CHAPTER 3
ENVIRONMENT AND EFFECTS

Environment and Effects

Introduction

This chapter combines the affected environment and environmental consequences discussions required by the NEPA implementing regulations (40 CFR 1500-1508). The discussions are combined so that the environmental consequences (effects) of the alternatives on forest resources and the background information needed to understand these consequences are discussed together for each resource.

Each resource is first described by its current condition, uses, supply, and demand, or expected use, along with an explanation of how each resource is measured and evaluated. The descriptions are limited to providing the background information necessary for understanding how the Draft Environmental Impact Statement (DEIS) alternatives may affect the resource. Methodology and scientific accuracy is discussed for most resources.

Existing conditions reflect the extensive changes brought about by long-term human occupancy and use of the forest and represent the present-day condition resulting from past and present actions. Effects include the short- and long-term effects that would result from each of the alternatives considered in this DEIS. Cumulative effects may result when the direct (in this case there are no direct effects) and indirect effects associated with the alternatives are added to the effects associated with other past, present, or reasonably foreseeable actions. Cumulative effects analyses are presented in the effects sections for each resource. Analysis of long-term cumulative effects extends at least 25 years into the future and to 100 years in many cases. A list of past, present, and reasonably foreseeable projects considered, is provided in Appendix B, Cumulative Effects.

Many of the relationships established and discussed in the 1997 Tongass Land and Resource Management Plan (Forest Plan) Revision Final EIS (FEIS), the 2003 Supplemental EIS (SEIS), the 2008 Forest Plan Amendment EIS, and the 2016 Forest Plan FEIS are still valid and, therefore, are incorporated by reference in this DEIS. However, this DEIS updates some of this information to better reflect current conditions and focuses on the potential effects most relevant to the potential changes that could occur from this proposed action and the alternatives.

An effort was made to obtain and use the best available information to evaluate and compare the effects of alternatives. NEPA implementing regulations (40 CFR 1502.22) state that when “there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.” This was done where appropriate. The regulation requirement goes on to say that if the incomplete information “is essential to a reasoned choice among alternatives” then considerations, such as the cost of obtaining it, apply. This DEIS, in conjunction with the analyses presented in the 2016 and 2008 Forest Plan Amendments and the 1997 Forest Plan Revision FEIS, along with their planning records, will provide the USDA Secretary or Undersecretary of Agriculture with the “essential” information needed to make a reasoned choice among alternatives.

Analyzing Effects

Following each resource description is a discussion of the potential effects (environmental consequences) to the resource associated with implementation of each alternative. All significant or potentially significant effects, including direct, indirect, and cumulative effects, are disclosed. Effects are quantified, where possible, although qualitative discussions are also included. Mitigation measures are also described, if relevant.

3 Environment and Effects

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity but could be significant in the foreseeable future.

Potential adverse environmental effects that cannot be avoided are discussed. Unavoidable adverse effects are those resulting from managing the land for one resource, while recognizing impacts on the use or condition of other resources. Some adverse effects can be reduced or mitigated by limiting the extent or duration of effects.

Short-term uses, and their effects, are those that occur annually or within about 10 years. Long-term productivity refers to the capability of the land and resources to continue producing goods and services for 50 years and beyond. Long-term and cumulative effects may be projected out 100 years or more, as needed, to fully analyze the potential consequences for specific resources.

For estimating the effects of alternatives at the programmatic level, the assumption is made that the kinds of resource management activities allowed under the 2016 Forest Plan will in fact occur under each alternative. The actual location, design, and extent of such activities are, however, not known at this time because that is a project-by-project decision. In many cases, the discussions refer to the potential for effects to occur, realizing that in many cases these are only estimates. For example, harvests are assumed to occur at the level authorized by the 2016 Forest Plan, even though this level of harvest may or may not occur.

The effects analysis is useful in comparing and evaluating alternatives but should not be applied per se to any specific location within the Forest. Thus, the effects presented here are comparative in nature. Specific effects that can be meaningfully measured and evaluated generally occur at the project and activity stage.

Cumulative Effects

Cumulative effects result from the incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. For this analysis, the area considered for cumulative effects varies according to the resource being assessed. Cumulative effects are discussed in detail for each resource in this chapter. Appendix B describes the projects considered for cumulative effects analysis.

For most aquatic or watershed-related resources, the area within the proclaimed Forest boundary (approximately 17.9 million acres, including 1.2 million acres of non-National Forest System [NFS] lands) was used and analyses were generally conducted at the watershed scale (sixth-level hydrologic unit).

For wildlife and other terrestrial resources, all of Southeast Alaska from Yakutat Bay southeast to the southeastern end of Alaska (approximately 21.6 million acres, including 4.8 million acres of non-NFS lands) is sometimes used for the analysis, although some analyses will be based on the area within the Forest boundary, depending on the availability and quality of available information. Often, Wildlife Analysis Areas (WAAs) will be used to summarize information. In addition, biogeographic provinces will be used to summarize cumulative effects information for wildlife and other terrestrial resources.

For social, economic, recreation, and related human uses, all of Southeast Alaska and adjacent areas will be given consideration for cumulative effects, especially regarding economic, market, and other factors.

Geographic Information System Database and Quantification for this EIS

The Forest Service has developed an extensive computerized geographic information system (GIS) database that is continually improved and updated and is used for programmatic and project-level analyses. However, the use of newer computer mapping and measurement techniques that are more accurate than earlier methods, and the use of updated data, affects the numbers. In general, the differences between previous documents and the baseline numbers used in this DEIS are small, and do not affect the analysis relationships among these documents.

The ongoing management of the Tongass National Forest and updating of data can affect comparability of baseline numbers. Examples include changes in land ownership, changes in resource conditions resulting from timber harvest and road construction, updating of resource data based on field surveys or other analyses, and forest plan amendments.

It should be noted that in some cases acreages are measured that depend on overlaying of multiple data coverages. The acreage measurements for individual categories may need adjustment to account for the fact that coverages are not registered precisely due to scale and data quality attributes. (e.g., along property boundaries, saltwater shorelines, lake edges). Very slight misalignment of the coverages can result in polygon slivers between the coverages, which can produce acreage differences initially. These differences can amount to tens or hundreds of acres or more, especially because of the large area (17 million acres) under analysis. However, on a percentage basis, these necessary adjustments are insignificant.

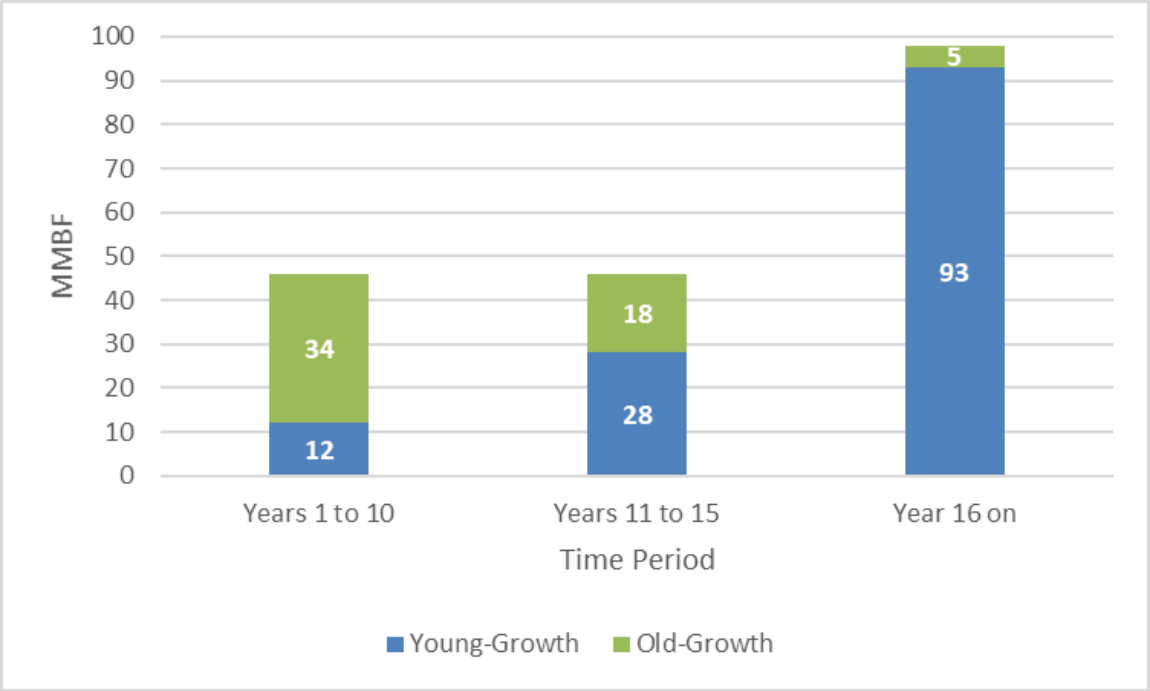
The figures presented are generally rounded to the nearest whole acre, whole mile, or whole percent. Sometimes they are rounded to tens, hundreds, or thousands, but when numbers are given to the nearest acre or tenth of a mile, it does not necessarily mean that they are accurate to that level. No attempt has been made to adjust rounded numbers to force their sums to equal the expected totals. Therefore, the sum of rounded individual numbers will often be one digit higher or lower than the expected sum. The sums that are presented are the sums of the unrounded numbers.

