kosciusko project area.
3. More thoroughly describe the cumulative effects related to deer, wolves, and goshawks, including the possible effects of reasonably foreseeable harvest on other ownerships.

The letter instructed me to complete the above items, update the EA and project record, and determine if any adjustments to the final decision are warranted. If this review were to identify any new information regarding potential cumulative effects, I would follow the procedures set forth in FSH 1909.15, Section 18.1 in my review and consider the new
information and its effect on my decision. The objector was also sent this letter in response to the groups’ objection.

In response to this letter and instructions, I have updated the EA and project record to clarify and further explain the identified information. The clarifications and changes to the EA are described more specifically below. I have also updated the FONSI (below) to include reference to specific pages in the EA.

Clarifications and Changes to the EA

After reviewing the information as instructed by the objection reviewing official, the Wildlife section of the EA was reorganized (beginning on page 42) to better synthesize the information and more clearly describe effects of the proposed project to wildlife. This was done by rearranging the flow from existing conditions to effects, summarizing information, and clarifying conclusions.

The effects of proposed young-growth management to wildlife are clarified under each species’ discussion with a more general discussion under the deer habitat capability discussion beginning on pages 50 and 66. All supporting documentation and reference literature is the same. No new information was utilized.

The relevancy of Matt Kirchhoff’s comments previously submitted by ADF&G identified by the objector in relation to deer winter habitat and using a different deer multiplier have been further explained under the Sitka black-tailed deer section beginning on page 48.

The cumulative effects related to deer, wolves, and goshawks have been clarified beginning on pages 70, 75, and 63 respectively. These sections include clarification of the changes to species-specific productive old-growth (POG) habitat, and the effects associated with these changes from reasonably foreseeable future harvest on other ownerships. Data that were provided previously in the EA were used to perform additional calculations, with results added to existing tables to help clarify the discussion of cumulative effects to POG habitat by species on all lands (see Tables 22, 23, 25, 27, 28, 29, 31, 33, and 34 on pages 64, 70, 75, 79, 81, 83, and 84 of the EA).

As directed in the Objection Resolution Letter, I have reviewed all clarifications and changes and I have concluded that this review did not disclose any significant new information or changed circumstances relevant to environmental concerns and bearing on the action alternatives or its impacts in a manner not previously considered.

Finding of No Significant Impact

The Finding of No Significant Impact (FONSI) is prepared based on information presented in the environmental analysis (EA) to briefly summarize the reasons why an action will not have a significant effect on the human environment. If it is determined the actions proposed may have a significant effect on the quality of the human environment, an environmental impact statement (EIS) will be prepared (CFR Title 40, Chapter V, Part 1508.13).

The FONSI considers the context of the Selected Alternative to the affected environment in which it would occur and its intensity, or the severity of the impact. The intensity of the
action is considered by addressing ten factors of significance and their expected impacts (see CFR Title 40, Chapter V, Part 1508.27).

In preparing this FONSI, I have determined that the Selected Alternative will not have a significant effect on the quality of the human environment; therefore, the preparation of an EIS is not needed. As presented below, I considered the context and intensity of the actions proposed within the Selected Alternative based on what is disclosed in the Kosciusko Project EA.

**Context**

Context refers to the affected environment in which the actions would occur. This means the significance of an action must be analyzed in several contexts, such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the actions that are proposed. For instance, in the case of a site-specific action, significance usually depends upon the effects in the locale rather than in the world as a whole (40 CFR 1508.27(a)). Both short- and long-term effects are relevant.

The local context of the Kosciusko Project is the site-specific locations where actions will occur within the project area, which is within the southern half of Kosciusko Island (see EA page 4 for a map). The 3,326 acres that will receive treatments under the Selected Alternative represent about 6 percent of all lands in the project area, and less than 10 percent of the NFS land within the project area boundary. The commercial timber harvests under the Selected Alternative are located in land use designations (LUDs) intended for timber harvest, primarily Timber Production (TM); young-growth harvest accounts for approximately 29.9 MMBF from 1,461 acres. The stands that are to be harvested under the Selected Alternative are prescribed a combination of even-aged, two-aged, and uneven-aged management. Even-aged management uses the clearcut regeneration method and applies to 396 acres of young-growth. Two-aged management uses the patch clearcut regeneration method where up to 50 percent of the stand is to be harvested initially, and this applies to about 856 acres of young-growth. Uneven-aged management is prescribed using a group selection system where about 66 percent of the stand area is retained in the first harvest entry and the remainder harvested in groups up to about two acres in size; this applies to about 209 acres of young-growth. Acreages for two-aged and uneven-aged management included the retention areas.

The discussion of the significance criteria that follows applies to the Selected Alternative and is within the context of local importance. The Kosciusko Project EA details the effects of the Selected Alternative. The scale of the Kosciusko Project is not indicative of significant effects, and none of the effects identified in the environmental analysis— including direct, indirect, and cumulative effects—are considered to be significant for the components of the Selected Alternative. Additionally, all resources meet or exceed their respective Forest Plan Standards and Guidelines, except for scenery. The scenery resource meets or exceeds its Forest Plan Standards and Guidelines on all NFS land, but may not meet them when considering scenic condition on adjacent non-NFS land. The Scenic Integrity Objectives (SIO) would not be met even if the No Action Alternative was selected because of the current and proposed future land management activities on adjacent non-NFS land.
Intensity

Intensity refers to the severity of impact. The following ten factors of significance and their expected impacts are considered in evaluating intensity.

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.

The predicted beneficial effects of the Selected Alternative, primarily addressing the Tongass National Forest’s transition to young-growth and managing other resources such as wildlife habitat and riparian areas, did not bias my finding of no significant environmental impacts (FONSI). How I considered both the beneficial and adverse effects of this action are outlined in my Decision Rationale (see pages 3 through 5 of this DN/FONSI). Effects determinations are summarized in the Kosciusko Project EA (beginning on page 25) and supporting analysis.

2. The degree to which the proposed action affects public health or safety.

I have determined that public health and safety will not be affected by implementation of the Selected Alternative. This alternative is comparable to other timber harvest and precommercial thinning projects within the project area and elsewhere on the Thorne Bay Ranger District that have occurred with no unusual health or safety concerns. The Forest Service will use standard safety measures, such as signing, to ensure public safety during timber harvest or road construction activities, as part of the project design.

3. Unique characteristics of the geographic areas such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

I have determined there will be no significant effects on any unique characteristics of the area. No historic properties, park lands or farmlands are located within the area of potential effects (see the EA on page 121 or the Heritage Report). There are no designated Wild and Scenic Rivers, or Recreational Rivers in the project area, nor will the actions affect the eligibility of any segments recommended for either Wild and Scenic River System or Recreational River designation. No unique wetlands will be affected by project implementation (see the EA on page 90 or the Soils and Wetlands Report). High-vulnerability karst features are protected by project design with a no-treatment buffer and will also not be affected by implementation of the Selected Alternative (see the EA on page 108, or the Geology Report).

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

I have reviewed all comments received during the three comment periods for this project, the analysis documented in the EA, and the project record. Based on the level of public outreach, the limited and localized response, and the lack of scientific controversy over the impacts of this project, I have determined it is unlikely the effects to the human environment from implementing the Selected Alternative will be highly controversial.

The management of National Forests can be controversial in nature; however, the management of publicly-owned forest is seldom controversial from a scientific perspective. Commenters provided an array of support for and opposition to various elements of the
alternatives, or the project in its entirety; these and the responses to all comments are documented in the project record. The interdisciplinary team developed the alternative to be responsive to both economic and ecologic objectives, with attention to the interests of the local community members. The Selected Alternative was designed to meet the purpose and need of the project, considering all relevant Forest Plan objectives, goals, standards, and guidelines.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

Based on the analysis, I believe the possible effects on the human environment are not highly uncertain and do not involve unique or unknown risks. Therefore, I have determined no significant impacts will occur that adversely affect the human environment.

The Kosciusko Project EA discloses the direct, indirect, and cumulative effects of the alternatives (see the Environmental Consequences sections for all the resources in the EA and individual resource reports in the project record). Those effects, along with those documented in the Biological Assessments/Evaluations, do not indicate uncertain, unique, or unknown risks.

The Forest Service has considerable experience implementing the types of activities planned in the Kosciusko Project EA, and has found the effects from similar actions in similar areas to be reasonably predictable and well-understood. Monitoring of past activities and projects support the predicted effects disclosed in this analysis. Tongass monitoring reports can be accessed online at: http://www.fs.usda.gov/main/tongass/landmanagement/planning.

6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

I have determined the Selected Alternative does not establish a precedent for future actions with significant effects. Any future action(s) not covered by this project, whether related to the actions in this project or separate, will consider all relevant scientific, site-specific information available at that time and be subject to the appropriate NEPA analysis that will consider the direct and indirect effects and cumulative effects of all other past, present, and reasonably foreseeable actions.

The effects of the Selected Alternative were considered by the interdisciplinary team within the context of past, present, and reasonably foreseeable future actions (see the cumulative effects analysis for all resources in the Environmental Consequences section of the Kosciusko Project EA). The final decision is within the scope of the 2008 Forest Plan and is not expected to establish a precedent for future actions.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

I have determined that, based on project design and available scientific information, the Selected Alternative is not related to other actions with individually insignificant but cumulatively significant impacts for resources in the project area, and does not result in cumulatively significant effects. In making my determination, I considered the incremental effects of the project and whether those effects added significantly to the past, present, and reasonably foreseeable future cumulative effects on the resources in the project area. Since
there will be no old-growth harvest, there will be no direct or indirect effects (and therefore no cumulative effects) to the more old-growth-dependent species, and there will be no negative effects to the old-growth portions of some species’ habitats, such as high-value deer winter habitat (deep- and average-snow).

Most of the effects to the wildlife habitat have occurred on the landscape due to past activities. Past timber harvest on Kosciusko Island resulted in about 19,300 acres of old growth being harvested. This resulted in large contiguous stands of young growth. These areas lack structural diversity and other key features of the old-growth stands they replaced (see the EA on page 2). Both the commercial harvest and precommercial thinning of young growth does not pose a significant risk to wildlife species and their habitat and should have beneficial effects to wildlife species by increasing heterogeneity, connectivity, and understory vegetation.

Finally, this cumulative effects significance determination includes the consideration of scenic integrity, a concern for the project. The direct and indirect effect of the Selected Alternative will have a negligible to slightly noticeable change in scenic integrity as viewed from Visual Priority Travel Routes and Use Areas. When combined with the cumulative effect of adjacent non-National Forest System lands, the outcome upon scenic conditions will not be appreciably greater than would occur under the No Action Alternative (see the EA on page 112 or the Scenery Report), based on the assumptions used for cumulative effects analysis (see Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area, available in the project record). Cumulative impacts for other resources are also not significant (see the Environmental Consequences section of the EA, beginning on page 16).

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

I have determined that a finding of No Historic Properties Affected is appropriate for this project. This project meets the provisions stipulated in the Programmatic Agreement between the Forest Service, Alaska Region, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer. I also determined that no significant impacts will occur that adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources (see the EA on page 121 or the Heritage Report).

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

I have determined no significant impacts will occur that adversely affect an endangered or threatened species or its critical habitat.

A Biological Assessment/Biological Evaluation (BA/BE) for fish and wildlife was completed for the Kosciusko Project EA, available in the project record. Humpback whales are the only federally listed species occurring in or near the project area. Humpback whales
occur in the marine environment adjacent to the Kosciusko Project area, and potential effects to their habitats or populations could be habitat degradation, acoustic disturbance, and potential for ship strike, from project activities such as use of a marine access facility (MAF), movement of log rafts to mills, and use of marine vessels and aircraft. A determination of “May affect, not likely to adversely affect” is made for humpback whales for the Selected Alternative. When compared to available habitat in the surrounding marine waters, short-term effects of the proposed logging is not likely to adversely affect humpback whales. All Forest Service permit holders or permitted activities are required to follow Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), and distance regulations. As a result, effects to humpback whales are expected to be insignificant and indistinguishable from other vessel traffic using the marine waters around Kosciusko Island. Aside from humpback whales, it was determined there are no known endangered or threatened species or critical habitat in the project area; therefore, project activities are not likely to adversely affect any other federally listed wildlife and fish species known or suspected to occur in the vicinity of the Thorne Bay Ranger District.

No plants federally listed or proposed by the U.S. Fish and Wildlife Service are known or expected to occur in the Alaska Region; therefore, the proposed activities will not affect endangered or threatened plant populations or habitat (see the EA on page 114 or the Botany BE).

10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

The following findings show the actions will not violate federal, State, or local law requirements imposed for the protection of the environment and have been reviewed by federal and State agencies. The action is consistent with the Forest Plan.

Findings Required by Other Laws and Regulations

Many federal laws and executive orders pertain to project-specific planning and environmental analysis on federal lands. While most of the laws and executive orders listed below pertain to all federal lands, some of the laws are specific to Alaska.

Several of the laws and executive orders listed below require project-specific findings or other disclosures. These apply to federal land management projects and activities and are included here in this Decision Notice. They apply to all alternatives considered in the Kosciusko Project EA.

Alaska National Interest Lands Conservation Act (ANILCA) of 1980; Section 810

Per Forest Service Handbook direction (FSH 2090.20 Section 21(3)), which states if, during the EA process, the responsible official perceives a finding of a significant possibility of a significant restriction on subsistence uses for a proposed action is likely to occur, a justification will be prepared and submitted to the Regional Forester for concurrence. The environmental analysis concluded a significant possibility of a significant restriction in subsistence opportunities is not expected to occur from implementation of any action alternative (see the EA on page 88, Wildlife Report, or Fisheries Report for more information).
2008 Tongass Land and Resource Management Plan (Forest Plan)
This final decision is consistent with, and all project alternatives comply with, the Forest Plan. This project incorporates all applicable Forest-wide Standards and Guidelines and management prescriptions, and complies with Forest Plan goals and objectives. The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Application of Forest Plan direction ensures compliance at the project level; therefore, the Selected Alternative is consistent with the Forest Plan.

Even-aged Management as the Optimal Method of Harvesting
The Forest Plan (USDA Forest Service 2008a, pp. 4-71 to 4-72) gives guidance on when to use even-aged management. Even-aged management will be used in this project to:

- Achieve timber production objectives;
- Preclude and minimize the occurrence of, and the potential adverse impacts from, windthrow; and
- Provide for the establishment and growth of desired trees.

Harvest Openings over 100 Acres in Size
There are no harvest openings over 100 acres proposed for this project. Therefore, the Selected Alternative is consistent with the Forest Plan and FSM 2410.3, R10 Supp. 2400-2002-1 and consequently also complies with the National Forest Management Act.

Bald and Golden Eagle Protection Act of 1940 (as amended)
The Bald and Golden Eagle Protection Act provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. Should an active nest be found adjacent to any proposed activity, appropriate nest site buffers and timing restrictions will be implemented. Bald eagles are managed by the USFWS under the National Bald and Golden Eagle Protection Act and through the Bald Eagle Take Permit Program (USDI Fish and Wildlife Service 2007).

Clean Air Act of 1970 (as amended)
Emissions from the implementation of the Selected Alternative will be of short duration and are not expected to exceed State of Alaska ambient air quality standards (18 AAC 50).

Clean Water Act of 1977 (as amended)
Project activities meet all applicable State of Alaska Water Quality Standards. Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 addresses federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to “any governmental entity” or private person. Compliance is to be in line with “all Federal,
State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution.”

Sections 208 and 319 recognized the need for control strategies for nonpoint source pollution caused by activities such as timber harvest. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) are recognized as the primary control mechanisms for nonpoint source pollution on National Forest System lands. The EPA supports this perspective in their guidance, “Nonpoint Source Controls and Water Quality Standards” (August 19, 1987).

The Forest Service must apply BMPs that are consistent with the Alaska Forest Resources and Practices Act (AFRPA) to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska’s Nonpoint Source Pollution Control Strategy (2007). In 1997, the State approved the BMPs in the Forest Service Soil and Water Conservation Handbook (FSH 2509.22, July 2006) as consistent with AFRPA. This handbook is incorporated by reference into the Forest Plan and this project.

The Forest Service recently issued National Core BMPs (USDA Forest Service 2012). The Kosciusko Project would implement the most recent BMP guidance. The list of key BMPs that would be implemented as part of this project is included in the unit cards, located on the project webpage: http://www.fs.usda.gov/goto/R10/Tongass/Kosciusko.

A discharge of dredge or fill material from normal silvicultural activities such as harvesting for the production of forest products is exempt from Section 404 permitting requirements in waters of the United States, including wetlands (404)(f)(1)(A). Forest roads qualify for this exemption only if they are constructed and maintained in accordance with Baseline Provisions to assure that flow and circulation patterns and chemical and biological characteristics of the waters are not impaired (404)(f)(1)(E). The Baseline Provisions that must be followed are specified in 33 CFR 323.4(a). These specific BMPs are incorporated into the Soil and Water Conservation Handbook under BMP 12.5. All necessary Clean Water Act permits will be obtained before project implementation, including, if necessary, any discharge permits under Section 402 of the Clean Water Act.

The design of harvest units for the project was guided by standards, guidelines, and direction in the Forest Plan and applicable Forest Service Manuals and Handbooks. The unit cards for the Kosciusko Project contain specific details on practices prescribed to prevent or reduce nonpoint sediment sources.

**Endangered Species Act of 1973 (as amended)**

A Biological Assessment/Biological Evaluation (BA/BE) was completed for the project activities, which indicates it is “not likely to adversely affect” any federally listed threatened or endangered species. The BA/BE is included in the project record. Consultation for the ESA determinations was initiated on August 6, 2015 with NMFS, and on August 10, 2015 with USFWS, when the Draft EA and BA/BE were sent to each agency. No responses were received, and consultation requirements were met.
Federal Cave Resource Protection Act of 1988
Within the project area there is approximately 38,659 acres of carbonate bedrock into which karst systems and cave features have developed. Forest Plan Standards and Guidelines adhere to requirements of the Federal Cave Resource Protection Act of 1988 (Forest Plan pp. 4-23 to 4-26 and pp. H-1 to H-10) and are integrated into the project design for the Kosciusko Project.

Forest Service Transportation Final Administrative Policy (Roads Rule)
This final decision and the EA have been prepared to be consistent with the Forest Service Transportation Final Administrative Policy (2005) and the Prince of Wales Access and Travel Management Plan Environmental Assessment (2009). The analyzed road system is “the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands” (36 CFR 212.5).

Magnuson-Stevens Fishery Conservation and Management Act
Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act states that all federal agencies must consult the National Marine Fisheries Service (NMFS) for actions or proposed actions that may adversely affect essential fish habitat (EFH). The Act promotes the protection of essential fish habitat through review, assessment, and mitigation of activities that may adversely affect these habitats. Consultation procedures have been documented in an attachment to a June 26, 2007 NMFS letter to the Regional Forester. Although this Consultation Procedures document expired on June 28, 2012, consultation is still required under the Act and the 2007 procedures remain applicable and have been followed for this project.

The EFH determination in the EA found that the Selected Alternative may adversely affect EFH because the project entails ground-disturbing actions in watersheds that contain anadromous species, and log hauling would occur on new temporary and existing roads that cross anadromous streams. In addition, the project would authorize the use of marine access facilities (MAFs). Effects to EFH will be minimized by following the Standards and Guidelines in the Forest Plan and implementing the BMPs specified in the unit cards. Formal consultation is initiated when the EA containing the full EFH determination is received by NMFS; the Draft EA was sent on August 19, 2015. No response was received from NMFS and the consultation requirement was fulfilled.

Marine Mammal Protection Act of 1972
Actions authorized in the Selected Alternative are “not likely to adversely affect” marine mammals (see the EA on page 59). Marine mammal viewing guidelines administered by the NMFS and enforced by the Coast Guard are sufficient for their protection. Contractors, purchasers, and employees will be required to follow provisions on marine wildlife guidelines, including special prohibitions on approaching humpback whales in Alaska as defined in 50 CFR 224.103. NMFS administers the Marine Mammal Protection Act (MMPA), which prohibits the “take” of all marine mammal species in U.S. waters. “Take” is defined as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” Harassment is defined in the MMPA as “any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in
the wild; or has the potential to disturb a marine mammal stock in the wild by causing
disruption of behavior patterns, including, but not limited to, migration, breathing, nursing,
breeding, feeding, or sheltering.”

**Multiple-Use Sustained-Yield Act of 1960**

The Act authorizes the Secretary of Agriculture to administer National Forest System lands
for outdoor recreation, range, timber, watershed, and wildlife and fish purposes; to develop
the surface renewable resources for multiple-use and sustained-yield of several products and
services to be obtained from these lands, without impairment of the productivity of the land;
and, to cooperate with interested state and local governmental agencies and others in the
development and management of the national forests. The Act also recognizes and clarifies
Forest Service authority and responsibility to manage wildlife and fish on national forests. The Kosciusko Project meets the requirements of this law.

**National Forest Management Act (NFMA) of 1976 (as amended)**

The National Forest Management Act (NFMA) requires specific determinations in the
Decision Notice: consistency with existing Forest Plan, a determination of clearcutting as
the optimal method of harvesting, if used, and specific authorizations to create openings
over 100 acres in size. Information and rationale used to develop unit prescriptions are
summarized in the Silviculture section of the EA beginning on page 25, and can be found in
full detail in the Silviculture Report and supporting documentation, available in the project
record.

**National Historic Preservation Act of 1966 (as amended)**

The Forest Service program for compliance with the National Historic Preservation Act
includes locating, inventorying and nominating all cultural sites that may be directly or
indirectly affected by scheduled activities. This activity has been reviewed by a qualified
archeologist and a determination was made that no known cultural resources are present in
proposed treatment areas.

**Tongass Timber Reform Act (TTRA) of 1990**

The Tongass Timber Reform Act (TTRA) prohibits commercial timber harvest within 100
feet on either side of Class I streams and Class II streams that flow directly into Class I
streams. TTRA also requires the use of BMPs. The Forest-wide Riparian Standards and
Guidelines in the Forest Plan incorporate the requirements of TTRA.

Timber harvested in the Selected Alternative will provide part of the timber supply to the
Tongass National Forest’s timber program, as stated in Section 101 of TTRA “… the
Secretary shall, to the extent consistent with providing for the multiple use and sustained
yield of all renewable forest resources, seek to provide a supply of timber from the Tongass
National Forest which (1) meets the annual market demand for timber from such forest and
(2) meets the annual market demand from such forest for each planning cycle.”

**Executive Order 11988 (Floodplain Management)**

Executive Order 11988 directs federal agencies to take action to avoid, to the extent
possible, the long- and short-term adverse effects associated with the occupancy and
modification of floodplains. The Selected Alternative will not affect floodplain occupancy. Forest Plan Standards and Guidelines limit riparian harvest to the extent feasible to facilitate road construction and logging operations. The amount of road in floodplains will be minimized whenever possible as stated in the BMPs. Roads may be constructed in or through floodplains subject to BMPs, which minimize floodplain modification.

**Executive Order 11990 (Protection of Wetlands)**

Executive Order 11990 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse effects associated with the destruction or modification of wetlands. There will be minimal loss of wetlands from the implementation of the Selected Alternative, primarily due to temporary road construction. In some areas, soil moisture regime and vegetation composition or structure may be altered by timber harvest; however, these altered acres would still be classified as wetlands and function as wetlands in the ecosystem.

Road construction through wetlands is avoided to the extent practicable. Where wetlands cannot be avoided, road construction will adhere to State-approved BMPs, which include, at a minimum, the federal baseline provisions in 33 Code of Federal Regulation (CFR) 323.

**Executive Order 12898 (Environmental Justice)**

Executive Order 12898 directs federal agencies to address whether a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations, or Indian tribes is likely to result from any of the alternatives. The 2010 Census demographics and economic data for Edna Bay do not exceed requirements for additional Environmental Justice review when compared to the Prince of Wales – Hyder Census Area, so no disproportional adverse effects are expected to occur to low-income and minority households (see the EA on page 39 or Timber Report for more information). Efforts were made during the public participation process to inform all public of the project and the possible effects through notices in local papers, local meetings, and tribal government correspondence (see the Public Involvement section of this DN/FONSI beginning on page 5).

The Executive Order directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife. Although low-income and minority people are not the sole users of these resources in Alaska, the effects on these resources are addressed in the Subsistence section of the Kosciusko Project EA (beginning on page 88), as well as in the Wildlife Report and Fisheries Report, which further address subsistence.

**Executive Order 12962 (Aquatic Systems, Recreational Fisheries)**

Federal agencies are required, to the extent permitted by law and where practicable, in cooperation with States and tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. The Selected Alternative minimizes the effects on aquatic systems through project design, application of standards and guidelines, BMPs, and site-specific mitigation measures. In the Selected Alternative, recreational fishing opportunities will remain essentially the same as the current condition because aquatic habitats are protected through implementation of BMPs and riparian buffers.
Executive Order 13007 (Indian Sacred Sites)
Executive Order 13007, Indian Sacred Sites, provides presidential direction to federal agencies to give consideration to the protection of American Indian sacred sites and allow access where feasible. In a government-to-government relationship, the tribal government is responsible for notifying the agency of the existence of a sacred site. A sacred site is defined as a site that has sacred significance due to established religious beliefs or ceremonial uses, and which has a specific, discrete, and delineated location that has been identified by the tribe. Tribal governments or their authorized representatives have not identified any specific sacred site locations in the project area.

Executive Order 13112 (Invasive Species)
Executive Order 13112 requires federal agencies (in part) to evaluate whether the proposed activities will affect the status of invasive species; and to not carry out activities that promote the introduction or spread of invasive species unless it has determined that the benefits of such action outweigh the potential harm caused by invasive species; and that all feasible and prudent measure to minimize risk of harm will be taken in conjunction with the actions. An invasive plant risk assessment was completed for this project which determined project activities are not expected to significantly increase the distribution of weeds within the project area (see the EA on page 117 or the Invasive Plants Report).

Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments)
Executive Order 13175 directs federal agencies to respect tribal self-government, sovereignty, and tribal rights, and to engage in regular and meaningful government-to-government consultation with federally recognized tribes on proposed actions with tribal implications.

Throughout the span of the Kosciusko Project, the District Ranger and archaeologists communicated with Sealaska Corporation, Craig Tribal Association, Hydaburg Cooperative Association, Klawock Cooperative Association, Organized Village of Kasaan, The Central Council of Tlingit & Haida Indian Tribes of Alaska, Wrangell Cooperative Association, Klawock Heenya Corporation, and Shaan Seet, Inc. as documented in the project record and described in the Public Involvement section of the Decision Notice. Tribal consultation does not imply the tribes endorse the preliminary selected action or any of the alternatives.

Executive Order 13186 (Migratory Birds)
The Migratory Bird Treaty Act of 1918 (amended in 1936 and 1972) prohibits the taking of migratory birds, unless authorized by the Secretary of Interior. The law provides the primary mechanism to regulate waterfowl hunting seasons and bag limits, but its scope is not just limited to waterfowl. The migratory species that may stay in the area utilize most, if not all, of the habitats described in the analysis for breeding, nesting, and raising their young. The effects on these habitats were analyzed for this project.

The decision will not have a significant direct, indirect, or cumulative effect on any migratory bird species in the project area (see the EA on page 87). There may be direct moderate effects on individuals or small groups and their nests from the harvest of timber or the disturbance caused by harvest and related activities.
Executive Order 13443 (Facilitation of Hunting Heritage and Wildlife Conservation)

Executive Order 13443 directs federal agencies to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat. The analysis considered and disclosed the effects on hunting activities. The Selected Alternative is expected to maintain the current hunting opportunities by adhering to the Forest Plan Standards and Guidelines that maintain habitat for hunted species.

Required Permits and Concurrence

Prior to implementation of a timber sale or precommercial thinning, various permits and concurrence are required from other federal and State agencies. Some permits are already in place for the project; others will need to be obtained.

- All new temporary road construction for this project is for silvicultural purposes and will be located and designed to meet State approved BMPs and 33 CFR 323 guidelines regarding permits for discharges of dredged or fill material into waters of the United States as discussed in Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344); therefore, new temporary road construction through wetlands will not require a 404 permit.

- A storm water discharge permit will be acquired by the timber sale contractor. A permit for Alaska Pollutant Discharge Elimination System (Section 402 of the Clean Water Act) is held by the Forest Service. Both of these permits are required for use of the East Edna Bay or the State of Alaska’s proposed West Edna Bay Marine Access Facilities (MAF).

- Permits will be needed from the US Army Corps of Engineers and the State of Alaska if large amounts of fuel are stored in the project area for project activities. The timber sale contractor will acquire these permits.

- ADF&G and the Forest Service have an MOU to reach concurrence prior to conducting any instream activities. A Title 16 concurrence must be reached before any work occurs below ordinary high water for fish-bearing water bodies that will use, divert, obstruct, pollute, or change the natural flow or bed of water bodies.

- It was determined by the Forest Service archaeologist that no historic properties will be affected by any of the proposed alternatives. Under the terms of the existing Programmatic Agreement with the Alaska State Historic Preservation officer and the Advisory Council on Historic Preservation (USDA Forest Service 2010) “the Forest may proceed with the undertaking in lieu of a consensus determination of eligibility pursuant to 36 CFR 800.4.”

Process for Considering New Information

In the event there is new information or changed direction for any resource during the implementation of the Kosciusko Project decision, the following Forest Service direction from Forest Service Handbook (FSH) 1909.15, Section 18.1, will be used to evaluate the previous analysis:
• If new information or changed circumstances relating to the environmental impacts of a proposed action come to the attention of the responsible official after a decision has been made and prior to completion of the approved program or project, the responsible official should review the information carefully to determine its importance. Consideration should be given to whether or not the new information or changed circumstances are within the scope and range of effects considered in the original analysis.

• Based on further direction in FSH 1909.15 Section 18, after interdisciplinary review and consideration of the changed circumstances or the new information, the responsible official may determine whether or not a correction, supplement, or revision to the EA is necessary. If a supplemented or revised EA and FONSI is completed, a new decision notice would be issued, or, documentation that the original decision is to remain in effect and unchanged, following direction in FSH 1909, Chapter 40.

Distribution
The Kosciusko Project Final Decision Notice, FONSI, and EA are available on the project webpage at http://www.fs.usda.gov/goto/R10/Tongass/Kosciusko. Notification of the availability of this Final Decision Notice is sent to those on the project mailing list.

The project mailing list is available in the project record. The Final Decision Notice is also available in hard copy or on CD, upon request.

Contact Information
For additional information concerning the final decision or the environmental analysis, contact Delilah Brigham, Project Leader, Thorne Bay Ranger District, P.O. Box 19001, Thorne Bay, AK, 99919, 907-828-3232, db Brigham@fs.fed.us.

Implementation
The Kosciusko Vegetation Management and Watershed Improvement Project can be implemented immediately upon my signing of this Decision Notice pursuant to 36 CFR 218.12.

Minor changes are expected to occur to better met on-site resource management, and protection objectives as well as logistical concerns. Changes made during implementation will be reviewed, documented and approved by the Responsible Official under the direction of R10-Supplement FSH 1909.15-2009-1.

Respectfully,

MATTHEW D. ANDERSON
District Ranger
Thorne Bay Ranger District

9/12/2016

Date
# Kosciusko Project Environmental Assessment

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Introduction

The Thorne Bay Ranger District of Tongass National Forest (Tongass NF, Forest) is proposing this vegetation management and watershed improvement project in primarily young-growth stands on Kosciusko Island. The three action alternatives for the Kosciusko Vegetation Management and Watershed Improvement Project (Kosciusko Project) described in this Environmental Assessment (EA) are consistent with the 2008 Tongass National Forest Land and Resource Management Plan (Forest Plan). The analysis and decision are subject to the objection process (36 CFR 218.7 parts (a) and (b)). Implementation of this project may include use of the stewardship contracting authority provided in the 2003 Appropriations Act (P.L. 108-7).

The July 2, 2013 Secretary's Memorandum 1044-009 addressing sustainable forestry in Southeast Alaska affirms that the U.S. Department of Agriculture is committed to maintaining Southeast Alaska’s exceptional natural resources in perpetuity while also doing its part to ensure that the communities within the Tongass National Forest are economically vibrant.

The memorandum states that “To conserve the Tongass National Forest under the principles of the Multiple-Use Sustained-Yield Act of 1960, Tongass Timber Reform Act and other relevant statutes, we must speed the transition away from old-growth timber harvesting and towards a forest industry that utilizes second growth – or young growth – forests. Moreover, we must do this in a way that preserves a viable timber industry that provides jobs and opportunities for residents of Southeast Alaska.”

Sealaska Land Entitlement Finalization

On December 19, 2014, Congress passed H.R.3979 – Carl Levin and Howard P. “Buck” McKeon National Defense Authorization Act for Fiscal Year 2015 (the Act). Section 3002 of the Act, Sealaska Land Entitlement Finalization, finalized the remaining land entitlement under the Alaska Native Claims Settlement Act (ANCSA) for Sealaska Corporation. In March of 2015, Sealaska Corporation received conveyance to approximately 70,075 acres throughout Southeast Alaska. On Kosciusko Island, approximately 11,970 acres and 32 miles of road were conveyed to Sealaska as part of the final conveyance. Section 3002(d) of the Act is specific to road easements on Kosciusko Island. Within a year of enactment, Sealaska and the Forest Service shall enter into an agreement relating to the access, use, maintenance, and improvement of the roads and facilities. Section 3002(c)(4)(D)(ii) of the Act provides an easement to Sealaska on Kosciusko Island to connect the “Cape Pole Road” to the “South Shipley Bay Road.” Reconstruction and use of the Shipley Bay Road and sort yard are also included. Within 2 years of enactment of the Act, reservations of easements shall be made under Section 17(b) of ANCSA (43 U.S.C. 1616(b)) on these roads.

Additionally, the Act designated “LUD II Management Areas” as conservation areas on National Forest System (NFS) lands; two of these newly designated areas are on Kosciusko Island. Finally, Section 3002(e)(4) of the Act, Tongass National Forest Young Growth Management, states “the Secretary of Agriculture may allow the harvest of trees prior to the culmination of mean annual increment of growth in areas that are available for commercial timber harvest under the Tongass National Forest Land and Resource Management Plan to facilitate the transition from commercial timber harvest of old growth stands.” H.R.3979 became law during the planning process of the Kosciusko Project. The components of the law mentioned above changed the land ownership and land management of the project area, as well as the proposals presented within the Draft EA and carried forward in the Final EA, for treatment of the remaining NFS land within the project area.
The purpose and need remains similar to what was presented during scoping (see page 3), but the strategies presented to best meet those objectives on remaining NFS land at the landscape scale shifted and are further described in the Alternatives section beginning on page 8.

Background

The majority of timber harvest on Kosciusko Island occurred between 1945 and 1965, with the most recent old-growth timber sale on NFS land occurring in 1997. During that span, approximately 19,300 acres were cut, resulting in large contiguous stands of young-growth. These areas lack structural diversity and other key features of the old-growth stands they replaced.

Most past harvest in the project area occurred during a time when little mitigation was in place to protect non-timber resources like under the current Forest Plan. As a result, some young growth from past timber harvest occurs in areas no longer emphasized for timber production, like the beach buffer and riparian areas. Conversely, there are areas where timber production is the emphasis for management, though the ability to manage intensively for timber is limited by the concentration of resources now requiring protection through the application of existing Forest Plan Standards and Guidelines.

Many stands harvested prior to 1966 have now grown to a size where they could be treated commercially to achieve both ecological and transition objectives. However most have not reached the culmination of mean annual increment (CMAI), which is defined in the National Forest Management Act as the point in time when the average annual growth is at its maximum for a stand of trees. On the Forest, the point where the stands meet national requirements that allow for even-age harvest is referred to as “95 percent of CMAI” (Forest Plan, p. 4-71 TIM3 I. L.). Current calculations indicate that the CMAI requirement will not be reached within any of the young-growth stands in the project area until about 2030; however, H.R. 3979 relaxed this requirement by allowing the harvest of trees prior to CMAI to aid with transition objectives, so long as the timber appraises at a positive value for sale. Stands not meeting CMAI requirements are included for even-aged harvest in the Kosciusko Project due to this allowance.

There are also opportunities to treat some of the younger stands using precommercial thinning to promote future forest health and productivity, encourage species diversity, and improve wildlife habitat.

The interdisciplinary team designed the original Proposed Action in the Scoping Document (August 2014) and Public Comment Period Document (November 2014) based on a strategy that breaks the project area into zones where: 1) resource concerns like wildlife travel corridors, riparian areas, and high-vulnerability karst areas coincide or are concentrated, and 2) resource concerns are minimal and timber production can be the major focus of future management. The Proposed Action used the strategy of responding to current resource condition needs for long-term health and productivity while progressively planning to meet future needs during the transition away from old-growth management. To do this, the proposal focused on restorative forestry treatments in areas where the most resource concerns exist now. The action alternatives presented in the Draft Environmental Assessment still integrated this strategy, though at different scales due to the land conveyance. There were minimal changes between the Draft EA and the Final EA. The action alternatives are described beginning on page 8 with a range from an emphasis on maximizing timber harvest to treatments that focus on mitigating potential long-term effects as a result of land conveyance, as well as from activities on adjacent state and private lands within the project area.
**Project Area**

The project area is located approximately 48 air miles northwest of Thorne Bay, Alaska (see Figure 1 on page 4), and is about 56,063 acres in size, roughly the southern half of Kosciusko Island, including the community of Edna Bay. Of the approximately 37,202 acres of NFS land in the project area, approximately 3,465 acres are under consideration for various treatments in this project. The Forest Plan Land Use Designation within the project area is predominantly Timber Production (TM), with some areas of designated Old-Growth Habitat (OG), and Special Interest Areas (SIA, geologic); the project area now also includes LUD II Management Areas designated in H.R. 3979.

**Purpose of and Need for Action**

There is a need to move National Forest System lands within the Kosciusko Project area closer to the desired conditions outlined in the Forest Plan and to meet the Forest-wide goals and objectives for Forest resources. The action alternatives are intended to: 1) help move the Forest forward in transitioning to young-growth management while enhancing wildlife habitat, improving riparian areas, and maintaining function of high-vulnerability karst areas; 2) supply a small component of old growth to meet the needs of the local community; 3) restore riparian management areas and improve fish habitat; 4) manage water flow and blockages to improve karst hydrologic systems; and 5) treat invasive plant infestations. The purpose would be accomplished primarily through young-growth vegetation treatments, young-growth and old-growth timber harvest, stream restoration treatments, invasive plant management, and road treatments.

**Young-growth Management**

Kosciusko Island has been identified as one of the best places on the Forest to begin the transition from old-growth timber to young-growth. It contains a large concentration of young-growth stands that contain sawtimber-size material now suitable for commercial harvest, although 7,352 acres of young growth previously located on NFS land are now under Sealaska Corporation ownership. Most of the young-growth on Kosciusko Island occurs as extensive single story, even-aged stands that are dense with trees, a situation that limits diversity and, if not corrected, can cause concerns for the long-term ability of the landscape to meet multiple resource objectives. Given the large contiguous acreages of young growth in the project area, there is a need to address this situation.

Many older young-growth stands in the project area are in a condition where vegetative treatments can be designed to meet the commercial timber objectives for the transition, while at the same time improving wildlife habitat and promoting circumstances that benefit multiple resources into the future. Stands where the timber is not large enough for commercial harvest are being considered for precommercial thinning treatments to reduce stand density and promote stand characteristics favorable for both timber production and wildlife habitat. In addition to the use of existing roads, additional road reconstruction, reconditioning, and construction of temporary roads may be necessary to provide access for the proposed young-growth treatments.
Figure 1: Vicinity Map with Forest Plan Land Use Designations for the Kosciusko Project.
Old-growth Timber Harvest

The community of Edna Bay on Kosciusko Island uses old-growth timber from the surrounding NFS land for building material. The isolation of the community makes obtaining lumber from other sources difficult. The purpose of including old-growth timber harvest in this proposal is to provide an economic timber supply that could be purchased by the local mills. Small old-growth timber sales or stewardship contracts would support some of these needs. The stands proposed for management are in areas that would be economically feasible to access and operate in. Road reconstruction, reconditioning, and/or temporary road construction would be needed for this timber harvest.

Riparian Management Area (RMA) Restoration

Another purpose of this proposal is to improve water quality and fish habitat. Harvested watersheds contain high-value fish habitat in combination with high-value surface and sub-surface water flow. The riparian zones of these watersheds had relatively high levels of timber harvest prior to enactment of the Tongass Timber Reform Act (TTRA). The management goal is to promote overall riparian area health by providing conditions where the function of riparian areas are either maintained or improved.

Riparian improvement activities are primarily proposed within and/or adjacent to the proposed young-growth treatment areas. These actions would also occur where past harvest activities have resulted in an undesirable resource condition. Additionally, some fish stream crossings on NFS roads in the project area do not meet Standards established in the Forest Plan, and so are rated “red”, which means they do not provide fish passage at all flows. Other crossings may require additional analysis to determine if they meet Forest Plan requirements. Potential restoration needs, methods, and results that are desired from this proposal are outlined in Table 1 below.

<table>
<thead>
<tr>
<th>Potential Restoration Needs</th>
<th>Proposed Restoration Method</th>
<th>Intended Result – Desired Future Condition</th>
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</thead>
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<tr>
<td>Short-term stream stabilization</td>
<td>In-stream work to replace roughness elements, such as large woody debris (LWD), into stream channels where losses of those elements have occurred</td>
<td>Returns structure and complexity into streams and maintains dynamic floodplain processes which meters erosion and improves aquatic habitat</td>
</tr>
<tr>
<td>Long-term stream stabilization</td>
<td>Riparian thinning in RMAs that have been previously harvested</td>
<td>Accelerates the return of forest within RMAs to old-growth-like conditions, expediting the recruitment and maintenance of LWD in stream channels and restoring natural flood plain processes</td>
</tr>
<tr>
<td>Improved fish passage at road crossings</td>
<td>Removal or improvement of “Red” fish crossing structures</td>
<td>Improves the upstream/downstream migration of fish at road crossings Increase the amount of upstream habitat available to fish</td>
</tr>
<tr>
<td>Improved water quality in watersheds where roads do not meet maintenance standards</td>
<td>Correct drainage paths and structures associated with roads that contribute to water quality degradation</td>
<td>Diminishes water quality degradation</td>
</tr>
<tr>
<td>Improved watershed/karst function</td>
<td>Silvicultural treatments and/or erosion control methods</td>
<td>Improves water quality and overall watershed function</td>
</tr>
</tbody>
</table>

Table 1: Proposed Kosciusko Project RMA Restoration.
Karst Systems

This proposal is also designed to enhance karst hydrologic function and maintain, to the extent practicable, the natural karst processes and the productivity of the karst landscape. Within the project area there are approximately 38,659 acres of carbonate bedrock in which karst systems have developed. In karst terrain, groundwater may flow relatively quickly through complex underground systems of fissures and caves. Concerns primarily involve potential changes of groundwater flow in these underground systems. Any management activity that causes sediment or organic debris to build up in the subsurface drainage system may degrade natural karst processes and the productivity of the karst landscape. The majority of past timber management and road construction activities occurred prior to there being any measures for karst resource protection. Past activities caused sediment to be delivered into karst systems and some blockages have occurred. These blockages have increased surface flow and erosion in some areas. Opportunities exist to improve the karst systems where ditches, culverts, slash, and beaver dams/structures are impeding natural water flows or creating unnatural water flows to karst features.