2016 Forest Plan Amendment

The 2016 Forest Plan amendment responded to a July 2013 Memorandum (1044-009) that directed the Forest Service to transition to a young-growth–based timber management program on the Tongass National Forest within 10 to 15 years, with the goal that at the end of this period the vast majority of timber sold by the Tongass will be young growth. The Secretary's memorandum indicated that this transition to young growth should be implemented in a manner that would preserve a viable timber industry that provides jobs and opportunities for Southeast Alaska residents

Based on the Pacific Northwest Research Station demand projections for 2015 to 2030 (Daniels et al. 2016), the Record of Decision (ROD) for the 2016 Forest Plan FEIS established an annual PTSQ of 46 MMBF prior to the young-growth transition. Under the alternative selected in the ROD, harvest volume would consist of old-growth and young-growth harvest, with old growth decreasing as a share of total volume (46 MMBF) over time as more young growth becomes economic to harvest. Young-growth volume as a share of the total would continue to increase until it reaches 41 MMBF per year (full transition). Under the Forest Plan, the Forest Service expected to sell an average of about 12 MMBF of young growth and 34 MMBF of old growth per year during the first 10 years to reach the estimated quantity of timber expected to be sold during the first decade, 460 MMBF. From Year 11 through Year 15, the Forest Service expected to sell an average of 28 MMBF of young growth and about 18 MMBF of old growth per year. The Forest Plan was expected to reach a full transition of 41 MMBF of young growth around Year 16. Young-growth sales were expected to continue to increase at a rapid rate after Year 16 and reach an upper limit of 93 MMBF around Year 18 (Figure 3-1). Following the transition, old-growth timber would continue to be offered at an average rate of 5 MMBF per year to support small operators and specialty products such as wood for musical instruments (USDA Forest Service 2016c).

Figure 3-1
Estimated Maximum Harvest under the 2016 Forest Plan Amendment



Source: USDA Forest Service 2016c

Land Use Designation Groupings

For many resources, the effects and the differences in effects among the alternatives are best identified through the LUD) allocations. While each LUD has a different management prescription, many are similar in the kinds of effects they would potentially create. Based on this and to simplify the identification of effects, the LUDs have been grouped into four categories: Wilderness, Natural Setting, Moderate Development, and Intensive Development. For some analyses, the LUDs are grouped into two categories: Wilderness and Natural Setting LUDs make up the non-development LUDs and Moderate and Intensive development LUDs make up the development LUD category. Therefore, acreages in this EIS generally reflect the underlying LUD acreages. Table 3-1 displays these LUD groupings.

Table 3-1
Land Use Designation Groupings Used to Discuss Effects

LUD Group	Land Use Designation
Non-development LUDs[3]	
Wilderness LUD Group	Wilderness
	Wilderness National Monument
	Nonwilderness National Monument
Natural Setting LUDs	LUD II
	Remote Recreation
	Semi-Remote Recreation
	Old-Growth Habitat
	Municipal Watershed
	Research Natural Area[1]
	Special Interest Area[1]
	Wild River[1]
	Scenic River
	Recreational River
Development LUDs	
Moderate Development	Experimental Forest[3]
	Scenic Viewshed
	Modified Landscape
Intensive Development	Timber Production
Overlay LUD[2]	
	Minerals

Notes:
[1] These three LUDs function as overlay LUDs (see footnote 2) when they occur within Wilderness, Wilderness National Monument, or LUD II areas.
[2] The Minerals LUD is an overlay LUD. Areas allocated to this LUD are managed according to the underlying LUD until such time that mineral development is approved, if at all. Generally, acreages in this EIS do not include the Minerals, but rather the underlying LUD.
[3] Sometimes Experimental Forest, which is a minor LUD in terms of acreage, is included with Non-development LUDs.

Land Divisions

The land area of the Tongass National Forest has been divided in different ways to describe the different resources and how they are affected by the alternatives. These divisions vary by resource because the relationship of each resource to geographic conditions and zones also varies. Several of these divisions are described briefly here.

Watershed

The 6th-level hydrologic unit code polygons were used for some watershed/fisheries effects. These come from the national Watershed Boundary Dataset.

Geographic Provinces

These are seven large land areas that are distinguished by differences in ecological processes. They are defined by a combination of climatic and geographic features. Geographic provinces are used in the evaluation of Research Natural Areas and Wild and Scenic Rivers. See the *Research Natural Areas* section of the 1997 Forest Plan Revision FEIS for a description of each province.

Biogeographic Provinces

Biogeographic provinces are areas within which certain kinds of plants and animals tend to occur together. They are defined by a combination of similarity in species, patterns of distribution of species, and natural characteristics or barriers. Twenty-one biogeographic provinces occur on the Tongass. They are used in the *Biological Diversity* and *Wildlife* sections.

Wildlife Analysis Areas

WAAs are land divisions used by the Alaska Department of Fish and Game. Approximately 190 WAAs apply to the Tongass National Forest; they average slightly less than 90,000 acres in size. In general, WAA boundaries correspond with Value Comparison Unit (VCU) boundaries, and they typically include three to eight VCUs (averaging just under five). They are used in the *Subsistence* and *Wildlife* sections.

Game Management Unit

Geographical areas defined by the Alaska Department of Fish and Game (ADF&G) to manage wildlife populations. Legal hunting and trapping regulations govern each unit.

Organization of Chapter 3

The remainder of Chapter 3 is divided into two parts, key issues and other important issues. Key Issues addresses the three key issues covered in Chapters 1 and 2 and Other Important Issues covers the other ten issues addressed in detail in this EIS.

Key Issues

Key Issue 1 – Roadless Area Conservation

Affected Environment

Roadless Area Characteristics

In the 2001 Roadless Rule, IRAs were drawn from undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act and were inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE) II process and subsequent updates and forest planning analyses. The IRA boundaries associated with the 2001 Roadless Rule (USDA Forest Service 2000), are identified in a set of maps, associated with the Forest Service Roadless Area Conservation, Final Environmental Impact Statement (FEIS), Volume 2, dated November 2000.

The characteristics of the IRAs within the Tongass are described within Appendix C to the 2016 Tongass Land Management Plan Revision, Final Supplemental EIS (SEIS), Roadless Area Evaluation for Wilderness Recommendations (USDA Forest Service 2003a).

Roadless characteristics (i.e., values or features that make the area meet the minimum criteria for wilderness consideration under the Wilderness Act) are described in the Roadless Area Conservation FEIS (USDA Forest Service 2000, Vol. 1, pp. 3-3 to 3-7). These have been modified for Alaska conditions and are summarized below in Table 3.1-1.

Table 3.1-1
Roadless Area Characteristics

2001 Roadless Rule Characteristics, Modified for Alaska
Biological Values
• Diversity of plant and animal communities and old-growth forests • Habitat – Roadless areas are expansive areas where high-quality intact habitat exists and ecosystems function with all their native species and components. Roadless areas serve as habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land.
Physical Values
• Environment – high-quality or undisturbed soil, water, and air. • Water – roadless areas provide a variety of water resources including public drinking water sources, fish and aquatic resources, and hatchery aquatic resources.
Social Values
• Remoteness – Roadless areas provide economic opportunity due to rich primitive, semi-primitive motorized, and semi-primitive non-motorized classes of dispersed recreation. • Landscape – reference landscapes of relatively undisturbed areas that serve as a barometer to measure the effects of development on other parts of the landscape. • Scenery – natural-appearing landscapes with high-scenic qualities that people value. • Cultural – rich in traditional cultural properties and sacred sites. • Locally-unique characteristics – geographic areas with additional locally-unique characteristics specific to Alaska including: 1) important sources of subsistence resource; 2) rich habitat that supports multiple species of fish for personal, subsistence, sport, recreation, and commercial harvest; and 3) supports diverse economic opportunity that is especially important for rural community well-being.

Source: USDA Forest Service 2000, modified to reflect the unique characteristics of Alaska.

3 Environment and Effects

The roadless area inventory displays the extent of the roadless resource and provides data for use by managers, legislators, and others to formulate land management proposals. Roadless areas may retain their roadless character by being managed in a way that emphasizes relatively large undeveloped or natural areas, such as areas usually required for old-growth habitat, scenic backdrops, or primitive recreation.

Table 3.1-3 (in the *Environmental Consequences* section below) provides an overview of the IRAs identified in the 2001 Roadless Rule. These areas consist of approximately 9.2 million acres spread over 110 separate IRAs ranging in size from just 465 acres (Fake Pass IRA 532) to 1.19 million acres (Juneau-Skagway Icefield IRA 301). All but 5 of the 110 IRAs identified in the 2001 Roadless Rule are larger than 5,000 acres.

Ecosystem Services

Ecosystem services are the products of functioning ecosystems that often are available without direct costs to people who benefit from them (Kline 2006).

These services have been described in a number of different ways including the typology developed by the Millennium Ecosystem Assessment (2005), which is featured on the Forest Service's Ecosystem Services web site (http://www.fs.fed.us/ecosystemservices/) and identifies four general categories of ecosystem services: provisioning, regulating, cultural, and supporting.

Provisioning services include wild food, fresh water, and fiber. Regulating services are the benefits obtained from ecosystem impacts on natural processes, such as air quality, climate stabilization, water quality, and erosion. Cultural services include recreation, aesthetic, educational, and spiritual and religious benefits. Supporting services are the underlying processes that maintain the conditions for life on Earth, such as nutrient cycling and soil formation (Smith et al. 2011).

The concept of ecosystem services has emerged as a way of framing and describing the comprehensive set of benefits that people receive from nature. The Forest Service has been exploring use of these concepts to describe the benefits provided by forests, but the ecosystem service approach has not been applied operationally in a management context. The Forest Service's Pacific Northwest Research Station issued a technical report that attempts to define an economics research program to describe and evaluate ecosystem services (Kline 2006). More recently, the Pacific Northwest Research Station and the Deschutes National Forest have partnered to develop a place-based application to explore how this type of approach might be implemented by a national forest to enhance forest stewardship. Ecosystem services are discussed at the forest planning level for the Tongass National Forest in the 2008 Forest Plan EIS (USDA Forest Service 2008b, pp. 3-544 to 3-556). The 2008 Forest Plan EIS also discusses non-use values, including existence, option, and bequest values (USDA Forest Service 2008b, pp. 3-551 to 3-552).

Environmental Consequences

The following analysis evaluates roadless area protection in terms of the acres designated as roadless and the degree of regulatory protection provided by the specific variations of the roadless rule language. Variations in the roadless rule language would generally allow more activities to take place, but all management activities on the Forest would remain subject to the 2016 Forest Plan standards and guidelines that directly and indirectly protect roadless area characteristics.

Comparison of Effects on Roadless Characteristics by Alternative

The following sections provide an overview of the potential effects to the roadless area characteristics identified in the 2001 Roadless Rule and summarized above in Table 3.1-1.

Roadless Characteristics: Biological Values

One major category of roadless area characteristics is biological value. Roadless areas are considered high in biological value if they contain a diversity of plant and animal communities, old-growth forests,

and/or habitat for threatened, endangered, or sensitive species or wide-ranging species that are dependent on large, undisturbed tracts of land. These values are of special importance on the Alaska national forests and particularly on the Tongass, because it, along with adjacent areas in Canada, represents the largest intact tract of coastal temperate rainforest on earth. In addition, the fish and wildlife on the Tongass are of exceptionally high importance for subsistence, recreation, and the economic well-being of the residents and visitors of southeast Alaska.

Of primary importance and of highest value in roadless areas on the Tongass are biological diversity, especially associated with old-growth habitats, and sensitive species, endemic species, and the wide-ranging predators of Southeast Alaska. The threatened and endangered fish and wildlife associated with the Tongass National Forest are all marine-oriented species and have only minor associations with the roadless areas of the Tongass (see Key Issue 3, *Fish* and *Wildlife* sections of this DEIS). There are no threatened or endangered plant species known to occur on the Tongass National Forest (see *Sensitive and Invasive Plants* section of this DEIS).

Biological Diversity and Old-Growth Habitat Conservation Strategy

Biological diversity of the Tongass, associated with old-growth forests, is considered of high importance to residents and visitors to the Tongass and from a national and worldwide perspective. Protection of this resource has been given high priority by the Tongass National Forest through the Old-growth Habitat Conservation Strategy, which was originally developed for the 1997 Forest Plan and has subsequently been carried forward through the 2008 and 2016 Forest Plan FEISs (USDA Forest Service 2008a, 2016a).

The effects of the alternatives on biological diversity and the Old-growth Habitat Conservation Strategy are described in detail in the *Biological Diversity* section of this DEIS. Effects related to old-growth harvest acres are the same as those for Alternative 1 under the 2016 Forest Plan FEIS, which prescribes a harvest level much lower than the level originally allowed under the Conservation Strategy (see 1997 Forest Plan and 2008 Forest Plan Amendment). However, effects due to the distribution of harvest, related to fragmentation and connectivity, would vary. Alternatives 1, 2, and 3 would have very low effects, while Alternatives 4, 5, and 6 would have greater effects because of entry into more remote watersheds and roadless areas.

Habitat in Roadless Areas

Roadless areas provide expansive areas of high-quality intact habitat for the full range of native species and ecosystem components. These include threatened, endangered, and sensitive species, endemic species, and wide-ranging species dependent on large, undisturbed areas.

The Tongass National Forest currently has no threatened or endangered species associated with terrestrial habitats. However, it does have 16 plant and 4 bird species designated as sensitive (Key Issue 3, *Fish* and *Wildlife* sections and the *Sensitive and Invasive Plants* section). Of the 16 sensitive plant species, only 4 species have known occurrences expected to be within suitable young-growth or old-growth harvest areas. For these populations and for previously undocumented populations that are located during project surveys, Forest-wide standards and guidelines under all alternatives would result in consideration for protection to minimize impacts to these species. Among the bird species, three are marine or shoreline species and are expected to be protected from almost all adverse effects by Forest Plan LUDs and standards and guidelines. However, the Queen Charlotte goshawk (*Accipiter gentiles laingi*) is a wide-ranging species that seems to prefer mature and old-growth forest habitats for nesting and foraging. This species would be affected under all alternatives; effects would generally be similar among the alternatives but slightly higher for Alternatives 4, 5, and 6 because of longer road developments and associated fragmentation expected under these alternatives relative to Alternatives 1, 2, and 3.