Invasive Plants

Invasive plant infestations are known to occur in the project area in both natural and human-caused disturbance areas. These infestations compete with native vegetation. They have potential to continue to spread or to act as a seed source for future introductions. The need to treat infestations is based on the invasiveness of the species, and the size and location of the infestation.

Public Involvement

Scoping

The Kosciusko Vegetation Management and Watershed Improvement Project was published in the first quarterly (Fiscal Year 2015) Tongass NF Schedule of Proposed Actions (SOPA) on October 1, 2014, and quarterly since then, although the project had also been listed and on hold several years prior as Kosciusko Vegetation Management Project. Individuals who requested more information on the project as well as adjacent landowners, local community members and leaders, affected special use permittees; those representing local conservation organizations, partner groups, community organizations; and various tribal associations and corporations were mailed the scoping letter, scoping document, and a proposed action map for review. Within the scoping letter, all aforementioned groups and individuals were also invited to public meetings and subsistence hearings scheduled in the communities of Thorne Bay, Naukati, and Edna Bay in August 2014. Tongass National Forest issued a press release to further inform the public on the scoping period and the associated public meetings. The scoping documents were posted to the project webpage at: http://www.fs.usda.gov/goto/R10/Tongass/Kosciusko. Scoping was initiated on August 1, 2014, with request for comments by August 18, 2014.

Fourteen letters were received during the scoping period. Comments received from the public are located in the project record and are also accessible on the project webpage. Using internal comments as well as the comments from other agencies, private industry, groups, and individuals, the Forest Service developed a list of issues to address. Issues identified from comments for the original Proposed Action pertained to the following: herbicide use, old growth harvesting, windfirmness, effects to the community of Edna Bay, biomass removal, deer forage, export
volume, even-aged harvest, policy for young-growth transition, road access, and a bridge to access lands across Trout Creek. Responses to these issues are located in the project record, and helped form the basis for alternatives to the Proposed Action that were displayed in the Public Comment Period Document in November 2014.

Additionally, after the scoping period, Sealaska Corporation requested a consultation meeting with Tongass National Forest in regards to the project being within areas they were pursuing under, what was called at the time, the Southeast Alaska Native Land Entitlement Finalization and Jobs Protection Act, a proposed bill that identified lands they were requesting be transferred to Sealaska Corporation.

Public Comment Period

A second opportunity for public involvement was provided beginning November 24, 2014 when the Public Comment Period Document was sent to all groups and individuals previously involved, as well as to those who had since provided input or requested to be on the mailing list for the project. The documents were posted to the project webpage at that time as well. This additional 30-day comment period provided the public a chance to review the alternatives developed by the Interdisciplinary Team in response to issues raised during the scoping period. Fourteen letters were received during the comment period; these are located in the project record and are also accessible on the project webpage, listed on the previous page. Comments received were reviewed to identify concerns the public had with the project; most were consistent with the previous list of issues raised. H.R. 3979 finalizing the Sealaska Land Entitlement was passed before this comment period ended; this new information formed the basis of nearly all new concerns submitted from the public.

Draft Environmental Assessment

The Draft EA was released to the public on August 6, 2015 with a request for comment by September 8, 2015. The document was sent to all groups and individuals previously involved, as well as to those who had since provided input or requested to be on the mailing list for the project; in all, 75 copies were mailed and it was provided electronically by email notification to 143 individuals at that time. During the designated comment period, three public meetings were scheduled to present the assessment and provide subsistence hearing opportunities to interested community members: in Naukati on August 12, Thorne Bay on August 18, and Edna Bay on Kosciusko Island on August 25. Further consultation with Tribal entities occurred during this time frame as well: with the Organized Village of Kasaan on August 20, and both the Craig Tribal Association and Klawock Cooperative Association on September 8. The cover letter, Draft EA, and Draft Unit Cards were all posted to the project webpage, available for public viewing. Nine letters from individuals, organizations, and state agencies were received during the comment period and are also available to view on the project webpage. Comments received assisted in refining the project and the resource reports for the Final EA. Responses to comments are available upon request and in the project record.

Issues

Although there are often many potential issues and concerns associated with planning actions that may affect the human and natural environment, National Environmental Policy Act (NEPA) direction requires detailed analysis of only those issues that may be significant. This ensures that the analysis and documentation are focused primarily on the issues that are most important to the project area and the decision to be made.
The Forest Service analyzed internal comments as well as the comments from other agencies, private industry, groups, and individuals that were submitted during public involvement phases. The following statements are the issues that were determined to be potentially key or significant and within the scope of the project.

- Cumulative effects from the proposed activities combined with past management and the reasonably foreseeable future actions on private lands may have adverse effects on wildlife habitat, water quality, scenery, and subsistence.
- The scale and frequency of harvest entries, as well as the prescriptions implemented, from all current, proposed, and reasonably foreseeable future actions across Kosciusko Island from all landowners may affect the socio-economic stability of the community.
- The Forest Service should promote a quicker transition to a primarily young-growth industry and limit harvest and utilization of old growth.

**Alternatives**

**Alternative 1: No Action**

No new actions would be initiated for treatment of resources on NFS land in the project area. Current management practices and those authorized by other NEPA decisions would continue, and future decisions affecting NFS land within the project area would not be precluded from occurring.

This alternative provides a foundation for describing and comparing the magnitude of environmental changes associated with the action alternatives against those changes that occur with no new action on NFS land at this time. This alternative, unlike the following action alternatives, does not meet the purpose and need for this project.

**Action Alternatives**

Alternatives 2, 3, and 4 were developed by the Interdisciplinary Team (IDT) and approved by the District Ranger to provide a reasonable range of options for meeting the purpose and need of this project and to address the issues identified from public involvement (see page 7). The list of actions in the “common to all” section below would apply to all three action alternatives; actions unique to Alternatives 2, 3, and 4 are described in their respective sections following below.

**Common to all Action Alternatives**

- Precommercial thinning would occur on 1,695 acres within stands currently (2015) 31 to 44 years old. This treatment would reduce the extent of stands in the stem exclusion stage and promote the creation of a more diverse and abundant understory vegetation component across the landscape. The treatment is proposed for stands in the Timber Production, Old Growth Habitat, LUD II, and Special Interest Area LUDs, and in the 1,000-foot beach buffer.
- An additional 170 acres of young-growth in RMAs would be precommercially thinned to reduce stand density, and promote stand diversity and wildlife habitat.
- Old growth would be harvested using even-aged management prescriptions on approximately 27 acres and uneven-aged management prescriptions on approximately 37 acres. Old-growth
harvest would result in about 1,051 MBF (thousand-board feet, volume measurement) of timber.

- Where karst systems have been impacted, blockages may be removed, and diverted water flow from culverts and ditch features would be remedied.
- Invasive plant infestations known to occur within NFS land in the project area or those found there during implementation or monitoring may be targeted for appropriate control treatments and/or monitoring. Treatment options would be limited to manual and mechanical methods.
- All new temporary roads would be decommissioned when all management activities are completed.
- Existing rock quarries would be further utilized as needed and approximately five new rock quarries would be developed to support road construction and road reconditioning.
- In-stream restoration activities may occur on up to 1 mile of stream segments. “Red” culverts in the project area may be removed or replaced, and culverts that need further analysis would be evaluated and also removed or replaced if determined to be impeding upstream travel for fish.

Finally, applying to all action alternatives, Sealaska Land Entitlement Finalization Section 3002(d) of the Act states the Secretary of Agriculture and Sealaska shall enter into an agreement relating to the access, use, maintenance, and improvement of the roads and facilities on Kosciusko Island. Alternatives 2, 3, and 4 propose to construct about 0.5 miles of road on Sealaska lands on decommissioned road prism. Timber haul is proposed on 9 miles of existing roads on Sealaska land. The access, use, maintenance, improvement, and post-haul disposition of these roads would be part of the agreement.

**Alternative 2**

The primary objective of this alternative is to maximize harvest efficiency and volume production in the near term to best facilitate the objectives of the transition at this time. Alternative 2 proposes mostly even-aged management in openings up to 100 acres in size with reasonable settings left between the proposed units to be harvested in the future, also designed for even-aged management. Uneven-aged management is proposed within the beach buffer according to the direction in the current Forest Plan, as well as adjacent to one area of concentrated karst features.

Even-aged management using clearcutting is constrained under the National Forest Management Act (NFMA) on the Tongass NF to openings of 100 acres or less, with certain allowances of up to 150 acres. Clearcuts must maintain a reasonable setting or harvest area between them. Since many of the original stands proposed for management at Kosciusko are well over 150 acres, they had to be divided into smaller openings and spaced out over time to meet NFMA requirements. Proposed units were designed to be as large as possible given this constraint. Harvest adjacent to the openings in the remainder of the stand cannot occur until regeneration from the first harvest has reached about 5 feet tall, attaining an adequately stocked condition. For sites in the project area, that stocking level is estimated to be reached at about 10 years post-harvest.

Alternative 2 proposes young-growth timber harvest on approximately 861 acres using even-aged management on suitable lands and on 75 acres with uneven-aged management, which would result in about 30.2 MMBF (million-board feet, volume measurement) of timber. These treatments, as well as those common to all action alternatives, would require about 1.5 miles of new temporary road construction, 3.9 miles of new temporary road construction on existing road
prism, 4.2 miles of road reconditioning, and 18 miles of road maintenance. See Figure 2 for a map of actions proposed in this alternative.

**Alternative 3**

Alternative 3 attempts to best meet the goals of both Alternatives 2 and 4, with harvests in young-growth stands that would be designed to address the objectives of transition, while also considering and managing for the long-term effects to other resources on the landscape. With proposed treatments that resemble elements of both other action alternatives, the effects of Alternative 3 would also be expected to be in the range between those of Alternatives 2 and 4. This proposal would utilize even-aged management with a combination of moderate and large sized openings. In the matrix between these larger openings, two-aged management would create patch clearcuts up to 20 acres in size, harvesting up to 50 percent of the stand acreage. Additionally, uneven-aged management would be used within the beach buffer per the current Forest Plan, adjacent to an area of concentrated karst features, and to enhance portions of the landscape identified to function as wildlife corridors.

Alternative 3 proposes young-growth timber harvest on approximately 396 acres using even-aged management, 856 acres with two-aged management, and 209 acres with uneven-aged management, which would result in about 29.9 MMBF of timber. Implementation of this alternative would require about 1.5 miles of new temporary road construction, 4.9 miles of new temporary road construction on existing road prism, 4.7 miles of road reconditioning, and 18 miles of road maintenance. See Figure 3 for a map of actions proposed in Alternative 3.

**Alternative 4**

The primary objective of Alternative 4 is to mitigate potential long-term effects as a result of the land conveyance within the project area, while still addressing the Forest’s transition to primarily young-growth management. There is uncertainty in the extent and intensity of future harvests on the substantial acreage of the project area that was conveyed to Sealaska Corporation on Kosciusko Island, and what the landscape-scale impact to wildlife and other resources may be. Proposed treatments designed to meet the objectives are: 1) uneven-aged management, where group selections up to 2 acres in size comprise about 33 percent of the stand acreage; and 2) two-aged management, where up to 50 percent of the stand acreage would be harvested as patch clearcuts up to about 20 acres in size.

Stands are considered uneven-aged when there are three or more distinct age classes. Harvest usually occurs as group selections up to about 2 acres in size or as single-tree selections. The prescription for uneven-aged management in this alternative would primarily be based off a series of harvests conducted from trails, and creating group openings dispersed through the stand. The first entry, from this proposal, would harvest about a third of the stand area in this manner. The second entry could occur about 30 years after, similarly harvesting another third of the stand. The third harvest could occur 60 years in the future. Single-tree selection is not expected to be necessary to achieve the goals of the alternative.

Alternative 4 proposes young-growth timber harvest on about 1,084 acres using uneven-aged management and 399 acres using two-aged management, which would result in about 19.0 MMBF of timber. Proposals in Alternative 4 would require about 1.3 miles of new temporary road construction, 5.3 miles of new temporary road construction on existing road prism, 4.7 miles of road reconditioning, and 18 miles of road maintenance (see Figure 4).
Figure 2: Alternative 2 Map for the Kosciusko Project.
Figure 3: Alternative 3 Map for the Kosciusko Project.
Figure 4: Alternative 4 Map for the Kosciusko Project.
Comparison of Alternatives

The actions that differ between Alternatives 2, 3, and 4, as described in their above sections respectively, are the treatments used for young-growth timber harvest and management of the transportation system. These differences are summarized in Table 2 below. Note that actions proposed that are common to all action alternatives, such as old-growth timber harvest and precommercial thinning, are not displayed since there are no differences between alternatives.

Table 2: Comparison of Alternatives.

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young-growth: even-aged management (acres)</td>
<td>861</td>
<td>396</td>
<td>0</td>
</tr>
<tr>
<td>Young-growth: two-aged management (acres)</td>
<td>0</td>
<td>856</td>
<td>399</td>
</tr>
<tr>
<td>Young-growth: uneven-aged management (acres)</td>
<td>75</td>
<td>209</td>
<td>1,084</td>
</tr>
<tr>
<td>Young-growth treatment (total acres)</td>
<td>936</td>
<td>1,461</td>
<td>1,483</td>
</tr>
<tr>
<td>Young-growth total volume (MMBF)</td>
<td>30.2</td>
<td>29.9</td>
<td>19.0</td>
</tr>
<tr>
<td>New temporary road construction (miles)</td>
<td>1.5</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>New temporary road construction on existing road prism (miles)</td>
<td>3.9</td>
<td>4.9</td>
<td>5.3</td>
</tr>
<tr>
<td>Road reconditioning (miles)</td>
<td>4.2</td>
<td>4.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Road maintenance (miles)</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

The Final Unit Cards for implementation of the Selected Alternative, described in the Decision Notice for this project, are available on the project webpage; see page 6 of this EA for the web address. There is an introduction section that describes the purpose of the Unit Cards and resource concerns for implementation, followed by a Unit Card for each proposed timber harvest unit, as well as a map corresponding to each Unit Card.

Alternatives Considered but Eliminated From Detailed Study

Additional action alternatives may be analyzed if proposed during scoping, collaboration, or public comment periods, and if they meet the purpose and need of the project. The Responsible Official selects which alternatives to consider and study in detail, and which ones will not be studied in detail. In addition to the No Action Alternative and three action alternatives selected to be analyzed in detail for this project, alternatives suggested during public involvement and in response to issues raised were considered. Alternatives not considered in detail may include, but are not limited to, those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm. Some of the suggested alternatives are to not implement certain actions; these are not being analyzed in detail as separate alternatives because they are inherently included in the No Action Alternative effects analysis, and will be compared to the action alternatives. Descriptions of alternatives considered but removed from detailed study are described below, along with the reasons for their elimination from detailed study. For the Kosciusko Project, these alternatives include: no herbicide treatments or applications, spot treatment on all invasive plant populations, no old-growth harvest, and a programmatic approach to young-growth management on Kosciusko Island.

Herbicide treatments on invasive plant populations

Concern Statement: Commenters stated that the application of herbicides should not be considered because it may affect water quality, wildlife, and subsistence use. Only mechanical
pulling, hand pulling, landscape fabric, and outreach to the community for “Weed Pull Adoption Sites” should be used to treat invasive plant populations.

**Response:** An alternative was initially considered in which herbicide would be applied where determined to be the best and most effective option for eradication. At this time, an alternative which includes the use of herbicide application is not being analyzed in detail, in order to be considered in a broader context in the future. Community outreach and involvement are feasible with all alternatives; it could be an approach to treating infestations that does not require a NEPA decision.

**Spot treatment on all invasive plant populations**

**Concern Statement:** Commenters have requested that spot spraying with an herbicide be used on all invasive plant populations because other treatments may not remove or control the spread of some species of invasive plants.

**Response:** Although targeted herbicide use may provide the most efficient option for eradication of specific infestations, it is not the only effective tool for invasive treatments. Some infestations, based on the species’ characteristics and extent, are feasible to treat by manually hand-pulling, and herbicide would be unnecessary. Other infestations are so widespread, that they would not be feasible to eradicate through spot spraying, and are not considered a priority for treatment in this project.

**No old-growth harvest**

**Concern Statement:** Harvest in old-growth stands may affect the functioning and sustainability of the whole ecosystem; therefore, the local community should supply their needs from the larger young-growth trees.

**Response:** An alternative was considered in which no old-growth stands would be harvested, but was not analyzed in detail because it would not meet the purpose and need for this project. The No Action Alternative would analyze the effects from excluding old-growth harvest from this project, although not in conjunction with harvest of young growth. The action alternatives would analyze the effects from both young-growth and old-growth harvest. The purpose of including a small amount of old-growth timber harvest in this project is to provide a small-scale timber supply for local mills. The Forest Plan Standards and Guidelines were developed to maintain full ecosystem function and provide protection and management of Forest resources.

**Programmatic approach to young-growth management on Kosciusko Island**

**Concern Statement:** Commenters have expressed concerns that since this proposed project begins the transition to a young-growth based industry, a programmatic approach that implements a “tree farm” management policy should be developed in which all acres of young-growth stands should be “NEPA cleared” so that management treatments can be conducted in a timely manner.

**Response:** A vegetation management plan is being developed that would guide management activities for all young-growth stands in the project area into the future. This project proposes to implement the beginning stages of that plan. Since the Tongass NF has never executed a large-scale young-growth management project like the Kosciusko Project, we believe it would be prudent to wait until we see results before we begin to clear programmatic treatments, so adjustments could be made. Much like with implementing adaptive management principles, what
we learn from this project will help inform the vegetation management plan for Kosciusko Island, as well as future young-growth NEPA decisions across the Tongass NF, which may be more programmatic in nature.

Environmental Consequences

This section describes the environmental impacts of the alternatives in relation to whether there may be significant environmental effects as described in 40 CFR 1508.27. The following documents are available upon request and are hereby incorporated by reference into this assessment:

- Final Silviculture Resource Report, For Young- and Old-growth Stands in the Kosciusko Vegetation Management and Watershed Improvement Project Area; Sheets, November 5, 2015 (Silviculture Report)
- Kosciusko Vegetation Management and Watershed Improvement Project, Transportation Resource Report - Final; Jacobson, October 2015 (Transportation Report)
- Kosciusko Vegetation Management and Watershed Improvement Project, Wildlife Report; Dillman, November 24, 2015, updated September 1, 2016 (Wildlife Report)
- Kosciusko Vegetation Management and Watershed Improvement Project, Final Biological Assessment/Biological Evaluation; Dillman and Mahara, November 17, 2015, updated September 1, 2016 (Wildlife and Fish BA/BE)
- Kosciusko Vegetation Management and Watershed Improvement Project EA, Soils and Wetlands; Reynolds, November 5, 2015 (Soils and Wetlands Report)
- Final Watershed Report for the Kosciusko Vegetation Management Watershed Improvement Project; Harris, November 5, 2015 (Watershed Report)
- Kosciusko Vegetation Management Watershed Improvement Project, Fisheries Resource Report; Mahara, November 23, 2015 (Fisheries Report)
- Final Geology, Minerals, Karst and Cave Resource Report for the Kosciusko Vegetation Management Watershed Improvement Project; Baichtal, October 31, 2015 (Geology Report)
- Scenery Resource Report, Supporting Kosciusko Vegetation Management and Watershed Improvement Project EA; Steward, November 2015 (Scenery Report)
- Kosciusko Vegetation Management and Watershed Improvement Project, Rare Plant Resource Report; Grinter, October 2015 (Botany Report)
- Biological Evaluation for Plants, Kosciusko EA; Grinter, October 2015 (Botany BE)
- Kosciusko Vegetation Management and Watershed Improvement Project, Invasive Plants Risk Assessment Report; Grinter, November 6, 2015 (Invasive Plants Report)
- Kosciusko Heritage Report, R2015100554028; Marshall, May 6, 2015 (Heritage Report)
- Final Climate Change Report for the Kosciusko Vegetation Management Watershed Improvement Project; Harris, November 1, 2015 (Climate Change Report)
These final resource reports for the Kosciusko Project are available upon request, or on the project webpage (see page 6 for web address). The full analysis and conclusions about the potential effects for each resource, including affected environment (existing condition), methodology, assumptions, and supporting literature, are available in the above reports and other supporting documentation located in the project record.

The following sections are discussions of resources that have relevance to a determination of significance. The cumulative effects boundary for each resource varies, depending on where the extent of effects on that resource may occur as a result of project implementation; for example, Fisheries considers effects at a watershed scale, while Soils uses the Kosciusko Project area as the effects analysis boundary. Within these boundaries, cumulative effects analysis also requires consideration of all other activities that have occurred or are anticipated to occur, regardless of land ownership and using the best information available. These activities are described in detail in a document titled *Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area*, available in the project record, as well as preserved geospatially in GIS data for analysis. Past activities include but are not limited to even-aged timber harvest, precommercial thinning of young-growth stands, and a variety of special use permits for rock material; presently ongoing activities include personal use firewood gathering, road maintenance, and timber harvest currently occurring on other land ownerships within the project area; and future actions which are anticipated to occur include road work in Edna Bay, outfitter and guide activities, and timber harvest on lands now under Sealaska Corp. ownership. See the aforementioned document for further details on these and more activities, and for the assumptions used for the anticipated harvests on Sealaska land within the project area.

Table 3, as follows on pages 18 through 24, displays a summary of effects of implementing each alternative, followed by a summary of the analysis completed for each resource, which should be referred to for explanations of the below table contents. As previously mentioned, more detailed information for all resource effects analysis can be found in the project record in their corresponding resource reports, listed above.
<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects on forest structure</td>
<td>Maintains all young-growth acres in the existing condition. Old-growth stands are not affected.</td>
<td>Maintains 861 acres of currently even-aged young growth under even-aged management and converts 75 acres to uneven-age management. Converts 27 acres of old growth to even-aged and maintains 37 acres as uneven-aged. Allows for some large-scale variation in young growth across the landscape; more than Alt 1 but less than Alt 3 or 4.</td>
<td>Maintains 396 acres of currently even-aged young growth under even-aged management and converts 856 acres to two-aged management and 209 to uneven-aged management. Converts 27 acres of old growth to even-aged and maintains 37 acres as uneven-aged. Allows for good variation in young-growth structure across the landscape; more than Alt 1 and 2 but less than Alt 4.</td>
<td>Converts 399 acres of even-age young growth to two-aged management and 1,084 acres to uneven-aged management. Converts 27 acres of old growth to even-age and maintains 37 acres as uneven-age. Allows for the greatest variation in forest structure across the landscape of all alternatives.</td>
</tr>
<tr>
<td>Effects on forest health and productivity</td>
<td>Maintains the existing condition which would result in increased risk long term.</td>
<td>Reduces risk of insect and disease over Alternative 1, but equal to Alternatives 3 and 4.</td>
<td>Reduces risk of insect and disease over Alternative 1, but equal to Alternatives 2 and 4.</td>
<td>Reduces risk of insect and disease over Alternative 1, but equal to Alternatives 2 and 3.</td>
</tr>
<tr>
<td>Effects on regeneration and species composition</td>
<td>Maintains the existing condition, does not allow for the opportunity to increase the occurrence of cedar in young-growth stands in the project area.</td>
<td>Allows for more cedar to be present in young growth long term, more so than Alternatives 1 and 4, but about equal to Alternative 3.</td>
<td>Allows for more cedar to be present in young growth long term, more so than Alternatives 1 and 4, but about equal to Alternative 2.</td>
<td>Allows for more cedar to be present in young growth long term, more so than Alternative 1, but less than Alternative 2 and 3.</td>
</tr>
<tr>
<td>Effects on windthrow risk</td>
<td>Maintains the existing condition where risk is minimal.</td>
<td>Increases short-term risk along harvest edges. About equal to or slightly more than Alternative 3.</td>
<td>Increases short-term risk along harvest edges. Slightly less than Alternative 2 but more than Alternatives 1 and 4.</td>
<td>Minor short-term increase over the existing condition.</td>
</tr>
</tbody>
</table>
### Silviculture (cont’d)

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects to future young-growth timber volume and availability</td>
<td>Maintains the existing condition where timber stands are growing towards CMAI.</td>
<td>Harvests young-growth stands prior to CMAI. Produces the most volume in the near term of all alternatives but maintains a potential age class imbalance on NFS land in the project area long term. This effect is likely to be amplified by State and private harvesting.</td>
<td>Harvests young-growth stands prior to CMAI. Produces less volume in the near term but allows for a more even flow in the long term.</td>
<td>Harvests young-growth stands prior to CMAI but primarily via uneven-aged management. Produces the least volume in the near term but allows for a more even flow in the long term. The most NFS acres would be allowed to grow to CMAI and beyond.</td>
</tr>
</tbody>
</table>

### Timber Economics

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (MMBF)</td>
<td>0</td>
<td>31.2</td>
<td>31.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Logging/Transportation Cost/MBF</td>
<td>$0</td>
<td>$353.50</td>
<td>$355.02</td>
<td>$360.55</td>
</tr>
<tr>
<td>Road Costs/MBF</td>
<td>$0</td>
<td>$20.60</td>
<td>$22.51</td>
<td>$34.44</td>
</tr>
<tr>
<td>Indicated Bid Value</td>
<td>$0</td>
<td>$(3,515,156) - $1,143,057</td>
<td>$(3,513,373) - $1,058,872</td>
<td>$(2,374,555) - $589,913</td>
</tr>
<tr>
<td>Number of Annualized Direct Jobs</td>
<td>0</td>
<td>122-150</td>
<td>119-144</td>
<td>77-95</td>
</tr>
</tbody>
</table>

### Transportation

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles of temporary road construction</td>
<td>0</td>
<td>5.4</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Miles of reconditioned NFS road</td>
<td>0</td>
<td>4.2</td>
<td>4.7</td>
<td>4.7</td>
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<tr>
<td>Miles of road to be closed after the timber harvest activities</td>
<td>0</td>
<td>10.1</td>
<td>11.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Costs including maintenance, reconditioning, and new temporary road construction</td>
<td>$0</td>
<td>$697,275</td>
<td>$748,156</td>
<td>$729,527</td>
</tr>
<tr>
<td>Wildlife</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Measurement Indicator</strong></td>
<td><strong>Alt 1</strong></td>
<td><strong>Alt 2</strong></td>
<td><strong>Alt 3</strong></td>
<td><strong>Alt 4</strong></td>
</tr>
<tr>
<td>Acres of current and post-project low/med. POG and high POG (HPOG) on NFS land in WAA 1525</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>low/med</td>
<td>Current = 4,090 (0% change from historical)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 4,090</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPOG</td>
<td>Current = 10,302 (45% from historical)</td>
<td>Post-project low/med POG = 4,070 (-1% from current)</td>
<td>Post-project HPOG = 10,269 (-1% from current)</td>
<td>Post-project SD67 = 7,742 (&lt;1% from current)</td>
</tr>
<tr>
<td>Historical = 18,897</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD67</td>
<td>Current = 7,755 (22% from historical)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 10,004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes to interior forest acres in WAA 1525</td>
<td>No Change</td>
<td>-1.1 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent change in acres of deer habitat on NFS land in WAA 1525</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep-snow</td>
<td>Post-project: 0%</td>
<td>Post-project: -2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 2,895</td>
<td>Stem exclusion: -1%</td>
<td>Stem Exclusion: -2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current = 1,358</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average-snow</td>
<td>Post-project: 0%</td>
<td>Post-project: 0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 22,571</td>
<td>Stem exclusion: -1%</td>
<td>Stem exclusion: -1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current = 13,976</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-winter</td>
<td>Post-project: 0%</td>
<td>Post-project: +5%</td>
<td>Post-project: +7%</td>
<td></td>
</tr>
<tr>
<td>Historical = 28,611</td>
<td>Stem exclusion: -1%</td>
<td>Stem exclusion: -1%</td>
<td>Stem exclusion: -1%</td>
<td></td>
</tr>
<tr>
<td>Current = 20,057</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in deer habitat capability in WAA 1525</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 2,257</td>
<td>Post-project = 1,327 (-41% from historical value)</td>
<td>Post-project = 1,387 (+5% from current value)</td>
<td>Post-project = 1,420/1,421 (+7% from current value)</td>
<td></td>
</tr>
<tr>
<td>Current = 1,327</td>
<td>Stem exclusion = 1,320 (-1% from current value)</td>
<td>Stem Exclusion = 1,314 (-1% from current value)</td>
<td>Stem Exclusion = 1,314 (-1% from current value)</td>
<td></td>
</tr>
<tr>
<td>Percent change in acres of marten habitat on NFS land in WAA 1525</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep-snow</td>
<td>2,078 (-59.2% change from historical acres)</td>
<td>2,059 (-1% from current acres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 5,091</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current = 2,078</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year-round</td>
<td>13,224 (-54.9% change from historical acres)</td>
<td>13,191 (-0.3% change from current acres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical = 29,312</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current = 13,224</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effects to identified wildlife corridors</td>
<td>No change</td>
<td>Young-growth treatments would improve the connectivity between the OGRs in VCU 5440 and 5450.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in road densities (miles of road per square mile) for both NFS land and All land</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAA 1525</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFS Current = 1.8</td>
<td>No change</td>
<td>Increase 0.1 miles per square mile on both NFS and all lands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All land = 2.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFS Current = 0.8</td>
<td>No change</td>
<td>No change on NFS land</td>
<td>Increase 0.1 miles per square mile on all lands</td>
<td></td>
</tr>
<tr>
<td>All land = 1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife (cont’d)</td>
<td>Alt 1</td>
<td>Alt 2</td>
<td>Alt 3</td>
<td>Alt 4</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
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</tr>
<tr>
<td>Measurement Indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres of young growth treated</td>
<td>0</td>
<td>936</td>
<td>1,461</td>
<td>1,483</td>
</tr>
</tbody>
</table>

**Endangered Species Act Determination**

| Humpback whale | “No Effect” | “May affect, not likely to adversely affect” |

**Region 10 Sensitive Species Effects Determination**

| Steller sea lion (Eastern DPS) | “No Impact” | “May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing” |
| Queen Charlotte goshawk | “No Impact” |

<table>
<thead>
<tr>
<th>Soils</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative acres of detrimental soil conditions</td>
<td>1,274</td>
<td>1,317</td>
<td>1,333</td>
<td>1,331</td>
</tr>
<tr>
<td>Percent of project area with detrimental soil conditions</td>
<td>2.3</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wetlands</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres of proposed wetland impacts (harvest and roads)</td>
<td>0</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Cumulative acres of harvested wetlands</td>
<td>1,139</td>
<td>1,169</td>
<td>1,169</td>
<td>1,169</td>
</tr>
<tr>
<td>Percent of wetlands harvested</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Cumulative acres of wetlands converted to road</td>
<td>113</td>
<td>114</td>
<td>114</td>
<td>114</td>
</tr>
<tr>
<td>Percent of wetlands converted to road</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fisheries and Watersheds</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total acres of proposed harvest units</td>
<td>0</td>
<td>999</td>
<td>1,526</td>
<td>1,547</td>
</tr>
<tr>
<td>Acres of proposed clearcut harvest units</td>
<td>0</td>
<td>888</td>
<td>423</td>
<td>27</td>
</tr>
<tr>
<td>Acres of proposed canopy removal</td>
<td>0</td>
<td>925</td>
<td>933</td>
<td>600</td>
</tr>
</tbody>
</table>
### Fisheries and Watersheds (cont’d)

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of the 21 project watersheds that cumulatively exceed the 20/30 threshold until 2055</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>(5 of these 8 would have additional canopy removal)</td>
<td></td>
<td>(5 of these 8 would have additional canopy removal)</td>
<td></td>
<td>(5 of these 8 would have additional canopy removal)</td>
</tr>
<tr>
<td>Number of the 21 watersheds that cumulatively exceed the 2.5 percent area as road threshold</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Number of the 14 red pipes that would be removed or replaced in the project</td>
<td>0</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Approximate distance in meters of upstream habitat that would be opened up from this project</td>
<td>0</td>
<td>1,700</td>
<td>1,700</td>
<td>1,700</td>
</tr>
<tr>
<td>Number of new fish stream crossings (would provide fish passage)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Anticipated miles of Class I and Class II streams that would have harvest in the RMA (on non-NFS land only)</td>
<td>23.0</td>
<td>23.0</td>
<td>23.0</td>
<td>23.0</td>
</tr>
<tr>
<td>Anticipated acres of harvest in Class I and Class II RMAs (on non-NFS land only)</td>
<td>648</td>
<td>648</td>
<td>648</td>
<td>648</td>
</tr>
<tr>
<td>Acres of PCT treatment in previously harvested Class I and Class II RMAs</td>
<td>0</td>
<td>224</td>
<td>224</td>
<td>224</td>
</tr>
<tr>
<td>Miles of potential in-stream restoration</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Freshwater Essential Fish Habitat (EFH)</td>
<td>No project actions, no adverse effects on Freshwater EFH</td>
<td>May adversely affect Freshwater EFH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine EFH</td>
<td>No project actions, no adverse effects on Marine EFH</td>
<td>May adversely affect Marine EFH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Geology, Minerals, Karst, and Caves

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres of moderate-vulnerability karst treated by harvest type</td>
<td>0 acres treated</td>
<td>802 acres even-aged and 61 acres uneven-aged</td>
<td>418 acres even-aged, 213 acres uneven-aged, and 755 acres two-aged</td>
<td>979 acres uneven-aged and 388 acres two-aged</td>
</tr>
<tr>
<td>Acres of high-vulnerability karst treated by harvest type</td>
<td>0 acres treated</td>
<td>28 acres even-aged and 9 acres uneven-aged</td>
<td>4 acres even-aged, 23 acres uneven-aged, and 40 acres two-aged</td>
<td>65 acres uneven-aged and 11 acres two-aged</td>
</tr>
</tbody>
</table>

### Scenery

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in the level of Scenic Integrity by Viewshed (Direct and Indirect Effects)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shipley Bay Cabin</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Sumner Strait</td>
<td>No Change</td>
<td>Slightly Noticeable</td>
<td>Slightly Noticeable</td>
<td>Slightly Noticeable</td>
</tr>
<tr>
<td>Sea Otter Sound to Cape Pole</td>
<td>No Change</td>
<td>Noticeable Change</td>
<td>Noticeable Change</td>
<td>Noticeable Change</td>
</tr>
<tr>
<td>Tuxekan Pass to Edna Bay</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Karheen Pass to New Tokeen</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Marble Pass</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Pole Anchorage</td>
<td>No Change</td>
<td>Slightly Noticeable</td>
<td>Slightly Noticeable</td>
<td>Slightly Noticeable</td>
</tr>
<tr>
<td>Community of Edna Bay</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Community of Pole Anchorage</td>
<td>No Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
</tbody>
</table>

### Scenic Integrity by Viewshed (Cumulative Effects)

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipley Bay Cabin</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Sumner Strait</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Sea Otter Sound to Cape Pole</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Tuxekan Pass to Edna Bay</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Karheen Pass to New Tokeen</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Marble Pass</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Pole Anchorage</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Community of Edna Bay</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Community of Pole Anchorage</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
</tbody>
</table>
## Sensitive and Rare Plants

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Populations and habitats of sensitive plants directly and indirectly impacted</td>
<td>No impacts</td>
<td>No direct or indirect effects to the known populations of <em>Lobaria amplissima</em> or lesser round-leaved orchid. May be direct or indirect effects to the unknown populations or habitat of Unalaska mist-maid, yellow lady’s slipper, Alaska rein orchid, <em>Lobaria amplissima</em> and lesser round-leaved orchid.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Populations and habitats of rare plants directly and indirectly impacted</td>
<td>No impacts</td>
<td>No direct or indirect effects to the known populations or habitats of Pacific silver fir, maidenhair spleenwort, northern golden saxifrage, fragile rockbreak, mountain bladderfern, twinberry honeysuckle, adder’s-mouth orchid, Pacific ninebark, western meadow-rue, and Carlott’s violet. May be direct or indirect effects to unknown populations or habitats of Alaska oniongrass and whiteflower rein orchid.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Invasive Plants

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of invasive plant spread</td>
<td>Low</td>
<td>Moderate to High&lt;br&gt;The high risk is associated with spread of invasive plant species already in the project area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of new invasive plant introduction and spread</td>
<td>Low</td>
<td>Moderate and Short-term&lt;br&gt;Mitigation and monitoring measures should limit the spread and establishment of potential new invasive plants not in the project area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of invasive plant spread along new and existing roads</td>
<td>Low</td>
<td>High&lt;br&gt;There would be additional spread of some high-priority invasive plants, but mitigation and monitoring measures should limit the spread and could limit some existing high-priority invasive plants not already widely distributed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Heritage

<table>
<thead>
<tr>
<th>Measurement Indicator</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of acres surveyed of both low and high sensitivity for Heritage resources</td>
<td>N/A</td>
<td>Over 651 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of archaeological sites in the Area of Potential Effect (APE) and mitigation/protection as required</td>
<td>N/A</td>
<td>22 historic properties identified, all removed from the APE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Silviculture

The spatial analysis area is the Kosciusko Project area. The timescale used to analyze effects is the next 100 years or the projected time when a substantial change is expected to occur.

Direct and Indirect Effects on Forest Structure

Alternative 1

Changes to Old-growth Stand Structure
Old-growth stands would remain in a predominantly old-growth condition and function as such. Small-scale, frequent disturbance events would continue, fostered by disease and decay.

Changes to Stand Structure in Commercial Young-growth Stands
Stem exclusion to beginning understory re-initiation stage stands would continue to grow and transition fully into the understory re-initiation stage structure over the next 40 to 50 years.

Changes to Precommercial Young-growth Stands
Lower productivity stands would remain primarily in the stand initiation stage for the next 5 to 10 years before entering fully into stem exclusion structure that would be expected to last for 100 to 120 years after that.

Average productivity stands are in stem exclusion now and are expected to stay in that structure for the next 50 to 75 years before exhibiting considerable characteristics of the understory re-initiation stage.

Alternatives 2, 3, and 4

Old-growth Harvest
About 27 acres would be converted using even-aged management to less complex stand structure that maintains few of the old-growth characteristics and functions present today.

About 37 acres would be harvested using uneven-aged management that maintains two-thirds of the existing old-growth structure for the next 30 years. The one-third of the area harvested would be in small openings 2 acres or less that progress through structural changes similar to even-aged management. After two additional harvest entries spread over 60 years, the entire stand would be converted to a mosaic of three separate age classes with stand structure that ranges from stand initiation to stem exclusion and stem exclusion that is trending toward understory re-initiation structure.

Commercial Young-growth Treatments
Where even-aged management is used, stem exclusion to beginning understory re-initiation stage stands would be converted to stand initiation stage structure. Following this harvest, it would require about 50 to 60 years to again advance to the same stand conditions present today and another 40 to 50 years to transition fully into understory re-initiation structure.

Where two-aged management is used, 50 percent of the harvest area would remain intact. A patchwork of openings up to about 20 acres in size would be dispersed throughout the harvest area. These areas would progress through structural changes similar to even-aged management. After 30 years the remaining stand area would be harvested.
Where uneven-aged management is used, two-thirds of the stand area would be retained in the first harvest entry. These areas would continue to grow from late stem exclusion to understory re-initiation structure. The harvested areas would regenerate as homogenous young growth and move through the same structural stages as the even-aged system already discussed. The second entry would be planned to occur in about 30 years or at a time when the young growth from this first harvest has been precommercially thinned and the slash from that treatment does not limit wildlife movement. This entry would similarly harvest another third of the stand. Following this harvest, there would remain one-third of the stand in late understory re-initiation structure that would be trending toward old-growth structure. One-third of the stand would be in 30-year-old stem exclusion from the first harvest and follow-up precommercial thinning (PCT), and one-third would be regenerating new growth. A third entry would then occur 60 years in the future harvesting the oldest portion of the stand. Harvest in this manner would result in stands of high vertical and horizontal structural diversity due to the high variability in age, tree size, and individual tree characteristics. Repeated harvest entries in this manner would generally mimic a natural regime of frequent but low-intensity disturbances.

<table>
<thead>
<tr>
<th>Harvest System</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even-aged</td>
<td>861</td>
<td>396</td>
<td>0</td>
</tr>
<tr>
<td>Two-aged</td>
<td>0</td>
<td>856</td>
<td>399</td>
</tr>
<tr>
<td>Uneven-aged</td>
<td>75</td>
<td>209</td>
<td>1,084</td>
</tr>
</tbody>
</table>

Table 4: Acres Treated by Harvest System and Alternative.

_Upland Precommercial Young-growth Treatments_

Stands proposed for PCT generally range from the stand initiation stage to stem exclusion. A PCT treatment would prolong the stand initiation stage where present and promote the development of understory re-initiation stage structure sooner in stands that are already in stem exclusion. In non-development areas where the desired condition is ultimately old-growth-like structure, PCT would promote conditions that allow that objective to be achieved sooner than if left untreated.

_Riparian and Beach Fringe Precommercial Young-growth Treatments_

The first treatment would be a patch thinning where thinned areas are spaced out along the stream corridor, or throughout the stand area in the 1,000-foot beach buffer, to mitigate slash and windthrow potential. Precommercial thinning in these areas would promote the development of understory re-initiation stage structure sooner. The unthinned areas would continue into the stem exclusion stage until thinned about 10 years in the future. Within-stand diversity can be increased by favoring trees with specific characteristics important for wildlife.

Where riparian in-stream work occurs adjacent to precommercial size young-growth stands, some trees would likely need to be cut for access trails between the stream and the existing road system. Trails are expected to be minimal. This is not expected to have any noteworthy effects to stand structure at the stand level. In the 1,000-foot beach buffer, 150-foot wide wildlife corridors would be maintained as needed to assure wildlife access after thinning. These areas would not be planned for thinning in the future. Leaving these areas unthinned would provide additional structural diversity to these stands and, due to the limited area, is not expected to affect the development of advanced stand structure.
Direct and Indirect Effects on Forest Health and Productivity

Alternative 1

Changes to Old-growth Stands
Under Alternative 1 no new timber harvest would occur. It is expected that forest growth would continue to be offset by decay. Insect and disease processes at work would persist at approximately current levels, but due to the generally unhealthy condition, the forest remains at risk and vulnerable to insect and disease attack. Hemlock dwarf mistletoe, where present, would remain in the stand and may infect hemlock stems that regenerate in the gaps adjacent to infected overstory trees.

Changes to Commercial Young-growth Stands
In general, commercial size young-growth stands in the project area are typically healthy and growing well with no foreseeable insect or disease issues that need immediate attention. This is primarily due to the extensive past PCT that has taken place that reduced stocking to healthy levels.

Changes to Precommercial Young-growth Stands
The primary function of PCT in regard to forest health and productivity is to reduce long-term insect and disease risk while promoting the growth of the trees that would best meet future objectives. Without treatment, precommercial size stands would remain predominantly in a stem exclusion stage. The relatively small spacing between each tree causes stress that would allow for an increased chance that insects and diseases could more easily take hold and spread. The overall productivity of the stand may be somewhat less than the full potential due to this overcrowding. Although these stands are relatively insect-, disease-, and defect-free, there would be a forfeiture of any opportunity to remove trees that are less likely to meet desired conditions and to promote the growth of those that are. Currently there are no foreseeable insect or disease issues in these stands; however, in light of a warming climate, there is potential for future issues to develop that are not apparent today if these stands are left in an overstocked condition. Yellow-cedar are typically constrained to lower productivity sites with poorer drainage since they do not compete well with other species on better sites. Yellow-cedar on poor sites would be susceptible to cedar decline.

From a timber production standpoint, less desirable trees may outcompete better trees with little defect, somewhat reducing the economic potential of any future harvests. Stands that are never precommercially thinned would take longer to develop enough large trees to make harvest practical. An abundance of non-merchantable stems reduces the economic feasibility of harvesting and decreases the opportunity for an economic future timber supply.

Stands proposed for riparian thinning are generally on highly productive sites but are overstocked. This overstocked condition would increase risk of large scale insect and disease outbreaks over time if not corrected. Currently there are no foreseeable insect or diseases issues in these stands; however, in light of a warming climate, there is potential for future issues to develop that are not apparent today if these stands remain in an overstocked condition.
Alternatives 2, 3, and 4

Old-growth Harvest

Where even-aged management is prescribed, the productivity of those areas for timber production would be enhanced. The risk of insect, disease, and decay within the newly established growing stand would be minimized. The new trees that regenerate after even-aged treatments would be vigorous and free from decay. The insect and disease processes at work in the stands previous to harvest, including hemlock dwarf mistletoe, would be mostly eliminated.

Where uneven-aged management is prescribed, forest health concerns can be used as factors to determine which trees to harvest. An attempt would be made to remove the trees that pose the greatest risk to the health of the new stand, but would have to be balanced with maintaining an economic sale. Due to the amount of disease and decay found within the old-growth stands proposed for harvest, it is unlikely that all or even a substantial proportion of the trees with disease and decay would be removed. Productivity of these stands would be reduced in proportion to the amount of old trees that remain and occupy growing space.

In uneven-aged management stands there would be a risk of the new stands being infected with the same diseases and decays present in the stands at time of harvest. This risk would generally be proportional to the amount of basal area retained. Decay organisms would be transferred between trees when decay ridden trees fall and strike adjacent healthy trees either during harvesting operations or during weather events post-harvest. Hemlock dwarf mistletoe would remain in the stand and likely infect the hemlock regeneration even with selection criteria favoring the removal of infected overstory trees first. The larger old trees retained for wildlife would be generally of low vigor. These trees are not expected to respond to the increase in growing space created by harvest.

Commercial Young-growth Treatments

Where even-aged management is used in commercial young-growth, the risk of insect or disease would remain basically the same. There would be no expected increase or decrease in productivity of the land for growing trees. Even-aged stands would be replaced with similar stands that grow through the same stages and experience the same risk factors as the stands replaced. Harvesting using larger clearcuts would be similar to the methods used originally to establish the stands now being proposed or harvested. Bole wounding and root damage can be a concern for introducing insect and disease issues into young-growth stands. Few trees are likely to be injured along the margin of openings and adjacent to roads and trails. Even-aged management using larger openings provides the lowest risk of damage to residual trees during the logging operation.

Where two-aged management is used, 50 percent of the harvest area would remain intact for a period of 30 years. A patchwork of openings up to about 20 acres in size would be dispersed throughout the harvest area. There would be no expected increase or decrease in productivity of the land for growing trees or noteworthy changes in risk of insect or disease. The portions of the stand left intact are not expected to be at any major risk of insect or disease within the planned rotation time. Where openings occur, a similar stand composition would regenerate and grow through the same stages and experience the same risk factors as the portions of the stand they replaced except at a smaller scale. Some trees are likely to be injured along the margin of openings and adjacent to roads and trails. The increase in edge resulting from smaller, more frequent harvest openings would therefore result in a slightly increased risk of harvest-related
bole wounding over even-aged management. Wounds may attract insects such as bark beetles, and would be places for decay organisms to enter the tree.

Where uneven-aged management is used, two-thirds of the stand area would be retained in the first harvest entry and about one-third would be harvested in what would result in small openings and connecting trails. A second and third entry would be planned to occur in 30 and 60 years in the future harvesting about one-third of the stand at each entry. Uneven-aged management would carry a greater risk for insect and disease than the other systems for two primary reasons. First, the potential for residual tree injury is greatest compared to two-aged and even-aged since there would be multiple harvest entries scheduled relatively frequently, and the small harvest openings and connecting trails would result in a large amount of edge where wounding of residual trees is most likely to occur. Some wounded trees may develop decay at the damage site or attract insects like spruce bark beetles under certain circumstances. Second, utilizing uneven-aged management would result in older age classes of trees occupying the landscape than the other two systems. Growing older aged stands allows more time for decay and other issue to develop. An older age cohort in the stand increases the potential for some trees to become stressed and less vigorous resulting in increased potential for insect or disease to establish. Careful harvest administration along with the overall good health and vigor of the stands being treated would be expected to render this potential issue irrelevant.

**Upland Precommercial Young-growth Treatments**

Precommercial thinning would promote stand health and disease resistance long-term by removing diseased trees and opening growing space that reduces competition stress and mortality. Where PCT is used, stresses on trees due to overcrowding would be reduced. Trees would be better spaced and individual trees that exhibit signs of disease or decay would be a priority for removal. By commercial harvest age, stands would be less defective, average a larger diameter and have fewer sub-merchantable sized stems. This would make these stands more economically viable and allow for wider range of potential future harvest options. During PCT operations, yellow-cedar can be promoted on sites where decline is of less concern.

**Riparian and Beach Fringe Precommercial Young-growth Treatments**

Precommercially thinned riparian and beach fringe stands would be healthier post-treatment than if left untreated. Trees would be better spaced and grow large enough to contribute to the riparian ecosystem at a faster rate. Stands would be less at risk of insect and disease attack over the long term. Trees with specific characteristics important for wildlife can be maintained and their growth promoted.

Where riparian in-stream work occurs adjacent to precommercial size young-growth stands, some trees would likely need to be cut for access trails between the stream and the existing road system. Trails are expected to be minimal. This is not expected to have any noteworthy effects to forest health and productivity at the stand level.
Direct and Indirect Effects on Regeneration and Species Composition

Alternative 1

Changes to Old-growth Stands
Under Alternative 1, no harvest would occur. Small- to moderate-sized openings in the forest canopy would be created over time by windthrow and trees falling as a result of decay. Hemlock regeneration would have a competitive advantage over other species when small openings in the canopy do occur. At some point in the future, it is expected that some stands in the project area would suffer larger-scale damage from a severe storm event, leading to the regeneration of those stands. Regeneration would likely be prolific with species composition similar to the former stand. Sitka spruce regeneration may have somewhat of a competitive advantage due to soil disturbance from upturned trees. There would be little opportunity to influence the species composition of the regenerating stand. Understory plant abundance and composition would remain approximately the same over time, increasing as openings occur and then decreasing as those openings are occupied by new trees.

Changes to Commercial Young-growth Stands
The species composition of commercial-sized stands under the No Action Alternative would remain basically the same into the future. As these stands age, Sitka spruce may make up more of the stand basal area because they are typically the dominant tree and would outcompete some of the co-dominant and intermediate western hemlock. As some trees die and the distance between tree crowns increase, the canopy would gradually open and understory plants would slowly increase in abundance and diversity. Little noteworthy new tree regeneration would be expected as a result of natural changes in these stands. Even though these stands are relatively wind and weather resistant, storm events, particularly those involving a combination of wind and wet snow or ice, can cause substantial damage mainly through breakage in the tree tops. When this occurs small gaps in the canopy develop and those openings become colonized by understory plants first, then by new trees. Being shade-tolerant, western hemlock regeneration would have an advantage.

Changes to Precommercial Young-growth Stands
The species composition of precommercial sized stands under the No Action Alternative would remain basically the same. Sitka spruce and western hemlock would typically dominate the moderate to higher productivity sites. Cedar would be mostly limited to lower productivity poorly drained sites. Yellow-cedar on these sites would be susceptible to decline.

The species composition in riparian stands would change over time based primarily on the amount of red alder present. Red alder is a relatively short lived, shade-intolerant tree that, once overtopped by other species, would quickly die out of the stand. Red alder is present in some of the stands proposed for riparian treatment, particularly where past disturbance either from logging or by stream channel movement has occurred. Over time, red alder would be replaced in these stands by mainly Sitka spruce and, to a lesser extent, western hemlock. Where alder is not present, the species composition would remain mostly unchanged in the short term, then as the stands age, Sitka spruce would increase somewhat as they dominate these sites.
Alternatives 2, 3, and 4

Old-growth Harvest
Where even-aged openings are prescribed, the resulting tree regeneration is expected to be vigorous and representative of the approximate species mix of the former stand. The even-aged opening prescribed would create conditions that are favorable for tree planting and the management of cedar. There would be a good opportunity to plant yellow-cedar on sites favorable for the long-term survival of the species. These sites often occur where yellow-cedar does not currently exist.

Where uneven-aged management is prescribed, growing space would be limited somewhat by the retention of overstory trees. Since group openings of up to 2 acres are being used, this is not expected to be an issue. Natural regeneration would occur in the stand in satisfactory amounts and represent the composition of the original stand. The limited openings in the canopy would somewhat favor hemlock regeneration over other species long term. Openings of 1 acre and larger would offer an opportunity to plant yellow-cedar.

Following harvest, understory plants would flourish in the openings created by all three systems. After 10 to 15 years, tree regeneration would dominate and begin to shade the understory out.

Young-growth Commercial Treatments
Where even-aged and two-aged management is used in commercial young-growth, a flush of understory plants would occur shortly after harvest both in the openings and along the margins. This would be followed by extensive tree regeneration in the opening. After 10 to 15 years the understory would begin to be shaded out by this new tree regeneration. Sitka spruce and western hemlock would naturally occupy the openings. The even-aged and two-aged openings prescribed would create conditions that are favorable for tree planting and the management of cedar. There would be a good opportunity to plant yellow-cedar on favorable sites. Side-lighting into the residual stand from the openings would enhance understory plant abundance and diversity.

Where uneven-aged management is used, the smaller, more linear openings are expected to regenerate adequately with both Sitka spruce and western hemlock. Western hemlock would have a competitive advantage due to the limited openings. Where larger openings of one to 2 acres occur, there would be an opportunity to plant yellow-cedar. The feasibility of planting any particular site would typically be determined after the harvest has been completed. This determination would be contingent on certain elements like the amount of remaining slash, potential for understory plant competition, soil scarification, drainage, and timing of the harvest with the availability of seedlings. Additional environmental analysis would be prepared to cover tree planting once post-harvest site reviews are conducted. Understory plant occurrence and diversity would be enhanced over the existing condition. The extensive edge created under this system would make the increase in understory more available to deer in winter over other treatments. When using uneven-aged management, harvest entries would be more frequent but at a smaller scale than with the other systems. This would result in more time that a robust understory would be present in the landscape over a given time period. There would be fewer acres of robust understory present than with other systems but these acres would be more evenly distributed across the landscape.

Precommercial Young-growth Treatments
In stands proposed for PCT, yellow-cedar would be the first, and western red cedar the second, priority to be maintained as leave trees. Both species would be thinned to a more narrow spacing
than other species. This would result in an important increase in the occurrence of the species in young-growth stands long term. Both cedar species are typically under-represented in older commercial young-growth stands in the project area since they didn’t compete well on the better sites those stands occupy. It is also likely the cedar that did survive were discriminated against during past PCT treatments.

Where cedar species are not present, Sitka spruce and western hemlock would be selected as leave trees. Because Sitka spruce often represents the most vigorous and robust trees in the stand, they may be selected for retention more frequently than western hemlock.

After thinning, the added growing space would increase the amount and diversity of understory plants until the canopy recloses in approximately 15 years.

Tree regeneration in any appreciable amount is not expected as a result of PCT treatments.

Riparian Young-growth Treatments
Most stands proposed for riparian thinning are primarily productive sites regenerated with spruce and hemlock. After thinning, the spruce component is expected to increase slightly since spruce are most often the more vigorous species. Red alder is prescribed to be left uncut to provide diversity.

Tree regeneration is not expected to occur following treatment.

Where riparian in-stream work occurs adjacent to precommercial size young-growth stands, some trees would likely need to be cut for access trails between the stream and the existing road system. Trails are expected to be minimal. This is not expected to have any noteworthy effects to regeneration and species composition at the stand level.

Direct and Indirect Effects on Windthrow Risk

Alternative 1

Changes to Old-growth Stands
Under the No Action Alternative, stands would remain in a predominantly old-growth condition. Small-scale, frequent disturbance events would continue in the stand until a large-scale event occurs. The inherent windthrow risk within stands would not change appreciably.

Changes to Commercial Young-growth Stands
No harvest would occur and wind risk would remain approximately the same. Even though these stands are relatively wind and weather resistant, storm events involving a combination of wind and wet snow or ice can cause damage mainly through tree bole and top breakage. Small openings in the canopy created by this process are not expected to predispose these stands to any added windthrow risk. Since most of these areas were precommercially thinned in the past, they tend to have stand and individual-tree characteristics that make them less susceptible to wind damage if undisturbed. The expected trend is for these stands to become more stable over time as thin, intermediate, and overtopped trees die out, and dominant spruce with good taper and lower height-to-diameter ratios make up more of the stocking.
Changes to Precommercial Young-growth Stands

As densely stocked precommercial sized stands grow and compete for light, trees would become tall and thin, predisposing them to wind and weather damage in the future particularly if the stand is opened up by harvest. In the short term, un-thinned stands would maintain a dense structure, which decreases the intensity of wind within the stand and the potential for damage.

Alternatives 2, 3, and 4

Old-growth and Commercial Young-growth Harvests

Windthrow risk was evaluated for each unit considering prevailing wind direction, topography, and evidence of windthrow both within proposed units and along edges of previous harvest units. Specific measures have been prescribed to reduce or minimize windthrow risk adjacent to unit edges, and within stream buffers. These measures are included on the unit cards and in the detailed unit prescriptions located in the project record.

Where even-aged and two-aged management is prescribed, windthrow risk would be eliminated within the harvest unit by the removal of all large trees. The future young growth created would typically be equally windfirm to the young-growth commercial stands they replaced. Where old growth is harvested, the regenerated stand would likely be more windfirm than the stands they replaced.

Exposed stand edges would, however, have increased risk of windthrow in the first few years after harvest due to the adjacent opening. The shape, location, and proximity of one harvest unit to another was planned to minimize windthrow along opening edges to the extent practical.

In two-aged management the potential for wind damage to stand edges might be slightly higher than under even-aged management because of the increased edge. This may be somewhat offset by the smaller opening size though.

Where uneven-aged management is prescribed, wind risk would remain approximately the same as in the stand prior to harvest. Openings would typically be 2 acres or less, which are considered to be windfirm (Stathers, R.J., T.P. Rollerson, and S.J. Mitchell 1994, Windthrow Handbook for British Columbia Forests; see Silviculture Report).

In all harvest areas, high-vulnerability karst areas and RMAs that have stream channel stability concerns and potential for windthrow would be evaluated for RAW. Those karst areas and RMAs determined to be at risk would be reviewed in the field once preliminary unit boundaries are in place. The specific windfirming prescription for that RMA would be determined at that time.

Precommercial Young-growth Treatments

Both upland and riparian precommercial stands proposed for thinning would have an increased risk of windthrow immediately after treatment. The residual tree spacing prescribed would mitigate this risk. The maximum residual tree spacing prescribed would be 16 feet by 16 feet. This spacing has been used extensively in similar stands in the area without windthrow issues. In riparian areas and the 1,000-foot beach buffer, the patch thinning prescription would further mitigate short-term windthrow risk. Over time the treated areas would stabilize. Precommercial thinning promotes tree and stand characteristics that impart long-term windthrow resistance.

Where riparian in-stream work occurs adjacent to precommercial size young-growth stands, some trees would likely need to be cut for access trails between the stream and the existing road.
system. Trails are expected to be minimal. This is not expected to have any noteworthy effects to windthrow risk at the stand level.

**Effects to Future Young-growth Timber Volume and Availability**

Harvesting in young growth would occur prior to CMAI under all action alternatives. In general, growth and yield modeling indicates that harvesting prior to CMAI would reduce long-term volume production over waiting until CMAI is reached. Stands proposed for commercial young-growth harvest (stand origin date 1951 to 1960) would average about 34.6 MBF net in the year 2016. By year 2056 those same stands would average 91.4 MBF per acre, net. Assuming we harvest these stands on a 60-year rotation and each rotation produces about the same volume, after three rotations or 180 years, we would have produced 103.8 MBF per acre. If the same stands were harvested on a 90 year rotation, after 180 years or two rotations, they would produce about 182.8 MBF per acre, or about 76 percent more volume.

**Kosciusko Island Harvest Projections for NFS Land**

The information below shows how young-growth harvest volume would be available on Kosciusko Island out to year 2056. This projection is based on the assumption that if we pick an action alternative proposed in this Kosciusko Project EA, that same style of management would be applied across all Forest Service young-growth on the Island into the future and beyond this particular NEPA document. The tables below show what harvest volumes could be achieved under each alternative starting in 2016 (implementing the current proposed Kosciusko Project alternative) and then each decade from then on out to 2056. Volumes are based on projections from the FPS model. All alternatives have harvests scheduled to initially occur when the stand has achieved about 30 MBF per acre net or greater if possible. This roughly equates to the trees having a merchantable height tall enough to produce two 36-foot long sawlogs. The acres reported below are gross; they do not account for high-vulnerability karst, stream buffers, RMAs, or other resource issues that may reduce harvest acres. The harvest designs do not make considerations for maintaining any certain percentage of un-harvested area by watershed within any 30-year period. Maps showing the proposed harvest areas and the timing of those harvests can be seen in Appendix A of the Silviculture Report.

Table 5: Harvest Projections from Year 2016 to 2056 Using the Alternative 2 Strategy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Even-aged Harvest</th>
<th>Uneven-aged Harvest (1st Entry)</th>
<th>Uneven-aged Harvest (2nd Entry)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>MBF/ac</td>
<td>MMBF</td>
<td>Acres</td>
</tr>
<tr>
<td>2016</td>
<td>861</td>
<td>34.1</td>
<td>29.4</td>
<td>75</td>
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<td>2026</td>
<td>922</td>
<td>44.4</td>
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<td>385</td>
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<td>2036</td>
<td>1,887</td>
<td>42.6</td>
<td>80.4</td>
<td>300</td>
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<tr>
<td>2046</td>
<td>1,255</td>
<td>46.9</td>
<td>58.9</td>
<td>57</td>
</tr>
<tr>
<td>2056</td>
<td>675</td>
<td>51.3</td>
<td>34.6</td>
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</table>
Table 6: Harvest Projections from Year 2016 to 2056 Using the Alternative 3 Strategy.

<table>
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<tr>
<th>Year</th>
<th>Even-aged Harvest</th>
<th>Two-aged Harvest (1st Entry)</th>
<th>Two-aged Harvest (2nd Entry)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>MBF/ac</td>
<td>MMBF</td>
</tr>
<tr>
<td>2016</td>
<td>396</td>
<td>33.9</td>
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<td>2056</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Uneven-aged Harvest (1st Entry)</th>
<th>Uneven-aged Harvest (2nd Entry)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>MBF/ac</td>
<td>MMBF</td>
</tr>
<tr>
<td>2016</td>
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Table 7: Harvest Projections from Year 2016 to 2056 Using the Alternative 4 Strategy.

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<th>Year</th>
<th>Even-aged Harvest</th>
<th>Two-aged Harvest (1st Entry)</th>
<th>Two-aged Harvest (2nd Entry)</th>
</tr>
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<tr>
<td></td>
<td>Acres</td>
<td>MBF/ac</td>
<td>MMBF</td>
</tr>
<tr>
<td>2016</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2026</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
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<td>2056</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Uneven-aged Harvest (1st Entry)</th>
<th>Uneven-aged Harvest (2nd Entry)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>MBF/ac</td>
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<td>12.4</td>
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<td>2026</td>
<td>806</td>
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<td>2036</td>
<td>1,514</td>
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<td>2046</td>
<td>643</td>
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<tr>
<td>2056</td>
<td>258</td>
<td>14.8</td>
<td>3.8</td>
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Discussion of Alternatives

Alternative 2 would produce the greatest volume early in the Tongass transition to young growth. The trade-off for timber production is that after 2056 most of the acres would be cut and there would not be any volume available until the original harvests areas can be cut again in the third rotation. There could be a 20-year or longer wait before stands cut in 2016 are again ready to be harvested. This could be an issue of socio-economic stability for Edna Bay, but would not likely be much of a concern to a young-growth industry due to the greater availability of young-growth timber elsewhere on the Forest by that time.
Both Alternatives 3 and 4 defer acres in both two-aged and uneven-aged management until 30 years out. The third entry into the uneven-aged stands is not shown in the projection but would occur in 2066. Both Alternatives 3 and 4 have less volume for cutting in the short term but would allow for a smoother volume flow after 2056. They would also maintain a more diverse stand structure with more acreage of older age classes represented in the landscape at any one particular time.

Acreages shown are the total proposed for harvest. Where two-aged management is proposed, the stand average volume-per-acre is halved to represent that about half of the stand total acres are being harvested in that entry. Where uneven-aged is proposed the stand average volume used is one-third to represent that about one-third of the stand would be harvested in that entry.

**Cumulative Effects**

The analysis area for cumulative effects is the Kosciusko Project area. The following are the activities expected to contribute to cumulative effects to forest vegetation.

**Timber Harvest on NFS Land in Addition to the Kosciusko Project**

Continued micro-sales and Free Use Timber Permits would occur throughout the project area along existing roads. Firewood cutting is also expected to occur. Both micro-sales and firewood cutting are limited to dead, down, and dying trees. Free use timber permits are usually for green trees but are limited to 10 MBF per permit. Free use permits may be for either young-growth or old-growth timber.

Due to the characteristics and limited scale of these activities, micro-sales, free use, and firewood cutting are not expected to have appreciable effects to forest structure, forest health and productivity, regeneration and species composition, or windthrow risk at the project-area scale. Taken in combination with the proposed activities in the Kosciusko Project, these actions would not create a situation where cumulative effects create any level of additional concern.

**Timber Harvest on State and Private Lands**

**Harvest on State Lands**

Large harvest units totaling about 1,383 acres are scheduled on State lands in the southern peninsula of Kosciusko Island near Survey Creek by the State Division of Forestry (DOF) starting in 2015. DOF proposes to sell the timber as one sale with harvest units designed by the purchaser. The sale is expected to be harvested using even-aged management where the majority of the acreage may be harvested in one block. Additionally, the DOF is proposing to construct a Log Transfer Facility (LTF) and sort yard in Section 34, Township 68 South, Range 76 East, Copper River Meridian (West Edna Bay). No other harvest is foreseeable on state lands in the affected areas.

**Harvest on University of Alaska Lands**

The Edna Bay Timber Sale parcel was offered and sold by the University of Alaska in May of 2013. The sale is located on Kosciusko Island, southwest of the Edna Bay State Subdivision, Alaska State Land Survey (ASLS) 81-116. The total acreage for the Edna Bay parcel is 1,717, more or less: approximately 630 acres are old-growth Sitka spruce, western hemlock, and western red cedar, and approximately 900 acres are 50 to 70 year-old second-growth timber. The harvest is being carried out using even-aged management with the majority of the acreage being harvested in one block. The harvest of this area is ongoing.
Harvest on Sealaska Lands

Portions of the lands recently transferred to Sealaska are expected to be harvested in the near future. Sealaska has not provided the Forest Service with a plan regarding these operations but the Forest Service anticipates the actions could take place based on the knowledge of the area and harvest planning done by the Forest Service prior to the land transfer.

The Forest Service has modeled stand growth and development on most of the lands Sealaska has acquired and determined it would be reasonable to expect Sealaska could begin harvest operations on about 4,569 acres of old growth and about 3,473 acres of young growth within the next 10 years.

The proposed State of Alaska Parlay Timber Sale and the ongoing University of Alaska Timber Sale are both located in the southern peninsula of Kosciusko. The State of Alaska Sale will adjoin the University of Alaska Sale along the entire northern boundary. These harvests may result in a continuous even-aged harvest opening of approximately 3,100 acres. Harvest on Sealaska lands is projected to exceed 8,000 acres over the next 10 years. The Forest Service stands proposed for harvest are between the State and University harvests and the potential Sealaska harvests. The Kosciusko Project would adjoin the western edge of the State and University harvest in the vicinity of Survey creek and also adjoin the southern extent of potential Sealaska harvests in the central portion of the Island.

Cumulative Effects Summary

The young growth expected to be harvested on State and private lands currently range from stem exclusion to understory re-initiation stand structure. The harvesting of these areas using even-aged management would convert these areas to stand initiation structure. This would initially bring a flush of understory plants followed by tree regeneration and canopy closure and then eventually back to stem exclusion structure. The time these areas spend in stand initiation and stem exclusion in the future would depend on the productivity of the sites and if the areas are precommercially thinned. Overall it would be expected the stem exclusion structure would take about 25 to 30 years to return and it would be about 50 more years before these stands begin to move into understory re-initiation stage. Based on current practices on State and Private lands, it would not be expected that these stands would be allowed to grow long enough into the future to fully obtain understory re-initiation structure.

Where old growth is harvested, that structure would be converted to stand initiation as well and develop similarly.

Harvest on NFS land as described for Alternative 2 of the Kosciusko Project would result in an additional 887 acres of stand initiation structure located between the State and University harvests to the west of Edna Bay and near the Sealaska parcels in the center of the Island. There would be the potential for the University, State, Forest Service, and Sealaska harvest areas to essentially coalesce into one expanse of homogenous stand structure approaching 12,000 acres in size. Alternatives 3 and 4 offer opportunities to influence stand structure on NFS land in ways that would somewhat mitigate the creation of large-scale homogenous stand structure in the project area. Alternative 4 would offer the most mitigation since it would essentially set the majority of NFS land between Sealaska and State and University lands up for uneven-aged management. Uneven-aged management would, over time, result in more advanced stand structure that would otherwise be scarce in this section of the project area.
Since even-aged management is expected, harvest on State and private lands in the project area are not anticipated to have appreciable negative effects to forest health and productivity, regeneration and species composition or windthrow risk.

There is a high likelihood that substantial changes to forest structure would occur in the project area as a result of cumulative large-scale State and private timber harvest within the next 10 years.

**Timber Economics**

Timber sale economics affect the viability of Southeast Alaska’s forest products industry and the ability of the industry to contribute to the local and regional economies. Loss of this industry’s business would negatively impact the ability to maintain the economic health of local communities. Three action alternatives were analyzed for this project. The scope of the affected environment included the communities near the project area as well as the Southeast Alaska region. The unit of measures used to evaluate the effects of the proposed action, and compare alternatives includes:

- Total volume of timber (MMBF)
- Logging and road costs (per MBF)
- Indicated bid value ($ per MBF)
- Number of annualized direct jobs

The Alaska Region Financial Analysis Spreadsheet Tool-Residual Value (“FASTR”), version October 21, 2013, was used to compare all Kosciusko Project alternatives. The FASTR model uses the same logging costs and manufacturing costs developed for the Alaska Region timber sale appraisal program. Timber volume estimates used in the project financial analysis are based on the Silviculture Forest Projection and Planning System (FPS) inventory database projections and site-specific stand examination information collected from stand exams within the proposed harvest areas. FASTR outputs are useful to gauge current economic conditions for a timber sale. While they do not provide a complete picture of actual costs and values at the time of offering, they do provide the Responsible Official with an economical range of project components and a relative comparison for alternatives.

**Direct and Indirect Effects**

Economic impacts of the project would most likely occur in the nearby communities on Prince of Wales Island. The direct and indirect employment and income likely to result from timber harvest is estimated by converting board feet to jobs and income. The economic analysis for Kosciusko Project includes adjustments to selling values based on the assumption that 50 percent of the young-growth volume would be approved for export, which follows the current export policy, as well as a scenario for 100 percent export of young growth. The 100 percent export scenario is included to illustrate the difference in potential economic impacts and sale value between the two export percentages. The following table shows a summary of the units of measure used in the timber economic analysis with a range of values shown from the current export policy guidelines of 50 percent, to 100 percent export of the young-growth western hemlock and Sitka spruce volume.
Table 8: Timber Economics Summary by Alternative.

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (MMBF)1</td>
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<td>31.2</td>
<td>31.0</td>
<td>20.0</td>
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<td>Logging and Transportation Cost/MBF</td>
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<td>$353.50</td>
<td>$355.02</td>
<td>$360.55</td>
</tr>
<tr>
<td>Road Costs/MBF</td>
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<td>$20.60</td>
<td>$22.51</td>
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<tr>
<td>Indicated Bid Value2</td>
<td>$0</td>
<td>$(3,515,156) - $(3,513,373) - $(2,374,555) -</td>
<td>$(3,513,373) - $(1,058,672) - $(589,913) -</td>
<td></td>
</tr>
<tr>
<td>Number of Annualized Direct Jobs</td>
<td>0</td>
<td>122-150</td>
<td>119-144</td>
<td>77-95</td>
</tr>
</tbody>
</table>

1 Includes utility volume.
2 ( ) indicates negative value

Cumulative Effects
Alternatives 2, 3, and 4 would contribute to the overall timber-related economy of Southeast Alaska. Alternative 1, however, would not contribute to the timber-related economy and timber from other areas on the Tongass NF would have to be used to provide a steady supply. Past timber sales have contributed the development of existing roaded infrastructure which would be used for each action alternative. Current and reasonably foreseeable future timber harvest from State of Alaska, University of Alaska, and Sealaska Corporation projects would also help meet the timber demand and support logging and sawmill or export jobs.

Conclusion
Each action alternative is responsive to the need to manage the timber resource for production of sawtimber and other wood products from suitable lands made available for timber harvest on an even-flow, long-term sustained yield basis, and in an economically efficient manner. By meeting this need each alternative has the potential to support timber industry employment and benefit local and regional economies. The extent to which each alternative meets this need is correlated directly to the total volume of timber harvest for that alternative. At this time, Alternative 2 has the greatest potential to provide wood products in an economically efficient manner and create the most jobs, followed by Alternative 3, with Alternative 4 being the least viable.

Environmental Justice
Executive Order 12898 requires all federal actions consider the potential of disproportionate effects on minority and low-income populations in the local region. The Environmental Justice principles were considered in regards to the Kosciusko Project. The 2010 Census demographics and economic data for Edna Bay do not exceed requirements for additional Environmental Justice review when compared to the Prince of Wales – Hyder Census Area. No direct, indirect, or cumulative impacts to low-income households or minorities would occur as a result of Alternative 2, 3, or 4 of the Kosciusko Project.

Transportation
The units used for measuring potential effects and comparing the alternatives include:

- Miles of temporary road construction
- Miles of reconditioned NFS road
• Miles of road to be closed after these timber harvest activities
• Costs including maintenance, reconditioning, and new temporary road construction

The effects of roads and access management on resources are discussed in their respective resource sections and reports.

Proposed new road construction routes are field reviewed by resource specialists. Specific comments and concerns along with site-specific mitigation measures are discussed in their respective resource reports. The methodology for field review does not vary by alternative; rather, the roads are included or excluded by alternative based on the design criteria of each alternative.

No change to the Access and Travel Management (ATM) Plan for Kosciusko Island is proposed with this project. The plan, as depicted on the Motor Vehicle Use map (MVUM) will continue to guide motorized use within the project area. The ATM plan is reviewed annually for potential updates.

**Direct and Indirect Effects**

Road work required to support any timber sales as a result of this project would be the financial responsibility of that timber sale; general road maintenance funds would not be used. The use of roads to support a timber sale would not take away from road maintenance on other parts of the Tongass NF.

All newly constructed roads would be temporary roads. These roads would be decommissioned at the end of their use period. The costs for construction, maintenance, and decommissioning would be the financial responsibility of the timber sale.

The ATM plan would not change as a result of this project.

Rock quarries would be needed for road construction. Every 1 mile of new road construction would require about a 1-acre rock quarry. Where feasible, existing quarries would be used; however, some new quarries may be required. All newly developed quarries would be reviewed and cleared by resource specialists prior to development. Quarry sites would be developed within 500 feet of a road and avoid Class I and Class II stream buffers, old-growth habitat reserves, eagle and goshawk nest tree buffers, and non-developmental LUDs.

**Comparison of Alternatives**

The following table provides a quantitative comparison of the alternatives. All roads, both existing and proposed, would be located, designed, constructed or reconditioned, and maintained following Best Management Practices (BMP), and other applicable laws, regulations, and specifications.

<table>
<thead>
<tr>
<th>Miles of Proposed Road Work</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Road Construction</td>
<td>0.0</td>
<td>1.5</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>New Road on Existing Prism</td>
<td>0.0</td>
<td>3.9</td>
<td>4.9</td>
<td>5.3</td>
</tr>
<tr>
<td>Road Reconditioning</td>
<td>0.0</td>
<td>4.2</td>
<td>4.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Road Maintenance(^1)</td>
<td>0.0</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Upgrade Road on Sealaska Lands</td>
<td>0.0</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>
### Estimated Costs of Road Construction and Reconditioning

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Road</td>
<td>0</td>
<td>$247,500</td>
<td>$247,500</td>
<td>$214,500</td>
</tr>
<tr>
<td>New Road on Existing Prism</td>
<td>0</td>
<td>$158,080</td>
<td>$194,007</td>
<td>$208,378</td>
</tr>
<tr>
<td>Reconditioning</td>
<td>0</td>
<td>$170,434</td>
<td>$185,388</td>
<td>$185,388</td>
</tr>
<tr>
<td>Road Maintenance</td>
<td>0</td>
<td>$143,621</td>
<td>$143,621</td>
<td>$143,621</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$697,275</td>
<td>$748,156</td>
<td>$729,527</td>
</tr>
</tbody>
</table>

### Miles of Storage and Decommissioning

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decommissioning</td>
<td>0.0</td>
<td>5.4</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Storage</td>
<td>0.0</td>
<td>4.7</td>
<td>5.1</td>
<td>5.1</td>
</tr>
</tbody>
</table>

### Estimated Costs of Road Storage and Decommissioning

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decommissioning</td>
<td>0</td>
<td>$16,200</td>
<td>$19,200</td>
<td>$19,800</td>
</tr>
<tr>
<td>Storage</td>
<td>0</td>
<td>$14,100</td>
<td>$17,100</td>
<td>$15,300</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$30,300</td>
<td>$36,300</td>
<td>$35,100</td>
</tr>
</tbody>
</table>

Note: Costs are estimated by road and by miles of road but are not exact values; these values are presented to provide a relative comparison between the alternatives. All costs are subject to change.

Total miles of road maintenance dependent on implemented haul routes.

### Cumulative Effects

The cumulative effects analysis area for the transportation system is the project area.

Maintenance of existing NFS road will be ongoing in the project area and periodic brushing and road grading projects may occur during the life of the project. Any potential contracts for maintenance and reconditioning would be designed to avoid interference with the proposed project. Currently two drainage structures are planned for replacement on NFS road 1500000 near Cape Pole. These structures will be designed and installed to provide aquatic organism passage.

The Sealaska Lands Bill transferred ownership and jurisdiction of about 32 miles of NFS roads from the Forest Service to Sealaska. For roads on Kosciusko, Section (D)(iii) of the act states the Secretary of Agriculture and Sealaska shall enter into an agreement relating to the access, use, maintenance, and improvement of the roads and facilities. Section (D)(II) provides an easement to Sealaska on Kosciusko Island to connect the “Cape Pole Road” to the “South Shipley Bay Road”. Reconstruction and use of the Shipley Bay Road and sort yard are also included. At this time there is no known timeline for Sealaska to construct this road.

The roads that provide access to most of the private lands in Edna Bay are under contract for upgrades. These are NFS roads 1520000 from milepost 7.14 to 9.99 and 1525000 from milepost 0.00 to 0.55. This contract includes replacement of native log stringer bridges with modular bridges, replacement of drainage structures, new aquatic organism passage structures, road reconditioning, and new road surfacing. This contract will also replace two culverts at Cape Pole with new aquatic organism passage structures. Improvements to NFS roads 1520000 and 1525000 would provide an alternate route to the East Edna Bay LTF site.
Wildlife

For all citations in this Wildlife section, refer to the Wildlife Report as well as the Wildlife and Fish BA/BE for full references. Past harvest on Kosciusko Island has resulted in reduction and fragmentation of productive old-growth (POG) stands, affected wildlife travel corridors, and reduced historical deer winter range. Many wildlife species are tied to POG or some subset of POG. The proposed treatment of young-growth stands is expected to be beneficial to wildlife, especially deer.

Wildlife habitat concerns focus on changes to productive old-growth stands and their effects on a variety of wildlife species and treatments of young-growth stands to provide greater heterogeneity across the landscape and encourage growth to accelerate old-growth conditions and /or to provide forage.

Units of measure for wildlife analysis are:

- Historical, current, and post-project acres of POG, high-volume POG (HPOG), and large-tree POG (SD67; note that SD classes are defined in the Wildlife Report)
  - Changes in patch sizes
  - Changes to interior forest acres
  - Changes to acres of deep-snow habitat for deer and marten
  - Changes to acres of average-snow deer winter range and non-winter deer habitat
  - Changes in deer habitat capability and deer density
  - Acres of year-round marten habitat
- Effects to identified wildlife corridors and connectivity
- Acres of treated young growth
- Road densities by Wildlife Analysis Area (WAA) and Kosciusko Island

Wildlife analysis is done at several scales (see Table 10). At the largest scale, some wildlife species are analyzed at the Forest level and are included in the Forest Plan analysis. Other scales used for analysis include Kosciusko Island, WAAs or multiple WAAs, and Value Comparison Units (VCU). Numbers in wildlife analysis may not match numbers in other resource analysis due to different analysis areas, rounding, and GIS mapping differences.

Table 10: Scales of Analysis.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Size in Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongass National Forest</td>
<td>16,900,000</td>
</tr>
<tr>
<td>Game Management Unit (GMU) 2</td>
<td>2,304,000</td>
</tr>
<tr>
<td>Biogeographic Province 14</td>
<td>1,487,324</td>
</tr>
<tr>
<td>Kosciusko Island¹</td>
<td>110,353</td>
</tr>
<tr>
<td>WAA 1525 - total</td>
<td>49,222</td>
</tr>
<tr>
<td>WAA 1526 - total</td>
<td>67,529</td>
</tr>
</tbody>
</table>

¹Note: Kosciusko Island total area is less than the combined WAAs because the WAAs include smaller outer island acreage.
Existing Condition

Kosciusko Island is about 110,353 acres in size and, in the southern part where the majority of past management has occurred (most of WAA 1525), it is characterized by a low-relief karst landscape. There has been less harvest in the more mountainous terrain to the north (WAA 1526).

The majority of past harvest on Kosciusko Island, which occurred in the 1960s, has been at low elevations, which are important areas for many wildlife species, including deer. In some areas, stands managed in the past are adjacent to one another and can form large contiguous blocks of young growth in the stem exclusion stage of stand development, the largest of which is over 1,000 acres. These stands which are in the beginning understory re-initiation stage can potentially provide travel corridors and connectivity for wildlife species.

Even-aged (clearcut) forest management has been the most common silvicultural system used on Tongass National Forest. After clearcut harvest, conifers, shrubs, and herbaceous plants rapidly regenerate, fully occupying the site. This usually results in beginning the stem exclusion stage of timber stand development between about 15 to 25 years of age (2008 Forest Plan FEIS, p. 3-268). During the stem exclusion stage, the understory shrub and herb layer may be virtually eliminated due to reductions in light. Without stand disturbance, this stage can persist for 100 years or longer (2008 Forest Plan FEIS). The lack of understory shrubs, forbs, and herbs; structural diversity; and other components associated with late seral stages can have a negative impact on wildlife species dependent on these characteristics.

Precommercial thinning has been accomplished in many of the previously harvested stands, providing a disturbance needed to allow light into the understory. Many of the young-growth stands have been thinned (36 percent) at some point but most are assumed to be in the stem exclusion stage again at this time (see Table 24). Existing conditions reflect the cumulative effects of past and current activities.

The Legacy Standard and Guideline (S&G) applies in VCUs where 33 percent or more of original (1954) total POG has been harvested (67 percent or less total POG remaining), or where more than 67 percent of the total POG is projected to be harvested by the end of the Forest Plan planning horizon.

Currently, VCUs 5440, 5450, and 5460 in the project area have had more than 33 percent of the original (1954) POG harvested and are listed in the 2008 Forest Plan as VCUs where the Legacy Standard and Guideline applies. No legacy acres have been retained because the 2008 Forest Plan Legacy Standard and Guideline does not apply to young-growth harvest (USDA Forest Plan 2008b, WILD1.IV.D., pp. 4-90 and 4-91). The Legacy S&G allows for more than 33 percent POG harvest by VCU and includes direction for mitigation when a VCU exceeds 33 percent POG.