Endemic species occur in isolated populations and can have limited mobility or specific habitat requirements (see *Key Issue 3, Wildlife* section). Thus, they are vulnerable to the effects of habitat loss and fragmentation, introduced non-natives, pathogens and disease, natural events (i.e., climate change), and overharvesting (Dawson et al. 2007). Although timber harvest levels are the same among all

alternatives, Alternatives 4, 5, and 6 would have the greatest potential for effects on endemics because the degree of fragmentation is likely to be higher under these alternatives (landscape connectivity and fragmentation are discussed in detail in the *Biological Diversity* section). Most endemic species would benefit from the transition to young-growth harvest permitted under all alternatives due to the reduced amount of scheduled productive old-growth harvest over the long term.

Roadless areas may be of greatest value to wide-ranging species that require large, undisturbed areas of land. In general, this group consists of predators. Three mammals are included in this category: Alexander Archipelago wolf (*Canis lupus ligoni)*, brown bear (*Ursus arctos*), and American marten (*Martes americana;* see Key Issue 3, *Wildlife* section). These species are of concern because their numbers are relatively low (they are at or near the top of the food chain), they are under harvest pressure (which is affected by access), they are sensitive to disturbance, and they range widely so they are often subject to many disturbances within their home ranges. Remote roadless areas often represent optimum habitats for them and may serve as important refugia for populations under harvest and development pressures. Of greatest concern on the Tongass is the Alexander Archipelago wolf, particularly on Prince of Wales and surrounding islands. Although the alternatives would be similar in terms of overall harvest levels, Alternatives 4, 5, and 6 would result in the largest adverse effects on these species because of greater road lengths, penetration into remote roadless areas, and habitat fragmentation that they would produce relative to Alternatives 1, 2, and 3.

Roadless Characteristics: Physical Values

The physical values associated with roadless areas include soils, water, and air. The Tongass roadless areas are generally in near pristine condition in terms of soils, water quality, and air quality.

Large acreages of excessive soil erosion, detrimental soil disturbance, or landslides attributed to management activities generally do not exist within roadless areas. However, there are localized areas within the roaded roadless portion that include past management-related soil impacts. During project-level analysis, areas sensitive to surface erosion or landslides are identified and appropriate mitigation measures including the Forest-wide standards and guidelines for Soil and Water (USDA Forest Service 2016a) are used to reduce surface erosion and sediment production. Although timber harvest, energy project development, mining activities, and other development would be similar under each alternative, the potential for adverse impacts on the soil and water resource in roadless areas would differ slightly among the alternatives based on different levels of projected road construction. Alternatives 4, 5, and 6 would have a slightly larger potential for adverse effects, relative to Alternatives 1, 2, and 3, because they are expected to result in slightly more road development. However, the differences among alternatives would be minor because effects from those projected activities would be mitigated through the use of site-specific analysis, Forest-wide standards and guidelines, and other best management practices (BMPs), including post-project rehabilitation of disturbed soil. In addition, actual impacts on water quality anticipated from any alternative would be small in magnitude and scattered over a wide geographic area. Most of the potential effects would be of short duration, with disturbed soil areas rehabilitated after projects are completed in those areas.

Effects on air quality would also not substantially differ among alternatives. Based on the projected land management activities that differ among alternatives, atmospheric emissions in roadless areas are not anticipated to directly, indirectly, or cumulatively increase to a level that would be likely to exceed state or federal air quality standards. Air quality impacts from dust emissions would be negligible and would not vary significantly by alternative.

Roadless Characteristics: Social Values

The social values considered under roadless characteristics include remoteness, scenic quality, traditional cultural areas and sacred sites, reference landscapes, and other locally-unique characteristics. The current condition of most roadless areas on the Tongass is nearly pristine relative to these social values. Exceptions include the roaded roadless areas, where previous road development and timber harvest has taken place and localized areas along the shoreline where historic development has occurred or localized areas where mining-related activities have occurred.

Roadless areas provide recreation opportunity due to rich primitive, semi-primitive motorized, and semi-primitive non-motorized Recreation Opportunity Spectrum (ROS) classes of dispersed recreation. Approximately 95 percent of the 2001 roadless areas on the Tongass consist of primitive and semi-primitive ROS classes, and almost two-thirds of these are primitive. Under Alternative 2, roaded roadless and other substantially altered areas would lose regulatory protection as designated roadless. The net change in roadless designations would result in 17,700 acres of suitable old growth and 10,300 acres of suitable young growth. The areas removed from roadless are 64 percent Roaded Modified and Roaded Natural and 35 percent semi-primitive ROS classes. Under Alternative 2, approximately 95 percent of Tongass roadless areas would be maintained as primitive and semi-primitive ROS classes (see *Recreation and Tourism* section for further details).

Under Alternative 3, approximately 96 percent of the roadless areas on the Tongass would be maintained as primitive and semi-primitive ROS classes. The net changes in roadless designations would provide 75,700 acres of suitable old growth and 13,900 acres of suitable young growth. Under Alternatives 4 and 5, the remaining roadless areas would maintain approximately 96 and 98 percent of their areas as primitive and semi-primitive ROS classes, respectively. The net change in roadless designations under these two alternatives would provide 158,400 and 165,400 acres of suitable old growth and 14,600 and 16,600 acres of suitable young growth, respectively. With Alternative 6, all regulatory roadless designations would be removed. The areas removed from roadless designation would provide 165,000 acres of suitable old growth and 20,000 acres of suitable young growth. Under Alternatives 1, 2, 3, 4, and 5, the retained roadless areas would remain similar in terms of their ROS allocations. The exception would be Alternative 6, which would include no retained roadless designations.

Similarly, outfitter-guide use on the Tongass includes activities in more remote areas. The majority of these areas would be retained as roadless under Alternatives 1, 2, and 3. Substantially more lands in the primitive ROS class would be removed under Alternatives 4, 5, and 6.

Scenic Quality

The Tongass National Forest offers a variety of high-quality scenery to its visitors, from spectacular mountain ranges and glaciers to low-lying marine landscapes composed of intricate waterways, bays, and island groups. Scenic quality is based on two definable elements, landscape character and scenic integrity. Tongass roadless areas have natural appearing landscapes and have very high scenic integrity and generally have high value for landscape character as well. The exception for scenic integrity is the roaded roadless areas, which have significantly reduced scenic integrity because of past harvest and road construction. Roadless areas are viewed from a variety of vantage points, including the communities of Southeast Alaska, the Alaska Marine Highway ferry route, cruise ship routes, existing road systems, popular small boat routes and anchorages, small aircraft, and hiking trails.

Road construction and timber harvest can have varying degrees of adverse effects on the scenic integrity of a landscape. In most studied viewsheds, the highest effects on scenery would be associated with Alternatives 5 and 6, followed in order by Alternative 4, Alternative 3, Alternative 2, and Alternative 1. In addition, Alternatives 4, 5, and 6 would likely result in more road development to reach more remote places, which would have a greater adverse effect on scenery than with less road development under Alternatives 1, 2, and 3. Road mileage differences, however, would not be large, because all alternatives would have the same level of harvest.

Traditional Cultural Properties and Sacred Sites

All alternatives require compliance with existing laws and regulations; therefore, before any management actions take place, the standard process for considering effects would be conducted as required by the implementing regulations for the National Historic Preservation Act and other relevant law, policy, and guidance provided in agreement documents. In most cases impacts would be avoided or mitigated. Tribal consultation is an integral part of the planning process for management actions; as well as consultations with the State Historic Preservation Officer and other interested parties.

For cultural resources, including historic and traditional cultural properties/heritage sites, prior to management actions taking place on the ground under any alternative, resource inventories and

appropriate mitigation are required by law. Increasing risk to cultural resources may occur under Alternatives 4, 5, and 6 because of potentially greater road lengths and potential activity in areas currently and previously protected from development, associated with harvest activities.