Connectivity of habitat on Kosciusko Island has been reduced by past harvest. In some areas, past harvest activities have created large contiguous stands of young growth, which may contain only narrow strips of old-growth forest. Some of the corridors were historically interior habitat acres included within much larger intact habitat patches. Past harvest and road building have fragmented these large old-growth habitat patches, creating both large areas of young growth and smaller patches of old growth, with more edge habitat in place of interior habitat. In many cases these remaining patches of old-growth edge habitat now serve as corridors between the remaining patches of interior forest and other areas; however, given the age of many of the young-growth stands on Kosciusko Island, it is likely that at least some of the older young-growth stands are providing at least some general connectivity and wildlife are using these areas as travel ways.
The majority of harvest on Kosciusko Island occurred prior to the establishment of current Forest Plan that restrict harvest within the 1,000-foot beach buffer and the RMAs. On NFS land, only minimal areas of the beach buffer have had past harvest. These areas are between Survey Cove and Halibut Harbor, and one small area about 1 mile north of Cape Pole. The beach fringe along the southern portion of the Island, from Survey Cove east to the Edna Bay Marine Access Facility (MAF), is in either State or private ownership. This portion of the beach buffer is not functioning as a corridor because timber harvest practices on lands in other ownerships do not require a 1,000-foot beach buffer to be maintained and timber harvest has occurred along the beach. The beach buffer from Cape Pole–north was designated as LUD II with the Sealaska land conveyance (Defense Authorization Act 2015). As a designated LUD II area, the beach buffer here along the west shore of Kosciusko Island would continue to function as a travel way and provide connectivity.

The term fragmentation is used to describe a process in which blocks of old-growth forest become divided into smaller more isolated blocks or patches. At the Forest scale, Tongass National Forest is naturally highly fragmented due to numerous islands, muskegs, and dramatic topographic relief. At the landscape scale of Kosciusko Island, the current distribution of POG forest is patchy, with fragmentation created by muskeg, forested wetlands, and past harvest. On a smaller scale, patches such as single-tree gaps within old-growth stands provide habitat for forest interior birds such as the hairy woodpecker. On a slightly broader scale, larger patches of 10 acres or more may create nesting habitat for migratory songbirds, or increase the growth of understory forage for some species such as deer. Fragmented POG, reduced wildlife travel corridors, and reduced high-value deer winter range, as well as reduced habitat for marbled murrelets, goshawks, bats, bird species, and flying squirrels, currently exist. There is a concern with the lack of forest structural diversity, especially large wood and snags for den and cavity nest creation. Connectivity is discussed under marten and Prince of Wales flying squirrel sections.

All old-growth reserves (OGR) or the combination of OGRs and other non-development areas, such as LUD II and SAs (Special Interest Areas), on Kosciusko Island meet or exceed Forest-wide Standards and Guidelines.

**Species**

More detailed information on the species discussed here can be found in the Wildlife Report. The Wildlife Report provides an assessment of the current condition of the analysis area and the potential effects of implementing the action alternatives on wildlife resources. The Wildlife Report focuses on Tongass National Forest management indicator species (MIS), endemic species, and migratory birds that could utilize habitat in the proposed project area (see Table 11).

<table>
<thead>
<tr>
<th>Table 11: Species Selected for Detailed Analysis for the Kosciusko Project.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species</strong></td>
</tr>
<tr>
<td>Federally Threatened and Endangered Species</td>
</tr>
<tr>
<td>Humpback whale</td>
</tr>
<tr>
<td>Forest Service Sensitive Species</td>
</tr>
<tr>
<td>Queen Charlotte goshawk</td>
</tr>
<tr>
<td>Steller sea lion (Eastern DPS)</td>
</tr>
</tbody>
</table>
### Management Indicator Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitka black-tailed deer</td>
<td>Odocoileus hemionus sitkensis</td>
<td>Important subsistence and game species</td>
</tr>
<tr>
<td>Alexander Archipelago wolf</td>
<td>Canis lupus ligoni</td>
<td>Species of interest on Kosciusko Island and important furbearer</td>
</tr>
<tr>
<td>American marten</td>
<td>Martes americana</td>
<td>Important furbearer</td>
</tr>
<tr>
<td>Hairy woodpecker, brown creeper, red-breasted sapsucker</td>
<td>Picoides villosus, Certhia americana, Sphyrapicus ruber</td>
<td>Snag dependent and associated with large old-growth trees</td>
</tr>
<tr>
<td>Black bear</td>
<td>Ursus americanus</td>
<td>Important game species and a species of interest</td>
</tr>
</tbody>
</table>

### Other Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marbled murrelet</td>
<td>Brachyramphus mammoratus</td>
<td>Associated with old-growth forests</td>
</tr>
<tr>
<td>Prince of Wales flying squirrel</td>
<td>Glaucomys sabrinus griseifrons</td>
<td>Species of interest</td>
</tr>
<tr>
<td>Prince of Wales spruce grouse</td>
<td>Falcipennis canadensis isleibi</td>
<td>Species of interest</td>
</tr>
<tr>
<td>Haida Gwai ermine</td>
<td>Mustela erminea haidarum</td>
<td>Endemic species</td>
</tr>
<tr>
<td>Keen’s myotis</td>
<td>Myotis keenii</td>
<td>Endemic species</td>
</tr>
<tr>
<td>Neotropical migratory birds</td>
<td>N/A</td>
<td>Migratory Bird Treaty Act (MBTA)</td>
</tr>
</tbody>
</table>

### Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) of 1973 as amended (19 U.S.C. 1536 (c)) protects threatened and endangered species or their designated critical habitat. This document is prepared in accordance with those legal requirements and follows standards established in Forest Service Manual (FSM) direction (2672.42) and the Code of Federal Regulations (50 CFR 402.12). There is one ESA listed species known to occur within the project vicinity: the humpback whale. All others were dropped from further analysis. There is no designated critical habitat for any threatened or endangered wildlife species on or near Kosciusko Island.

### Humpback Whale (*Megaptera novaeangliae*)

Humpback whales were federally listed as endangered in 1970 under the precursor to the ESA and have remained on the list of threatened and endangered species since the ESA was passed in 1973 (35 CFR 8491 8498). Humpback whales were also afforded additional protection under the Marine Mammal Protection Act in 1972 under which they are considered “depleted” (NMFS 2013b). In November 1991, National Marine Fisheries Service (NMFS) published a recovery plan for humpback whales. Humpback whales are thought to be increasing throughout most of their range (NMFS 2013b). No critical habitat has been designated for this species.

Humpbacks in Southeast Alaska are part of the Central North Pacific stock – a relatively distinct population that winters near Hawaii and feeds in the waters of Southeast and Southcentral Alaska. They have a distinct seasonal pattern of occurrence in Southeast Alaska. Dahlheim *et al.* (2009) documented that humpback whale numbers increased throughout the year, with the fewest whales seen in the spring and more whales seen during the summer and fall. In Southeast Alaska, capture–recapture analyses using data from the 1980s and 1990s produced various minimal estimates of 400 to 1,000 humpbacks in the region, but more extensive analyses recently increased the estimate substantially to 2,883 to 6,414 whales over a broader area of Southeast Alaska, northern British Columbia, and waters offshore from the region (Allen and Angrliss 2010).
Distribution of humpback whales appears to be correlated with the density and seasonal availability of prey, particularly herring (*Clupea harengus*) and euphausiids (krill and other small crustaceans). Glacier Bay and Icy Strait are important feeding areas in Southeast Alaska early in the season when whales prey heavily on herring and other small, schooling fishes. Frederick Sound is important later in summer, when whales feed on swarming euphausiids. During autumn and early winter, humpbacks move out of the Sound to areas where herring are abundant, particularly Seymour Canal. Other areas of Southeast Alaska may also be important for humpbacks, including: Cape Fairweather, Lynn Canal, Sumner Strait, Dixon Entrance, the west coast of Prince of Wales Island, and offshore banks such as the Fairweather Grounds. Dahlheim *et al.* (2009) found humpback whales throughout all major inland waters of Southeast Alaska with annual concentrations consistently observed in Icy Strait, Lynn Canal, Stephens Passage, Chatham Strait, and Frederick Sound. They observed humpback whales less frequently in Sumner and Clarence Straits than in other areas in Southeast Alaska – a pattern that spanned the 17-year study. However, the number of whales they observed in this southern region appeared to increase in more recent years.

National Forest management activities that could affect humpback whales generally fall into the categories of acoustic disturbance and potential for ship strike. Activities that could potentially affect humpback whales include: development and use of marine access facilities, movement of log rafts or barges from marine access facilities to mills, and potential development of other docks and associated facilities for mining, recreation, or other Forest uses and activities.

**Sensitive Species**

**Steller Sea Lion (*Eumetopias jubatus*)**

In 1997, NMFS classified the Steller sea lion into two distinct population segments (DPS), the eastern stock and western stock, and re-evaluated their status. The stock differentiation is based primarily on differences in mitochondrial DNA, but also on population trends in the two regions. Steller sea lions occurring west of 144 degrees longitude were reclassified as endangered while those occurring east were removed from the list.

There is some limited interchange between the Western DPS and Eastern DPS populations. Raum-Suryan *et al.* (2002, 2004) branded 8,596 sea lion pups from 1975 to 2001, and found that a few juveniles from the Western DPS moved to the Eastern DPS region. Overall, movement of individuals between the Western DPS and Eastern DPS populations were documented only in very low numbers, and only among males (Raum-Suryan *et al.* 2004). Although some Western DPS individuals have been observed foraging in Southeast Alaska, the Western DPS Steller sea lion population there is an extremely low number of sightings.

Harassment or displacement of sea lions from preferred habitats by human activities, such as boating, recreation, aircraft, use of LTFs, log raft towing, etc., is a concern with regard to long-term conservation of the sea lion in Southeast Alaska. Forest-wide Standards and Guidelines direct the Forest Service to prevent and/or reduce potential harassment of sea lions and other marine mammals from activities carried out by or under the jurisdiction of the Forest Service. The existing Standards and Guidelines are not specific to the Western DPS Steller sea lion stock but protect both populations.
Queen Charlotte Goshawk (*Accipiter gentilis laingi*)

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, and is identified as a species of concern throughout its range. It is also identified as a sensitive species by the Forest Service, Alaska Region (USDA 2009). 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).

In Southeast Alaska, the Queen Charlotte goshawks inhabit forested lands but favor dense stands of coniferous or deciduous old-growth for nesting and foraging habitat. Nest trees are typically located in Sitka spruce or western hemlock and in mature to old-growth forest types. In Alaska, goshawks generally occur in low densities. The most recent estimates of the goshawk populations range from 261 to 336 breeding pairs on Tongass National Forest and 300 to 400 pairs across Southeast Alaska (Federal Register 2007). Research specific to Southeast Alaska concluded that goshawks are uncommon in this region and nesting densities are lower than other areas (Federal Register 2007). The major threat to goshawks is the loss of old-growth habitat due to logging.

Multiple goshawk surveys were completed in the project area between 1995 and 2014. Surveys followed Tongass National Forest protocol in effect at the time. Surveys were conducted in 1995 and 1996 for the 2002 Kosciusko Timber Sale DEIS, and again for the Kosciusko Integrated Resource Management Plan (2013), and finally in 2012 and 2014 for the current proposed project, with no responses. District records and databases indicate incidental goshawk sightings on Kosciusko Island, mostly in and around the community of Edna Bay. Follow-up surveys on these sightings were completed, but did not locate a nest or record any additional goshawk detections. Goshawks have been reported near Trout Creek by the residents of Edna Bay.

This analysis used HPOG less than or equal to 1,000 feet in elevation for goshawk nesting habitat and all POG less than or equal to 1,500 feet in elevation for goshawk forging habitat. Historical (1954) and current nesting habitat is shown in Table 12 and foraging habitat in Table 13. On NFS land there are currently about 8,698 acres of nesting habitat and about 14,392 acres of foraging habitat; a reduction of about 50 and 37 percent respectively, compared to 1954 amounts. On all lands there are currently about 11,733 acres of nesting habitat and about 18,519 acres of foraging habitat; a reduction of about 57.8 and 46 percent respectively.

### Table 12: Current Goshawk Nesting Habitat in WAA 1525.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS Land</td>
<td>17,227</td>
<td>8,698</td>
<td>-50%</td>
</tr>
<tr>
<td>All Lands</td>
<td>27,755</td>
<td>11,733</td>
<td>-57.8%</td>
</tr>
</tbody>
</table>

Note: Nesting habitat is defined as HPOG less than or equal to 1,000 feet elevation.

### Table 13: Current Goshawk Foraging Habitat in WAA 1525.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS Land</td>
<td>22,987</td>
<td>14,392</td>
<td>-37%</td>
</tr>
<tr>
<td>All Lands</td>
<td>34,607</td>
<td>18,519</td>
<td>-46%</td>
</tr>
</tbody>
</table>

Note: Foraging habitat is defined as POG less than or equal to 1,500 feet elevation.
At any time a nest is found, nest buffers would be applied and timing restrictions implemented. Forest-wide Standards and Guidelines require the maintenance of an area of at least 100 acres of POG, generally centered over the nest tree or probable nest site, preferably with a multi-layered, closed canopy and providing foraging opportunities for young goshawks. No commercial timber harvest is permitted, and no continuous disturbance likely to result in nest abandonment is permitted within the surrounding 600 feet from March 15 to August 15.

Management Indicator Species

The Forest Plan identifies 13 management indicator species (MIS). Ten MIS are known to occur on Prince of Wales and Kosciusko Islands. Habitat exists for Sitka black-tailed deer, Alexander Archipelago wolf, American marten, black bear, river otter, Vancouver Canada goose, bald eagle, red-breasted sapsucker, hairy woodpecker, and brown creeper on Kosciusko Island. The brown bear, mountain goat, and red squirrel do not occur on Kosciusko Island and are not discussed in this document.

The river otter, Vancouver Canada goose, and bald eagle were not selected as MIS to be analyzed in detail for this project because they inhabit beach, estuary fringe, and riparian habitats, where no commercial harvests are proposed and where there are Forest-wide Standards and Guidelines that apply. The action alternatives are expected to have negligible effects to these species due to the implementation of best management practices or other avoidance and minimization measures (see the Wildlife Report for more information) and implementation of Forest-wide Standards and Guidelines.

MIS are those species whose responses to land management activities reflect responses of other species with similar habitat requirements. Under the MIS concept, the responses to management activities of relatively few species are studied and monitored, in order to predict the impacts to entire assemblages of species and associated habitats. MIS are used to assess population viability and biological diversity. All of these management indicator species are associated either directly or indirectly with old-growth forests. The Prince of Wales flying squirrel is included on the list for analysis because it is a species of interest on Prince of Wales and neighboring islands. The U.S. Fish and Wildlife Service and the Forest Service identify species of interest, which are species are not currently listed as threatened or endangered.

Sitka Black-tailed Deer (Odocoileus hemionus sitkensis)

The Sitka black-tailed deer is an important game and subsistence species and is at least seasonally associated with old-growth forests. Research conducted in Southeast Alaska indicates that high-volume mature forests at low elevations are needed during severe winters (Yeo and Peek 1992).

There are no specific S&G thresholds tied to the reduction of any specific type of POG, including important deer habitat such as deep- and average-snow winter habitat.

Optimum habitat during a deep-snow winter is low-elevation, old-growth forest on south facing slopes. The majority of the Kosciusko Project area falls within deep-snow deer winter range where the elevation is less than 800 feet and the aspect is not north. Although the deer in Southeast Alaska are generally considered to be an old-growth dependent species (Suring et al. 1992b and Kessler 1982) they will forage in areas in the stand initiation stage, especially in mild winters (DellaSalla et al. 1993) and spring and summer (Kessler 1982).

There is increasing evidence on the importance of spring, summer, and fall habitats (non-winter) for maintaining healthy populations of deer, deer reproduction, and population recovery following severe winters (Stewart et al. 2005), in addition to forage availability in winter. These habitats
include all vegetation types, except young growth in the stem exclusion phase. In the absence of snow, fat accumulated from foraging on high-quality summer and autumn ranges may make it possible for deer to survive, regardless of the quality of winter habitat (Kie et al. 2003, Stewart et al. 2005).

Comments on the 2002 Kosciusko Timber Sales Project DEIS included ADF&G deer research biologist Matt Kirchhoff suggesting that the deer model multiplier be changed (lowered) to reflect the low-elevation, year-round non-migratory deer population in the project area. The lack of high-value alpine habitat may indicate a non-migratory deer population occupying the area all year, with little seasonal variation (Ingle 2002, p. 13). The deer model was run for the Kosciusko Project using the most recent interagency approved version.

While ADF&G Research Biologist Matt Kirchhoff suggested that the low elevation of Kosciusko Island may indicate a non-migratory – and therefore resident – deer population, there have been no studies or research projects on Kosciusko Island on whether the deer are in fact resident or migratory or both. This statement was in relation to his research on deer populations on Admiralty Island from February 1979 to July 1982 (Schoen and Kirchhoff 1990). This research is not that relevant to Kosciusko Island as Admiralty Island is much more susceptible to the influence of snow than Kosciusko Island. On Admiralty Island elevations above 600 meters (1,969 feet) are generally covered by deep snow for 6 to 9 months per year. Snow accumulations of greater than 30 centimeters (11 inches) at sea level are common during winter, but vary annually in duration and depth. The average annual snowfall for the nearby city of Juneau ranged from 81 to 546 centimeters (32 to 215 inches). During this study, the annual snowfall in Juneau varied from 160 to 300 centimeters (63 to 118 inches) (National Weather Service, Juneau Alaska, unpublished data).

The nearest weather station to Kosciusko Island is the station in Klawock, Alaska. The Klawock weather station began keeping records in October 1980. For the time frame of October 1980 to July 1982, which coincides with the Admiralty Island study, the Klawock weather station reported only 2.6 inches of snow: 2 inches in February 1982 and 0.6 inches in March 1982 (NOAA National Weather Service). Researchers believe causes of death related to severe winter weather to be the primary sources of mortality of deer in Southeast Alaska (Klein and Olson 1960, Klein 1965, Wallmo and Schoen 1980), particularly where snow depth exceeds 50 centimeters (about 19.6 inches; Hanley and Rogers 1989). Since the snowfall recorded at the nearest weather station was less than what research suggests to have an effect on deer winter survival it is likely that snow was having less of an impact on deer, both resident and migratory, on Kosciusko Island than on Admiralty Island.

**Deer Habitat**

Within WAA 1525 and 1526, deer habitat, including average- and deep-snow winter habitat, and non-winter habitat, has been reduced (see Table 18).

On NFS land, WAA 1525 currently has about 1,358 acres of deep-snow deer habitat, a reduction of about 53 percent from what was estimated to be available in 1954. WAA 1525 has about 13,976 acres of average-snow habitat, a reduction of about 38 percent since 1954. The non-winter habitat in WAA 1525 has been reduced by about 30 percent since 1954 with an estimated 20,057 acres remaining. The reductions to deer habitat in WAA 1526 is less than what has occurred in WAA 1525. In WAA 1526 deep-snow deer habitat has only been reduced by about 19 percent, average-snow by about 7 percent, and non-winter by about 4 percent (see Table 24).
On all lands, WAA 1525 currently has about 2,078 acres of deep-snow habitat, a reduction of about 60 percent since 1954; about 18,103 acres of average-snow habitat, a reduction of about 47 percent since 1954; and about 31,789 acres of non-winter habitat, a reduction of about 33 percent since 1954. In WAA 1526 deep-snow deer habitat has only been reduced by about 17 percent, average-snow by about 7 percent, and non-winter by about 4 percent.

Deer Habitat Capability
Currently, on both NFS land and all lands, WAA 1525 has about 59 percent remaining of the estimated deer habitat capability (DHC) available in 1954 while WAA 1526 still has almost 91 percent of the 1954 habitat capability remaining. The Forest Plan estimated that with full implementation on National Forest System land, WAA 1525 would maintain 46 percent of the historical 1954 DHC, and WAA 1526 would retain about 89 percent; therefore, effects of the action alternatives would still be within the deer habitat capability predicted by the Forest Plan (2008 Forest Plan FEIS, Table 3.10-9, p. 3-284).

Alexander Archipelago Wolf (Canis lupus ligoni)
Forest-wide Standards and Guidelines require, where possible, to provide 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; 2008 Forest Plan). 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. Road densities and harvest of wolves (legal and unreported take) also affect wolf populations (Person and Logan 2012). The generally level nature of Kosciusko Island may be conducive to a high level of wolf predation on deer. The harvest of acres on NFS land would increase the acres of open habitat (young clearcuts) which would likely increase the risk of wolf predation on deer in these areas, but may also help support the deer population by increasing the forage. However, at the landscape scale on NFS land, these open areas would be intermixed with uncut areas, areas that are harvested by two-aged management and uneven-aged management (both of which would result smaller openings), and precommercially thinned areas, which should also provide more forage. This mosaic of habitat types across the landscape should allow for escapement habitat for deer from predators.

Wolves on Kosciusko Island occupy a wide range of habitats, from the beach to the interior forests. Analyses of wolf population are linked strongly to deer density and habitat.

Deer Density
Prior to the start of large-scale commercial timber harvest in 1954, the estimated modeled deer density on NFS land only in WAA 1525 was about 50.3 deer per square mile and in WAA 1526 it was about 23.5 deer per square mile. Currently, these WAAs have a habitat capability of about 29.6 deer per square mile (a decrease of 41 percent) and about 21.4 deer per square mile (a decrease of 9 percent) respectively (see Table 14).

At the scale of Kosciusko Island, there has been a decline in deer densities from an estimated 31.5 deer per square mile present in 1954 to about 21.4 deer per square mile (a decrease of 25 percent) currently. At the biogeographic province scale, the deer density has declined from about 25.9 deer per square mile to an estimated 19.0 deer per square mile (a decrease of 27 percent). This suggests that based on modeled deer densities on NFS land, at the scales of the project area WAAs, the Island, and the province are all likely currently capable of supporting wolves without
immigration from neighboring areas (meaning there is capability for greater than or equal to 18 deer per square mile).

Table 14: Estimated Deer Density, with Change from Historical to Current on NFS Land.

<table>
<thead>
<tr>
<th>Scale (NFS Land)</th>
<th>1954 Deer Density (Historical)</th>
<th>Current Deer Density (deer/mi²)</th>
<th>Percent Change from Historical</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>50.3</td>
<td>29.6</td>
<td>-41%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>23.5</td>
<td>21.4</td>
<td>-9%</td>
</tr>
<tr>
<td>Kosciusko Island¹</td>
<td>31.5</td>
<td>23.8</td>
<td>-25%</td>
</tr>
<tr>
<td>Biogeographic Province²</td>
<td>25.9</td>
<td>19.0</td>
<td>-27%</td>
</tr>
</tbody>
</table>

¹Calculated from adding deer and dividing by total land; GI run May 2015.
²Biogeographic Province numbers from GI deer model full-batch.

Road Density

The current calculated road density in WAA 1525 on NFS land below 1,200 feet elevation is about 1.8 miles per square mile. On all lands the current estimated road density in WAA 1525 is about 2.1 miles per square mile. The majority of the roads are in WAA 1525, with WAA 1526 having a road density of only about 0.25 miles per square mile. When the densities of the two project area WAAs are combined the resulting density is only about 0.8 miles per square mile for NFS land. At the Island scale (combined WAAs) on all lands, the current estimated road density is about 1.1 miles per square mile. Person (Big Thorne FEIS/ROD statement August 2013) says that the combined WAAs on Kosciusko Island support one pack so the WAAs were combined for road density calculation as well.

See the Wildlife Report for information on wolf mortality.

**American Marten (Martes americana)**

Marten populations fluctuate greatly over time in response to habitat conditions, prey densities, and trapping pressure. Timber harvest reduces habitat for marten through the removal of forest cover, fragmentation of old-growth habitat, reductions in habitat for some prey species, and road building associated with timber harvest, which increases access for trappers. In Southeast Alaska, marten prefer POG (Flynn 2006, Flynn and Schumacher 2001). Research on nearby Chichagof Island showed 82 percent of marten use was in forested habitat. Marten selected large multi-storied and medium multi-storied habitats during the winter with 63 percent of winter locations occurring at less than 820 feet elevation (Flynn and Schumacher 2001, Flynn 2004, Appendix B). However, Flynn and Schumacher recommended using 1,500 feet elevation for winter analysis due to the number of locations (32 percent) between 800 and 1,500 feet elevation. Additional marten research is currently underway on nearby Kuiu Island (Flynn et al. 2012 and 2013 progress reports).

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 (2008 Forest Plan FEIS). 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). Large, contiguous patches of old growth, particularly below 800 feet elevation during winter, provide the highest quality habitat for marten, and marten densities are typically higher in these areas than in
fragmented habitats (Hargis *et al.* 1999, Flynn *et al.* 2004). Consequently, the quantity and quality of winter habitat is likely the limiting factor for marten in Southeast Alaska. Therefore, the availability of deep-snow marten habitat, defined as high-volume POG (SD5N, SD5S, and SD67) below 800 feet in elevation, provides a measure of habitat quality for marten. Deep-snow marten habitat is HPOG below 800 feet. Year-round marten habitat is defined as HPOG below 1,500 feet in elevation.

Deep-snow Habitat: On NFS land within the WAAs, the historical (1954) amount of deep-snow marten habitat has been reduced by about 59.2 percent in WAA 1525 and about 17.2 percent in WAA 1526; deep-snow marten habitat on Kosciusko Island as a whole has been reduced by about 45.6 percent (see Table 15).

Year-round Habitat: On NFS land within the WAAs, the historical (1954) amount of year-round marten habitat has been reduced by about 54.9 percent in WAA 1525 and about 13.6 percent in WAA 1526; year-round marten habitat on Kosciusko Island as a whole has been reduced by about 39.1 percent (see Table 16).

Table 15: Acres of Deep-snow Marten Habitat on NFS Land.

<table>
<thead>
<tr>
<th>Scale (NFS Land)</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>5,091</td>
<td>2,078</td>
<td>-59.2%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>2,452</td>
<td>2,032</td>
<td>-17.2%</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>7,543</td>
<td>4,110</td>
<td>-45.6%</td>
</tr>
</tbody>
</table>

Table 16: Acres of Year-round Marten Habitat on NFS Land.

<table>
<thead>
<tr>
<th>Scale (NFS Land)</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>29,312</td>
<td>13,224</td>
<td>-54.9%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>18,190</td>
<td>15,722</td>
<td>-13.6%</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>47,502</td>
<td>28,946</td>
<td>-39.1%</td>
</tr>
</tbody>
</table>

Connectivity: Marten also travel easily through non-forested areas or scrubby areas, POG, and young growth with established cover (Flynn *et al.* 2007). Thus, maintaining a matrix that facilitates movement (i.e., roadless refugia from harvest and the presence of old-growth for foraging and denning) between large, contiguous patches of old growth is important to this species.

Assuming the minimum travel distance for marten of 8 miles (13 kilometers) reported by Flynn (1991) and that corridors through POG are optimal, connectivity between OGRs and other non-development LUDs in the project area VCUs are functional for marten (see the Wildlife Report for more information).

Refugia: Roadless refugium from harvest and the presence of old growth for foraging and denning, between large, contiguous patches of old growth is important to this species. The adjacent 56,546 acre Mt Calder–Mt Holbrook LUD II area, as well as other OGR and non-development LUD areas, provides refugia for marten.

Roads: The current and estimated post-project road densities are above the 0.2 miles per square mile at the WAA scale for both WAA 1525 and 1526. When the road density is calculated at the
Island scale (combined WAAs), the road density is still above the 0.2 miles per square mile recommended by Flynn et al. (2001). See the wolf section for discussion on road densities. Note that road densities for marten have been calculated in the past using road density below 1,500 feet in elevation whereas 1,200 feet in elevation is used for wolves.

The marten population cycles in other Southeast locations seem to be more dramatic than in GMU 2. This suggests that an alternative food source or sources may benefit martens in this area when small mammal numbers decline. The ADF&G furbearer report also states that GMU 2 furbearer populations appear stable at this time and that winter severity and habitat alterations have more impact than trapper effort on furbearer populations at this time. Furbearer harvest is spread across the unit and appears sustainable at this time. Closure of NFS roads under the Access and Travel Management Plan (ATM) (USDA 2009) would reduce passenger vehicle access to parts of GMU 2. This could reduce harvests but may also concentrate trapper efforts. ADF&G will be monitoring the effects of the ATM on long-term furbearer harvest patterns.

**Black Bear (Ursus americanus)**

In Southeast Alaska, black bears are present throughout the mainland and on the islands south of Frederick Sound (1997 Forest Plan FEIS). Black bears in Southeast Alaska are part of a population of the Alexander Archipelago black bears endemic to coastal British Columbia and Southeast Alaska, except Admiralty, Baranof, and Chichagof Islands (Stone and Cook 2000; Peacock et al. 2007).

Preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the Forest Plan. The current Forest Plan includes no specific S&Gs for black bears or their habitat.

The measurement criteria for analyzing direct and indirect effects on the black bear include denning habitat equal to acres of POG.

On NFS land there has been about a 37.4 percent decrease in denning habitat since 1954, and on all lands the reduction has been about 39.2 percent (see Table 17).

<p>| Table 17: Black Bear Denning Habitat on NFS Land and All Lands. |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Habitat</th>
<th>NFS Land</th>
<th>All Lands</th>
<th>Habitat</th>
<th>NFS Land</th>
<th>All Lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denning Habitat (all POG)</td>
<td>22,987</td>
<td>14,390</td>
<td>(-37.4%)</td>
<td>26,045</td>
<td>15,901</td>
</tr>
</tbody>
</table>

**Red-breasted Sapsucker, Hairy Woodpecker, and Brown Creeper**

Maintenance of habitat for the red-breasted sapsucker, hairy woodpecker, and brown creeper is provided by the Forest Plan Conservation Strategy (2008 Forest Plan FEIS) and Forest-wide Standard and Guideline for Reserve Tree/Cavity Nesting Habitat (WILD1.V.A). The intent of this Standard and Guideline is to leave snag and reserve trees within units, beyond buffers and other exclusions. The Standard and Guideline directs the Forest Service to provide habitat for cavity-nesting wildlife species in all LUDs and provides guidance on the selection and retention of reserve trees.
Hairy woodpeckers and red-breasted sapsuckers are primary cavity excavators that require snags or dying trees for foraging and nesting. The red-breasted sapsucker is typically associated with low- and medium-volume POG (SD5H, SD4S, SD4N, and SD4H) at all elevations and patch size greater than or equal to 250 acres. The hairy woodpecker is typically associated with high-volume POG (SD5S, SD5N, and SD67) and the brown creeper with large-tree POG (SD67) and interior POG.

**Red-breasted Sapsucker (Sphyrapicus ruber)**

On NFS land there has been no reduction in the amount of low- and medium-volume POG (see Table 18). See changes in patch size discussion below.

**Hairy Woodpecker (Picoides villosus)**

HPOG has declined about 45 percent since 1954 (see Table 18). This decrease has likely resulted in a reduction in hairy woodpeckers.

**Brown Creeper (Certhia americana)**

On NFS land there is currently a reduction of about 22 percent in the SD67 habitat type (see Table 18). Currently there has been about an 81 percent decline in interior old-growth forest habitat in WAA 1525 (see Table 19). These decreases have likely resulted in a reduction in brown creepers in WAA 1525.

Table 18: Changes to POG Habitats on NFS Land.

<table>
<thead>
<tr>
<th>Habitat</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525 (NFS Land)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low- and Medium-volume POG</td>
<td>4,090</td>
<td>4,090</td>
<td>0%</td>
</tr>
<tr>
<td>HPOG</td>
<td>18,897</td>
<td>10,302</td>
<td>-45%</td>
</tr>
<tr>
<td>SD67</td>
<td>10,0041</td>
<td>7,755</td>
<td>-22%2</td>
</tr>
<tr>
<td>WAA 1526 (NFS Land)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low- and Medium-volume POG</td>
<td>20,521</td>
<td>20,521</td>
<td>0%</td>
</tr>
<tr>
<td>HPOG</td>
<td>18,905</td>
<td>16,453</td>
<td>-13%</td>
</tr>
<tr>
<td>SD67</td>
<td>9,0291</td>
<td>7,043</td>
<td>-22%2</td>
</tr>
</tbody>
</table>

1954 SD67 calculated by multiplying current SD67 acres on NFS land by 29 percent (see Forest Plan FEIS Vol II Appendix B p. B-30)

2The reduction in SD67 is not equal to 29 percent due to acres of SD67 in LUD II.

Table 19: Changes to Interior Habitat Acres.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change</th>
<th>Alternatives 2, 3, and 4 Acres (Post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>31,837</td>
<td>6,049</td>
<td>-81%</td>
<td>6,048</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>37,081</td>
<td>13,720</td>
<td>-63%</td>
<td>13,720</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>68,918</td>
<td>19,769</td>
<td>-72%</td>
<td>-</td>
</tr>
</tbody>
</table>

In 1954 WAA 1525 was estimated to have 2 patches of old-growth habitat of 250 acres or greater. One patch was in the size class of 250 to 500 acres and one was a patch in the greater than 10,000 acres size class. WAA 1526 was estimated to have 6 patches greater than 250 acres: 2 in the size classes 500 to 1,000 acres, 2 in the 1,000 to 10,000 acres size class, and 2 were estimated to be greater than 10,000 acres in size (see Table 20).

Table 20: Number of Patches per Size Class (acres) in 1954.

<table>
<thead>
<tr>
<th>Scale</th>
<th>0 - 50</th>
<th>50 - 100</th>
<th>100 - 250</th>
<th>250 - 500</th>
<th>500 - 1,000</th>
<th>1,000 - 10,000</th>
<th>10,000+</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>71</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>88</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>159</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

The patch size classes 250 to 500 and 500 to 1,000 remain the same between 1954 and now. In the 1,000 to 10,000 acres size class the increase of one patch in this size class is a result of harvest in the greater than 10,000 size class patch resulting in one patch in the 1,000 to 10,000 size class while the greater than 10,000 size class patch remained greater than 10,000 (resulting in no change in the largest patch size class). These changes have likely had only a minimal effect to sapsuckers, hairy woodpeckers, and brown creepers (see Table 21).

Table 21: Number of Patches per Size Class (acres) Currently Existing.

<table>
<thead>
<tr>
<th>Scale</th>
<th>0 - 50</th>
<th>50 - 100</th>
<th>100 - 250</th>
<th>250 - 500</th>
<th>500 - 1,000</th>
<th>1,000 - 10,000</th>
<th>10,000+</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>85</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>95</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>180</td>
<td>11</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Species of Interest

Marbled Murrelet (*Brachyramphus mammatus*)

The Forest Plan includes Standards and Guidelines for murrelet nests; however, there are no Forest-wide Standards and Guidelines for murrelet habitat. Acres of HPOG were used as the unit of measure for effects to marbled murrelet habitat. Due to the amount of past harvest on Kosciusko Island, there has been a reduction in the acres of HPOG (54 percent reduction in WAA 1525 since 1954). This decrease has likely resulted in a reduction of marbled murrelets.

Historically on NFS land there was an estimated 18,987 acres of HPOG in WAA 1525. Currently there are about 10,302 acres, a reduction of about 45 percent. In WAA 1526 historically there were an estimated 18,905 acres of HPOG. Currently there are about 16,453 acres in WAA 1526, a reduction of about 13 percent.

Prince of Wales Flying Squirrel (*Glaucomys sabrinus griseifrons*)

Densities of flying squirrels are linked to structural features common in POG forests such as large-diameter downed woody debris, snags, and tall trees (Smith *et al.* 2004) and abundance has been shown to be reduced by forestry practices that influenced the structure or age of residual stands (Smith *et al.* 2011). All action alternatives propose to harvest 64 acres of old-growth forest.
Due to the amount of past harvest on Kosciusko Island, there has been a reduction in the acres of POG. This change has likely resulted in a reduction in the number of flying squirrels. Past harvest on Kosciusko Island has also resulted in a reduction in connectivity and an increase in fragmentation. This has likely reduced the ability of these areas to facilitate recolonization of vacant areas. Past timber harvest has likely affected flying squirrel populations where clearcut size is larger than their maximum gliding range, or where scattered tall conifers in large cuts have not been retained as cover and for travel across the open spaces. These conditions may hinder dispersal and result in the creation of isolated populations.

Currently there are about 14,390 acres of POG within WAA 1525 and about 12,650 acres of POG in WAA 1526 providing suitable habitat for flying squirrels.

Smith et al. (2011) suggest that spacing small OGRs at a maximum distance of 0.6 miles (1 kilometer) from each other through old-growth habitat would probably facilitate the recolonization of vacant reserves and supplementation of existing populations. However, the Forest Plan provided no distance criteria and did not require that connectivity between small OGRs was needed (Forest Plan FEIS, Appendix D, p. D-8). Based on Smith’s suggested spacing, functional connectivity between existing small OGRs is as follows:

- Small OGR in VCU 5410 is connected to both the SA in VCU 5410 and to the Mt Calder–Mt Holbrook LUD II area; they are less than 0.6 miles apart.
- The SA in VCU 5410 is connected to the SA in VCU 5430; they are less than 0.6 miles apart.
- The small OGRs in VCUs 5430 and 5440 are not connected; they are more than 0.6 miles from each other. The beach buffer is the logical connection between these two areas.
- The small OGRs in VCUs 5440 and 5450 are not connected; they are more than 0.6 miles from each other.
- The small OGRs in VCUs 5450 and 5460 are not connected; they are more than 0.6 miles from each other.
- The small OGR (SA) in VCU 5460 is connected via the beach buffer to Mt Calder–Mt Holbrook LUD II area; the small OGR in VCU 5460 less than 0.6 miles from any other small OGR or SA.

**Prince of Wales Spruce Grouse (Falciipennis canadensis isleibi)**

The Prince of Wales spruce grouse is a subspecies that is endemic to Prince of Wales and nearby islands in southern Southeast Alaska. The Prince of Wales Island spruce grouse is associated with muskegs, POG, and mixed conifer (scrub) habitats but will also use young-growth forest (15 to 30 years following timber harvest) with a well-developed middlestory; they avoid clearcuts (Russell 1999). Spruce grouse are closely associated with conifer forests, with the highest densities supported by areas with a mosaic of older coniferous habitats interspersed with regenerating patches of dense trees.

Denser forest stands are selected during winter because they intercept more snow. Grouse also select habitats with abundant shrubs and herbaceous plants where cover and forage are available during summer. Prince of Wales spruce grouse eat Sitka spruce needles and buds, western hemlock needles, and Vaccinium spp. vegetation (Russell 1999).

Spruce grouse are an important prey species for goshawks and marten. Forest birds, including spruce grouse, comprised a larger proportion of goshawk diets during the breeding season on
Prince of Wales Island than elsewhere in Southeast Alaska (Lewis et al. 2006). Thus, impacts to spruce grouse could also impact goshawk and marten populations.

Spruce grouse are poor long-distance flyers and are generally sedentary, with some limited migratory movement – typically less than a mile (Dickerman and Gustafson 1996), between summer and winter habitats (Boag and Schroeder 1992; Williamson et al. 2008). Connectivity between general POG habitat types is discussed in both marten and Prince of Wales flying squirrel sections (and in more detail in the Wildlife Report). Although the connectivity has been impacted by past harvest activities which has likely impacted spruce grouse, current connectivity (less than a mile) is still provided between the OGRs and SAs in most places.

Spruce grouse are managed as a game species by ADF&G. In GMU 2, taking of spruce grouse is allowed between August 1 and May 15, with a bag limit of five per day. Spruce grouse are particularly vulnerable to hunting along road systems, and thus are susceptible to overexploitation near roads and human populations (Williamson et al. 2008, Rabe 2009).

**Endemic Species**

The following species are endemic and occur in the Prince of Wales Island complex, which includes Kosciusko Island (ISLES 2009):

- **Haida Gwaii ermine** (*Mustela erminea haidarum*): endemic to Haida Gwaii, British Columbia, Canada and the Prince of Wales Island complex (Fleming and Cook 2002); closely associated with riparian areas at low elevations and shoreline (Reid et al. 2000).

- **Keen’s myotis** (*Myotis keenii*): endemic to Southeast Alaska and British Columbia, recorded from Juneau–south (MacDonald and Cook 2007); selects roost sites in forest patches with greater availability of large-diameter trees with decay for roosting and that were close to streams (Boland et al. 2009).

The objective of the Forest-wide Standards and Guidelines for endemic species is 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. The Federal ESA defines endemic as “a species native and confined to a certain region; having comparatively restricted distribution.” The Forest Service uses existing information on the distribution of endemic mammals to assess project-level effects, and to assess the impacts of the proposed project relative to the distinctiveness of the taxa, population status, degree of isolation, island size, and habitat associations relative to the proposed management activity. Where distinct taxa are located, projects should be designed to provide for their long-term persistence on the island. The habitat needs of endemic mammals should also be considered in design of thinning treatments. Likewise, the National Forest Management Act 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). 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. The Prince of Wales Island complex appears to be an endemic ‘hotspot’ based on evidence that it was refugia during the last glacial
event (Cook et al. 2001, 2006). The Alexander Archipelago wolf, endemic to Southeast Alaska (Weckworth et al. 2005); Prince of Wales flying squirrel, endemic to the Prince of Wales Island complex (Bidlack and Cook 2001, 2002); Alexander Archipelago black bear, endemic to coastal British Columbia and Southeast Alaska, except Admiralty, Baranof, and Chichagof Islands (Stone and Cook 2000); and Prince of Wales spruce grouse, endemic to Prince of Wales Island and nearby islands including Kosciusko, Heceta, Suemez, Warren and Zarembo, and also reported on Mitkof Island (Dickerman and Gustafson 1996) are all discussed above. Small mammal trapping on Prince of Wales and Kosciusko Island reflects this. (Data from http://www.msb.unm.edu/mammals/ISLES_website_final_20091028/isles_home.html.)

**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 interest. 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.

Birds protected under the Migratory Bird Treaty Act (MBTA) include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows, and others, including their body parts (e.g., feathers, plumes), nests, and eggs. Prince of Wales Island is part of the Southeastern Biogeographic Region of Alaska, one of five Biogeographic Regions in Alaska (based on the Commission for Environmental Cooperation’s hierarchical framework of nested ecological units) in which priority species, habitats, and conservation actions are identified under the Boreal Partners in Flight (BPIF) Alaska Landbird Conservation Plan (BPIF 1999). Priority migratory bird species identified in the Landbird Conservation Plan (BPIF 1999, 2011) with the potential to occur on Kosciusko Island are listed in the Wildlife Report. Of these species, 14 species use hemlock/spruce/cedar forest as primary habitat for known or probable breeding; the remaining five use this forest as secondary habitat. Marbled murrelets (addressed under the Species of Interest section of this document), and goshawks (addressed below) are also protected by the MBTA.

**Environmental Consequences**

The ongoing and reasonably foreseeable future projects considered during analysis of cumulative effects of young-growth activities on wildlife species and their habitat are documented in the Wildlife Report, in the Silviculture section of this Environmental Assessment, and the Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area document, available in the project record.

**Old Growth Reserves**

Old-growth reserves (OGR) and the combination of OGRs and other non-development areas currently meet Forest-wide Standards and Guidelines.

The action alternatives propose to treat approximately 708 acres of past harvest that occurred in OGRs, beach buffers, and other non-development LUDs on Kosciusko Island to increase forage production and attempt to re-establish old-growth characteristics by creating gaps with forage production interspersed with clumps to provide cover. These treatments would provide a beneficial result to wildlife. These acres would be treated in a method to try to reduce slash accumulation.
Under all alternatives, OGRs and the combination of OGRs and other non-development areas would meet Forest-wide Standards and Guidelines.

**Environmental Consequences by Species**

For a more in-depth analysis of wildlife species see the Wildlife Report.

**Humpback Whale (Megaptera novaeangliae)**

National Forest management activities that have an effect on whale habitats or populations generally fall into the categories of habitat degradation, acoustic disturbance, and potential for ship strike. Activities that can contribute to habitat degradation include: development and use of marine access facilities (MAF) and associated camps, movement of log rafts from MAFs to mills, and potential development of other docks and associated facilities for mining, recreation, or other Forest uses and activities. Alternatives 2, 3, and 4 would all require the reconstruction of the Forest Service MAF in Edna Bay. Acoustic disturbance sources include project related marine vessels and low-flying aircraft associated with helicopter yarding. No helicopter harvest is proposed under any of the action alternatives. Tugs towing log barges or rafts along with other project related boating could increase the possibility of ship strike.

**Direct and Indirect Effects**

Alternative 1: The No Action Alternative would have no direct or indirect effects on humpback whales. There would be no acoustic disturbance since no timber harvest or log shipment would occur. The MAF would not be reconstructed as part of the project.

Alternatives 2, 3, and 4: All action alternatives would harvest 64 acres of old growth. Potential effects would be similar, but could vary slightly in duration depending upon alternative selected, as Alternatives 3 and 4 may require a longer operating period than Alternative 2 because of the differences in young-growth volume and harvest prescriptions.

Habitat degradation can occur from the reconstruction and use of the Forest Service MAF and dock and from related camps, particularly if the purchaser utilizes a floating camp. Impacts to the marine environment would be limited to the MAF reconstruction and activities would comply with all permit requirements and BMPs for limiting erosion and maintaining water quality. Operation of all MAFs and similar facilities require U.S. Army Corps of Engineer, U.S. Environmental Protection Agency, and State of Alaska tidelands permits. The permitting process requires that MAF construction and operation maintain water quality in the specific facility locations and that marine circulation and flushing are maintained. Strict adherence to water quality standards and hazardous material containment and spill guidelines would limit the potential for contamination from associated MAFs. Additionally, stream monitoring has not shown any significant detrimental impacts from sedimentation caused by previous logging, and Forest-wide Standards and Guidelines for riparian management would be applied. Therefore, effects to habitat and prey species are expected to be immeasurable and discountable.

Potential acoustic disturbance includes noise generated from project related boating, barging or rafting logs to a mill or export site, and from equipment during the reconstruction of the MAF. Measurement of acoustic disturbance is an evolving scientific field with conflicting methodology and results (Ellison et al. 2011, Clark et al. 2009). Whale response to noise varies and is correlated to size, behavior, location, and composition of the whales at the time of disturbance (2008 Forest Plan FEIS, Appendix F). Response varies from no apparent response, to pod dispersal, sounding, breaching, evasive underwater maneuvers, and maintaining distance from...
vessels. Responses have also included leaving or avoiding feeding and nursery areas to becoming habituated to vessel traffic and its noise. Logging operations would generate acoustic noise in the marine environment and could temporarily displace humpback whales from the immediate project area during MAF reconstruction and active logging of the sale, but is not anticipated to affect the remainder of the project area. The daily volume of boat traffic from the project is not expected to be distinguishable from baseline conditions. Therefore, project related acoustic disturbance would be insignificant and discountable when compared to baseline conditions.

The potential for ship strike is expected to be insignificant and discountable because all permitted watercraft are required to follow Marine Mammal Protection Act (MMPA) regulations and stay at least 100 yards from any marine mammal. Forest-wide Standards and Guidelines direct the Forest Service to ensure that Forest Service permitted or approved activities are conducted in a manner consistent with the MMPA, Endangered Species Act (ESA), and National Marine Fisheries Service (NMFS) regulations for approaching whales, dolphins, and porpoise. “Taking” of whales is prohibited; “taking” includes harassing or pursuing, or attempting any such activity (2008 Forest Plan, WILD4.B, p. 4-99). Direct pursuit of whales by boats and frequent changes in boat speed and direction appear to elicit avoidance behaviors more frequently than other types of boat traffic. Tug boats towing log barges and rafts maintain relatively slow, constant speeds and direction. Ships of this type are less likely to lead to ship strikes (Jensen et al. 2010). Actual routes and frequency are undetermined at this time and would depend upon purchaser and export approvals.

Cumulative Effects
Cumulative effects include the proposed activities on lands in other ownership. The State of Alaska currently owns land to the east of the project area. The State is proposing to log this ground in the next 5 years. To facilitate this planned logging the State is also building a new MAF at Edna Bay. The Sealaska Corporation also owns land on Kosciusko Island, to the west of the project area, with plans to log this area in the near future.

All Alternatives: Cumulative effects under NEPA include the consideration of past timber harvest and related road activities, and recreational and commercial boating activities. All are part of the current condition and contribute to acoustical disturbance and potential temporary displacement of humpback whales. Barge traffic would occur from the planned logging activities on both State land and Sealaska land, but would be temporary in nature. The proposed project and associated effects are limited in size and scope (as compared to both past sales and the marine habitat for humpback whales). No long-term effects are anticipated.

Determination
A determination of “no effect” is made for Alternative 1. A determination of “may affect, not likely to adversely affect” is made for humpback whales for Alternatives 2, 3, and 4. When compared to available habitat in the surrounding marine waters, short-term effects of the proposed logging is not likely to adversely affect humpback whales. All Forest Service permit holders or permitted activities are required to follow MMPA, ESA, and distance regulations. As a result, effects to humpback whales are expected to be insignificant and indistinguishable from other vessel traffic using the marine waters around Kosciusko Island.
Steller Sea Lion (*Eumetopias jubatus*)

**Direct and Indirect Effects**

Alternative 1: Alternative 1 would have no direct or indirect effects on Steller sea lions or their habitat. No habitat disturbance would occur since the MAF would not be reconstructed. Likewise, there would be no project related barge or rafted log traffic.

Alternatives 2, 3, and 4: Kosciusko Island and the project area occur within the Eastern DPS boundary. The critical habitat on Coronation Island is about 8 miles from the project area and would not be affected by any alternative.

Disturbance from increased human use of remote areas in Southeast Alaska represent a potential threat in the future but little is known about the potential impacts from changes to the physical environment, disturbance from vessel traffic, and tourism related activities. Temporary movements from areas of disturbance have been documented and rookeries subject to repeated disturbance may be permanently abandoned. However, because of lack of information, it is not possible to quantify these threats (NMFS 2008). NFMS (2012) reviewed the above threats and concluded that “the eastern DPS of Steller sea lion is not likely in danger of extinction throughout all or a significant portion of its range, nor likely to become so in the foreseeable future due to the present or threatened destruction, modification, or curtailment of its habitat or range”.

There may be incidental disturbance to Steller sea lions (Eastern DPS) from MAF reconstruction and barging or rafting logs but the travel routes would not be near critical habitat. Short-term displacement could occur during the MAF reconstruction, but would be minimal. Long-term effects are not anticipated due to past history of the area. None of the proposed activities would degrade the marine environment long-term due to regulatory controls. Acoustic disturbance would be temporary and indistinguishable from baseline conditions.

Forest-wide Standards and Guidelines direct the Forest Service to prevent and/or reduce potential harassment of sea lions due to activities carried out by or under the jurisdiction of the Forest Service. Forest Service funded, permitted, or authorized activities must be conducted in a manner consistent with the requirements, consultations, or advice received from the appropriate regulatory agencies for the Marine Mammal Protection Act (MMPA), the Endangered Species Act, and NMFS guidelines for approaching seals and sea lions. “Taking” of sea lions is prohibited; “taking” includes harassing or pursuing, or attempting any such activity.

NMFS concluded that, following delisting, regulatory requirements and protection measures under the MMPA and other laws will provide a variety of regulatory measures designed to provide protection from unauthorized disturbance, and will ensure any such taking occurs only through a regulated process, so as to ensure the Eastern DPS Steller sea lion continues to recover and remain a fully functional part of the marine ecosystem. Protection measures for Western DPS Steller sea lions remain in effect and take of Western DPS Steller sea lions is prohibited under the ESA “regardless of where the animal is found” (Federal Register 2013a). As part of delisting of the Eastern DPS, NMFS is to consider whether additional protection is needed for Western DPS Steller sea lions in those parts of their range east of 144 degrees west longitude.

**Cumulative Effects**

All alternatives: Cumulative effects under NEPA would be similar to those discussed under humpback whales. All Forest Service permit holders or permitted activities are required to follow MMPA, ESA, and distance regulations as stated under direct effects above.
Determination

Alternative 1 has a determination of “no impact” on Steller sea lions. A determination of “may adversely impact individuals, but not likely to cause a trend to federal listing or a loss of viability in the Planning Area” is made for Steller sea lions under Alternatives 2, 3, and 4. MAF reconstruction and log barging or rafting operations could cause temporary displacement of Steller sea lions within the immediate project area and cause intermittent short-term acoustic disturbance. Disturbance and/or displacement would be minor relative to the amount of available habitat.

Queen Charlotte Goshawk (*Accipiter gentilis laingi*)

Timber harvest affects goshawks by reducing the amount of suitable nesting habitat, and impacting prey abundance and/or availability (USFWS 2007). Nest habitat is affected in three ways: direct removal of higher volume, structurally diverse habitat, and increased fragmentation. Nests tend to be located in the least fragmented areas of individual home ranges and nest areas in large patches of old or mature forest are used more consistently than those in small patches (multiple studies summarized in USFWS 2007). Logging within and near nest stands has been implicated in nest site abandonment, although effects on productivity are varied (USFWS 2007).

Clearcut logging substantially degrades habitat for the Queen Charlotte goshawk by creating large forest openings devoid of prey (USFWS 2007). Young growth may support some prey species, but prey are generally unavailable until stands approach maturity since stand structure is generally too dense to allow goshawks to hunt effectively (USFWS 2007). Logging removes both foraging cover and perches; young growth often lacks adequate visibility and adequate space for flight. Goshawks hunt by alternating short flights with a period of watching from a perch, then attacking prey from the perch. This method of hunting relies on cover to conceal the predator’s approach, perches from which to observe and attack, adequate visibility for spotting prey, and adequate space between trees to allow for flying between perches and attacking prey (USFWS 2007). Low prey diversity results in higher sensitivity to habitat modification which may further reduce prey diversity and abundance (see hairy woodpecker and red-breasted sapsucker analysis in Wildlife Report). Longer foraging distances increase energy demands on adults, increase risk of nest abandonment, and decrease protection of chicks from adverse weather or predation. Thus, habitat quantity and quality is a function of the amount and distribution of POG through space and time (USFWS 2007). Clearcutting may also favor open habitat competitors or predators such as red-tailed hawks, barred owls, and great-horned owls (USFWS 2007).

Uneven-aged silviculture treatments that remove single trees or groups of trees has less effect on goshawks because it retains some older trees for nesting, maintain relatively high-value foraging habitat in a variety of areas across the landscape, and maintains habitat for a diverse suite of prey (Iverson *et al.* 1996). Partial harvest is likely to have less impact on goshawk foraging than clearcuts, provided that the remaining trees have branches adequate to support goshawk perching (Detrich and Woodbridge 1994 as cited in USFWS 2007).

Timber harvest, and subsequent lack of habitat, could increase competition by other raptors, increase predation, reduce life expectancy, and reduce nesting success.

Current high levels of fragmentation and impacts on nesting habitat could be affecting goshawk use of the area and limiting nesting. Research in British Columbia suggests that landscapes that should be managed to retain at least 40 to 50 percent mature old-growth forest (POG) to provide adequate nesting and foraging habitat for Queen Charlotte goshawks (Doyle 2005, Northern Goshawk Recovery Team 2008).
The least amount of remaining productive old-growth (general POG not nesting or foraging habitat) within any goshawk use area (home range of 10,000 acres) reported in the Goshawk Assessment (Iverson et al. 1996) was 23 percent. The Goshawk Assessment indicated that when remaining productive old-growth is less than 23 percent, it may not be capable of supporting goshawks. The 1997 Forest Plan used the VCU scale for goshawk analysis.

**Direct/Indirect Effects**

**Alternative 1**

Alternative 1 would have no direct or indirect impact on goshawks because no timber harvest activities would occur. All existing nesting and foraging habitat would remain intact to support current levels of goshawks and prey (see Tables 22 and 23). Natural processes such as weather and fluctuations in prey would continue to influence whether goshawks nest in any given year.

**Alternatives 2, 3, and 4**

Alternatives 2, 3, and 4 would all directly reduce goshawk nesting habitat, including the availability of nest trees, by 33 acres or by an average of 1 percent or less in WAA 1525. A total of 64 acres of old-growth harvest is proposed under all action alternatives. Of these 64 acres about 57 percent (37 acres) would be harvested using uneven-aged harvest prescriptions which could maintain suitable nesting and foraging habitat.

Suitability as foraging habitat in partial cuts would depend upon the availability of perching trees and prey abundance. With impacts to foraging habitat, goshawks may spend more time foraging and forage further distances which could impact chick survival and condition. The proposed harvest could also minimally affect the prey base as some of the preferred species are linked to old-growth habitat. Available prey has been shown to have direct influence on whether goshawks nest or not.

WAA 1525 would retain about 50 percent of the original (1954) nesting habitat (HPOG less than or equal to 1,000 feet in elevation) on NFS land (see Table 22), and about 63 percent of the original foraging habitat, and about 53.3 percent of the original overall POG (see Table 23). This suggests that in WAA 1525, NFS land alone should be providing adequate nesting and foraging habitat.

When considering effects on NFS land alone at the VCU scale, all VCUs retain greater than 23 percent POG (see Table 5 in the Wildlife Report for more information about general POG).

Young-growth management has the potential to benefit species such as marten and goshawk through an increase in small mammal populations such as red-backed voles, which are a major prey of these species, and by speeding the succession of older young-growth stands toward old-growth conditions (Hanley 1996 and 2005 cited in 2008 Forest Plan p. 3-255). See the discussion on young-growth management for more information.

**Cumulative Effects**

All Alternatives: Additional impacts to goshawks come from the past, present, and reasonably foreseeable timber harvest on lands in all ownerships. Current high levels of fragmentation and impacts on nesting habitat (58 percent reduction on all lands) could be affecting goshawk use of the area and limiting nesting.
The cumulative effects analysis assumes that all POG acres on non-NFS land would be harvested. WAA 1525 would retain about 31.2 percent of the original nesting habitat (see Table 22) and about 41.4 percent of the original foraging habitat (see Table 23) when considering lands in all ownerships. This suggests that based on the Doyle (2005) research in B.C., when considering lands in all ownerships, the landscape should provide adequate foraging habitat, but falls below the value suggested by research for adequate nesting habitat.

When considering effects on lands in all ownership at the VCU scale, only VCU 5450 falls below the 23 percent (21.9 percent remaining) indicating that this area may not be capable of supporting goshawks (see Table 5 in Wildlife Report for more information about general POG).

Table 22: Impacts to Goshawk Nesting Habitat in WAA 1525.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alt 1)</th>
<th>Percent Change 1954 to Current</th>
<th>Alts 2, 3, 4 Acres (Post-treatment)</th>
<th>Percent Change Current to Post-treatment</th>
<th>Percent Change from Current due to Non-NFS Land</th>
<th>Total Change on All Lands Since 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS Land</td>
<td>17,227</td>
<td>8,698</td>
<td>-49.6%</td>
<td>8,665</td>
<td>-0.4%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>All Lands</td>
<td>27,755</td>
<td>11,733</td>
<td>57.8%</td>
<td>11,700</td>
<td>0.3%</td>
<td>-11.1%</td>
<td>-68.8%</td>
</tr>
</tbody>
</table>

Note: Nesting habitat is HPOG less than or equal to 1,000 feet elevation.

Table 23: Impacts to Goshawk Foraging Habitat in WAA 1525.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alt 1)</th>
<th>Percent Change 1954 to Current</th>
<th>Alts 2, 3, 4 Acres (Post-treatment)</th>
<th>Percent Change Current to Post-treatment</th>
<th>Percent Change from Current due to Non-NFS Land</th>
<th>Total Change on All Lands Since 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS Land</td>
<td>22,987</td>
<td>14,392</td>
<td>-37.4%</td>
<td>14,334</td>
<td>0.5%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>All Lands</td>
<td>34,607</td>
<td>18,519</td>
<td>-46.5%</td>
<td>18,460</td>
<td>0.4%</td>
<td>-12.1%</td>
<td>-58.6%</td>
</tr>
</tbody>
</table>

Note: Foraging habitat is POG less than or equal to 1,500 feet elevation.

Conclusion

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to goshawks, the proposed land management on all lands on Kosciusko Island would not pose an overall significant risk to goshawks. This is because of: 1) the presence of the one very large reserve immediately adjacent to the project area; 2) the fact that VCU's with greater than 47 percent POG harvest are not incapable of supporting goshawks, only that the risk of not supporting goshawks in these VCU's is greater; 3) that on NFS land alone, all four VCU's would retain greater than 23 percent of the original POG; 4) when considering effects on lands in all ownership at the VCU scale, only VCU 5450 falls below the 23 percent (21.9 remaining); and 5) the fact that both the 1997 and 2008 Forest Plans determined that there will be sufficient habitat on Federal lands on the Tongass to maintain viable and well-distributed goshawk populations.
Determination

A determination of “no impact” is made for goshawks under Alternative 1. A determination of “May adversely impact individuals, but not likely to result in a loss of viability in the Planning area, nor cause a trend toward federal listing” is made for goshawks for Alternatives 2, 3, and 4.

Sitka Black-tailed Deer (*Odocoileus hemionus sitkensis*)

Direct and Indirect Effects

There would be no direct effects to deer and negligible indirect effects (as the few previously harvested stands move from stand initiation into stem exclusion) in WAA 1526 under all alternatives. There would be no direct effects to deer and negligible indirect effects (as the few previously harvested stands move from stand initiation into stem exclusion) in WAA 1525 under the No Action Alternative. The No Action Alternative would result in about a 1 percent reduction at the time the stem exclusion stage is reached in deep-snow deer habitat.

Table 24: Effects to Acres of Deer Habitat on NFS Land.

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Scale (NFS Land)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WAA 1525</td>
<td>WAA 1526</td>
<td>Kosciusko Island</td>
<td></td>
</tr>
<tr>
<td>Deep-snow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1954 (acres)</td>
<td>2,895</td>
<td>5,315</td>
<td>8,210</td>
<td></td>
</tr>
<tr>
<td>Current (acres)</td>
<td>1,358</td>
<td>4,320</td>
<td>5,678</td>
<td></td>
</tr>
<tr>
<td>Percent change</td>
<td>-53%</td>
<td>-19%</td>
<td>-31%</td>
<td></td>
</tr>
<tr>
<td>Stem exclusion Alternative 1 (acres)</td>
<td>1,352</td>
<td>4,320</td>
<td>5,672</td>
<td></td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
<td>0%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Alternatives 2, 3, and 4 (acres)</td>
<td>1,339</td>
<td>4,320</td>
<td>5,659</td>
<td></td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-2%</td>
<td>0%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Difference between current percent change and total percent change due to project</td>
<td>-1%</td>
<td>0%</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Average-snow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1954 (acres)</td>
<td>22,571</td>
<td>37,569</td>
<td>60,321</td>
<td></td>
</tr>
<tr>
<td>Current (acres)</td>
<td>13,976</td>
<td>35,086</td>
<td>49,062</td>
<td></td>
</tr>
<tr>
<td>Percent change</td>
<td>-38%</td>
<td>-7%</td>
<td>-19%</td>
<td></td>
</tr>
<tr>
<td>Stem exclusion Alternative 1 (acres)</td>
<td>13,930</td>
<td>35,086</td>
<td>49,016</td>
<td></td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
<td>0%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Alternatives 2, 3, and 4 (acres)</td>
<td>13,923</td>
<td>35,086</td>
<td>49,009</td>
<td></td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
<td>0%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Stem exclusion Alternatives 2, 3, and 4 (ac)</td>
<td>13,877</td>
<td>35,086</td>
<td>48,963</td>
<td></td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
<td>0%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Percent change from 1954</td>
<td>-39%</td>
<td>-7%</td>
<td>-19%</td>
<td></td>
</tr>
<tr>
<td>Difference between current percent change and total percent change due to project</td>
<td>-1%</td>
<td>0%</td>
<td>&lt;1%</td>
<td></td>
</tr>
</tbody>
</table>
### Habitat

<table>
<thead>
<tr>
<th>Non-winter</th>
<th>Scale (NFS Land)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WAA 1525</td>
</tr>
<tr>
<td>1954 (acres)</td>
<td>28,611</td>
</tr>
<tr>
<td>Current (acres)</td>
<td>20,057</td>
</tr>
<tr>
<td>Percent change</td>
<td>-30%</td>
</tr>
<tr>
<td>Stem exclusion Alternative 1 (acres)</td>
<td>19,937</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
</tr>
<tr>
<td>Alternative 2 (acres)</td>
<td>20,990</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>+5%</td>
</tr>
<tr>
<td>Stem exclusion Alternative 2 (acres)</td>
<td>19,874</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
</tr>
<tr>
<td>Alternative 3 (acres)</td>
<td>21,516</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>+7%</td>
</tr>
<tr>
<td>Stem exclusion Alternative 3 (acres)</td>
<td>19,874</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
</tr>
<tr>
<td>Alternative 4 (acres)</td>
<td>21,537</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>+7%</td>
</tr>
<tr>
<td>Stem exclusion Alternative 4 (acres)</td>
<td>19,874</td>
</tr>
<tr>
<td>Percent change from current</td>
<td>-1%</td>
</tr>
<tr>
<td>Percent change at stem exclusion from 1954 All Alternatives</td>
<td>-31%</td>
</tr>
<tr>
<td>Difference between current percent change and total percent change due to project</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Note: Deer habitat acres presented are less than acres shown in tables that include total POG acres because deep-snow habitat is SD5S, SD5N, and SD67 <800 feet elevation only, and average-snow winter habitat is POG <1500 feet (POG equal to SD4H, SD4N, SD4S, SD5H, SD5N, SD5S, and SD67). Non-winter habitat acres are greater than acres shown in tables that include total POG acres because non-winter deer habitat is considered to be all POG plus non-productive old-growth, lakes, and muskeg.

Deep-snow Habitat: In WAA 1525, there would be about a 2 percent reduction in deep-snow habitat as a result of any of the action alternatives. Indirectly, at the stem exclusion stage, there would be an estimated 2 percent reduction in deep-snow habitat (see Table 24).

Average-snow Habitat: In WAA 1525, the action alternatives would result in a direct effect of an estimated 1 percent reduction in average-snow habitat and an indirect effect of about 1 percent reduction at the stem exclusion stage in WAA 1525 (see Table 24).

Non-winter Habitat: In WAA 1525, the direct effect of the action alternatives would result in an increase in non-winter habitat. This increase would range from 5 percent in Alternative 2 to 7 percent in Alternatives 3 and 4. Indirectly, non-winter habitat would be reduced by about 1 percent at the stem exclusion stage (see Table 24).

**Deer Habitat Capability**

All action alternatives would result in a positive direct effect to deer by converting older young-growth stem excluded stands with little to no forage into stands with more forage available. The indirect effect, after approximately 25 years, is all alternatives would result in about a 1 percent decrease in the DHC once the stands reach the stem exclusion stage again.
The indirect, and more long-term, effect of all alternatives, including No Action, would be about a 1 percent reduction in the DHC once the stands reach the stem exclusion stage again.

Alternative 2 would convert large, contiguous stem-excluded stands to the stand initiation stage that can produce large amounts of forage. Under Alternative 2, the DHC in WAA 1525 would increase by about 5 percent in the short term.

Under Alternative 3, commercial treatments of young growth would include even-aged harvest on 419 acres, two-aged harvest on 869 acres, and uneven-aged harvest on 179 acres. Using two-aged harvest would result in 50 percent removal with openings up to about 20 acres and increase DHC by about 7 percent in the short term.

Under Alternative 4 commercial treatments of young growth would include 1,028 acres of uneven-aged harvest and 465 acres of two-aged harvest. Alternative 4 would not include any even-aged harvest treatment in young-growth stands. Alternative 4 would result in the DHC of WAA 1525 increasing by about 7 percent in the short term.

**Young Growth Treatments**

The proposed treatments to uniform older young-growth stands would increase structural diversity across the landscape by increasing the heterogeneity of stand sizes and age classes. The remaining stands of older young growth would continue growing, resulting in larger trees at the next entry. Under the action alternatives, the generally uniform stands of young growth would be treated, resulting in new stands of young trees surrounded by untreated areas of the existing older young-growth. It is expected that proposed even-aged and two-aged young-growth treatments would increase edge effect around adjacent untreated stands increasing the amount of light reaching the forest floor and the amount of plant forage species used by many wildlife species, including deer. Edge effects created by the proposed young-growth treatments may include changes in understory vegetation structure, species composition (both plants and animals), predation rates, and disturbance (Murcia 1995, As 1999).

The evidence in support of the potential benefits of young-growth management for multiple values is derived from projects that have tested various young-growth management methods (e.g., Zaborske et al. 2002; Deal et al. 2004; McClellan 2004 and 2005; Wipfli et al. 2003), retrospective assessments (Hanley and Barnard 1998).

Precommercial thinning (PCT) treatments of stands promotes future forest health and productivity, encourages species diversity, and improves wildlife habitat. Benefits to wildlife species include the reduction in both the overall number of stands in the stem exclusion stage, and the amount of time each stand is in that stage. Currently there are a total of approximately 1,863 acres (including in both upland and riparian areas) that are expected to be suitable for PCT over the next ten years.

All proposed precommercial thinning prescriptions would be designed to meet multiple objectives with spacing designed to enhance both timber production and wildlife habitat. Within non-development LUDs, beach fringe, and other areas where timber production is not an objective, precommercial thinning treatments would be more variable and designed primarily to increase stand diversity and wildlife habitat, as well as promote the development of old-growth forest structure.
In both average- and deep-snow areas the proposed treatment objectives would be to:

1. Increase forage production
2. Provide cover
3. Facilitate travel between areas of forage production with slash treatments

Commercial harvest of young-growth stands has beneficial impacts to deer by opening up the forest and promoting the growth of understory vegetation. Young-growth management has the potential to benefit species such as marten and goshawk through an increase in small mammal populations such as red-backed voles, which are a major prey of these species and by speeding the succession of older young-growth stands toward old-growth-like conditions (Hanley 1996 and 2005 cited in 2008 Forest Plan p. 3-255).

Commercial harvest of young-growth stands utilizing even-aged management would have the effect of creating an opening with increased forage availability, thereby benefiting species such as deer. Even-aged and two-aged management of commercial young-growth stands would result in a more open canopy than currently exists and understory plants would likely increase in abundance and diversity. A flush of understory plants would likely occur shortly after harvest both in the openings and along the margins. Side-lighting into the residual stand from the openings would enhance understory plant abundance and diversity.

When uneven-aged management is used in young-growth stands, understory plant occurrence and diversity would be enhanced over the existing condition. The extensive edge created under this system would make the increase in understory more available to deer in winter; however, all commercial harvest treatments proposed in young growth would result in increased understory plants as compared to the existing condition. Usually when uneven-aged management is utilized there would be multiple entries more frequently but at a smaller scale. This would result in an understory that would likely be present for a longer period of time on the landscape. There would be fewer acres of uneven-aged management than with other systems but these acres would be more evenly distributed across the landscape.

The openings created by harvest would influence understory development, particularly along opening edges, and promote an advancement of stand structure in uncut areas. A second entry would be planned to occur in about 30 years or at a time when the young growth from this first harvest has been precommercially thinned and the slash from that treatment would not limit wildlife movement. Following this harvest, there would remain one-third of the stand in late understory re-initiation structure that would be trending toward old-growth-like structure. One-third of the stand would be in a 30-year-old stem exclusion stage of development from the first harvest and follow-up precommercial thinning, and one-third would be regenerating new growth. A third entry would then occur 60 years in the future harvesting the oldest portion of the stand. Harvest in this manner would result in stands of high vertical and horizontal structural diversity due to the high variability in age, tree size, and individual tree characteristics. Repeated harvest entries in this manner would generally mimic a natural regime of frequent but low-intensity disturbances.

All action alternatives propose commercial treatments to young-growth acres. All action alternatives would result in a positive direct effect to deer by converting stem-excluded stands with little-to-no forage into stands with more forage available. The project proposes commercial harvest on up to about 1,493 acres of young growth out of about 9,083 total acres of young growth on NFS land.
Implementation of the action alternatives would result in acres that are currently in the stem exclusion stage being converted to the stand initiation stage through even-aged harvest resulting in an increase in forage availability, areas in stand initiation combined with some overhead structure (two-aged), or areas of uneven-aged harvest. The areas of uneven-aged harvest would have only about one-third of the overstory removed at this time, eventually resulting in a stand with more old-growth-like characteristics (three or more distinct age classes, with openings up to 2 acres in size). Retaining two-thirds of the stand would provide snow interception; removing one-third of the stand would increase the amount of light reaching the forest floor, resulting in increased forage. The amount of each type of harvest varies by alternative with Alternative 2 including the most even-aged harvest and least amount of uneven-aged harvest, while Alternative 4 includes the most uneven-aged harvest and least amount of even-aged harvest. Alternative 3 includes an intermediate amount of both even-aged and uneven-aged harvest.

In Alternatives 3 and 4, more of the overstory canopy in the project area would be opened by cutting corridors and thinning adjacent to the corridors, to encourage understory vegetation for deer forage. The wildlife objective is to produce deer forage over time, distributed throughout the winter range, in proximity to cover.

Even-aged openings would have the most effect on fragmentation, increasing the number of smaller patch sizes and edge effect; uneven-aged openings have the least effect. Under Alternative 2, even-aged openings of up to 100 acres would occur and would result in an increase in fragmentation and a reduction in connectivity. Alternative 2 would harvest 861 acres of young growth with even-aged management and 75 acres of young growth with uneven-aged management. Alternative 2 would also harvest 27 acres of old growth with even-aged management and 37 acres with uneven-aged management.

Under Alternative 3, a mix of uneven-aged, two-aged, and even-aged young growth harvest would occur and would result in less fragmentation and a more connected habitat than under Alternative 2. Alternative 3 would harvest 396 acres of young growth with even-aged management, 856 acres of young growth with two-aged management, and 209 acres of young growth with uneven-aged management. Alternative 3 would also harvest 27 acres of old growth by even-aged management and 37 acres with uneven-aged management. Alternative 3 would allow for good variation in young-growth structure across the landscape.

Alternative 4 would have the least effect to fragmentation and patch sizes because it does not propose any even-aged harvest. The acres of uneven-aged harvest, and to a lesser extent the two-aged harvest, would result in fewer smaller patches of young-growth being created and less edge effect resulting in less fragmentation and a more connected habitat. Alternative 4 would harvest 399 acres of young growth with two-aged management and 1,084 acres of young growth with uneven-aged management. Alternative 4 would also harvest 27 acres of old growth by even-aged management and 37 acres with uneven-aged management. Alternative 4 would allow for the greatest variation in forest structure across the landscape of all alternatives.

**Connectivity**

Under all action alternatives only 64 acres of old growth has been proposed for harvest. Therefore, the increase in fragmentation of large blocks of old growth would be very small. The direct effect of this project is that less than 1 acre of interior old-growth habitat would be affected.

In the current project the action alternatives include creating corridors through treating blocks of young-growth forest to achieve the following objectives:
- Facilitate elevational travel
- Facilitate travel between areas of old-growth, beach buffer, and other treated areas
- Increase forage production
- Provide escapement cover along travel routes
- Maintain connectivity among existing patches of old-growth habitat and patches of habitat trending towards old-growth-like conditions

Corridors and treatments identified in previous project analyses on Kosciusko Island and carried forward into the current planning effort include using silvicultural treatments with wildlife objectives in stands between 16 and 35 years old to improve wildlife habitat, deer winter range, and improve or maintain wildlife forage production. Additionally, treatments would improve wildlife habitat, understory forage production and increase the development of old-growth characteristics in young growth (WILD2.I.A.1, Forest Plan p. 4-97).

Alternative 2 would have the most impact to corridors and connectivity due to the amount of even-aged harvest. Alternative 4, even though it harvests the most acres, would likely have the least negative effect on connectivity and corridors because no even-aged harvest would occur. The effect of Alternative 3 would be somewhere in between Alternatives 2 and 4.

Effects to corridors and connectivity to specific species are discussed in those sections.

**Cumulative Effects**

In WAA 1526, there would be no direct or indirect effects from this project; thus, there would be no cumulative effects.

In WAA 1525, the No Action Alternative would result in about a 1 percent reduction at stem exclusion in deep-snow and non-winter deer habitat.

**Table 25: Effects to Deer Winter Habitat in WAA 1525.**

<table>
<thead>
<tr>
<th>Winter Habitat</th>
<th>Percent Change 1954 to Current</th>
<th>Percent Change Current to Post-treatment</th>
<th>Percent Change from Current on Non-NFS Lands</th>
<th>Total Change on All Lands Since 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep-snow</td>
<td>-59.2%</td>
<td>-0.3%</td>
<td>-14.5% (-14.7% at stem exclusion1)</td>
<td>-73.7% (-73.9% at stem exclusion)</td>
</tr>
<tr>
<td>Average-snow</td>
<td>-47.1%</td>
<td>-0.3%</td>
<td>-12.2% (-12.4% at stem exclusion)</td>
<td>-59.3% (-59.5% at stem exclusion)</td>
</tr>
</tbody>
</table>

Note: The cumulative effects analysis assumes that all POG acres on non-NFS lands will be harvested.

1According to the deer model, the stem exclusion stage begins 40 years post-harvest and extends to 150 years post-harvest.

Deep-snow Habitat: On all lands in WAA 1525, considering past, present, and reasonably foreseeable future projects there would be an estimated additional reduction of about 14.5 percent (see Table 25). This would result in an overall reduction of about 73.7 percent in deep-snow deer habitat from 1954, and a reduction of about 73.9 percent at the point the stem exclusion stage is reached (see Table 25).

Average-snow Habitat: On lands in all ownership in WAA 1525, considering past, present, and reasonably foreseeable future projects there would be an estimated additional reduction of about
12.2 percent (see Table 25). This would result in an overall reduction of about 59.3 percent in average-snow deer habitat from 1954, and a reduction of about 59.5 percent at the point where the stem exclusion stage is reached (see Table 25).

Non-winter Habitat: Since the proposed activities on NFS land result in an increase in non-winter habitat, it could be presumed that these activities on non-NFS lands would, as well. The amount of non-winter habitat would be reduced when newly treated stands reach the stem exclusion stage (see Table 25).

**Deer Habitat Capability**

The cumulative effects analysis for this project assumed that all lands in other ownerships had a zero value for deer. By assigning a zero value to acres that are not NFS land, the DHC is the same for both NFS acres and lands in all ownerships; however, the deer density would be different because the deer density for all lands would be calculated using total acres in the WAA whereas the deer density on NFS land would be calculated using only NFS land acres.

In WAA 1525 on all lands the DHC has been reduced to about 59 percent of the DHC in 1954. As a result of the proposed project the DHC increases by about 4.5 to 7 percent depending on alternative when calculated across acres in all ownerships. At where the stem exclusion stage is reached, this reduction will only change by about 1 percent, to about 58 percent of the DHC in 1954.

**Young-growth Treatments on Non-NFS Lands**

The young growth expected to be harvested on State and private lands currently range from stem exclusion to understory re-initiation stand structure. The harvesting of these areas using even-aged management would convert these areas back to stand initiation structure. This would initially bring a flush of understory plants which would be beneficial to wildlife species including deer; however, this stage would be followed by tree regeneration and canopy closure and then eventually back to stem exclusion structure. The time these areas spend in stand initiation and stem exclusion in the future would depend on the productivity of the sites and if the areas are precommercially thinned. Overall it would be expected the stem exclusion structure would take about 25 to 30 years to return and it could take 50 to 150 years or more before these stands begin to move into understory re-initiation stage.

Activities on lands in other ownerships would reduce connectivity and travel corridors. The lands to the east of this proposed project are in State ownership and are expected to be harvested in the near future. To the west of this proposed project is Sealaska land; these young-growth acres would also likely be harvested in the near future. The result is that the entirety of NFS land within the project area would likely function as a corridor or area of connectivity between the southern and northern parts of the Island.

The proposed State of Alaska Parlay Timber Sale and the ongoing University of Alaska Timber Sale are both located in the southern peninsula of Kosciusko Island. The State of Alaska Sale will adjoin the University of Alaska Sale along the entire northern boundary. These harvests may result in a continuous even-aged harvest opening of approximately 3,100 acres. Harvest on Sealaska land is projected to exceed 8,000 acres over the next 10 years. The Forest Service stands proposed for harvest are physically located between the State and University harvests and the potential Sealaska harvests. This project would adjoin the western edge of the State and University harvest in the vicinity of Survey Creek. The Kosciusko Project would also adjoin the southern extent of potential Sealaska harvests in the central portion of the Island. The relationship
on the landscape of proposed Forest Service activities to those on non-NFS lands was taken into consideration. Most young-growth acres proposed for even-aged management are not adjacent to non-NFS lands. Most units that are immediately adjacent to non-NFS lands are proposed for either uneven-aged or two-aged management (Units 1, 2, 3, 7, 10, and 202). A very small portion (the extreme southeast corner, about 30 acres) of Unit 5, Setting 5-1 which is proposed for even-aged management, is immediately adjacent to non-NFS lands. Units 101 and 106 are adjacent to non-NFS lands and are proposed for even-aged management; however, they are only 9 and 8 acres in size respectively. See the Unit Cards for unit locations.

**Conclusion**

Most of the effects to the deer habitat have occurred on the landscape due to past activities. The proposed project would directly increase the estimated deer habitat capability; however, the indirect result, at the stem exclusion stage, would be deer habitat capability decreasing slightly (about 1 percent) as a result of the project on National Forest System lands only.

On all lands, average-snow deer habitat would be reduced by about 59.3 percent from 1954 with a reduction of about 59.5 percent at the stem exclusion stage. Deep-snow deer habitat would be reduced by about 73.7 percent from 1954, with a reduction of about 73.9 percent at the stem exclusion stage.

Both WAA 1525 and WAA 1526 are within the levels of deer habitat capability estimated by the analysis for the Forest Plan (Forest Plan FEIS Table 3.10-7, p. 3-270).

While the percent reduction in average- and deep-snow habitat types may have biological impacts, it should also be noted that most of the reduction in deer habitat has either already occurred and the proposed project contributes negligibly to this, or it is occurring on lands in other ownerships. It should also be noted that the proposed project would have a positive effect on non-winter deer habitat and that the proposed uneven-aged and two-aged young-growth treatments are likely to promote more old-growth-like characteristics in these stands sooner than if no treatments are done. Young-growth treatments that move the young growth towards more old-growth characteristics may help to offset effects of loss of deep- and average-snow winter habitat.

The NFS land within the project area would likely function as a corridor or area of connectivity between the southern and northern parts of the Island. Alternatives 3 and 4 were designed to try to improve these connections. Treating corridors would benefit wildlife across the Island and result in the entire southern portion of the Island being better connected. The harvest of these acres in other ownerships increases the importance of the proposed treatments on NFS land.

Harvest on NFS land as described for Alternative 2 of the Kosciusko Project would result in an additional 887 acres of stand initiation structure located between the State and University harvests to the west of Edna Bay and east of the Sealaska parcels in the center of the Island. There would be the potential for the University, State, Forest Service, and Sealaska harvest areas to essentially coalesce into one expanse of homogenous stand structure approaching 12,000 acres in size.

Alternatives 3 and 4 offer opportunities to influence stand structure on NFS land in ways that would mitigate the creation of that large-scale homogenous stand structure in the project area.

In conclusion, the proposed treatments will likely benefit several species of wildlife, such as deer and birds, by increasing the old-growth-like characteristics and creating food supplies. Other species of animals and birds may benefit more in the areas left untreated. The proposed activities
in the Kosciusko Project are a mix of treated and untreated acres thereby providing a mosaic of habitat across the landscape that should benefit a variety of wildlife and bird species.

**Alexander Archipelago Wolf (Canis lupus ligoni)**

Forest-wide Standards and Guidelines require, where possible, to provide 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; 2008 Forest Plan). 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. Road densities and harvest of wolves (legal and unreported take) also affect wolf populations (Person and Logan 2012).

**Direct and Indirect Effects**

There would be no direct effects to wolves resulting from any activities proposed. Indirectly, there would be a negligible reduction (less than 1 percent) in average- and deep-snow deer habitat and an increase of 5 to 7 percent in non-winter habitat depending on the alternative. About 25 years post-treatment, in all alternatives, there would be about a 1 percent decrease in the deer habitat capability once the stands reach the stem exclusion stage. See more specific effects to deer habitat capability in previous section.

All PCT prescriptions would be designed to meet multiple objectives, with spacing designed to enhance timber production and wildlife habitat. In most stands, both Alaska yellow-cedar and western red cedar would be given preference for retention over Sitka spruce and western hemlock. Within non-development LUDs, beach fringe, and other areas where timber production is not an objective, precommercial thinning treatments would usually be more variable and designed primarily to increase stand diversity and wildlife habitat as well as promote the development of old-growth forest structure.