Reference Landscapes and Locally Identified Unique Characteristics

A range of distinctive characteristics occur within the Tongass roadless areas. Many of these are already identified in the Forest Plan and managed as Special Interest Areas. These include Geological Areas, Recreation Areas, Zoological Areas, Botanical Areas, Cultural Areas, and Scenic Areas. Special Interest Areas cover 184,000 acres within 2001 roadless areas. In addition, a number of Research Natural Areas occur within the Tongass roadless areas (21,000 acres). The Research Natural Areas, along with some of the Special Interest Areas, serve as reference landscapes. Further, a number of river corridors are managed under the Forest Plan as wild and scenic rivers. Within 2001 roadless areas, there are 13,000 acres of Recreational River, 15,000 acres of Scenic River, and 40,000 acres of Wild River. Finally, there are other small areas, not included within these special LUDs, such as areas with unique karst features that occur within roadless areas.

Altogether, these special LUDs cover 273,000 acres within 2001 roadless areas (Alternative 1). Under Alternative 2, these acres would actually increase slightly to 275,000 acres, and they would be little changed under Alternatives 3, 4, and 5 at 270,000 acres, 268,000 acres, and 272,000 acres, respectively. However, under Alternative 6, the roadless acreage within these special LUDs would decrease to zero.

Alternative 1

Under Alternative 1 there would be no change in the boundaries of the IRAs identified in the 2001 Roadless Rule and no changes to current management (Table 3.1-2, Figure 3.1-1). This alternative would continue the general prohibitions on tree cutting, sale, and removal and road construction/reconstruction within IRAs (9.2 million acres), with some of those activities permitted under certain exceptions. There would be no impact to existing Forest-wide roadless characteristics under this alternative. Existing IRA boundaries would not be corrected or modified to address ownership changes and updated mapping.

Viewed relative to the action alternatives, along with Alternative 2, Alternative 1 would protect the most acres and existing management direction would provide the highest degree of protection, with the existing general prohibitions remaining in place.

Alternative 2

Under Alternative 2, there would be a net gain in roadless area acres, with 9.22 million acres managed as ARAs (Table 3.1-2, Figure 3.1-1). As discussed in Chapter 2, this net increase in acres would result from gains exceeding reductions in roadless areas. In addition to gains and losses from ownership changes and updated mapping, gains would include the addition of LUD II acres not designated as roadless in 2001, while losses would include the removal of approximately 113,000 acres from roadless designation that have been substantially altered as identified by prior road construction or timber harvest. These areas are generally known as “roaded roadless” areas and include additional areas considered to be substantially altered. Because roaded roadless areas have been substantially altered, the roadless area characteristics they once had have been greatly diminished.

The removal of roaded roadless acres from roadless designation and other removals and additions would convert a net of about 18,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest. The projected harvest on these suitable acres would be about 3,000 acres over 100 years (assuming a uniform distribution of the projected old-growth harvest over all suitable old-growth lands). Harvest in these areas would further reduce the limited roadless characteristics that remain in roaded roadless areas.

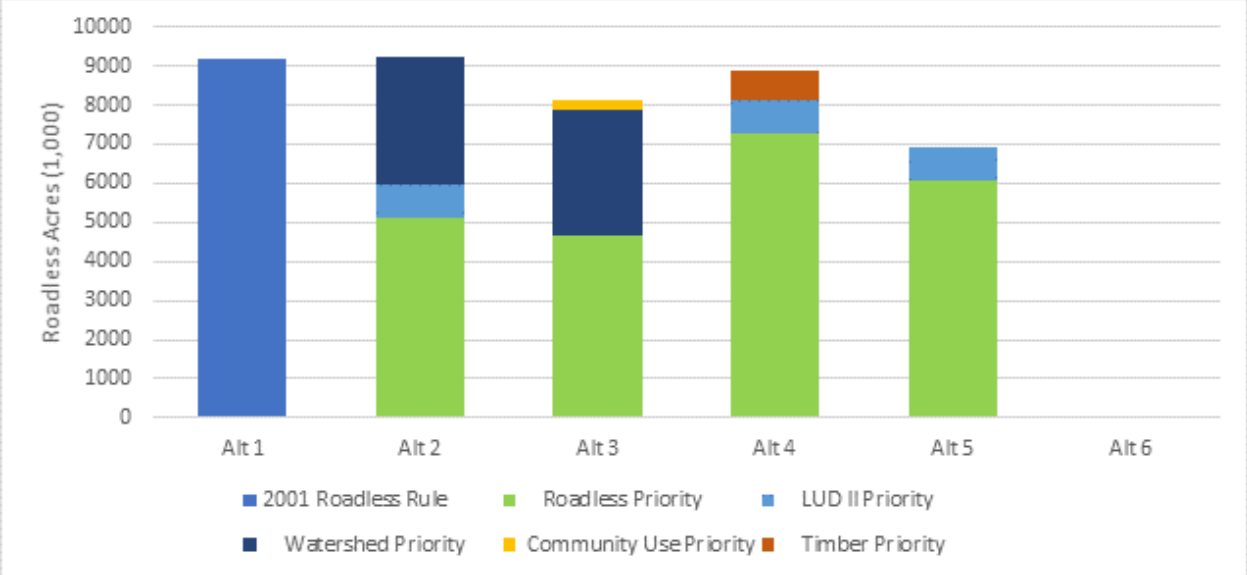
Table 3.1-2
Roadless Areas by Alternative and Management Category

Roadless Category (acres)	Alternative 1 No Action	2 Roaded Roadless	3 Logical Extension	4 Partial Dev. LUDs[1]	5 All Dev. LUDs	6 Full Exemption
Total Roadless Area	9,200,000	9,220,000	8,103,000	8,857,000	6,905,000	0
ARA Management Categories						
LUD II Priority	N/A	856,000	0	856,000	828,000	0
Watershed Priority	N/A	3,250,000	3,208,000	0	0	0
Roadless Priority	N/A	5,114,000	4,653,000	7,252,000	6,078,000	0
Community Priority	N/A	0	241,000	0	0	0
Timber Priority	N/A	0	0	749,000	0	0
Change in Roadless Area Acres						
Roadless Area Removed	0	113,000	1,202,000	375,000	2,298,000	9,200,000
Roadless Area Added	0	133,000	105,000	32,000	3,000	0
Net Change	0	20,000	-1,098,000	-343,000	-2,295,000	-9,200,000
Old-Growth Acres Suitable for Harvest						
Total Acres	230,000	247,000	305,000	388,000	395,000	395,000
Net Change	0	18,000	76,000	158,000	165,000	165,000

N/A = not applicable

[1] Includes Timber Production and Modified Landscape LUDs, but not Scenic Viewshed.

Figure 3.1-1
Roadless Areas by Alternative and Management Category



Roadless area increases larger than 100 acres would be distributed over 24 IRAs, with increases ranging from 101 acres to 2,861 acres. Almost two-thirds of the suitable old-growth lands in roaded roadless are located on existing road systems in six 2001 IRAs: North Kupreanof (IRA 211), North Revilla (IRA 526), Twelvemile (IRA 534), Lindenberg (216), South Zarembo (IRA 237), and West Wrangell (IRA 288) (Table 3.1-3). Most of the increase (95 percent) in suitable acres would be in the five ranger districts on the south part of the Forest (Craig, Ketchikan-Misty Fjords, Petersburg, Thorne Bay, and Wrangell (Table 3.1-4, Figure 3.1-2).

Table 3.1-3
Total Acres by 2001 Inventoried Roadless Area and Net Change in Suitable Old-Growth Acres by IRA and Action Alternative

Ranger District[1]	Roadless Area Number	Roadless Area Name	Total IRA Acres	Increase in Suitable Old-Growth Acres[2]				
				Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
PRD	201	Fanshaw	48,116	0	0	0	0	0
PRD	202	Spires	533,184	1	3,136	6,724	6,771	6,771
PRD	203	Thomas	739	-739	-739	0	0	0
WRD	204	Madan	67,695	0	0	0	0	0
WRD	205	Aaron	78,547	0	0	0	0	0
WRD	206	Cone	127,862	0	0	0	0	0
WRD	207	Harding	173,125	0	0	0	0	0
WRD	208	Bradfield	197,789	0	0	0	0	0
WRD	209	Anan	36,635	0	237	242	242	242
WRD	210	Frosty	37,296	101	105	1,467	1,467	1,467
PRD	211	North Kupreanof	114,242	2,861	4,696	10,610	10,610	10,610
PRD	212	Missionary	16,652	788	1,855	2,468	2,553	2,553
PRD	213	Five Mile	18,802	1	1,113	1,256	1,263	1,263
PRD	214	South Kupreanof	216,279	2	2	882	882	882
PRD	215	Castle	49,129	0	0	0	0	0
PRD	216	Lindenberg	25,743	2,056	4,316	6,392	6,761	6,761
PRD	217	Green Rocks	10,575	214	237	319	328	328
PRD	218	Woewodski	9,988	0	0	0	0	0
PRD	220	East Mitkof	7,921	0	0	551	551	551
PRD	223	Manzanita	8,384	0	964	966	966	966
PRD	224	Crystal	18,321	2	462	1,866	2,025	2,025
WRD	225	Kadin	2,000	0	0	0	0	0
WRD	227	North Wrangell	7,829	408	2,674	2,674	2,674	2,674
WRD	229	South Wrangell	14,110	0	2,369	2,368	2,369	2,369
WRD	231	Woronkofski	11,047	0	0	0	0	0
WRD	232	North Etolin	40,834	-5	1,180	1,326	2,402	2,402
WRD	233	Mosman	53,018	0	216	216	272	272
WRD	234	South Etolin	26,122	0	191	1,443	1,443	1,443
WRD	235	West Zarembo	6,780	0	0	264	264	264
WRD	236	East Zarembo	10,845	224	224	3,024	3,123	3,123
WRD	237	South Zarembo	36,236	1,594	2,551	5,138	5,138	5,138
WRD	238	Kashevarof Islands	4,564	0	0	0	0	0
PRD	239	Keku	8,976	0	0	5	5	5
PRD	240	Security	31,277	17	574	1,418	1,418	1,418
PRD	241	North Kuiu	6,352	-1,298	-1,298	512	513	513
PRD	242	Camden	36,458	0	1,886	1,886	1,886	1,886
PRD	243	Rocky Pass	76,625	0	0	256	256	256
PRD	244	Bay of Pillars	26,948	0	0	0	0	0
PRD	245	East Kuiu	26,770	0	0	608	608	608
PRD	246	South Kuiu	61,576	0	0	0	0	0
WRD	247	East Wrangell	7,224	12	369	369	369	369
WRD	288	West Wrangell	8,825	1,140	1,299	1,299	1,299	1,299
WRD	289	Central Wrangell	13,097	0	2,147	2,147	2,147	2,147
WRD	290	Southeast Wrangell	18,336	20	819	819	819	819
JRD	301	Juneau-Skagway Icefield	1,186,325	0	0	7	7	7
JRD	302	Taku-Snettisham	660,070	0	0	0	0	0
JRD	303	Sullivan	66,831	0	0	0	0	0
JRD	304	Chilkat-West Lynn Canal	193,891	256	256	3,420	4,341	4,341
JRD	305	Juneau Urban	100,269	0	0	0	1	1
JRD	306	Mansfield Peninsula	52,598	0	0	0	0	0

Table 3.1-3 (continued)
Total Acres by 2001 Inventoried Roadless Area and Net Change in Suitable Old-Growth Acres by IRA and Action Alternative

Ranger District[1]	Roadless Area Number	Roadless Area Name	Total IRA Acres	Increase in Suitable Old-Growth Acres[2]				
				Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
JRD	307	Greens Creek	26,813	0	0	0	0	0
JRD	308	Windham-Port Houghton	159,941	0	0	5	5	5
JRD	310	Douglas Island	24,381	0	0	0	0	0
HRD/SRD	311	Chichagof	551,179	-265	1,956	8,312	8,824	8,824
HRD/SRD	312	Trap Bay	13,166	13	972	972	972	972
JRD	313	Rhine	22,794	0	0	0	0	0
SRD	314	Point Craven	10,722	0	0	0	490	490
HRD	317	Point Augusta	15,445	0	1,382	2,532	2,532	2,532
HRD	318	Whitestone	5,612	0	0	705	856	856
HRD	319	Pavlof-East Point	4,906	45	348	348	414	414
SRD	321	Tenakee Ridge	20,511	2	1,222	3,529	3,577	3,577
HRD/SRD	323	Game Creek	49,835	805	1,093	7,177	7,177	7,177
HRD	325	Freshwater Bay	43,122	79	79	4,889	4,889	4,889
SRD	326	North Kruzof	31,563	0	0	55	55	55
SRD	327	Middle Kruzof	14,659	6	6	2,360	2,360	2,360
SRD	328	Hoonah Sound	78,330	0	0	0	0	0
SRD	329	South Kruzof	54,417	-22	-22	4	4	4
SRD	330	North Baranof	310,357	45	45	6,602	6,604	6,604
SRD	331	Sitka Urban	110,793	0	0	97	97	97
SRD	332	Sitka Sound	13,101	0	0	0	0	0
SRD	333	Redoubt	66,850	8	8	12	12	12
SRD	334	Port Alexander	118,900	0	0	0	0	0
YRD	338	Brabazon Addition	498,080	0	0	0	0	0
YRD	339	Yakutat Forelands	317,008	0	0	0	0	0
YRD	341	Upper Situk	16,371	0	0	0	0	0
HRD	342	Neka Mountain	6,100	0	0	0	0	0
HRD	343	Neka Bay	6,936	0	0	0	0	0
CRD	501	Dall Island	103,659	0	0	0	0	0
CRD	502	Suemez Island	19,795	0	0	1,505	1,505	1,505
CRD	503	Outer Islands	97,788	0	0	0	8	8
CRD	504	Sukkwan	43,846	0	0	1	1	1
CRD	505	Soda Bay	63,292	416	1,133	2,620	2,624	2,624
CRD	507	Eudora	190,211	16	95	856	856	856
TRD	508	Christoval	8,968	133	133	320	320	320
TRD	509	Kogish	63,429	757	7,018	7,018	7,018	7,018
CRD	510	Karta	51,047	701	3,468	5,201	6,160	6,160
TRD	511	Thorne River	72,971	263	1,959	2,304	2,665	2,665
TRD	512	Ratz	5,323	40	40	210	210	210
TRD	514	Sarkar	51,350	41	458	496	496	496
TRD	515	Kosciusko	63,537	-149	1,062	1,568	1,568	1,568
TRD	516	Calder	8,573	0	0	0	0	0
TRD	517	El Capitan	26,081	124	212	4,431	5,029	5,029
TRD	518	Salmon Bay	22,615	169	443	1,179	1,179	1,179
CRD	519	McKenzie	76,010	603	1,632	2,387	2,387	2,387
TRD	520	Kasaan	7,572	0	0	0	0	0
KRD	521	Duke	44,382	0	0	0	0	0
KRD	522	Gravina	37,104	0	1,021	1,020	1,021	1,021
KRD	523	South Revilla	51,620	89	3,571	3,672	3,673	3,673
KRD	524	Revilla	29,017	0	1,330	1,330	1,330	1,330
KRD	525	Behm Islands	4,327	0	0	0	0	0
KRD	526	North Revilla	212,613	2,489	7,066	14,375	15,025	15,025
KRD	528	Cleveland	185,414	-13	-13	-13	101	101
KRD	529	North Cleveland	104,863	0	0	1	271	271
KRD	530	Hyder	121,289	0	0	0	2	2

Table 3.1-3 (continued)
Total Acres by 2001 Inventoried Roadless Area and Net Change in Suitable Old-Growth Acres by IRA and Action Alternative