**Table 26: Estimated Deer Density (deer per square mile) on NFS Land.**

<table>
<thead>
<tr>
<th>Scale (NFS Land)</th>
<th>1954 Density (Historical)</th>
<th>Current Density (Alt 1) (Percent Change from 1954)</th>
<th>Stem Ex. Density (Percent Change from Current)</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
<th>Stem Ex. All Alts</th>
<th>Total Percent Change from 1954 (Post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>50.3</td>
<td>29.6 (-41%)</td>
<td>29.4 (-1%)</td>
<td>30.9 (+4%)</td>
<td>31.6 (+7%)</td>
<td>31.7 (+7%)</td>
<td>29.3 (-1%)</td>
<td>-41.8%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>23.5</td>
<td>21.4 (-10%)</td>
<td>21.4 (-0%)</td>
<td>21.4 (-0%)</td>
<td>21.4 (-0%)</td>
<td>21.4 (-0%)</td>
<td>21.4 (-0%)</td>
<td>-10%</td>
</tr>
<tr>
<td>Kosciusko Island¹</td>
<td>31.5</td>
<td>23.8 (-25%)</td>
<td>23.6³</td>
<td>25.4⁴</td>
<td>25.4⁴</td>
<td>25.4⁴</td>
<td>23.4³</td>
<td>-25.8%</td>
</tr>
<tr>
<td>Biogeographic Province²</td>
<td>25.9</td>
<td>19.0 (-27%)</td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
<td>-27%</td>
</tr>
</tbody>
</table>

¹Calculated from adding deer from both WAAAs and dividing by total land.
²Province numbers from GI deermodelfullbatch.
³Assumes a 1 percent decline at the Island scale.
⁴Calculated by increasing current value by same percentage as alternatives.
Current deer densities on NFS land are estimated to be about 29.6 deer per square mile in WAA 1525, about 21.4 deer per square mile in WAA 1526, 23.8 deer per square mile for the Island, and 19.0 deer per square mile for the Biogeographic Province. All these estimated densities are above 18 deer per square mile (see Table 26).

Under Alternative 1, deer densities would be about 29.4 deer per square mile. The direct effects of Alternative 2 would result in deer density increasing from about 29.7 deer per square mile to 30.9 deer per square mile. Under Alternative 3 deer densities would increase to about 31.6 deer per square mile, and under Alternative 4 to about 31.7 deer per square mile (see Table 26).

As a result of the action alternatives, the estimated deer densities would increase (see Table 26). This is due to the fact that most of the activities proposed would result in acres in the stem exclusion stage being moved from stem exclusion either back into stand initiation or towards more old-growth-like characteristics. All proposed activities are in WAA 1525.

At the stem exclusion stage, under all action alternatives as treated stands reach stem exclusion, there would be about 29.3 deer per square mile (see Table 26).

The estimated deer density when calculated on NFS land as result of the proposed project and at the stem exclusion stage, are above the current Forest-wide Standard and Guideline for both WAAs included in the project area, as well as the Island, and the province.

This project would not result in any change in the estimated deer density at the province scale (see Table 26).

Road Density

Calculated road densities at or below 1,200 feet in elevation in WAA 1525 are above the recommended number of 0.7 miles per square mile, where wolf mortality concerns have been identified.

The current calculated road density in WAA 1525 below 1,200 feet is about 1.8 miles per square mile. The majority of the roads are in WAA 1525, with WAA 1526 having a road density of only about 0.25 miles per square mile. When the densities of the two project area WAAs are combined the resulting density is only about 0.8 miles per square mile for NFS land. This project would increase the total road density on NFS land in WAA 1525 by only 0.1 miles per square mile, from 1.8 to 1.9 miles per square mile in WAA 1525. There would be no change in the estimated road density in WAA 1526 as a result of this project. At the Island scale (combined WAAs) the road density would remain at about 0.8 miles per square mile.

There are factors which would help wolf sustainability on Kosciusko Island, including the fact that wolves are highly mobile and move between WAAs (Person and Logan 2012), the potential benefits of young-growth management for deer habitat, road management for controlling hunter access, the presence of the 56,546 acre Mt Calder–Mt Holbrook LUD II area adjacent to the project area, the isolation of the area (the road system is not connected to any other road systems), and the very low human population on the Island, which is estimated to be about 42 (http://factfinder2.census.gov/faces_tableservices/jsf/pages/productview.xhtml?src=bkmk).

However, at the landscape scale on NFS land, these open areas would be intermixed with uncut areas, areas that are harvested by two-aged management and uneven-aged management (which would result in openings up to 20 acres) and treated areas (both PCT and commercial harvest).
This mosaic of habitat types across the landscape should allow for escapement habitat for deer from predators.

**Cumulative Effects**

The Forest Supervisor provided a letter of direction on the 2011 Deer Model, which states that “for cumulative effects rerun the model with all land ownerships and clearly state how non-NFS lands were treated (given zero habitat value or used actual data) OR Discuss non-federal (non-NFS) lands (percent of area, contribution to overall habitat, etc.) in general write-up, not as part of the deer model.” The cumulative effects analysis for this project assumed that all lands in other ownerships had a zero value for deer. By assigning a zero value to acres that are not NFS land, the DHC is the same for both NFS land and lands in all ownerships; however, the deer density would be different because the deer density for all lands would be calculated using total acres in the WAA whereas the deer density on NFS land would be calculated using only NFS land acreage.

On non-NFS lands, with these lands given a zero value, the cumulative effect in WAA 1525, at stem exclusion, would result in an estimated 1 percent reduction in the estimated deer density. The cumulative effect to deer densities in WAA 1526 would not change as a result of the proposed project. At the Island scale, the estimated densities would increase by 1 percent due to habitat improvement resulting from project activities on NFS land. The proposed project would not result in any change to the estimated deer densities at the province scale (see Table 27).

**Table 27: Estimated Modeled Deer Density (deer per square mile) on All Lands.**

<table>
<thead>
<tr>
<th>Scale (All Lands)</th>
<th>1954 Density (Historical)</th>
<th>Current Density (Alt 1) (Percent Change from 1954)</th>
<th>Stem Ex. Density (Percent Change from Current)</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
<th>Stem Ex. All Alts</th>
<th>Total Density Post-Treatment (Percent Change from 1954)</th>
<th>Total Percent Change from 1954 (Post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>30.3</td>
<td>17.8 (-41%)</td>
<td>17.7 (-1%)</td>
<td>18.6 (+4%)</td>
<td>19.1 (+5%)</td>
<td>19.1 (+5%)</td>
<td>17.6 (-1%)</td>
<td>17.7 (-1%)</td>
<td>-42%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>23.4</td>
<td>21.2 (-10%)</td>
<td>21.2 (0%)</td>
<td>21.2 (0%)</td>
<td>21.2 (0%)</td>
<td>21.2 (0%)</td>
<td>21.2 (0%)</td>
<td>21.2 (0%)</td>
<td>-10%</td>
</tr>
<tr>
<td>Kosciusko Island1</td>
<td>26.8</td>
<td>19.5 (-27%)</td>
<td>19.3³</td>
<td>20.3⁴</td>
<td>20.5⁴</td>
<td>20.5⁴</td>
<td>19.3</td>
<td>-28%</td>
<td></td>
</tr>
<tr>
<td>Biogeographic Province2</td>
<td>20.6</td>
<td>15.1 (-27%)</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
<td>-27%</td>
<td></td>
</tr>
</tbody>
</table>

1Calculated from adding deer and dividing by total land.
2Province numbers from GI deermodelfullbatch.
3Calculated by reducing current value by 1 percent.
4Calculated by increasing current value by same percentage as alternatives.

The estimated deer density when calculated on all lands drops only slightly below the recommended 18 deer per square mile at the stem exclusion stage. Under Alternative 1 the estimated deer density at the stem exclusion stage would be about 17.7 deer per square mile and under all other alternatives it would be about 17.6 deer per square mile. At the Island scale on lands in all ownerships the current estimated deer density is about 19.5 deer per square mile (19.3 deer per square mile at the stem exclusion stage). At the scale of the entire biogeographic
province the current estimated deer density on all lands is about 15.1 deer per square mile (no change at the stem exclusion stage at this scale).

Falling below the 18 deer per square mile does not in itself imply viability concerns for wolves. The Standard and Guideline was designed to maintain equilibrium populations of wolves and deer while also providing for a sustainable harvest of deer by humans (Person et al. 1996; Appendix C Wolf Sustainability, Viability, and Deer Density from the Deer Model 2012 SIR). To maintain viable wolf populations under the Forest Plan, the Viable Population Committee recommended that a deer density of at least 5 deer per square mile be maintained in areas where deer are their primary prey. This is below the Standard and Guideline of 18 deer per square mile. In addition, both the 1997 and 2008 Forest Plans disclose that deer density, as measured using habitat capability model outputs, in a number of WAAs may fall below the standard after full implementation of the Forest Plan (Table 3-111, 1997 Forest Plan, pp. 3-77 through 3-79 and Table 3.10-9, 2008 Forest Plan FEIS, p. 3-284).

Road Density

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. Person et al. (1996) reported that wolf harvest increased twofold when total road density below 1,200 feet elevation exceeded 0.7 miles per square mile.

Person and Russell (2008) found that rate of harvest of both resident and non-resident (e.g., those dispersing or moving through unfamiliar territory) wolves increased with density of roads, which provide access to hunters and trappers; however, road densities of about 1.5 miles per square mile (about 0.9 kilometers per square kilometer) or greater had little additional effect on harvest rates. This study did not differentiate between open and closed roads though the authors stated that road status likely had an important influence on wolf mortality.

Road densities in WAA 1525 exceed both the Forest Plan recommendation (0.7 miles per square mile) as well as the 1.5 miles per square mile suggested by Person and Russell (2008). The road density in adjacent WAA 1526 is only estimated to be 0.25 miles per square mile. So while there may still be a concern for wolf mortality research showed that road densities greater than 1.5 miles per square had little additional effect on harvest rates. In the wolf mortality analysis (included in the Wildlife Report) the reported wolf harvest take was doubled to try to take into account unreported take; however this factor should also help to account for the increased take with increased road densities as reported by Person et al. (1996).

This project would increase the total road density on all lands in WAA 1525 by about 0.1 miles per square mile, from about 2.1 to 2.2 miles per square mile. At the Island scale, the road density would increase from an estimated 1.1 to 1.2 miles per square mile.

Person (Big Thorne FEIS/ROD statement August 2013) says that the combined WAAs on Kosciusko Island support one pack, so the WAAs were combined for road density calculation as well. When the densities of the two project area WAAs are combined (equating to the Kosciusko Island scale), the resulting road density on all lands is about 1.1 miles per square mile.

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1 Although deer density outputs from the deer model are useful for estimating changes that result from proposed projects, they do not reflect actual known deer numbers. They do represent the functioning of the predator-prey system dynamic (2008 Forest Plan FEIS, p. 3-282)
Some factors which would help to mitigate the road density effect to wolf sustainability on Kosciusko Island includes: the fact that wolves are highly mobile and move between WAAs (Person and Logan 2012), the potential benefits of young-growth management for deer habitat, road management for controlling hunter access, the presence of the 56,546-acre Mt Calder–Mt Holbrook LUD II area adjacent to the project area, the isolation of the area (the road system here is not connected to any other road systems), and the very low human population on the Island, which is estimated to be about 42.

Conclusion

Deer density: The estimated deer density when calculated on NFS land as result of the proposed project and at the time the stem exclusion stage is reached, is above the current Forest-wide Standard and Guideline for both WAAs included in the project area, as well as the Island, and the province. This suggests that based on modeled deer densities alone, the individual WAAs, the Island, and the province (on NFS land) are likely capable of supporting both wolves and humans.

The estimated deer density when calculated on all lands is above the current Forest-wide Standard and Guideline for both WAAs included in the project area, as well as the Island; this suggests that based on modeled deer densities alone, the individual WAAs and the Island for all lands are likely capable of supporting both wolves and humans. At the scale of the province, for lands in all ownership, the modeled deer densities are below that which the deer model generally considers necessary to support both wolves and humans.

Falling below the 18 deer per square mile does not in itself imply a concerns for wolves. The 18 deer per square mile S&G was designed to maintain equilibrium populations of wolves and deer while also providing for a sustainable harvest of deer by humans (Person et al. 1996; Appendix C Wolf Sustainability, Viability, and Deer Density from the Deer Model 2012 SIR). To maintain wolf populations under the 1997 Forest Plan, the Viable Population Committee recommended that a deer density of at least 5 deer per square mile be maintained in areas where deer are their primary prey. So while this analysis does not rely on the 5 deer per square mile, the value is included here to show that even at the province scale on lands in all ownership the estimated deer density is above 5 deer per square mile.

When combined the estimated road density on all lands is about 2.1 miles per square mile, for Kosciusko Island. As a result of the Kosciusko Project this density is estimated to increase to about 2.2 miles per square mile. While there is no specific information on the amount of roads that may be built on non-NFS lands it should be noted that a fairly extensive road infrastructure currently exists on Kosciusko Island, which may minimize the need for additional road building. It should also be noted that the road densities in WAA 1525 are currently above the Forest Plan recommended density and the effects were analyzed as such. Any additional road densities will not result in any current road densities exceeding Forest Plan thresholds.

There are factors which may help to mitigate the road density effect to wolves on Kosciusko Island, including the fact that wolves are highly mobile and move between WAAs (Person and Logan 2012), the potential benefits of young-growth management for deer habitat, the potential for road management for controlling hunter access, the presence of the 56,546-acre Mt Calder–Mt Holbrook LUD II area adjacent to the project area, the isolation of the area (the road system here is not connected to any other road systems), and the very low human population on the Island, which is estimated to be about 42. See the Wildlife Report for information on wolf mortality.
American Marten (*Martes americana*)

**Direct and Indirect Effects**

Habitat: Direct and indirect effects of the action alternatives would be about a 1 percent reduction in deep-snow deer habitat and less than a 1 percent reduction in year-round marten habitat in WAA 1525, with no change in WAA 1526. At the Island scale this would be about a 1 percent reduction in year-round marten habitat. This is not likely to impact the viability of marten.

Connectivity: Marten travel easily through many habitat types. The areas that are likely to provide refugia (non-development LUDs) appear to be connected except for the non-development areas in VCUs 5450 and 5460 and the OGRs in VCUs 5440 and 5450. The connection between the OGRs in 5440 and 5450 is an area identified as a priority for treatment in the action alternatives, which should improve connectivity in this area. The Forest Plan Conservation Strategy provides habitat and connectivity for marten on NFS land (2008 Forest Plan FEIS).

Refugia: Roadless refugium from harvest and the presence of old-growth for foraging and denning between large, contiguous patches of old growth is important to this species. The adjacent 56,546-acre Mt Calder–Mt Holbrook LUD II area, as well as other OGR and non-development LUD areas, provides refugia for marten. There would be no change to the areas currently providing refugium to marten.

Roads: Roads can indirectly affect marten by facilitating trapper access. Although there are no road density thresholds identified for marten in the current Forest Plan, some research has shown that habitat suitability for marten begins to decline when road density reaches 0.2 miles per square mile. An extensive road network can result in marten home ranges being intercepted by roads which can result in the entire population being vulnerable to overharvest (Suring *et al.* 1993).

Calculated road densities on NFS land at or below 1,200 feet in elevation in WAA 1525 are above the density shown by some research to effect the habitat suitability of an area for marten (0.2 miles per square mile). The proposed project would increase the total road density on NFS land in WAA 1525 by only 0.1 miles per square mile, from 1.8 to 1.9 miles per square mile. The majority of the roads are in WAA 1525, with WAA 1526 having a road density of only about 0.25 miles per square mile.

Although the existing estimated road densities at all scales are all above 0.2 miles per square mile, according to the ADF&G 2010 and 2013 harvest reports, marten populations appear to be stable and the harvest sustainable for GMU 2, which includes Kosciusko Island. The fact that the road system on Kosciusko Island is not connected to any other road system or large communities helps mitigate the effect of the road density on marten populations.

Young Growth: Young-growth management has the potential to benefit both marten and goshawk through an increase in small mammal populations such as red-backed voles, a major prey item of these species, which benefit from more open forests with abundant understory vegetation and by speeding the succession of older young-growth stands toward old-growth conditions (Hanley 1996, 2005 cited in 2008 Forest Plan p. 3-255).

**Cumulative Effects**

Habitat: In WAA 1525 on all lands the cumulative effects result in a reduction of about 73 percent of the current deep-snow marten habitat and about an 89 percent reduction since 1954. At the
Island scale the cumulative effect is about a 36.9 percent reduction in deep-snow habitat from current amounts and about a 65.7 percent reduction since 1954 (see Table 28).

In WAA 1525 on all lands the cumulative effects result in a reduction of about 11.5 percent of the current year-round marten habitat and about a 60.2 percent reduction since 1954. At the Island scale the cumulative effect is about a 5.3 percent reduction in year-round habitat from current amounts and about a 42.4 percent reduction since 1954 (see Table 29).

Table 28: Deep-snow Marten Habitat (HPOG below 800 feet elevation), Cumulative Effects.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change from 1954 to Current</th>
<th>Percent Change Post-treatment (Alternatives 2, 3, and 4)</th>
<th>Acres Post-treatment (Reasonably Foreseeable Future Actions) on Non-NFS Lands (Percent Change from Current)</th>
<th>Total Percent Change from 1954 (All Lands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>5,091</td>
<td>2,078</td>
<td>-59.2%</td>
<td>-1.0%</td>
<td>561 (-73%)</td>
<td>-89.0%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>2,452</td>
<td>2,032</td>
<td>-17.2%</td>
<td>0%</td>
<td>2,030 (0%)</td>
<td>-17.2%</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>7,543</td>
<td>4,110</td>
<td>-45.6%</td>
<td>0.5%</td>
<td>2,591 (-36.9%)</td>
<td>-65.7%</td>
</tr>
</tbody>
</table>

Table 29: Year-round Marten Habitat (HPOG below 1,500 feet elevation), Cumulative Effects.

<table>
<thead>
<tr>
<th>Scale</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Change from 1954 to Current</th>
<th>Percent Change Post-treatment (Alternatives 2, 3, and 4)</th>
<th>Acres Post-treatment (Reasonably Foreseeable Future Actions) on Non-NFS Lands (Percent Change from Current)</th>
<th>Total Percent Change from 1954 (All Lands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>29,312</td>
<td>13,224</td>
<td>-54.9%</td>
<td>0.3%</td>
<td>11,680 (-11.5%)</td>
<td>-60.2%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>18,190</td>
<td>15,722</td>
<td>-13.6%</td>
<td>0%</td>
<td>15,722 (0%)</td>
<td>-13.6%</td>
</tr>
<tr>
<td>Kosciusko Island</td>
<td>47,502</td>
<td>28,946</td>
<td>-39.1%</td>
<td>0.2%</td>
<td>27,402 (-5.3%)</td>
<td>-42.4%</td>
</tr>
</tbody>
</table>

Since the Kosciusko Project does not have any direct or indirect effects to habitat in WAA 1526 there are no cumulative effects in this WAA.

Connectivity: Due to the Sealaska land conveyance, the connectivity between the OGR in VCU 5450 and the SA in VCU 5430 has been lost.

Refugia: Even with activity occurring on non-NFS land, refugia for marten is still provided on Kosciusko Island. While a part of the OGR near Shipley Bay was impacted, other new non-development acres were added.
Road density: The total road density on all lands in WAA 1525 would increase by about 0.1 miles per square mile, from 2.1 to 2.2 miles per square mile, as a result of the Kosciusko Project. The road density may increase further from activities on non-NFS lands.

Road density concerns are tied to trapping pressure; however, roadless areas and OGRs provide refugia from trapping pressure. WAA 1525 contains both small OGRs as well as other non-development LUD acres, and most of WAA 1526 is included in the 56,546 Mt Calder–Mt Holbrook LUD II area.

Conclusion
Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to marten, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to marten. This is because of: 1) the presence of the one very large reserve immediately adjacent to the project area; 2) marten travel easily through many habitat types and most of the areas that are likely to provide refugia (non-development LUDs) appear to be connected through some means; and 3) according to the ADF&G 2010 harvest report, marten populations appear to be stable and the harvest sustainable for GMU 2.

Black Bear (*Ursus americanus*)

Direct and Indirect Effects
Habitat: Preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the Forest Plan. Therefore, none of these areas are expected to be substantially affected by the proposed project.

As a result of action alternatives in this project, reduction in black bear denning habitat on NFS land would be about 1 percent (see Table 30).

Table 30: Effects on Black Bear Denning Habitat on NFS Land.

<table>
<thead>
<tr>
<th>Habitat</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Alternatives 2, 3, and 4 Acres (Post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denning Habitat (all POG)</td>
<td>22,987</td>
<td>14,390 (-37.4%)</td>
<td>14,337 (-0.4%)</td>
</tr>
</tbody>
</table>

The effect of the proposed treatments to the young-growth acres would be increased light to the forest floor, thereby increasing forage. Many wildlife species, including bears, would benefit from the increased forage. Proposed riparian thinning treatments would likely result in long-term improvements to the habitat around streams.

Road Density – Impacts to bears due to hunting would likely be greatest during logging operations. For the years 2004 through 2013 about twice as much of the bear harvest occurred in WAA 1526 as in WAA 1525 (see the Wildlife Report). This seems to indicate that most of the bear harvest is occurring from the beach and not from access provided by roads.

Cumulative Effects
Denning habitat is all POG so for cumulative effects it was assumed all POG on non-NFS land would be harvested. On all lands the current reduction in denning habitat is about 39.2 percent.
The cumulative effect on lands in all ownerships is that the denning habitat would be reduced about 12.4 percent from current and about 46.7 percent from 1954 (see Table 31).

### Table 31: Effects on Black Bear Denning Habitat in WAA 1525 on All Lands.

<table>
<thead>
<tr>
<th>Habitat</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Percent Change from 1954)</th>
<th>All Lands Acres (Percent Change from Current)</th>
<th>Total Percent Change from 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denning Habitat (all POG)</td>
<td>26,045</td>
<td>15,901 (-39.2%)</td>
<td>14,329 (-12.4%)</td>
<td>-46.7%</td>
</tr>
</tbody>
</table>

Source: GI Run May 25, 2015.

### Conclusion

Habitat – Preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the current Forest Plan. None of these areas are expected to be substantially affected by the proposed action alternatives. On NFS land, denning habitat would only decrease about 1 percent.

The cumulative effect on lands in all ownerships is that the denning habitat would be reduced about 12.4 percent from current and about 46.7 percent from 1954.

The effect of the proposed treatments to the young-growth acres would increase light to the forest floor thereby increasing forage. Many wildlife species, including bears, would benefit from the increased forage. Proposed riparian thinning treatments would likely result in long term improvements to the habitat around streams.

Road Density: For the years 2004 through 2013 about twice as much of the bear harvest occurred in WAA 1526, which has a very low road density, as in WAA 1525. This indicates that most of the bear harvest is occurring from the beach and not from access provided by roads, therefore this project is unlikely to have a significant effect on black bears due to road access.

See the Wildlife Report for information on black bear harvest.

Based on habitat protection in OGRs, the 1,000-foot beach fringe, and RMAs, the current low road density at the Island scale, along with the implementation of the ATM, the isolation of the road system, the low human population, and the proposed treatments, it is not expected there would be a significant effect on the black bear.

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to bears, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to bears. This is because of: 1) preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the current Forest Plan; 2) proposed treatments to the young-growth acres would increase light to the forest floor thereby increasing forage and many wildlife species, including bears, would benefit from the increased forage; and 3) about twice as much of the bear harvest has occurred in WAA 1526 as in WAA 1525, indicating most of the bear harvest is occurring from the beach and not from access provided by roads and, therefore, it is unlikely that any additional road building will have a substantial effect on bear harvest.
Red-breasted Sapsucker, Hairy Woodpecker, and Brown Creeper

Direct and Indirect Effects - Red-breasted Sapsucker (*Sphyrapicus ruber*)
Habitat: The action alternatives on NFS land would result in about a 1 percent reduction in low- and medium-volume POG acres. Therefore, this project would not have a substantial impact to this forest habitat or species (see Table 32).

Patch size: The number of patches in the greater than or equal to 250-acre class size does not change as result of this project.

Direct and Indirect Effects - Hairy Woodpecker (*Picoides villosus*)
The action alternatives on NFS land would result in about a 1 percent reduction in HPOG acres. Therefore, this project would not have a substantial impact to this forest habitat or species (see Table 32).

<table>
<thead>
<tr>
<th>Table 32: Effects to POG Habitat on NFS Land.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Habitat</strong></td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>WAA 1525 (NFS Land)</td>
</tr>
<tr>
<td>Low- and Medium-volume POG</td>
</tr>
<tr>
<td>HPOG</td>
</tr>
<tr>
<td>SD67</td>
</tr>
<tr>
<td>WAA 1526 (NFS Land)</td>
</tr>
<tr>
<td>Low- and Medium-volume POG</td>
</tr>
<tr>
<td>HPOG</td>
</tr>
<tr>
<td>SD67</td>
</tr>
</tbody>
</table>

Source: GI Run May 25, 2015.

\(^1\) 1954 SD67 calculated by multiplying current SD67 acres on NFS land by 29 percent and acres of non-NFS land by 37 percent. See Forest Plan FEIS Vol II Appendix B p. B-30.

\(^2\) The reduction in SD67 is not equal to 29 or 37 percent due to acres of SD67 in LUD II.

Direct and Indirect Effects - Brown Creeper (*Certhia americana*)
Habitat: The action alternatives on NFS land would result in a less than 1 percent reduction in SD67 acres. Therefore, this project would not have a substantial impact to this forest habitat or species (see Table 32).

Interior Habitat: The acres of interior forest habitat have been reduced due to past harvest. Action alternatives would affect 1.1 acre of interior forest habitat which is unlikely to have an effect on species such as the brown creeper. Therefore, this project would not have a substantial impact to interior forest habitat or species.
This project would not be likely to have a substantial impact to red-breasted sapsuckers, hairy woodpeckers, or brown creepers.

Young-growth treatments proposed under all action alternatives may provide additional foraging opportunities for some cavity nesters due to the increase of downed wood and decaying slash.

**Cumulative Effects - Red-breasted Sapsuckers (Sphyrapicus ruber)**

Habitat: The reduction in low- and medium-volume POG is estimated to be about 3.6 percent since 1954 (see Table 33).

Patch Size: The old-growth acres in the different old-growth patch size classes have been changed due to past harvest on all lands, as well as ongoing harvest on non-NFS lands.

**Cumulative Effects - Hairy Woodpecker (Picoides villosus)**

Habitat: Cumulatively there would be an estimated 7.2 percent reduction in HPOG from the current amount. Overall since 1954 the HPOG would be estimated to have declined about 57.8 percent (see Table 33).

**Cumulative Effects - Brown Creeper (Certhia americana)**

Habitat: Cumulatively there would be an estimated 4.2 percent reduction in HPOG from the current amount. Overall since 1954 the HPOG would be estimated to have declined about 26.7 percent (see Table 33).

Interior Habitat: The acres of interior old-growth forest habitat have been reduced due to both past harvest on all lands and ongoing harvest on non-NFS lands.

<table>
<thead>
<tr>
<th>Table 33: Cumulative Effects to POG Habitat in WAA 1525.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat (All Lands)</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Low- and Medium-volume POG</td>
</tr>
<tr>
<td>HPOG</td>
</tr>
<tr>
<td>SD67</td>
</tr>
</tbody>
</table>

Source: GI Run May 2015.


2The reduction in SD67 is not equal to 29 or 37 percent due to acres of SD67 in LUD II.

In WAA 1526 there would be no direct or indirect effect in large-tree POG, low- and medium-volume POG, or HPOG as a result of any alternatives and, therefore, there would be no cumulative effects in WAA 1526.

Young-growth treatments may provide additional foraging opportunities for some cavity nesters due to the increase of downed wood and decaying slash.
Conclusion

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to these birds, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to these species. This is due to the Forest-wide S&G that provides for maintenance of habitat for these species is provided by the Forest Plan Conservation Strategy (USDA Forest Service 2008a) and Forest Plan Standards and Guideline Reserve Tree/Cavity Nesting Habitat (WILD1.V.A). The intent of this Standard and Guideline is to leave snag and reserve trees within units, beyond buffers and other exclusions. The Standard and Guideline directs the Forest Service to provide habitat for cavity-nesting wildlife species in all LUDs and provides guidance on the selection and retention of reserve trees.

Marbled Murrelet (*Brachyramphus mammatus*)

Direct, Indirect, and Cumulative Effects

Acres of HPOG at all elevations were used as the unit of measure for effects to marbled murrelet habitat. These acres will be different from HPOG acres listed in the goshawk and marten sections because these acres include HPOG at all elevations.

On all lands in WAA 1525, there would be a 1 percent reduction in habitat from proposed action alternatives. The project would have no effect on HPOG in WAA 1526. Due to the amount of past harvest on Kosciusko Island, there has been a reduction in the acres of HPOG (54 percent reduction in WAA 1525 since 1954). This decrease has likely resulted in a decline in marbled murrelets.

The acres of interior forest habitat have also been reduced due to past harvest. The action alternatives would affect about 1 acre of interior forest habitat which is unlikely to have an effect on species such as the marbled murrelet (see Table 34). Action alternatives would not have a substantial impact to old-growth interior forest habitat or species.

Forest-wide Standards and Guidelines pertaining to marbled murrelets include maintaining a 600-foot radius no-cut buffer zone around identified murrelet nests (Forest Service 2008a). If at any time a marbled murrelet nest is discovered, Forest-wide Standards and Guidelines would be applied.

<table>
<thead>
<tr>
<th>Scale (All Lands)</th>
<th>1954 Acres (Historical)</th>
<th>Current Acres (Alternative 1)</th>
<th>Percent Reduction 1954 to Current</th>
<th>Alternatives 2, 3, and 4 Acres (Post-treatment on NFS Land) (Percent Change from Current)</th>
<th>Post-treatment Acres on All Lands (Percent Change)</th>
<th>Total Percent Reduction from 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAA 1525</td>
<td>29,544</td>
<td>13,456</td>
<td>-54%</td>
<td>13,423 (-1%)</td>
<td>12,494 (-7.2%)</td>
<td>-57.8%</td>
</tr>
<tr>
<td>WAA 1526</td>
<td>18,983</td>
<td>16,516</td>
<td>-13%</td>
<td>16,516 (0%)</td>
<td>(0%)</td>
<td>-13%</td>
</tr>
</tbody>
</table>
Conclusion

Due to the amount of past harvest on Kosciusko Island, there has been a reduction in the acres of both HPOG and interior forest. This decrease has likely resulted in a reduction in the marbled murrelet population.

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to murrelets, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to this species. This is because the Forest Plan determined that there was a very high likelihood of maintaining habitat to support viable and well distributed populations of marbled murrelets (Appendix D Table D-17) and the Forest-wide Standard and Guideline pertaining to marbled murrelets that includes maintaining a 600-foot radius no-cut buffer zone around identified murrelet nests (Forest Service 2008a). If at any time a marble murrelet nest is discovered, Forest-wide Standards and Guidelines would be applied.

Prince of Wales Flying Squirrel (*Glaucomys sabrinus griseifrons*)

Direct and Indirect Effects

There has been a reduction in the acres of POG on Kosciusko Island due to past harvest when compared to 1954. This has likely resulted in a reduction in the number of flying squirrels. Past harvest on Kosciusko Island has also resulted in a reduction in connectivity and an increase in fragmentation. This has likely resulted in the reduction of the ability of these areas to facilitate recolonization of vacant reserves. On NFS land there has been about a 37.4 percent decline in POG. Action alternatives would reduce POG by about 0.4 percent resulting in total reduction of about 37.7 percent.

The two-aged and uneven-aged harvests proposed in the action alternatives would likely benefit flying squirrels over the short-term by increasing canopy height and creating more open space in the midstory, creating conditions which facilitate efficient gliding (Scheibe *et al.* 2006). Over the long-term, two-aged and uneven-aged harvests proposed in all action alternatives would promote stand development toward conditions capable of supporting breeding flying squirrel populations and improve the functional connectivity between old-growth reserves (Smith *et al.* 2011).

Although connectivity has been impacted by past harvest activities which has likely impacted flying squirrels, current connectivity is still provided between the OGRs and SAs in most places. Treatments proposed under action alternatives would improve connectivity in the area, benefiting flying squirrels.

Cumulative Effects

In WAA 1525 there has been about a 39.2 percent POG reduction since 1954. It is estimated that for all lands the reduction would be about 12.4 percent. Since 1954 the reduction would be about 46.7 percent.

In WAA 1526 there would be no change to POG acres. Therefore, there would be no cumulative effects from any alternative.

Conclusion

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to flying squirrels, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to this species. This is because of: 1) functional connectivity
across the landscape is provided by the reserve system, the Legacy Standard and Guideline, and old-growth forest in the matrix, and connectivity between reserves for flying squirrels is also provided by structural elements of the Forest Plan Conservation Strategy including the stream, estuary, lake, and beach buffers; and 2) current connectivity is still provided between the OGRs and SAs in most places. Treatments proposed under the action alternatives would improve connectivity in the area.

**Prince of Wales Spruce Grouse (Falcipennis canadensis isleibi)**

**Direct and Indirect Effects**

It is assumed that alternatives that harvest the most POG would result in the greatest effects to spruce grouse; action alternatives propose to harvest 64 acres of old-growth habitat. Two-aged and uneven-aged treatments would encourage structural and horizontal diversity beneficial to grouse in previously harvested stands.

Although the connectivity has been impacted by past harvest activities which has likely impacted spruce grouse, current connectivity (less than a mile) is still provided between the OGRs and SAs in most places. Treatments proposed in this project would improve connectivity in the area.

Effects to spruce grouse are similar to effects to other POG-associated species. See the discussion on black bear and flying squirrels for effects to general POG, and the red-breasted sapsucker, hairy woodpecker, and brown creeper section for discussion on specific types of POG, changes to old-growth patch sizes, and interior forest acres. See wolf and marten sections for discussion on road densities. See the discussion on connectivity in the marten and flying squirrel sections as well in the Wildlife Report.

**Cumulative Effects**

Effects to spruce grouse are similar to effects to other POG-associated species. See the discussion on black bear and flying squirrels for effects to general POG and the red-breasted sapsucker, hairy woodpecker, and brown creeper section for discussion on specific types of POG, changes to old-growth patch sizes, and interior forest acres. See wolf and marten sections for discussion on road densities. See the discussion on connectivity in the marten and flying squirrel sections as well in the Wildlife Report.

**Conclusion**

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to grouse, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to this species. This is because the Forest Plan Conservation Strategy maintains connectivity within matrix lands that help facilitate dispersal and interchange between isolated spruce grouse populations.

**Endemic Species**

Due to their restricted ranges, specific habitat requirements, and sensitivity to human activity, insular endemic species (i.e., those restricted to islands or groups of islands) are more susceptible to extirpation and eventually extinction (Soule 1983, Reid and Miller 1989, Burkey 1995). Species tied to island archipelagos are more sensitive to the effects of introduced non-natives, including pathogens and disease, and natural events, such as climate change, than other managed landscapes due to their limited mobility and isolation from other subpopulations (Cook et al. 2006).
Haida Gwaii ermine (*Mustela erminea haidarum*) is closely associated with riparian areas at low elevations and shoreline (Reid *et al.* 2000). Riparian and shoreline habitats are both protected by Forest-wide Standards and Guidelines. Due to the protection of preferred habitats provided under the Forest Plan this project is expected to have limited effect to the Haida Gwaii ermine.

The Keen’s myotis (*Myotis keenii*) selects roost sites in forest patches with greater availability of large-diameter trees with decay for roosting and that were close to streams (Boland *et al.* 2009). Effects to Keen’s myotis are likely tied to changes in POG, HPOG, and large-tree POG (SD67).

The effects of the proposed project to POG, HPOG, and large-tree POG are discussed above in the red-breasted sapsucker, hairy woodpecker, and brown creeper section. Due to the amount of past harvest on Kosciusko Island there has been a reduction in the acres of POG, HPOG, and SD67. These reductions have likely resulted in a reduction in Keen’s myotis populations.

**Direct, Indirect, and Cumulative Effects**
Effects to endemic are expected to be similar to effects to other POG-associated species. See the discussion on red-breasted sapsucker, hairy woodpecker, and brown creeper section for discussion on specific types of POG. See the discussion on connectivity in the marten and flying squirrel sections as well in the Wildlife Report.

**Conclusion**
Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to endemics, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to these species. This is because: 1) the Forest-wide Standards and Guidelines for endemic species is 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, and 2) the Legacy S&G will provide habitat protections in high-risk biogeographic provinces across the Forest for species including endemic small mammals and forest birds. The Legacy Standard and Guideline addresses the high degree of endemism within the islands of the Tongass and a degree of uncertainty in managing for endemic species because of gaps in information about species’ distribution and habitat needs (Appendix D p. D-40).

**Migratory Birds**

**Direct, Indirect, and Cumulative Effects**
Effects to migratory birds are dependent on their habitat requirements. Effects to migratory birds dependent on POG would be similar to effects described for other POG-associated species, such as the red-breasted sapsucker, hairy woodpecker, and brown creeper.

*DellaSala et al.* (1996) documented that six bird species were associated with at least one of the silvicultural modifications of young growth. Dark-eyed juncos were positively associated with thinning, hermit thrushes and Townsend’s warblers were negatively associated with thinning. American robins were positively associated with gapping, and fox sparrows and Wilson’s warblers were negatively associated with gapping.

*DellaSala et al.* (1996) also showed that four species, orange-crowned warblers, Swainson’s thrushes, fox sparrows, and Wilson’s warblers were negatively associated with old growth and
may therefore benefit initially from clearcut logging and no silvicultural modification of young regenerating forest.

**Conclusion**

Although timber harvest on NFS and non-NFS lands would increase the local, cumulative risk to POG-associated migratory birds, the proposed NFS and non-NFS land management on Kosciusko Island would not pose an overall significant risk to these species. This is because migratory bird old-growth habitat is maintained by the Forest Plan Conservation Strategy and the Legacy S&G will provide habitat protections across the Forest for species including endemic small mammals and forest birds.

**Subsistence**

Subsistence hunting, fishing, trapping, and gathering activities are a major focus of life for many residents on Prince of Wales and surrounding islands. Reasons given for the participation in subsistence activities include the ability to provide food or supplemental income, the perpetuation of cultural customs and traditions, and the importance of values associated with self-reliance (2008 Forest Service Forest Plan).

The effects of landscape changes caused by timber harvest on the availability of wild game are important when the harvest of wild game is a critical cultural practice, food source, and recreational activity. Timber harvest may influence the abundance and distribution of subsistence resources (through changes in suitable habitat), access to subsistence resources (through changes in habitat and through road development or management), and competition for subsistence resources (through changes in abundance or access). *Alaska National Interest Lands Conservation Act* (ANILCA) requires that the analysis of potential effects on subsistence uses focus on these factors.

**Abundance and Distribution of Resources**

Subsistence resources in the vicinity of the project include terrestrial mammals (deer, wolves, black bears, furbearers, and small game), upland birds and waterfowl, marine mammals, salmon and other fin fish, marine invertebrates, plants, berries, bark, and firewood.

**Access to Resources**

Road networks connecting local communities provide access to subsistence resources in WAA 1525. Road building associated with timber harvest can provide access to previously inaccessible areas, providing greater opportunities for subsistence harvest; disperse hunting and fishing pressure; and create the potential for increased competition. 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 2009).

**Competition for Resources**

Competition for subsistence resources may occur when resources are abundant and accessible to local and non-local communities. Increased competition can occur between different subsistence user groups and between subsistence hunters and sport hunters.
Subsistence Communities

The communities that either currently or have historically used WAAs 1525 and 1526 for subsistence use include Edna Bay and Meyers Chuck (2008 Forest Plan). There are records of subsistence use of these WAAs by other communities, but either the levels of use are generally low or the community does not qualify as a Federal subsistence community. Therefore, these communities have not been included in this assessment.

Sitka Black-tailed Deer

Alternative 1 would have no direct effects on subsistence resources as no project-related activities would occur. Abundance of, access to, and competition for subsistence resources under Alternative 1 would be similar to existing conditions. However, there would be indirect effects to deer habitat over time as existing previously harvested stands move into the stem exclusion stage thereby reducing the abundance of the resource.

Abundance and Distribution

As described in the deer section, implementation of the action alternatives would initially increase deer winter habitat capability, but over the long-term could result in a slight reduction in deer numbers. All action alternatives would result in a temporary increase in deer over what is currently estimated to be present. The treatments proposed would move acres of deer habitat back into the stand initiation stage or into a stand with more old-growth-like characteristics. Both of these effects would provide better habitat than what is currently available, resulting in an increase in deer numbers.

Access

Expansion of the road system would result in increased access to both subsistence and non-subsistence hunters. The greatest increase in road access would occur during project implementation when temporary roads are in use. Road access would decrease as road closures are applied, making them no longer available for use by motorized vehicles. Historical access would remain available under all the alternatives. Under all action alternatives, there would be temporary restrictions in road access to subsistence during active logging operations as a safety precaution.

Timber harvest would also increase access to deer over the short term, due to the clearing of dense vegetation which makes them more visible to hunters. Young-growth management that is proposed in all action alternatives may locally improve hunter access to deer.

Competition

The project area is not commonly used by subsistence hunters from other communities for harvesting deer and other subsistence resources, although it does occur. The road network on Prince of Wales Island does not connect to Kosciusko Island; therefore, the project area is not connected to the communities on Prince of Wales Island and does not allow these communities easy access to the area for hunting and other subsistence activities. Non-subsistence users (e.g., those from Ketchikan and Juneau, as well as out-of-state hunters) also may hunt in the project area on Kosciusko Island. However, there is no public marine transportation to the Island which also limits off-island hunters from other communities.

Timber harvest can influence competition for resources through new road construction, particularly near communities, potentially generating competition from outside communities with lower abundance of the same resources. Habitat alterations that reduce carrying capacity, which
could in turn reduce deer densities, would also increase competition for deer if allowable levels of harvest remain the same but available subsistence resources are diminished. Indirectly, displacement of subsistence hunters from areas with active timber harvest operations could temporarily increase competition in other subsistence use areas. Alternatives resulting in the greatest reduction in deer carrying capacity and increase in the road system would be expected to result in the greatest likelihood of increasing competition for resources.