Ranger District[1]	Roadless Area Number	Roadless Area Name	Total IRA Acres	Increase in Suitable Old-Growth Acres[2]				
				Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
CRD	531	Nutkwa	40,319	0	0	78	78	78
TRD	532	Fake Pass	465	0	0	0	0	0
CRD	533	Hydaburg	11,014	0	0	0	0	0
CRD	534	Twelvemile	37,894	2,133	3,193	3,376	3,376	3,376
KRD	535	Carroll	11,268	717	2,090	3,014	3,014	3,014
TRD	536	Kasaan Bay	6,210	767	870	870	870	870
KRD	577	Quartz	142,264	0	0	0	0	0
		Total	**9,200,000**	**17,700**	**75,700**	**158,364**	**165,433**	**165,433**

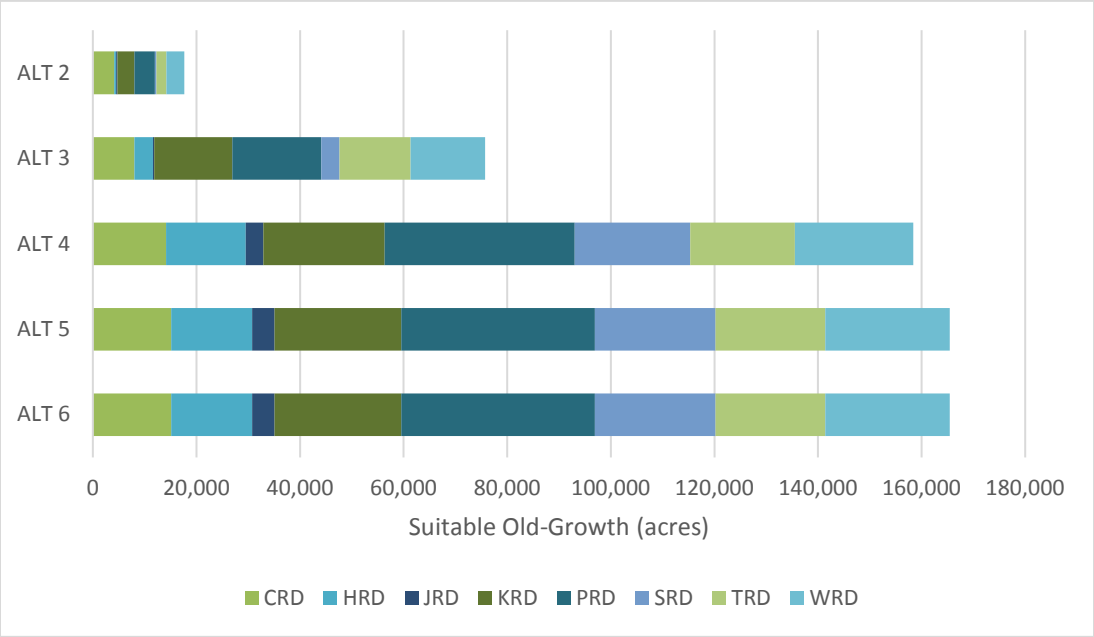
Notes:
IRA = Inventoried Roadless Area
[1] CRD = Craig Ranger District; HRD = Hoonah Ranger District; JRD = Juneau Ranger District; KRD = Ketchikan-Misty Fjords Ranger District; PRD = Petersburg Ranger District; SRD = Sitka Ranger District; TRD = Thorne Bay Ranger District; WRD = Wrangell Ranger District; YRD = Yakutat Ranger District
[2] Increases in suitable old-growth acres would occur in areas removed from roadless area designation under all five action alternatives. In addition, under Alternatives 3 and 4 suitable old-growth acres would also be available in Community Priority and Timber Priority ARAs, respectively.

Table 3.1-4
Percentage of the Increase in Suitable Old Growth Acres that is on Each Ranger District by Alternative

Ranger District	Total IRA Acres	Percentage of the Increase in Suitable Old-Growth Acres[2]				
		Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Admiralty NM	15,300	0%	0%	0%	0%	0%
Craig	715,400	23%	11%	9%	9%	9%
Hoonah	410,100	2%	5%	10%	9%	9%
Juneau	2,478,700	1%	0%	2%	3%	3%
Ketchikan-Misty Fjords	944,100	19%	20%	15%	15%	15%
Petersburg	1,353,000	22%	23%	23%	23%	23%
Sitka	1,116,400	2%	5%	14%	14%	14%
Thorne Bay	356,500	11%	18%	13%	13%	13%
Wrangell	979,900	20%	19%	14%	15%	15%
Yakutat	831,500	0%	0%	0%	0%	0%
Total Acres[1]	**9,200,900**	**17,700**	**75,700**	**158,400**	**165,400**	**165,400**

Notes:
IRA = 2001 Inventoried Roadless Area; NM = National Monument
[1] Total IRA acres represent the total IRA acres for the Forest. Total acres presented by alternative are the estimated increase in suitable old-growth acres that would be available for harvest under each alternative.
[2] Percent of total increase identifies the share of the total Forest-wide increase in suitable old-growth acres by Ranger District.

Figure 3.1-2
Increase in Suitable Old-Growth Acres Available for Harvest by Ranger District and Alternative



Notes:
CRD – Craig Ranger District; HRD – Hoonah Ranger District; JRD – Juneau Ranger District; KRD – Ketchikan-Misty Fjords Ranger District; PRD – Petersburg Ranger District; SRD – Sitka Ranger District; TRD – Thorne Bay Ranger District; WRD – Wrangell Ranger District.
[1] There are no suitable old-growth acres on the Admiralty National Monument, and there would be no increase in suitable old-growth acres available for harvest on the Yakutat Ranger District under any of the alternatives.

Three ARA categories would be designated: LUD II Priority (9 percent), Watershed Priority (35 percent), and Roadless Priority (55 percent) (Table 3.1-2). None of these categories would allow commercial timber harvest or associated road building. The Watershed Priority ARA is more restrictive than the 2001 Roadless Rule. Areas identified as Tongass 77 (T77) Watersheds or The Nature Conservancy (TNC)/Audubon Conservation Priority Areas in the 2016 Forest Plan (USDA Forest Service 2016a) would be designated as Watershed Priority ARAs. Forest-wide, the majority of the ARA acres would allow some forms of infrastructure development and mineral-related road construction, as is the case under Alternative 1, but they would be more explicitly allowed under Alternative 2. The impacts of these types of development are expected to be limited in terms of acreage covered, especially when viewed as a share of total protected acres.

Alternative 3

Under Alternative 3, there would be an overall reduction in roadless area acres, with an estimated total of 1.2 million acres removed from roadless designation, for a net loss of approximately 1.1 million acres due to roadless area additions. A total of 8.10 million acres would be managed as ARAs under this alternative (Table 3.1-2). Like Alternative 2, this alternative would remove “roaded roadless” areas. In addition, areas adjacent to existing road and harvest systems would be removed from roadless designation. These adjacent areas, considered “logical extensions” of the existing road and harvest systems within the same watersheds, would convert 50,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest. Altogether, the removal of roaded roadless and logical extension acres from roadless designation, along with the gains and losses from ownership changes and updated mapping, would result in a net increase of about 76,000 acres of suitable old-growth lands that would be available for harvest. The projected harvest on these suitable acres would be about 10,500 acres over 100 years (assuming a uniform distribution of the projected old-growth harvest over all suitable old-growth

lands). Harvest in these areas would affect roadless characteristics that are presently protected under Alternative 1.

Increases in suitable old-growth lands available for harvest larger than 100 acres would be distributed over 48 IRAs, with increases ranging from 133 acres to 7,018 acres. Half of the suitable old-growth lands that would be made available for harvest under this alternative are located in eight IRAs. The largest increases (more than 4,000 acres each) would be in areas that are presently part of the Kogish (IRA 509), North Revilla (IRA 526), North Kupreanof (IRA 211), and Lindenberg (IRA 216) IRAs (Table 3.1-3). Most of the increase in suitable old-growth acres would be in the five ranger districts on the south part of the Forest (91 percent) with increases in these five districts ranging from 11 percent (Craig) to 23 percent (Petersburg) of the total increase (Table 3.1-4).