Other Species

The project would have no effect to the abundance or distribution of, access to, or competition for marine fish and invertebrates; waterfowl; furbearers using estuary, riparian, or coastal habitats; or marine mammals. Therefore, the project would make no contribution to cumulative effects to these species. The amount of land in other ownership combined with the effects on NFS land have likely had cumulative effects on the abundance and distribution, access to, and competition for some subsistence species such as waterfowl and furbearers.

The marten (furbearer) could be affected by reductions in POG habitat and/or increased road densities and related effects associated with increased human access. Other timber harvest projects would contribute to these effects. The project would result in temporary increases in the abundance and distribution of edible plants, and temporary increases in access to edible plants, personal use timber, and freshwater fish. Ongoing and foreseeable future timber harvest (through increases in early seral forest and road densities) would further contribute to these effects.

Subsistence Findings

Section 810 (a)(3) of ANILCA requires that when a use, occupancy, or disposition of public lands may result in a significant possibility of a significant restriction, a determination must be made whether (1) such a restriction is necessary, consistent with sound management principles for the utilization of public lands, (2) the proposed activity involves the minimum amount of public lands necessary to accomplish the purposes of the use, and (3) reasonable steps would be taken to minimize adverse impacts on subsistence uses and resources resulting from the actions. The alternatives were evaluated for potential effects on subsistence uses and needs, and a significant possibility of a significant restriction in subsistence opportunities is not expected to occur from implementation of any alternative (see Wildlife Report for more information).

Soils

This section provides a summary of the effects to soil resources in the Kosciusko Project area. Forest-wide Standards and Guidelines for this resource are on pages 4-64 through 4-67 of the 2008 Forest Plan. The environmental consequences are based upon analysis of proposed harvest unit and road locations, and for cumulative effects, analysis within the project area boundary. For detailed discussion of the soil resource in the Kosciusko Project area, see the Soils and Wetlands Report.

Timber harvest has the potential to adversely affect the soils resource by disturbing, displacing, or burying the nutrient-rich forest floor and exposing mineral soils to erosion.

For all action alternatives, detrimental soil disturbances within individual harvest units and across the analysis area would be well within the Region 10 Soil Quality Standards and Guidelines. This finding is based on analysis summarized in the Soils and Wetlands Report, as well as over 20 years of soil quality monitoring data collected on the Forest and documented in numerous soil quality monitoring reports, the most pertinent of which are: Landwehr and Nowacki 1999, and
Landwehr et al. 2012 (see the Soils and Wetlands Report for full citations). The monitoring data indicate that about 3 percent of harvest units yarded with cable or shovel system incur detrimental soil conditions. Temporary roads and associated landings are also considered detrimental soil conditions. Existing detrimental soil disturbance (including temporary roads and landings) was estimated for each young-growth unit using aerial photography taken shortly after harvest.

There are no proposed roads located on slopes greater than 67 percent and no harvest units located on slopes greater than 72 percent in the Kosciusko Project area. All proposed activities would meet Region 10 Soil Quality Standards.

Best management practices and site-specific recommendations for soil in harvest units and road segments are or would be based on field data. Project-wide analysis was completed using soil survey data in GIS and aerial photos, and is summarized in the Soils and Wetlands Report.

**Direct and Indirect Effects**

**Alternative 1**
Under Alternative 1, no timber harvest or road building would take place and no soil disturbances would be caused by new management activities. Vegetation in harvested areas would continue to grow. Existing detrimental soil conditions occupy about 756 acres, or about 1.4 percent, of the Kosciusko Project area. That areal extent of detrimental soil conditions is within Region 10 Soil Quality Standards.

**Alternative 2**
New temporary road construction and associated rock pits and landings would disturb about 13 acres of soil. About 30 acres of soil disturbance would occur in new harvest units. Proposed and existing detrimental soil conditions would occupy about 799 acres, or about 1.4 percent, of the Kosciusko Project area.

**Alternative 3**
New temporary road construction and associated rock pits and landings would disturb about 13 acres of soil. About 46 acres of soil disturbance would occur in new harvest units. Proposed and existing detrimental soil conditions would occupy about 815 acres, or about 1.5 percent, of the Kosciusko Project area.

**Alternative 4**
New temporary road construction and associated rock pits and landings would disturb about 11 acres of soil. About 46 acres of soil disturbance would occur in new harvest units. Proposed and existing detrimental soil conditions would occupy about 813 acres, or about 1.5 percent, of the Kosciusko Project area.

The direct and indirect effects to soils under Alternatives 2, 3, and 4 are not considered significant because the estimated amount of detrimental soil conditions resulting from the proposed activities is well within Region 10 Soil Quality Standards.

**Cumulative Effects**
The cumulative effects analysis area for soils is the Kosciusko Project area. Reasonably foreseeable future projects considered for analysis of the soils resource include the University of Alaska timber sales, Sealaska Corporation timber sales, State of Alaska timber sales, the State of
Detrimental soil disturbance anticipated from the Kosciusko Project, along with foreseeable actions and existing conditions, would total approximately 2.4 percent of the project area under Alternatives 2, 3, and 4, and 2.3 percent under Alternative 1. The Region 10 Soil Quality Standards would be met for all alternatives at the project-area scale. Details regarding the methods of the analysis and the results are in the Soils and Wetlands Report.

Wetlands

The analysis area for direct and indirect effects includes areas where timber harvest or road construction is proposed. For cumulative effects the analysis area includes the entire Kosciusko Project area. The analysis from the cumulative effects for the wetlands resource also includes the foreseeable actions listed in the project record. The key indicators identified for measuring project effects on wetlands include:

- Acres of wetland altered by road construction, and
- Acres of timber harvest on forested wetlands.

All action alternatives propose some level of timber harvest and road construction on forested wetlands. The effects of timber harvest on forested wetlands (primarily increased soil moisture levels) are expected to be temporary. All harvested sites are expected to regenerate naturally based on many decades of regeneration surveys. However, trees are expected to grow slower on wetland sites. The detailed effects are described in the Soils and Wetlands Report.

The effects of road building on wetlands may vary based on the substrate, or soil type, and the landscape position of the wetland. Regardless of the type and location, road construction on wetlands results in an overall loss of wetland acreage. Hydrologic effects beyond the disturbed soil (road) corridor are expected to be limited to within a few meters of the road. The analysis is based on pertinent pieces of literature discussed in the Soils and Wetlands Report, including Glaser 1999, Kahklen and Moll 1999, McGee 2000, and Landwehr 2011.

Due to the interspersed nature of wetlands with uplands in the project area, complete avoidance of wetlands from proposed road construction activities is not practicable. All proposed roads would be constructed according to State-approved BMPs as required by 33 CFR 323. All roads through wetlands would also follow the 15 baseline provisions provided in 33 CFR 323.

The effects of the watershed improvement activities proposed in the Kosciusko Project (such as weed pulling, karst dam extractions, precommercial thinning, and watershed restoration) are all expected to have minor or negligible effects to the wetland resource. All these projects would follow the Tongass Forest Plan, R10 Soil Quality Standards, National BMPs, R10 BMPs, Executive Order 11990: Protection of Wetlands, 40 CFR 230 Section 404, 33 CFR 323.3b, the Clean Water Act Section 404b, and US Corps of Engineers Wetlands Delineation Manual (1987).

Direct and Indirect Effects

Alternative 1

No wetlands would be impacted under Alternative 1 due to the absence of harvest and road construction activities as a result of the Kosciusko Project. Vegetation on forested wetlands harvested in the past would continue to grow toward hydrologic maturity; many stands have
already reached this stage. Wetlands impacted by roads in the past would continue to be impacted. Vegetation would occupy ditch lines and, in the case of closed roads, the roadbed may be occupied by 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.

**Alternatives 2, 3, and 4**

Alternatives 2, 3, and 4 propose to harvest timber from approximately 26 acres of forested wetland and 4 acres of forested wetland/emergent short sedge wetlands. Road construction under these alternatives would result in conversion of wetland to road on approximately 1 acre of forested wetlands.

**Cumulative Effects**

Present and reasonably foreseeable projects (as described on page 17) are analyzed with this proposed project for the purpose of determining cumulative effects.

No planned roads are associated with Forest Service micro- and salvage sales. The State of Alaska rock pit expansion would not impact any wetlands. It is unknown if the proposed future timber harvest and road building on state and private lands (such as the University of Alaska, State of Alaska, and Sealaska timber sales) would convert wetland to roads. The State of Alaska Log Transfer Facility (LTF) is located on upland soils and does not impact any wetlands.

**Alternative 1**

Cumulatively, approximately 1,139 acres of timber have been harvested from wetlands in the project area, including 686 acres of forested wetland and 453 acres of forested wetland/emergent sedge complex. Vegetation on the oldest harvested wetland areas is 30 to 60 years old and typically consists of vigorous young-growth stands, and soil moisture conditions should be returning to near pre-harvest conditions.

About 54 acres of forested wetland and 59 acres of forested wetland/emergent short sedge complex have been converted to road surfaces, ditches, and fill slopes in the project area. Open, drivable roads on the project area would continue to receive incidental use by recreation visitors. Vegetation would grow in ditch lines on all roads, and on closed roads vegetation would likely colonize the road surfaces.

About 93 percent of wetlands in the project area would remain in a natural condition.

**Alternatives 2, 3, and 4**

Cumulative effects following implementation of Alternatives 2, 3, or 4 would be approximately 1,169 acres of timber harvest from wetlands in the project area (outside of roads), including 712 acres of forested wetland and 457 acres of forested wetland/emergent sedge complex. This equates to approximately 6 percent of the wetlands on the project area.

Implementation of Alternative 2, 3, or 4 would result in cumulative impacts of about 114 acres of wetland converted to road surfaces, ditches, and fill slopes in the project area, consisting of 55 acres of forested wetland and 59 acres of forested wetland/emergent sedge complex.

Under Alternative 2, 3, or 4, about 93 percent of wetlands in the project area would remain in a natural condition.
Implementation of the action alternatives would not have a significant effect due to the compliance with the Section 404 of the Clean Water Act, Executive Order 11990, National and Regional BMPs, and the Forest Plan.

**Watersheds**

Watersheds are hydrologically defined geologic areas that are drained by or contribute water to a stream, lake, or other waterbody. Within a watershed there are many physical, chemical, and biological components whose functioning is complexly interrelated. On Kosciusko Island, annual precipitation may exceed 100 inches, with the highest rainfall occurring during October and the lowest in June. Individual storms vary dramatically over short distances and can produce intense rainfall and high winds. Because the project area boundary does not coincide with topographic watershed boundaries, the analysis area for direct, indirect, and cumulative effects includes only watersheds with proposed ground disturbance in the action alternatives.

A large amount of field data was compiled and synthesized for this analysis. Forest Service watershed and fisheries personnel conducted field reconnaissance of the proposed roads and units between 2000 and 2014, resulting in updates to the streams GIS layer. Ground reconnaissance for soils and karst are explained in their respective resource reports for this project.

GIS queries were used to evaluate effects and compare alternatives. The Tongass National Forest does not have predictive models for changes in streamflow, sediment, or aquatic habitat in response to timber harvest and roads. Therefore, GIS queries provide surrogate measures of effects supported by the literature cited in the Watershed Report. Harvest and road thresholds are used for analysis purposes only. A literature threshold (Bosch and Hewlett 1982) of 20 percent of the watershed area harvested in less than 30 years is used to establish the point at which effects of the harvest on watersheds is measurable (referred to here as the “20/30 threshold”). As a result of existing conditions and expected cumulative harvests on non-NFS lands, eight of the watersheds within the Kosciusko Project area would be expected to exceed the 20/30 threshold exclusive of the action alternatives for this project. Furthermore, none of the alternatives would push any of the remaining watersheds within the project area beyond the 20/30 threshold.

Because the project area boundary does not coincide with watershed boundaries, the analysis area for direct, indirect, and cumulative effects includes only watersheds with proposed ground disturbance in the proposed alternatives. Sections of outlying watersheds which extend into the project area but are not affected by the project are not characterized in this report. To simplify the analysis, some of the GIS watershed polygons within the project area were modified. Because existing small watersheds, together with larger watersheds, have the potential to confuse effects analysis, a lower limit near 1,000 acres was desired for HUC14 level delineation. As a result some of the smaller frontal watersheds in the final product were combined to create a more homogeneous data set.

Sealaska Corp., State of Alaska, and University of Alaska have past, present, and future harvest areas that occur in watersheds also in the Kosciusko Project area. One objective of this analysis is to answer the question of whether or not proposed alternatives, if implemented, combined with anticipated harvest on non-National Forest System land, would cumulatively constitute a measurable impact.
The following assumptions are adopted for this analysis:

- Sealaska, State of Alaska, and University of Alaska would harvest timber as delineated in GIS by the IDT. See the Watershed Report, Appendix C for these predictions which include scheduling and locations of harvest.
- Sealaska would be operating under State of Alaska Regulations and therefore be protective of water quality by State standards.
- Forest Service management practices are mitigative and subject to Forest Plan Standards and Guidelines.
- Clear-cutting (even-aged management) would result in the highest risk of measurable cumulative watershed effects, based on the large continuous areas of canopy removal.

Although baseline aquatic data is limited for the affected watersheds, we have sufficient empirical information to describe their current condition. Our ability to actually measure changes in streamflow, sediment, habitat features, or other aquatic parameters in response to the Kosciusko 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. However, we have sufficient empirical data relative to these watersheds to provide a credible analysis of the magnitude and extent of the effects of this project. Also, see Fisheries within this Environmental Consequences section beginning on page 98 for related aquatic habitat and additional water quality analysis.

**Alternative 1**

**Direct and Indirect Effects**

Direct and indirect effects can include existing soil disturbance, compaction, sediment delivery to streams, stream channel disturbance, changes to both low and peak flows, and water quality changes.

Since no activities are proposed in this alternative, no direct or indirect effects would occur.

**Cumulative Effects**

Because there are no direct or indirect effects, there would be no cumulative effects. Effects of foreseeable future activities would be as described in the previous sections.

**Conclusion**

Alternative 1 would have no direct or indirect effects; however, foreseeable harvest by Sealaska, State of Alaska and University would likely cause minor effects even with no additional action on NFS land.

**Actions Common to All Action Alternatives**

The descriptions of action alternatives below pertain to the different objectives driving the alternatives, and the differences in how young-growth management would occur to meet those objectives. In addition, and common to all three alternatives, is the 1,864 acres of proposed precommercial thinning (PCT), which includes some riparian thinning. PCT in non-development LUDs and riparian thinning are considered a mitigation action in that they promote the return of desired old-growth-like conditions. Old-growth harvest is also proposed in all three alternatives, which would contribute to total acres treated and total volume harvested additional to what is described below. The old-growth harvest would result in about 1,051 MBF of timber from 27

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Kosciusko Project Environmental Assessment
acres of even-aged management and about 37 acres of uneven-aged management. Additional actions common to all alternatives are invasive plant treatments, treatments to correct blocked karst features, and in-stream treatments to address water quality and habitat issues. These proposed actions may cause soil and channel disturbances which could result in erosion and sediment delivery to waterbodies and may result in short-term reductions in water quality and aquatic habitat; however, these results would likely be offset by long-term enhancement of the desired watershed condition.

**Alternative 2**

**Direct and Indirect Effects**
Because Alternative 2 proposes more than two times the clearcutting (even-aged management) acres (853 acres) as compared to Alternatives 3 and 4, it would remove approximately 925 acres of forest canopy, increasing the risk of elevated peak stream flow response. As a result, Alternative 2 would result in the highest risk of measurable watershed effects. Streamflow and sediment delivery to streams may increase in the short term but the changes are not expected to result in measurable long term effects on water quality or aquatic habitat. Alternative 2 would increase the basin area harvested but would not push any other watersheds to exceed the 20 percent in 30 years threshold.

**Cumulative Effects**
Past and reasonably foreseeable activities that may affect watersheds are consistent across all alternatives (see Alternative 1). Alternative 2 would result in the highest level of cumulative effects because it proposes the most acres of clearcutting with a high percentage of canopy removal. Recovery of stream response to comparable pre-harvest levels as a result of Alternative 2 is expected to be at least 10 years (Jones 2000). The total cumulatively harvested acres proposed by Sealaska, State of Alaska, and University harvest would result in effects that would likely be measurable for greater than 10 years.

**Conclusion**
Alternative 2 may result in minor watershed effects when compared to other alternatives because it proposes more than double the clearcutting which results in high canopy removal. Comparatively, Alternative 2 would result in the highest risk of long-term watershed effects. Alternative 2 would also result in the greatest risk of cumulative effects in comparison to the other alternatives because in addition to elevated clearcutting and canopy removal, it would contribute more-so to foreseeable effects caused by other land owners.

**Alternative 3**

**Direct and Indirect Effects**
Alternative 3 would result in negligible effects on sedimentation and aquatic habitat. Streamflow may increase in the short term but the changes are not expected to result in sustained measurable effects. Alternative 3 would not push any other watershed over the 20 percent in 30-year measurable effects threshold. Compared to Alternative 2, Alternative 3 proposes less clearcutting which would result in less risk to water quality and aquatic habitat.
Cumulative Effects
Watershed effects from past practices are described in the Affected Environment section of the Watershed Report. Because reasonably foreseeable activities are consistent across all alternatives, fewer proposed clearcutting acres would result in reduced risk of long-term cumulative watershed effects when compared to Alternative 2.

Conclusion
Alternative 3 would result in negligible effects to water quality and aquatic habitat.

Alternative 4
Direct and Indirect Effects
Alternative 4 would result in negligible effects on sedimentation and aquatic habitat. Because there is no clearcutting proposed in young growth, streamflow is not likely to increase or result in measurable effects to water quality or aquatic habitat.

Cumulative Effects
Proposed reasonably foreseeable future activities are consistent across all alternatives. Alternative 4 would result in negligible cumulative effects to water quality or aquatic habitat in all watersheds when compared with Alternatives 2 and 3. However, reasonably foreseeable future harvest on non-NFS lands would likely result in measurable cumulative watershed effects.

Conclusion
Alternative 4 would result in negligible effects on sedimentation and aquatic habitat. Alternative 4, when compared to the other alternatives, is most similar to Alternative 1 in that it has less effect on soil and aquatic habitat. Alternative 4 would also result in reduced cumulative effects compared to Alternative 2 and 3 because it would help mitigate any resulting short-term effects through partial harvest. Combined harvest proposed under Alternative 4 and past harvest would not push any other watershed past the 20 percent in 30-year threshold. However, reasonably foreseeable future harvest on non-NFS lands would likely result in minor cumulative watershed effects.

Results
The likelihood of this project to contribute to cumulative watershed effects is expressed in terms of increased peak flows or stream channel degradation, or measureable contributions to erosion. Sediment delivery to waterbodies would likely be minimal due to the small percentage of mechanically treated area within the project watersheds and the use of appropriate design features and BMPs. Proposed mechanical harvest area and canopy removal is less than 20 percent of the total combined watershed area.

Watershed analysis did not find any significant conditions, existing or potential, which would contribute to long-term detrimental effects to water quality. The small harvest/thinning area, as compared to the overall size of the watersheds, is not likely to have a perceptible effect on stream hydrography, erosion, sediment transport, or water quality. It is unlikely that any detrimental effects to water quality caused by past, present, or future projects, when added to the insignificant effects of this project, would produce a measurable cumulative adverse effect to watersheds. In fact, proposed forest thinning and restoration projects, which are assumed to improve water quality and increase watershed resiliency, would help mitigate any short-term effects while
improving existing watershed condition. Watersheds associated with this project are not known to be impaired; however, it is likely that on a site-specific or stream reach basis, restoration activities may be considered necessary and appropriate.

Fisheries

Introduction

This section briefly describes the potential effects on fisheries and aquatic resources in the four project alternatives, and more detailed descriptions and analysis can be found in the Fisheries Report. Alternative 1, the No Action Alternative, provides a basis for comparing any additional effects proposed by the three action alternatives.

Direct, indirect, and cumulative effects within the watersheds affected by the project area are estimated using both quantifiable and qualitative parameters. Quantifiable parameters include:

- Existing and proposed harvest acres and percent canopy removal
  - Harvest acres are calculated as the total area of harvest units
  - Percent canopy removal is calculated as 100 percent of the harvest unit area for even-aged management, 50 percent of the harvest unit area for two-aged management, and 33.33 percent of the harvest unit area for uneven-aged management
- Existing and proposed road-acres and miles of road
  - Road-acres were included in the canopy removal analysis for each watershed
- Number of existing and proposed stream crossings and their fish passage category
- Riparian area habitat (acres and adjacent stream miles) removed or improved
- Changes, if any, to access, competition, and abundance of subsistence fisheries

The level of effects due to these conditions is estimated using qualitative descriptors which account for how measurable the effect would be, how widespread the effect is likely to be, how long it is likely to last, and whether it is likely to require mitigation. The descriptors are “negligible”, “minor”, “moderate”, and “major”, and are further described in the Fisheries Report. Effects to fisheries resources are analyzed at the HUC (Hydrologic Unit Code) 14 watershed level, and there are 21 watersheds that intersect the Kosciusko Project area.

Canopy cover within a watershed is important for moderating stream flow. Studies have indicated that 20 to 35 percent of precipitation is intercepted by canopy in coastal temperate rainforests (Banner et al. 2005; see Fisheries Report for full citation). If timber harvest and road building is extensive enough to cause increases in water yield during salmon spawning seasons, spawning success may be affected. Canopy removal decreases this interception, increasing the amount of water available to streams. Changes in annual water yield following timber harvest and road building have been documented in numerous studies in the Pacific Northwest and are commensurate with the proportion of watershed harvested. Tongass NF assumes that forest canopy recovery occurs in 30 years and would be instrumental in recovery of pre-harvest rainfall interception (Hicks et al. 1991b, Jones 2000; see Fisheries Report for full citations). With current road-acres, past harvest acres younger than 30 years, and anticipated harvest on non-NFS land, 8 of the 21 project watersheds exceed the 20 percent threshold in Alternative 1, the No Action Alternative. Table 35 shows the anticipated percent basin area in roads or harvest openings.
younger than 30 years by alternative for these 8 watersheds, and these ranges were calculated in 5 year increments from 2015 to 2055. For a more detailed analysis, consult the Fisheries Report.

Cederholm et al. (1980) found that the accumulation of fine sediment in streambeds was highest in basins where the road area exceeded 2.5 percent of the basin area. When less than 2.5 percent of the basin area is road area, the amount of sediment remains near natural levels; however, when the road area exceeds 2.5 percent, the proportion of fines in spawning gravels begins to consistently exceed natural levels. In the existing condition, only one watershed located near the southwest corner of Kosciusko Island, 19010103091102, exceeds the 2.5 percent threshold, with 2.7 percent of the basin area as road. For a more detailed analysis, consult the Fisheries Report.

Table 35: Anticipated Percent Basin Area in Roads or Harvest Openings.

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Total Basin Acres</th>
<th>Alt 1(^1)</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basin Percent</td>
<td>Addition-</td>
<td>Total</td>
<td>Addition-</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>al Effect</td>
<td>Basin</td>
<td>al Effect</td>
<td>Basin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from Alt 2</td>
<td>Percent</td>
<td>from Alt 3</td>
<td>Percent</td>
</tr>
<tr>
<td>19010103091003</td>
<td>2,142.8</td>
<td>37.0 - 82.5</td>
<td>-</td>
<td>37.0 - 82.5</td>
<td>-</td>
</tr>
<tr>
<td>19010103091101</td>
<td>951.0</td>
<td>80.1 - 92.5</td>
<td>-</td>
<td>80.1 - 92.5</td>
<td>-</td>
</tr>
<tr>
<td>19010103091102</td>
<td>1,911.3</td>
<td>76.7 - 84.9</td>
<td>5.5</td>
<td>82.2 - 92.5</td>
<td>3.8</td>
</tr>
<tr>
<td>19010103091103</td>
<td>682.9</td>
<td>15.1 - 21.6</td>
<td>6.2</td>
<td>21.3 - 27.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Davidson Inlet-Frontal Iphigeria Bay</td>
<td>10,877.6</td>
<td>16.0 - 20.8</td>
<td>-</td>
<td>16.0 - 20.8</td>
<td>-</td>
</tr>
<tr>
<td>Headwaters Charley Creek</td>
<td>3,820.8</td>
<td>18.0 - 33.8</td>
<td>0.3</td>
<td>18.3 - 34.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Lower Trout Creek</td>
<td>5,702.2</td>
<td>27.7 - 36.6</td>
<td>0.1</td>
<td>27.8 - 36.9</td>
<td>0.1</td>
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<tr>
<td>Survey Creek</td>
<td>6,532.3</td>
<td>37.3 - 50.2</td>
<td>5.1</td>
<td>42.4 - 55.3</td>
<td>6.0</td>
</tr>
</tbody>
</table>

\(^1\)Anticipated harvests on Sealaska Corporation, State, and other private lands included.

Along the 159 miles of road in the project area, there are 245 stream crossings, 45 of which are fish stream crossings. The guiding criterion for culvert design is to allow for natural migration by adult and juvenile fish through the culvert during various flows. The Tongass National Forest 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 barrier (or perch) at culvert outlet. Culvert categories are described below. Table 36 lists the 45 fish crossings by passage category and watershed.
- Green: conditions that 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
- Red: conditions that have a high certainty of not providing juvenile fish passage at all desired stream flows
- Black: more information is required for the analysis to determine juvenile fish passage ability

Table 36: Fish Passage in the Project Area for the 10 Watersheds with Fish Crossings.

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Green Crossings</th>
<th>Gray Crossings</th>
<th>Red Crossings</th>
<th>Black Crossings</th>
<th>Total Fish Crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>19010103091003</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>19010103091102</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>19010103091103</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Davidson Inlet – Frontal Iphigeria Bay</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Fishermans Harbor – Frontal Sumner Strait</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hamlin Creek</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Iphigenia Bay-Frontal Pacific Ocean</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Lower Trout Creek</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Survey Creek</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Upper Trout Creek</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>6</td>
<td>14</td>
<td>1</td>
<td>45</td>
</tr>
</tbody>
</table>

Effects Common to all Action Alternatives

Alternatives 2, 3, and 4 allow for the removal or replacement of the 14 “red” pipes in the project area. These activities could cause minor short-term increases in sediment, but would provide long-term improvements to fish habitat and fish access to approximately 1,700 meters of habitat upstream of those crossings. A map of the 14 “red” crossings is available in the Fisheries Report.

There is only one new stream crossing proposed in all of the action alternatives, and a full suspension crossing would be constructed over this Class I stream near Survey Creek. The construction of this crossing could cause minor short-term increases in sediment, but the crossing structure would not impede fish passage.

The action alternatives propose 1,864 acres of precommercial thinning treatment, with 237 acres of treatment on previously harvested RMAs (170 of those acres are stand-alone riparian thinning treatments), and restoration on up to 1 mile of streams with RMAs that are not functioning properly or are functioning at risk as a result of previous harvest. These activities could cause minor short-term increases in sediment, but in the long-term would help mitigate some of the riparian losses from previous harvest in the project area and anticipated harvest on non-NFS land.
Alternative 1

Direct and Indirect Effects
Since no new activities are proposed in this alternative, no direct or indirect effects are expected to occur.

Cumulative Effects
As a result of existing conditions and cumulative harvest on non-NFS land, 8 out of the 21 watersheds intersecting the project area are expected to exceed the threshold of 20 percent of the watershed in openings younger than 30 years (see Table 35). The anticipated harvest, particularly on Sealaska land, may cause moderate to major peak flow increases in these eight watersheds depending on when actual harvest occurs. The 13 other watersheds would remain below the threshold in this alternative. Within 10 to 30 years, the watershed canopy cover would approach normal levels and would reduce the effects on flow.

Riparian area habitat in the project area is likely to be affected even in Alternative 1 as a result of anticipated harvest activities on non-NFS land, primarily on Sealaska Corporation land. As private landowners, Sealaska Corporation would follow the riparian standards for private land as outlined in the State of Alaska’s Forest Resources and Practices Act (ADF&G, Sec. 41.17.116; see Fisheries Report for full citation). Streams within private land that are confirmed anadromous (listed on the Anadromous Waters Catalog) receive a 66-foot no-harvest buffer, and in some cases may receive a 100-foot no-harvest buffer. Any stream that flows directly into a confirmed anadromous stream would receive protections similar to Forest Service Class IV streams (See Appendices 2 and 3 in the Fisheries Report). Any other stream receives minimal protection, similar to “non-stream” rills on NFS land.

Within the Sealaska Corporation land on Kosciusko Island, there are 38.2 miles of Class I, II, and III streams, and only 5.7 miles of these streams would receive protection under the aforementioned state standards. Nine watersheds intersect Sealaska land, and three of these are predicted to lose over half of their RMAs to timber harvest: 19010103091101 (74.0 percent), 19010103091003 (63.0 percent), and 19010103091102 (53.6 percent).

Resident fish (and anadromous fish in uncatalogued streams) would likely be displaced in some of these un-buffered streams. Important riparian processes that maintain fish habitat features like large wood, pool size and frequency, substrate, shade, hiding cover, and food may be diminished or lost in some cases.

In this alternative, important Kosciusko Project restoration options that could help mitigate some of the riparian losses from harvest on non-NFS land within the project area would not be available, and no previously harvested RMAs would receive any silvicultural treatments. Other restoration projects could be proposed in the future, but the effects from the existing condition of these RMAs would continue on for the foreseeable future.

Currently only one watershed within the project area exceeds the 2.5 percent basin area in road surface threshold (19010103091102, 2.7 percent), which is considered to result in increased sediment in streams and likely causes minor effects to fish habitat (see Table 15 in Fisheries Report). Non-project-related cumulative actions are not expected to increase road surface area to the extent of exceeding the 2.5 percent threshold in any other watersheds.
Roads would be stored or decommissioned under the Prince of Wales Access and Travel Management Plan (ATM) when funding became available, and the 14 “red” stream crossings would remain in place for the foreseeable future. Eventually, various activities including culvert replacement and removal would be conducted under ATM, and these future actions would have a beneficial cumulative effect on fish habitat.

**Alternative 2**

**Direct and Indirect Effects**

Alternative 2 proposes the lowest total area of commercial harvest units with 999 acres, and the second highest area of harvest canopy removal with 925 acres (uneven-aged harvest areas adjusted proportional to canopy removal). This alternative has the highest amount of clearcut harvest (even-aged management) at 888 acres, which is the harvest method with the highest erosion potential (see Watersheds Report). These harvest levels may increase stream flow and sediment delivery, and would result in minor effects to fish habitat.

The amount of proposed road work is similar among action alternatives. Alternative 2 proposes 5.4 miles of new temporary roads (including new roads on existing prisms and new construction), which is the lowest of the action alternatives. With an additional 18 miles of proposed road maintenance, Alternative 2 has the lowest amount of proposed road work at 27.6 miles, and would result in negligible to minor effects on fish habitat.

**Cumulative Effects**

Cumulative effects from past practices are described in the affected environment of the Fisheries Report. Because reasonably foreseeable future activities are consistent across all alternatives, Alternative 2 would result in the highest level of cumulative effects on fish habitat.

Cumulatively, as a result of existing conditions and foreseeable harvest, primarily on Sealaska Corporation land but also on State of Alaska and University of Alaska land, 8 out of the 21 watersheds intersecting the project area are expected to exceed the threshold of 20 percent of the watershed area in openings younger than 30 years. Alternative 2 proposes additional harvest in 5 of these 8 watersheds with the second highest amount of additional percent basin area removal among the three action alternatives (see Table 35). These harvests cumulatively may cause moderate peak flow increases in these 5 watersheds, depending on when actual harvest occurs. Within 10 to 30 years, the watershed canopy cover would approach normal levels and would reduce the effects on flow, likely making increases from this alternative immeasurable.

Alternative 2 actions would not result in any additional watersheds exceeding the 2.5 percent basin area in road surface threshold, above which is considered to result in increased sediment in streams. Alternative 2 does not add any new roads to the watershed (19010103091102) that already exceeds the threshold.

This alternative provides silvicultural treatments and restoration options that could help mitigate some of the riparian losses from previous harvest and anticipated harvest on non-National Forest System land.

**Conclusion**

Alternative 2 is consistent with the Forest Plan Standards and Guidelines. Based on known effects from timber harvest and road building, this alternative would result in minor additional effects on fish habitat. Compared to other action alternatives, Alternative 2 would have the highest effects
on fish habitat based on the amount of canopy removal and the higher amount of even-aged management.

**Alternative 3**

**Direct and Indirect Effects**

Alternative 3 proposes the second highest total area of harvest units with 1,526 acres, and the highest area of harvest canopy removal with 933 acres (two-aged and uneven-aged harvest areas adjusted proportional to canopy removal). This alternative has the second highest amount of clearcut harvest at 423 acres, which is the harvest method with the highest erosion potential (see Watersheds Report). These harvest levels may increase stream flow and sediment delivery, and would result in minor effects to fish habitat.

The amount of proposed road work is similar among action alternatives. Alternative 3 proposes 6.7 miles of new temporary roads (including new roads on existing prisms and new construction; difference in miles is due to rounding differences in GIS), which is the second highest of the action alternatives. With an additional 18 miles of proposed road maintenance, Alternative 3 has the second highest amount of proposed road work at 29.1 miles, and would result in negligible to minor effects on fish habitat.

**Cumulative Effects**

Cumulative effects from past practices are described in the affected environment of the Fisheries Report. Because reasonably foreseeable future activities are consistent across all alternatives, Alternative 3 results in the second highest level of cumulative effects on fish habitat.

As a result of existing conditions and cumulative harvest, primarily on Sealaska Corporation land but also on State of Alaska and University of Alaska land, 8 out of the 21 watersheds intersecting the project area are expected to exceed the threshold of 20 percent of the watershed area in openings younger than 30 years. Alternative 3 proposes additional harvest in 5 of these 8 watersheds with the highest amount of additional percent basin area removal among the three action alternatives (see Table 35). This cumulative harvest may cause moderate peak flow increases in these 5 watersheds, depending on when actual harvest occurs. Within 10 to 30 years, the watershed canopy cover would approach normal canopy cover and would reduce the effects on flow, likely making increases from this alternative immeasurable.

Alternative 3 actions would not result in any additional watersheds exceeding the 2.5 percent basin area in road surface threshold, above which is considered to result in increased sediment in streams. Alternative 3 does not add any new roads to the watershed (19010103091102) that already exceeds the threshold.

This alternative provides silvicultural treatments and restoration options that could help mitigate some of the riparian losses from previous harvest and anticipated harvest on non-NFS land.

**Conclusion**

Alternative 3 is consistent with the Forest Plan Standards and Guidelines. Based on known effects from timber harvest and road building, this alternative would result in minor additional effects on fish habitat. Compared to other action alternatives, Alternative 3 has the second highest effects on fish habitat based on the amount of canopy removal and the higher proportion of two-aged and uneven-aged management.
Alternative 4

Direct and Indirect Effects
Alternative 4 proposes the highest total area of harvest units with 1,547 acres, and the lowest area of harvest canopy removal with 600 acres (two-aged and uneven-aged harvest areas adjusted proportional to canopy removal). This alternative has the least amount of clearcut harvest at 27 acres, which is the harvest method with the highest erosion potential (see Watersheds Report). These harvest levels may increase stream flow and sediment delivery, and would result in minor effects to fish habitat.

The amount of proposed road work is similar among action alternatives. Alternative 4 proposes 6.9 miles of new temporary roads (including new roads on existing prisms and new construction; difference in miles is due to rounding differences in GIS), which is the highest of the three action alternatives. With an additional 18 miles of proposed road maintenance, Alternative 4 has the second highest amount of proposed road work at 29.3 miles, and would result in negligible to minor effects on fish habitat.

Cumulative Effects
Cumulative effects from past practices are described in the affected environment of the Fisheries Report. Because reasonably foreseeable future activities are consistent across all alternatives, Alternative 4 would result in the lowest level of cumulative effects on fish habitat.

As a result of existing conditions and cumulative harvest, primarily on Sealaska Corporation land but also on State of Alaska and University of Alaska land, 8 out of the 21 watersheds intersecting the project area are expected to exceed the threshold of 20 percent of the watershed area in openings younger than 30 years. Alternative 4 proposes additional harvest in 5 of these 8 watersheds with the least amount of additional percent basin area removal among the three action alternatives (see Table 35). This cumulative harvest may cause moderate peak flow increases in these 5 watersheds, depending on when actual harvest occurs. Within 10 to 30 years, the watershed canopy cover would approach normal levels and would reduce the effects on flow, likely making increases from this alternative immeasurable.

Alternative 4 actions would not result in any additional watersheds exceeding the 2.5 percent basin area in road surface threshold, above which is considered to result in increased sediment in streams. Alternative 4 does not add any new roads to the watershed (19010103091102) that already exceeds the threshold.

This alternative provides silvicultural treatments and restoration options that could help mitigate some of the riparian losses from previous harvest and anticipated harvest on non-NFS land.

Conclusion
Alternative 4 is consistent with the Forest Plan Standards and Guidelines. Based on known effects from timber harvest and road building, this alternative would result in minor additional effects on fish habitat. Compared to other action alternatives, Alternative 4 has the least effects on fish habitat based on the amount of canopy removal and the higher proportion of two-aged and uneven-aged management.
Essential Fish Habitat Assessment

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act states that all federal agencies must consult the National Marine Fisheries Service (NMFS) for actions and proposed actions that may adversely affect essential fish habitat (EFH) for federally managed marine and anadromous fish species. The Act promotes the protection of essential fish habitat through review, assessment, and mitigation of activities that may adversely affect these habitats. Consultation procedures have been documented in an attachment to a June 26, 2007 NMFS letter to the Regional Forester. Although this Consultation Procedures document expired on June 28, 2012, consultation is still required under the Act and the 2007 procedures remain applicable and have been followed for this project.

There are four main steps in the consultation process:

1. The Forest Service determines if the proposed action would 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 would respond in writing as to whether it concurs with the conclusion in the EFH Assessment. In addition, they may provide extra conservation recommendations to minimize effects of the action on EFH.
4. The Forest Service must provide a written response to NMFS within 30 days explaining our evaluation of the conservation recommendations. The response may include reasons for not following the recommendations.

Following our 2007 agreement with the NMFS, formal consultation is initiated when the EA containing the full EFH determination is received by NMFS; the Draft EA was sent on August 19, 2015. No response was received from NMFS and the consultation requirement was fulfilled.

Essential Fish Habitat is the water and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. For EFH, “fish” refers to federally managed fish or shellfish species and their prey. Freshwater EFH in the project area includes streams, rivers, lakes, ponds, wetlands, and other bodies of water currently and historically accessible to salmon. Marine EFH in Alaska includes estuarine and marine areas from tidally submerged habitat to the 200-mile exclusive economic zone.

Essential fish habitat 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 essential fish habitat.

Freshwater EFH

The Kosciusko Project area has over 350 miles of streams in 21 watersheds. Of this total, 95.6 miles are Class I streams. These streams and tributaries provide EFH for the following federally managed fish species under the jurisdiction of the North Pacific Management Council: pink salmon, chum salmon, coho salmon, sockeye salmon, and sculpin.
Features of freshwater EFH that could be adversely affected include substrate composition, water quality and temperature, channel gradient and stability, food availability, cover and habitat complexity, and recruitment of LWD to the stream channel. It is also possible that juvenile and adult migratory access and floodplain habitat complexity could be altered should slides or mass erosion occur. Unmitigated, the temporary road construction associated with project area development would increase sediment delivery to the streams, increasing turbidity and the potential for slides and decreasing dissolved oxygen and suitable spawning gravels.

The Forest Service has determined that the Kosciusko Project would have minor additional effects of fish habitat, and therefore “may adversely affect” freshwater EFH. These adverse effects on EFH would result from the alteration of riparian and upland areas that modify the delivery and routing of water, sediment, and LWD to the stream channel. To protect these habitat features, the following mitigation and conservation measures would be in place for the entire project to minimize potential impacts:

- All harvest units adjacent to Class I streams would have no-harvest riparian buffers at least 100-feet wide or wider according to Forest Plan Standards and Guidelines;
- Windfirm buffers would be used where necessary to prevent windthrow within no-harvest riparian zones;
- The BMPs described in the unit cards would provide assurance of water quality and aquatic habitat protection for all freshwater streams affected by the project;
- Proposed new temporary roads and a stream crossing across a Class I stream would be constructed according to the Forest Plan Standards and Guidelines;
- Reconstruction of existing stream crossings at Class I, II, and III streams would be in conformance with Forest Plan Standards and Guidelines.

The planned mitigation practices are supported by field surveys of Class I streams and tributary systems in the project area to identify and protect stream channels and tributary systems potentially affected by timber harvest and road building activities. The Forest Service believes these mitigation measures would be effective and would minimize effects of this project on freshwater EFH.

**Marine EFH**

There are two Marine Access Facilities (MAF) in the project area, and a third is planned for construction: East Edna Bay, West Edna Bay, and Cape Pole. The East Edna Bay MAF is a Log Transfer Facility (LTF) under the jurisdiction of the Forest Service. It is a sloped shot rock fill with a riprap-buttressed barge loading ramp. The West Edna Bay MAF is planned for construction by the State of Alaska, and it would be connected to the Kosciusko Island Edna Bay road system. It is possible that an agreement may be reached with the State for use of this facility. The Cape Pole MAF is a decommissioned facility and is not proposed for use in this project.

The following is a list of fish species that may be found in the marine environment and could be affected by the use of the MAFs for the Kosciusko Project: arrowtooth flounder (*Atheresthes stomias*), Atka mackerel (*Pleurogrammus monopterygius*), Dover sole (*Microstomus pacificus*), flathead sole (*Hippoglossoides elassodon*), Pacific cod (*Gadus macrocephalus*), Pacific Ocean perch (*Sebastes alutus*), Rex sole (*Glyptocephalus zachirus*), rock sole (*Lepidopsetta bilineatus*), sablefish (*Anoplopoma fimbria*), sculpin (*Cottidae family*), shortraker/rougheye rockfish (*Sebastes borealis*), skates (*Rajidae family*), squid (*Cephalopoda class*), walleye pollock
(Theragra chalcogramma), weathervane scallops (Patinpecten caurinus), yelloweye rockfish (Sebastes ruberrimus), and yellowfin sole (Limanda aspera).

In addition, pink salmon, chum salmon, coho salmon, and sockeye salmon could be affected during estuarine juvenile, marine juvenile, marine immature, and maturing adult stages. The potential effects on marine EFH by rafting logs include diminished habitat for managed species and their prey, as well as reduced rearing capability for juvenile salmon from potential water quality impacts.

Primary prey items for the following species are based on the Gulf of Alaska Fishery Management Plan (NPFMC 2015; see Fisheries Report for full citation):

- Arrowtooth flounder feed in gravel-mud substrates near the seafloor. Adults feed on other groundfish. Juveniles feed on euphausiids, crustaceans, amphipods, and young pollock. Larvae feed on phytoplankton and zooplankton.
- Sablefish feed throughout the water column. Larval sablefish feed on a variety of zooplankton. Juveniles feed primarily on macrozooplankton and euphausiids. Adults are opportunistic feeders. Their main diet is other fish, including salmon fry and pollock. Other food includes benthic invertebrates, squid, jellyfish, and fishery discards.
- Sculpins mainly feed near the bottom. Prey items include crabs, barnacles, and mussels. Larger sculpins eat fish.
- Adult chum, sockeye, coho, and pink salmon are primarily fish eaters, although pelagic crustaceans and squid are also consumed (with the exception of chum), particularly by pink salmon. Juvenile salmon consume plankton and small crustaceans.
- Pacific cod are omnivorous. Adult cod feed mostly on other fish such as walleye pollock, yellowfin sole, and fisheries discard. Young cod feed mostly on invertebrates such as amphipods, crangonid shrimp, polychaete worms, and bivalves.
- Skates feed on bottom invertebrates (crustaceans, mollusks, polychaetes) and fish.
- Walleye pollock feed throughout the water column on copepods, euphausiids, young pollock, and other fish.
- Yelloweye rockfish eat primarily fish including other small rockfish, herring, sand lance, as well as caridean shrimp, small crabs, and lingcod eggs.
- Shortraker and rougheye rockfish feed primarily on shrimp, squids, and myctophids. Juveniles feed on shrimp and amphipods.
- Pacific Ocean perch are overwhelmingly planktivorous, and may eat small shrimp and squids. Juveniles eat mostly calanoid copepods and euphausiids.

Primary prey items for the following species are based on the Alaska Fisheries Science Center NOAA website:

- Atka mackerel are a schooling semi-demersal fish. Juveniles and adults eat mainly copepods and euphausiids, but have been known to eat shrimp, gastropods, annelids, and fish eggs and larvae.
• Rock sole eggs are adhesive and are laid on the bottom of the ocean. The larvae that hatch consume small zooplankton until they metamorphosis into juveniles. Juveniles are abundant in shallow, near-shore waters and feed on polychaetes and small crustaceans. Adults continue to eat small invertebrates throughout their lives.

• Yellowfin sole adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions feeding mainly on benthic infauna and epifauna, euphausiids, and fish.

• Flathead sole adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions with their diet is composed primarily of organisms living on the bottom (epibenthic) and pelagic organisms in close association with the bottom (nektobenthic). Flathead sole less than 30 centimeters total length consumed mainly mysids, gammarid amphipods, and decapod shrimps, whereas flathead sole larger than 30 centimeters total length consumed mainly ophiuroids, walleye pollock, and decapod shrimps.

• Rex sole feed almost exclusively on benthic invertebrates. Small (less than 15 centimeters Standard-Length [SL]) rex sole feed mainly on amphipods and other crustaceans. Large (15 to 45 centimeters SL) rex sole prey chiefly on polychaetes. Rex sole less than 20 centimeters SL prey primarily on euphausiids, decapod crab larvae, copepods, Oikopleura, and ostracods. Mollusks form only a minor part of rex sole diet. Euphausiids are principal prey only during summer and cumaceans and Oikopleura are more common during the winter.

• Dover sole feed almost exclusively on benthic infaunal and epifaunal invertebrates, mainly polychaetes, ophiuroids, and mollusks. Amphipods are important crustacean prey and pelecypods make up the most molluskan biomass consumed. Annelids are usually dominated in the diet of juvenile Dover sole.

The Forest Service has determined that the use of these MAFs “may adversely affect” marine EFH. The potential effects on marine EFH include diminished habitat for bottom-dwelling creatures in addition to effects on underwater vegetation used as food and potential rearing sites. All necessary federal or state permits would be obtained prior to any work for the reconstruction or maintenance of the East Edna Bay MAF. Mitigation for potential impacts to EFH is provided by:

• Adhering to the LTF Guidelines provided in the Forest Plan;
• Implementing Region 10 BMPs 14.26 and 14.27, and National Core BMPs Fac-2, Fac-5, Road-6, and Road-9, which include daily LTF cleanup and erosion control.

Geology, Minerals, Karst, and Cave

A full discussion of the geology of Kosciusko Island as well as minerals resources in the project area may be found in the Geology Report. The effects discussion as follows is focused on the potential impacts of the Kosciusko Project on karst and cave resources.

Karst and Cave Resources within the Project Area

In Southeast Alaska the karst landscape can be characterized as an ecological unit found atop carbonate bedrock in which karst features and drainage systems have developed as a result of differential solution by surface and groundwater. These acidic waters are a direct product of abundant precipitation and passage of these waters through the organic-rich forest soil and the adjacent peat lands. Recharge areas may be on carbonate or adjacent non-carbonate substrate. A few characteristics of this ecological unit include: mature, well developed spruce and hemlock
forests along valley floors and lower slopes, increased productivity for plant and animal communities, extremely productive aquatic communities, well-developed subsurface drainage, and the underlying unique cave resources.

Within the project area there is approximately 38,659 acres (55.7 square miles or 144.3 square kilometers) of carbonate bedrock into which karst systems have developed. These systems have developed from sea-level to the highest flanks of Mount Francis. Under the 2008 Tongass Land Management Plan Amendment, several Geologic Special Interest Areas were created adjacent to and within the project area. These are areas of intense karst development; their unique geomorphologic characteristics, the intensity of karst features found there, and the potential and known significant caves and their associated resources warrant recognition of these areas. 9,342 acres of Geologic Special Area were created in the planning area. In 2014, the National Defense Authorization Act for Fiscal Year 2015 changed some of those Geologic Special Areas to LUDII Geologic Conservation Areas. The land ownership of some of the Geologic Special Areas was transferred to the Sealaska Corporation. Today there are 5,135 acres of LUDII Geologic Conservation Areas and 3,452 acres of Geologic Special Areas. 754 acres of the Mount Francis Geologic Special Area was transferred to Sealaska Corporation. Of the 38,659 acres of karst in the Project Area, 23,569 acres is on lands administered by the Tongass National Forest. 15,090 acres are in private or State of Alaska ownership.

The karst vulnerability of the karst lands on Kosciusko Island have been assessed multiple times and reported on in a myriad of reports; see the Geology Report for more information. The 2008 Tongass Land Management Plan Amendment, Karst and Cave Resource Standards and Guidelines and the guidance in Appendix H of that Plan were applied throughout this project.

**Existing Condition**

The 38,659 acres of the Project area is underlain by limestone. We assume that karst has developed on all those acres. Approximately 53.6 percent or 20,718 acres of karst in the Project Area have been harvested historically. The USFS manages some 23,569 acres of karst in the Project Area of which 62.1 percent or 14,634 acres have been harvested historically. Where karst systems have developed adjacent and beneath harvested areas, it is possible that sedimentation and slash from prior harvest washed into karst features, altering the ecology of the karst system through affecting the water chemistry and flow paths. It is also possible that in areas that have already been harvested, thickly regenerated forests are causing greatly increased interception rates resulting in less water moving through the karst systems. Without the natural flow rates through the system, sediment would remain instead of being washed out. In addition, decreased water flow downstream from these karst areas results in a reduction of fish habitat where karst streams contribute to fish streams.

**Desired Condition**

Maintain to the extent practical the natural karst processes and the productivity of the karst landscape while providing for other land uses, where appropriate. Strive to maintain the productivity of the soils of the karst landscape and the quantity and quality of the waters issuing from the karst hydrologic systems. Protect the many resource values within underlying significant cave systems as per the requirements of the Federal Cave Resources Protection Act of 1988 (Forest Plan pp. 4-23 to 4-26 and pp. H-1 to H-10).
Environmental Consequences for Alternatives

Alternative 1: No Action

*Indirect Effects and Cumulative Effects*

The no action alternative is just as stated. If this alternative is chosen, no harvest or road building would occur within the project area and thus there would be no effects.

Alternative 2

*Direct and Indirect Effects*

This alternative would harvest approximately 997 acres of karst and precommercially thin 1,760 acres of karst. This Alternative would clearcut 27 acres of mature forest and harvest an additional 37 acres through group selection up to 2 acres in size. The high-vulnerability acres would be excluded from harvest. A large portion of the acreage to be precommercially thinned is in Geologic Special Interest Areas or LUDII Geologic Conservation Areas and is mapped as high vulnerability. Individual features would be appropriately buffered. The delineation of karst vulnerability classes on the lands and the protection of the highly vulnerable areas are intended to protect the karst features within the units and the karst systems beneath. No adverse effects are expected to the features or karst systems. Additionally, with the proposals intended to improve karst systems (described on page 8 under “Common to All Action Alternatives”), this alternative may have beneficial direct and indirect effects to karst hydrologic function within the project area.

*Cumulative Effects*

This Alternative would harvest approximately 64 acres of mature forest and 933 acres of young-growth by a variety of methods. This would increase the harvested karst by 0.27 percent, most harvest occurring on already harvested karst lands. No commercial harvest would occur on high-vulnerability lands. Since there would be no adverse direct or indirect effects to karst resources anticipated by this alternative, there would also be no adverse cumulative effects.

Alternative 3

*Direct and Indirect Effects*

This alternative would harvest approximately 1,545 acres of karst and precommercially thin 1,760 acres of karst. This Alternative would clearcut 27 acres of mature forest and selectively harvest an additional 37 acres. The high-vulnerability acres indicated would be excluded from harvest. A large portion of the acreage to be precommercially thinned is in Geologic Special Interest Areas or LUDII Geologic Conservation Areas and is mapped as high vulnerability. Individual features would be appropriately buffered. The delineation of karst vulnerability classes on the lands and the protection of the highly vulnerable areas are intended to protect the karst features within the units and the karst systems beneath. No adverse effects are expected to the features or karst systems. Additionally, with the proposals intended to improve karst systems (described on page 8 under “Common to All Action Alternatives”), this alternative may have beneficial direct and indirect effects to karst hydrologic function within the project area.

*Cumulative Effects*

This Alternative would harvest approximately 64 acres of mature forest and 1,481 acres of young-growth by a variety of methods. This would increase the harvested karst by 0.27 percent, most
harvest occurring on already harvested karst lands. No commercial harvest would occur on high-vulnerability lands. Since there would be no adverse direct or indirect effects to karst resources anticipated by this alternative, there would also be no adverse cumulative effects.

**Alternative 4**

*Direct and Indirect Effects*

This alternative would harvest approximately 1,523 acres of karst and precommercially thin 1,760 acres of karst. This Alternative would clearcut 27 acres of mature forest and selectively harvest an additional 37 acres. The high-vulnerability acres would be excluded from harvest. A large portion of the acreage to be precommercially thinned is in Geologic Special Interest Areas or LUDII Geologic Conservation Areas and is mapped as high vulnerability. Individual features would be appropriately buffered. The delineation of karst vulnerability classes on the lands and the protection of the highly vulnerable areas are intended to protect the karst features within the units and the karst systems beneath. No adverse effects are expected to the features or karst systems. Additionally, with the proposals intended to improve karst systems (described on page 8 under “Common to All Action Alternatives”), this alternative may have beneficial direct and indirect effects to karst hydrologic function within the project area.

*Cumulative Effects*

This Alternative would harvest approximately 64 acres of mature forest and 1,459 acres of young-growth by a variety of methods. This would increase the harvested karst by 0.27 percent, most harvest occurring on already harvested karst lands. No commercial harvest would occur on high vulnerability lands. Since there would be no adverse direct or indirect effects to karst resources anticipated by this alternative, there would also be no adverse cumulative effects.

**Common to Alternatives 2, 3, and 4**

Considering past, present, and reasonably foreseeable future projects (on NFS and other lands) relative to this project, the following effects would be expected:

1. If the vulnerability mapping and prescriptions are effective and remain windfirm, there would be no adverse effects to karst features or systems.
2. Projects on adjacent non-NFS lands should not affect the karst features on NFS land that would be protected.
3. Projects on adjacent non-NFS lands may have an effect on the karst hydrology and spring flow depending on the harvest method, soil disturbance, and harvest proximal to karst features on those lands.

**Roads on Karst**

For all alternatives specific requirements concerning road building on moderate vulnerability (Appendix H, section III.A.4.b.ii) and high vulnerability karst (Appendix H, section III.A.4.b.ii) are located in the 2008 Forest Plan. Road building on high-vulnerability karst would be avoided under all alternatives.

**Conclusions**

The harvest proposed in Alternatives 2, 3, and 4 are focused on previously harvested karst lands. No more than a 0.27 percent increase of total new harvest on karst would occur. High-vulnerability karst areas and resources would be protected and appropriately buffered.
Opportunities exist to enhance karst hydrologic function and correct karst blockages and diverted water flows from past activities. Since high-vulnerability karst acres would be excluded from harvest and individual karst features would be buffered, there would be no adverse direct, indirect, or cumulative effects to karst and cave resources anticipated by any alternative.

**Scenery**

Scenery is evaluated from locations and routes that a visitor of the Tongass National Forest uses to gain physical and visual access. These means of access are identified as Visual Priority Travel Routes and Use Areas (VPRs) which may include waterways, roads, trails, cabins, shelters, or other facilities within dispersed recreations areas. To understand the importance of scenery as a resource, it needs to be inventoried, classified, and managed with an understanding that there are activities that occur on TNF lands where landscapes may be altered from a natural forest condition. Scenic assessment includes the analysis of landscapes that allow informed management decisions affecting scenery based on the direction contained in the 2008 Tongass National Forest Land and Resource Management Plan Scenery Standards and Guidelines.

The scenic quality for a portion of Kosciusko Island would be affected by timber harvest, vegetation management, and road development activities proposed under the action alternatives. The Forest Plan Scenic Integrity Objectives are applied to any land altering activity that has the potential to affect the scenic integrity of the landscape. SIOs are a measure of alteration to the scenic appearance of landscapes and generally coincide with management objectives for specific Land Use Designations. The effects upon the scenery resource vary by the degree of alteration of proposed activities visible from Visual Priority Travel Routes and Use Areas (Forest Plan Appendix F).

**Direct and Indirect Effects**

<table>
<thead>
<tr>
<th>Viewshed</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipley Bay Cabin</td>
<td>No Change</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Sumner Strait</td>
<td>No Change</td>
<td>Slightly</td>
<td>Slightly</td>
<td>Slightly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noticeable</td>
<td>Noticeable</td>
<td>Noticeable</td>
</tr>
<tr>
<td>Sea Otter Sound to Cape Pole</td>
<td>No Change</td>
<td>Noticeable</td>
<td>Noticeable</td>
<td>Noticeable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Tuxekan Pass to Edna Bay</td>
<td>No Change</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Karheen Pass to New Tokeen</td>
<td>No Change</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Marble Pass</td>
<td>No Change</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
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<tr>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Pole Anchorage</td>
<td>No Change</td>
<td>Slightly</td>
<td>Slightly</td>
<td>Slightly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noticeable</td>
<td>Noticeable</td>
<td>Noticeable</td>
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<tr>
<td>Community of Edna Bay</td>
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<td>Negligible</td>
<td>Negligible</td>
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<tr>
<td></td>
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<td>Change</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Community of Pole Anchorage</td>
<td>No Change</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>
Alternatives 2, 3, and 4

The direct and indirect scenic effects within the Kosciusko Vegetation Management and Watershed Improvement Project have been designed to meet to Scenery Standards and Guidelines of the Forest Plan. See Table 37 for effects to scenic integrity of viewsheds by alternative.

Cumulative Effects

No Action Alternative

Since the No Action Alternative would not propose timber harvest and/or related activities there would be no activities proposed and therefore no cumulative effect from this alternative.

Table 38: Comparison of Past, Present, and Future Activities Cumulatively as a Change in Scenic Integrity.

<table>
<thead>
<tr>
<th>Viewshed</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipley Bay Cabin</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Sumner Strait</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Sea Otter Sound to Cape Pole</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Tuxekan Pass to Edna Bay</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Karheen Pass to New Tokeen</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Marble Pass</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
<tr>
<td>Pole Anchorage</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Community of Edna Bay</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
<td>Extremely Noticeable</td>
</tr>
<tr>
<td>Community of Pole Anchorage</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
<td>Negligible Change</td>
</tr>
</tbody>
</table>

Action Alternatives

The past and proposed scenic effects would meet or achieve a higher degree of scenic quality than the Very Low SIO adopted under the Forest Plan partially visible from Sea Otter Sound to Cape Pole Travel Route (VCUs 5440 and 5450), and the Sumner Strait Travel Route and Pole Anchorage (VCU 5440). Timber harvest would not be visible from the remaining VPRs in the project area (Shipley Bay Cabin, Tuxekan Pass to Edna Bay Travel Route, Okheen Pass to New Tokeen Travel Route, Marble Pass Saltwater Use Area, and the communities of Pole Anchorage and Edna Bay). Associated activities connected to the implementation of the Kosciusko Project such as road construction, landings, and rock source development, road maintenance, and precommercial thinning have been incorporated into the direct effects analysis and would not contribute further to the cumulative effects.

When adding the reasonably foreseeable future effects of the expected Sealaska Corporation and University of Alaska timber harvests, combined with the present harvest of the Edna Bay Parlay Timber Sale by State of Alaska, a scenic integrity condition below that which was adopted under
the Forest Plan would be expected for the Sumner Strait, Pole Anchorage, Sea Otter Sound, Tuxekan Pass to Edna Bay, and Community of Edna Bay viewsheds, if the timber on these lands were entirely removed at one time. This would occur even under the No Action Alternative. Other projects in the Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area listing would not further contribute to cumulative effects.

Conclusions

The direct and indirect effects would meet or achieve a higher degree of scenic integrity than defined in the Forest Plan. The cumulative effects of all action alternatives when adding the potential scenic effect of potential timber harvest proposed on Sealaska, University of Alaska, and State of Alaska non-NFS lands would not be appreciably greater than that of the No Action Alternative.

Other projects in the Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area listing not mentioned above would not further contribute to cumulative scenic effect.

Botany

Surveys for the proposed project covered various habitats throughout the project area. The majority of the surveys completed on Kosciusko Island targeted proposed timber harvest in both young-growth and old-growth habitat. Most surveys conducted were a focused (intuitive controlled) type of survey, targeting suspected habitat for rare and sensitive species within the project area (see the Botany Report and Botany BE for definitions of plant survey types). Several additional surveys were completed by Meridian Environmental Incorporated in non-development land use designations to establish some baseline rare plant information for Forest Plan Monitoring. The analysis area for direct, indirect, and cumulative effects for threatened, endangered, sensitive, and rare plants is Kosciusko Island since the effects of the proposed project activities are limited to the Island. No federally listed threatened or endangered plants are known or suspected to occur on the Tongass National Forest; therefore, only rare and sensitive plants are addressed.

Sensitive Plants

Sensitive plant species are designated by the Regional Forester because they are rare species with a viability concern due to significant current or predicted downward trends in population and/or habitat capability (FSM 2670.5.19). Two sensitive plant species populations were discovered during surveys, the lesser round-leaved orchid (*Platanthera orbiculata*) and the lichen *Lobaria amplissima*.

The lichen species *Lobaria amplissima* has been found throughout Southeast Alaska. On Kosciusko Island, *Lobaria amplissima* is known from several locations in Halibut Harbor and along the southwestern shoreline of Kosciusko Island south of South Cape Pole. It has also been found on neighboring islands, including Warren and Whale Head. *Lobaria amplissima* is not ranked globally, but is ranked by Alaska Natural Heritage Program as S1S3, meaning its rarity ranges from critically imperiled to rare within the State (AKNHP 2012; see Botany BE for full citation).

Lesser round-leaved orchid (*Platanthera orbiculata*) occurs in open forest, forest edge, and forested habitats. The known location of this species is in an area that was included in the
conveyance of land to the Sealaska Corporation. There are currently no known occurrences on NFS land.

For more information on the other sensitive species see the Botany BE.

Direct and Indirect Effects

Alternative 1
Alternative 1 would have no direct or indirect impact on any of the known populations of sensitive plants or lichen.

Alternatives 2, 3, and 4
Known Sensitive Plants and Lichen Species: Alternatives 2, 3, and 4 would have no direct or indirect effects to the known populations of *Lobaria amplissima* or lesser round-leaved orchid.

Unknown Sensitive Plants and Lichen Species: There may be direct or indirect effects to the unknown populations or habitat of *Lobaria amplissima*, lesser round-leaved orchid, yellow lady's slipper, Alaska rein orchid, and Unalaska mist-maid. These species can be found in areas where land management activities may occur.

Cumulative Effects and Determinations
Cumulative effects are the sum of direct and indirect effects from the Kosciusko Project added to effects from other projects that have occurred in the past, are presently occurring, or are expected to occur in the near future. The following activities, in addition to the proposed activities of the action alternatives, may cumulatively affect sensitive species or their habitat within the project area: road construction, road storage or decommissioning, gravel extraction, timber harvest, special use activity, and recreation (for more details on these activities, see the *Past, Present and Reasonably Foreseeable Future Activities in the Kosciusko Project Area* document, available in the project record). Individually, any effects may be minor for a species, but together could result in cumulative effects that over time impact viability. See the Biological Evaluation for Botany for more information.

Sensitive Plants or Lichen Species
Known Sensitive Species: There would be no direct or indirect effects to the documented populations of *Lobaria amplissima*. However, this lichen is known to occur on Kosciusko Island in beach fringe forests; therefore, some unknown populations could be impacted by precommercial thinning activities. Therefore, the determination for this species is “May adversely impact individuals, but not likely to cause a loss of viability in the Planning Area nor cause a trend towards federal listing.”

The lesser round-leaved orchid has been found on Kosciusko Island; therefore, unknown populations could be impacted by future management activities or on state or private land. Therefore, the determination for this species is: “May adversely impact individuals, but not likely to cause a loss of viability in the planning area nor cause a trend towards federal listing.”

Suspected Sensitive Species: No known populations of yellow lady’s slipper, Unalaska mist-maid, and Alaska rein orchid would be affected; however, since road construction, and timber harvest would affect habitat and could affect some unidentified plants/populations, the effects determination is: “May adversely impact individuals, but not likely to cause a loss of viability in the planning area nor cause a trend towards federal listing.”
**Rare Plants**

Alaska Natural Heritage Program (AKNHP) collaborates between State, federal, and private agencies as well as individuals to compile information on rare plants and animals in the State of Alaska. For botanical resources, this includes a rare vascular plant list and a rare lichen list, which were updated in 2012. Some rare plants may be considered rare that do not currently have a State ranking. Other rare plants may be included based on population viability concerns on the Tongass or for plants that have been an issue because of rarity or conservation concerns through the NEPA process.

There were 13 species of rare plants found within the project area and most were located in the 1,000-foot beach buffer, within protected riparian stream corridors, or outside proposed units. There is one population of adders-mouth orchid (*Malaxis monophyllos*) located outside but near a planned unit boundary. There are three known populations of the Alaska oniongrass (*Melica subulata*) that are also located near but outside planned units.

The rare plants that were found on Kosciusko Island include: Pacific silver fir (*Abies amabilis*), fragile rockbreak (*Cryptogramma stelleri*), and Carlott's violet (*Viola biflora ssp. carlottae*), maidenhair spleenwort (*Asplenium trichomanes*), northern golden saxifrage (*Chrysosplenium tetrandrum*), Pacific ninebark (*Physocarpus capitatus*), Alaska oniongrass (*Melica subulata*) and western meadow-rue (*Thalictrum occidentale*), mountain bladderfern (*Cystopteris montana*), twinberry honeysuckle (*Lonicera involucrata*), adder's-mouth orchid (*Malaxis monophyllos*) and whiteflower rein orchid (*Piperia candida*). For species of rare plants suspected to occur in or near the project area see the Botany Resource Report for more information.

Pacific silver fir, fragile rockbreak, and Carlott's violet are known to occur in alpine and subalpine, carbonate rock ledges and crevices, from high elevation limestone on Mount Francis which is located in the Mt Calder–Mt Holbrook LUD II area.

Maidenhair spleenwort was found on limestone cliffs and outcroppings at very low elevations, in close proximity to the beach along the southern coast of the Island.

Northern golden saxifrage, Pacific ninebark, Alaska oniongrass and western meadow-rue are known to occur along streambanks, lakeshores, fens, and beaches in the project area.

Mountain bladderfern is known to occur in timbered areas, generally associated with karst landscapes. The one population documented in the project area was found along a stream with karst influence.

Twinberry honeysuckle was found along the beach/forest edge on the west coast of Kosciusko Island.

Adder's-mouth orchid was found in muskegs, fens, and beaches, as well as roadsides and ditches. It tends to be associated with a limestone substrate or calcareous influence. The known populations occur along roadsides, the beach, and along streams.

Whiteflower rein orchid was found in forested habitats, forest edges, and muskegs. There are known populations along muskeg and forest edges. This species was found within the project area in three locations.
Direct and Indirect Effects

*Alternative 1*

Alternative 1 would have no direct or indirect impact on any of the known populations of rare plants.

*Alternatives 2, 3, and 4*

Alternatives 2, 3, and 4 would have no direct or indirect effects to the known populations or habitats of Pacific silver fir, maidenhair spleenwort, northern golden saxifrage, fragile rockbreak, mountain bladderfern, twinberry honeysuckle, adder's-mouth orchid, Pacific ninebark, western meadow-rue, and Carlott's violet. These species can be found in habitats that are located in non-development LUDs or habitats that are protected by buffers as outlined in the Forest Plan Standards and Guidelines.

There may be direct or indirect effects to the known populations or habitats of Alaska oniongrass and whiteflower rein orchid. These species can be found in habitats in which land management activities or road building may occur.

There could be impacts to unknown populations of these species; however, impacts would likely be minimal due to several factors including lack of habitat, species occurring in protected areas, Forest Plan Standards and Guidelines, minimal old-growth harvest and new road construction likely to occur.

*Cumulative Effects*

Since there would be no direct or indirect effects to the rare plant species Pacific silver fir, northern golden saxifrage, fragile rockbreak, mountain bladderfern, twinberry honeysuckle, adder's-mouth orchid, Pacific ninebark, western meadow-rue, and Carlott's violet, there would be no cumulative effects of any of the alternatives on these species.

One population of maidenhair spleenwort occurs in an area that could be impacted by future young-growth treatments.

Alaska oniongrass and whiteflower rein orchid can be found within habitats in which land management activities or road building may occur. Although there may be activity in some of these habitats with implementation of the project, the locations of new temporary roads are analyzed to minimize impacts to soils, water, and associated resources and may therefore minimize impacts to these plant species and only 1.5 miles of new temporary are proposed and only 64 acres of forested habitat are proposed for harvest. Therefore, the cumulative effects to undocumented individuals/populations or the habitats of these species would be minimal.

*Invasive Plants*

The Tongass National Forest used the Alaska Natural Heritage Program’s (ANHP) Weed Ranking Project results to create the Tongass National Forest High Priority Invasive Plant Species List (see Invasive Plants Report). This is a list of plants for which we are initiating control measures across the Forest. However, there are several species – *Phalaris arundinacea* (reed canary grass), *Leucanthemum vulgare* (oxeye daisy), *Hieracium aurantiacum* (orange hawkweed), and *Taraxacum officinale* (common dandelion) – that are well established and eradication would be impossible to achieve, so these species are not a high priority for control.
Table 39: Invasive Plant Species Present in the Project Area.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Code</th>
<th>Known Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td><em>Cirsium arvense</em></td>
<td>Canada thistle</td>
<td>CIAR4</td>
<td>One infestation on NFS 1500000 road near Cape Pole</td>
</tr>
<tr>
<td>61</td>
<td><em>Cirsium vulgare</em></td>
<td>Bull thistle</td>
<td>CIVU</td>
<td>One plant on road system west of Survey Cove; one infestation at Carwash springs</td>
</tr>
<tr>
<td>56</td>
<td><em>Crepis tectorum</em></td>
<td>Narrowleaf hawksbeard</td>
<td>CRTE3</td>
<td>Five infestations along the NFS 1500000 road near Cape Pole and NFS 1505000 and 1510000 roads</td>
</tr>
<tr>
<td>67</td>
<td><em>Geranium robertianum</em></td>
<td>Robert's geranium</td>
<td>GERO</td>
<td>One infestation under an abandoned building at Cape Pole</td>
</tr>
<tr>
<td>79</td>
<td><em>Hieracium aurantiacum</em></td>
<td>Orange hawkweed</td>
<td>HIAU</td>
<td>Ubiquitous on the open road system; also from several natural settings including Hardscrabble and Survey Creeks</td>
</tr>
<tr>
<td>61</td>
<td><em>Leucanthemum vulgare</em></td>
<td>Oxeye daisy</td>
<td>LEVU</td>
<td>Ubiquitous on the open road system and several natural settings, including wetland fens and along the beach</td>
</tr>
<tr>
<td>71</td>
<td><em>Lupinus polyphyllus</em> ssp. <em>polyphyllus</em></td>
<td>Bigleaf lupine</td>
<td>LUPOP2</td>
<td>Two infestations in Edna Bay on private land</td>
</tr>
<tr>
<td>83</td>
<td><em>Phalaris arundinacea</em></td>
<td>Reed canary grass</td>
<td>PHAR3</td>
<td>Ubiquitous on the open road system and in several natural settings, including Hardscrabble and Survey Creeks</td>
</tr>
<tr>
<td>63</td>
<td><em>Senecio jacobaea</em></td>
<td>Tansy ragwort</td>
<td>SEJA</td>
<td>Scattered infestations known along the road system</td>
</tr>
<tr>
<td>63</td>
<td><em>Schedonorus arundinaceus</em></td>
<td>Tall fescue</td>
<td>SCAR7</td>
<td>Scattered infestations known along the road system</td>
</tr>
</tbody>
</table>

The majority of Kosciusko Island is occupied by both productive and unproductive old-growth forests, intermixed with peatland, riparian, and alpine plant communities that are typically unaltered. However, on Kosciusko Island, extensive forest areas have been logged, thus their plant communities have changed to early successional types that differ in character from old-growth forests. Regeneration is rapid and most of the logged areas are covered by dense stands of 15 to 70 year-old young-growth.

There is an extensive existing road system on Kosciusko Island. The road system is utilized for timber harvesting activities and recreational purposes by residents and visitors. There are two marine access facilities near the project area in Edna Bay and Cape Pole, which could be used for the transfer of logs and equipment to and from the Island.

Baseline plant surveys on Kosciusko Island were completed in 2007. Since 2007 Forest Service employees have been on Kosciusko Island several times for project-level botany and invasive surveys. Additional invasive plants have been identified along open and closed roads, as well as native settings, such as stream banks, karst features, and beach edges. Ten species of invasive plants were found during botany and invasive surveys, which have a ranking of 60 points or more based on the ANHP weed ranking or have been identified for treatment by the Thorne Bay Ranger District.
Environmental Consequences (Overall Risk Assessment)

The overall risk of high-priority invasive plant spread in the project area as a result of any of the action alternatives is “moderate to high.” The high risk component is associated with spread of invasive plant species already in the project area along new and existing system roads. This risk level was determined based on the following factors:

- Overall increase in new temporary road corridors and landings would be low to moderate (includes temporary roads as well as reconditioned road) and about 18 miles of road maintenance.
- Traffic use on newly constructed roads during the active timber sale is anticipated to be low. After the timber sale would be complete, temporary roads would be decommissioned and are expected to eventually revegetate, forming a closed canopy that would reduce spread and minimize establishment.
- Invasive plants should remain primarily along open road corridors with implementation of mitigation measures and soil BMPs.

Risk of new invasive plant introduction and spread of existing invasive plants into natural habitats and along temporary roads is “moderate and short term.” This risk level was determined based on the following factors:

- Temporary roads and forested areas are expected to rapidly regenerate which in turn reduces light exposure, thus decreasing the susceptibility of these habitats to infestation by invasive plants.
- Mitigation and monitoring measures, including targeted control and monitoring, should prevent the spread of new high-priority invasive species and those species not yet widely distributed.
- Existing high-priority invasive plants in the project area are generally shade-intolerant.

Overall Risk by Alternative

While the project area is not an area where the oxeye daisy, orange hawkweed, and reed canarygrass are being actively controlled, the risk of spread of these invasive plants along the road corridor is high. However, with implementation of soil erosion BMPs, the risk would be lessened. For example, immediately reseeding disturbed areas in new road construction corridors with the standard weed-free seed mix should lessen the time mineral soils are exposed and open to sunlight, and therefore encouraging the establishment of non-invasive species.

Risk of spread and establishment in natural habitats is moderate and not expected to increase as a result of the action alternatives due to mitigation and monitoring measures.

Alternative 1

There is no direct increased risk of invasive plants spreading into the project area due to proposed harvest activities or road building with this alternative. The risk level for Alternative 1 is low because there would be no new ground disturbance. Indirectly, even if there are no new activities in the project area, invasive plant species currently present would continue to spread due to existing traffic and natural vectors.
Alternatives 2, 3, and 4

All the action alternatives are expected to have a high risk of the spread of existing invasive plants along new and existing road corridors. Implementation of any of the action alternatives would result in additional spread of some high-priority invasive plants. Mitigation and monitoring measures should limit the establishment and spread of invasive plants not currently in the project area and could limit the spread of some existing high-priority invasive plants not already widely distributed. Alternative 3 would have the greatest risk due to amount of road management and harvest activities and Alternatives 2 and 4 would have slightly less, equivalent risk.

Mitigation Measures

- In order to avoid the introduction of new invasive plants into and out of the project area, equipment would be cleaned before entering the area and before equipment gets transported to another road system. The contracts would include equipment cleaning provisions for off-road equipment (both harvest and road equipment) and roadside brushing machines only. These provisions would apply if equipment comes from any location other than Kosciusko Island.

- Only Forest Service approved rock sources would be used. If available, rock material free of high-priority species would be required of all new road constructions and new landings. This would require an invasive species specialist to inventory all rock sources prior to use and certify in writing that they are acceptable. Many of the existing rock quarries in the project area have already been surveyed.

- Seed sources used to revegetate the roadsides and rock quarries are no longer a vector, since the Tongass National Forest requires a seed mixture that must be certified “weed-free” or contain no more than 0.01 percent other seed, whether identified or not. This “weed-free” seeding specification would be used in all revegetation efforts (National Core BMP Road-2).

- Any new introductions of high-priority invasive plants found in the project area would be treated according to Forest Service Manual supplement (TNF 2000-2007-1), and the Region 10 and Tongass Invasive Plant Management Plan as part of the District’s program of work for invasive species management.

- The following specific invasive plant species have been identified for manual treatment (hand-pulling) or monitoring based on their limited distribution in the project area, potential for spread, and feasibility for treatment: Canada thistle, bull thistle, narrow-leaf hawk’s beard, and tansy ragwort.

Monitoring Measures

- Newly constructed roads, existing roads that were improved, and any active rock quarries in the project area would be monitored for at least 3 years after project completion for new non-native plant introductions.

- Monitor treated plant populations as noted in Invasive Plants Report and according to the Tongass Invasive Plant Management Plan and the District’s program of work.

- Prioritize the control or eradication of newly introduced high-priority invasive plant species/populations not currently in the project area after project completion and prior to closing temporary roads as part of the District 5-year program of work for invasive species management.
On-going Treatments
Independent of the mitigation and monitoring measures recommended for the project, the Forest Service also has an ongoing invasive plant program of work. This work varies from year to year, and would continue as funding allows.

Heritage
Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties eligible to the National Register of Historic Places, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The Forest Service conducted an investigation for Heritage resources within this undertaking’s Area of Potential Effect (APE). Heritage resources include the aforementioned historic properties as well as traditional cultural properties and native sacred sites. The APE is defined in 36 CFR 800 (Protection of Historic Properties) as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. To investigate the APE, the Forest Service applied the provisions of the Third Programmatic Agreement (as amended) between the Alaska Region of the USDA Forest Service, the Alaska State Historic Preservation Officer (AK SHPO), and the Advisory Council on Historic Preservation (PA). In the PA, there are two sensitivity zones in the Alaska Region recognized: high and low. Sensitivity zones are dynamic estimates or approximations based on interpretation of data from previous cultural resource investigations. Over 651 acres of the undertaking’s APE was investigated which included areas of high and low sensitivity for the aforementioned resources. Twenty-two historic properties were recorded and determined potentially eligible to the National Register of Historic Places- each of which have been removed from the APE.

Direct and Indirect Effects

Alternative 1
The No Action Alternative would result in no changes to the existing condition. Recreation and subsistence uses associated with modern lake and marine shorelines, as well as activities associated with existing roads, facilitate access to locales of high sensitivity for Heritage resources. Alternative 1 would not change that situation.

Alternatives 2, 3, and 4
Based on the results of the required archaeological examination of the APE for the undertaking Alternatives 2 through 4 contain no proposed harvest units or roads that would have a direct and significant effect on extant Heritage resources. All significant Heritage resources found during the field investigation or prior to investigation were removed from the undertaking’s APE. For Heritage purposes, the effects of the alternatives are “No Historic Properties Affected.” For Alternatives 2, 3, and 4, there would be no direct effects.

Due to the small inhabitant population on the Island relative to its size, harvest and road construction would not significantly increase access and visitation to areas of high sensitivity for heritage resources. All proposed new roads would be decommissioned or put into storage after harvest activities are complete. No indirect effects are anticipated from these alternatives.
Cumulative Effects

Based on the analysis of similar past and present timber harvests in which extant Heritage resources were removed from the project APE and looking at reasonably foreseeable future actions on NFS and other lands, there are no anticipated cumulative effects to extant Heritage resources for the proposed undertaking. In order to confirm or deny this supposition, archaeological monitoring would be conducted on the harvest while it is ongoing and after it has been completed.

Conclusion

As required by federal regulations this undertaking was investigated for potential impact to extant Heritage resources eligible to the National Register using the methodology stipulated in a Programmatic Agreement between USDA Forest Service, the Alaska State Historic Preservation Officer, and the Advisory Council on Historic Preservation. Over 651 acres of land defined as high and low sensitivity by that agreement was examined and 22 potentially eligible historic properties were found. In order to avoid an adverse effect to any of the historic properties by the undertaking each was removed from the area of potential effect. There are no anticipated direct, indirect, or cumulative effected expected from this undertaking on those Heritage resources. In order to confirm or deny this supposition, archaeological monitoring would be conducted on the harvest, while it is ongoing and after it has been completed. Each Heritage resource would be monitored during the harvest to ensure they are not affected also. The final determination for this undertaking, as per 36 CFR 800, is “No Historic Properties Affected.”

Climate Change

It is not currently feasible to reliably quantify the effects of individual or multiple projects on global climate change; therefore, determining significant effects of project alternatives on global climate change cannot be made at any scale (USDA Forest Service 2009a; see Climate Change Report for full citation). Even at the Forest Plan level, differences between alternatives in terms of the effects of climate change on the Tongass are uncertain, unquantifiable, and likely to be insignificant (especially when compared to other routine human activities in the area). This analysis provides a qualitative assessment of the possible impacts of the proposed alternatives on climate change, but does not attempt to calculate quantifiable impact values.

Direct and Indirect Effects

Alternative 1

Climate Change

The current rate of climate change would likely continue with the implementation of Alternative 1. While it is not possible to quantify changes this project might have on local, regional, or global climate change, it is reasonable to assume that this alternative would have less of an effect than the action alternatives.

Carbon Sequestration

The rate of carbon sequestration would likely continue at the current rate if this alternative was chosen.
Alaska Yellow-cedar Regeneration

Yellow-cedar decline and regeneration would likely continue at the same rate if Alternative 1 was selected. Decline and regeneration of Alaska yellow-cedar is directly related to seasonal snow pack (loss of snow cover at lower elevations) and thawing cycles in late winter, and the No Action Alternative is not anticipated to have an effect on either factor.

Greenhouse Gas Emissions

The carbon dioxide equivalent (CO₂e) is the unit typically used when reporting greenhouse gasses (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). Under the No Action Alternative, CO₂e emissions are anticipated to stay the same. No new construction-related CO₂e emissions would be generated; however, CO₂e production would continue on Kosciusko Island as a result of existing vehicle, aviation, and other commercial and private activity.

Alternatives 2, 3, and 4

Climate Change

The action alternatives are expected to have no measurable impact on the global, regional, or local climate. It is reasonable to assume the action alternatives would lead to slightly higher levels of CO₂e emissions related to the changes in old-growth versus young-growth forests within the project area. The increase in greenhouse gas (GHG) emissions produced as a result of the project operations is also predicted to not lead to any measurable or long-term changes in climate.

Carbon Sequestration

Mature forests in Alaska are considered carbon “sinks”, meaning these forest stands accumulate more carbon than they release (2008 Forest Plan FEIS, p. 3-17; see Climate Change Report for full citation). The regeneration of trees that follow timber harvest has rapid growth relative to old-growth, which also accumulates carbon into the system.

Overall, under the action alternatives, the rate of carbon sequestration would likely continue at the current rate, and a quantifiable change from implementation of either alternative would be difficult to detect, and would not lead to measurable effects locally, regionally, or globally.

Alaska Yellow-cedar Regeneration

The action alternatives are not expected to affect the rate of Alaska yellow-cedar decline and regeneration. Decline and regeneration of Alaska yellow-cedar is directly related to seasonal snow pack (loss of snow cover at lower elevations) and thawing cycles in late winter, and these alternatives are not anticipated to have an effect on either factor.

Greenhouse Gas Emissions

For all action alternatives, road construction activities, timber harvest operations, and administration of the project would result in a slight and temporary increase in the emission of greenhouse gases due to CO₂e emissions from fuel combustion during sale activities.

The relative amounts of GHGs for each action alternative is proportional to the amount of road construction and harvest operations. Each alternative would have an insignificant overall contribution to GHGs at any scale.
Cumulative Effects

All Alternatives
None of the alternatives proposed in this EA, combined with any past, present, or reasonably foreseeable activities, are predicted to contribute any measurable effects to climate change, carbon sequestration, Alaska yellow-cedar regeneration and decline, or greenhouse gas emissions locally, regionally, or globally.