Roadless designation would also be removed from the 828,000 LUD II acres that are currently within an IRA. This change in management accounts for a large share of the decrease in roadless area acres that would occur under this alternative. Alternative 3 proposes to remove all LUD II areas from roadless designation as a means of eliminating confusion and ensuring congressional intent. As a result, LUD II areas under Alternative 3 would retain their congressional protections and would continue to be managed "in a roadless state to retain their wildland character" (USDA Forest Service 2016b).

ARAs would be designated according to three ARA categories under this alternative. Roadless Priority ARA would receive 4.7 million roadless acres, Watershed Priority would receive 3.2 million roadless acres, and Community Priority would receive 0.24 million acres. The Roadless Priority ARA is similar to the 2001 Roadless Rule, but less restrictive with respect to some forms of infrastructure development and mineral-related road construction. The Watershed Priority ARA is more restrictive than the 2001 Roadless Rule and the Community Priority, which covers lands around five communities, is less restrictive. The impacts of developments within this latter category are expected to be limited in acreage covered and affect a relatively small number of acres. In addition, Alternative 3 would provide long-term regulatory protection from old-growth harvest in all T77 and TNC/Audubon Conservation Priority Areas outside of roadless under the Alaska Roadless Rule. Although these would not be categorized as roadless areas, they would receive some degree of regulatory protection because the Alaska Roadless Rule would designate them as off-limits to old-growth harvesting (with a few exceptions) on a permanent basis.

Alternative 4

Under Alternative 4, there would be an overall reduction in roadless area acres, with an estimated total of 375,000 acres removed from roadless designation, 32,000 acres added, and a net loss of approximately 343,000 acres. A total of 8.9 million acres would be managed as ARAs under this alternative (Table 3.1-2). The areas removed from roadless designation under this alternative would produce about 70,000 acres of suitable old-growth lands that would be available for harvest. In addition, the Timber Priority ARA (see below) would result in the conversion of about 88,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest, resulting in an increase of 158,000 acres of suitable old growth. Additions to roadless designation under this alternative include the LUD II acres not previously designated as roadless in 2001.

Three ARA categories would be designated: LUD II Priority (10 percent), Roadless Priority (80 percent), and Timber Priority (10 percent) (Table 3.1-2). The LUD II Priority and Roadless Priority ARAs, which account for the majority of ARA acres (90 percent) under this alternative, do not allow commercial timber harvest or associated road building. Forest-wide, most of the ARA acres (80 percent) would allow some forms of infrastructure development and mineral-related road construction, but the impacts of these types of development are expected to be limited in terms of acreage, especially when viewed as a share of total protected acres.

As noted above, the Timber Priority ARA (8 percent of ARA acres) would exempt timber harvest and road construction, resulting in the conversion of about 88,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest. The ARA acres that would be managed as Timber Priority are allocated to Timber Development and Modified Landscape LUDs in the 2016 Forest Plan. The Timber Priority ARA often include areas farther from existing road systems, making them more expensive and less likely to be accessed for timber production under the current Forest Plan. If harvest were to

occur in these areas, impacts to roadless characteristics would likely be more noticeable than in logical extension areas, which are, by definition, in watersheds where road development and harvest has occurred in the past.

Reductions in roadless areas (roaded roadless and logical extensions) and the allocation of ARA acres to Timber Priority management would result in the total conversion of 158,000 acres of previously unsuitable lands to suitable old growth. The projected harvest on these suitable acres would be about 17,000 acres over 100 years (assuming a uniform distribution of the projected old-growth harvest over all suitable old-growth lands). Harvest in these areas would affect roadless characteristics that are presently protected under Alternative 1.

Increases of 100 acres or more in suitable old growth within an individual roadless area would occur in 60 IRAs, with increases ranging up to 14,375 acres. The largest gain in suitable old-growth acres would be in the North Revilla (IRA 526) IRA, followed by the North Kupreanof (IRA 211), Chichagof (IRA 311), Game Creek (IRA 323), and Kogish (IRA 509) IRAs (Table 3.1-3).

Slightly less than three-quarters of the increase (74 percent) in suitable acres would be in the five south ranger districts (Craig, Ketchikan-Misty Fjords, Petersburg, Thorne Bay, and Wrangell), with shares ranging from 9 percent (Craig) to 23 percent (Petersburg) of the total (Table 3.1-4).

Alternative 5

Under Alternative 5, there would be an overall reduction in roadless area acres, with an estimated net loss of approximately 2.3 million acres. A total of 6.9 million acres would be managed as ARAs under this alternative (Table 3.1-2). In addition to roaded roadless and logical extension areas, this alternative would remove all other Timber Production, Modified Landscape, and Scenic Viewshed LUDs identified in the 2016 Forest Plan from roadless designation, including T77 Watersheds and TNC/Audubon Conservation Priority Areas within those development LUDs. Areas with mineral potential as defined by the "minerals overlay" in the Tongass Forest Plan would also be removed.

As with Alternative 6, this alternative would result in the total conversion of about 165,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest. The projected harvest on these suitable acres would be about 18,000 acres over 100 years (assuming a uniform distribution of the projected old growth harvest over all suitable old-growth lands). Harvest in these areas would affect roadless characteristics that are presently protected under Alternative 1. Suitable old-growth acres would be distributed across the same IRAs and ranger districts as they would be under Alternative 6, as summarized above (see also Tables 3-3 and 3-4).

Two ARA categories would be designated: LUD II Priority (12 percent) and Roadless Priority (88 percent) (Table 3.1-2). The LUD II Priority and Roadless Priority categories do not allow commercial timber harvest or associated road building. Forest-wide, most of the ARA acres (88 percent) would allow some forms of infrastructure development and mineral-related road construction, but the impacts of these types of development are expected to be limited, especially when viewed as a share of total protected acres.

Alternative 6

Alternative 6 is the full exemption alternative, as requested in the State of Alaska's petition. Under this alternative, regulatory roadless designation would be removed from all designated roadless areas on the Tongass, resulting in a net reduction of 9.2 million acres of designated roadless areas (Table 3.1-2). Former roadless areas would be managed in accordance with the 2016 Forest Plan. Existing protections to roadless characteristics provided by Forest Plan Non-development LUDs (including LUD II, Remote Recreation, Semi-remote Recreation, Old-growth Habitat, Special Interest Area, Wild River, Scenic River, and others) would remain in place.

Viewed in terms of suitable acres, the removal of regulatory roadless area prohibitions would result in the total conversion of about 165,000 acres of previously unsuitable lands to suitable old-growth lands that would be available for harvest. This is similar to the additional old-growth acres that would be suitable under Alternative 4 (158,000 acres). The projected harvest on these suitable acres would be about 18,000 acres over 100 years (assuming a uniform distribution of the projected old growth harvest over all

suitable old growth lands). Harvest in these areas would affect roadless characteristics that are presently protected under Alternative 1.

Overall increases in suitable old-growth larger than 100 acres would occur within 63 IRAs, with increases ranging up to 15,025 acres. The largest gains in suitable old-growth acres would be in the same IRAs as Alternative 4; the largest increase would be in in North Revilla (IRA 526), followed by North Kupreanof (IRA 211), Chichagof (IRA 311), Game Creek (IRA 323), and Kogish (IRA 509) IRAs (Table 3.1-3). Slightly less than three-quarters of the increase (75 percent) in suitable acres would be in the five south ranger districts (Craig, Ketchikan-Misty Fjords, Petersburg, Thorne Bay, and Wrangell). Increases in suitable old-growth in these five districts would range from 9 percent (Craig) to 23 percent (Petersburg) of the total (Table 3.1-4).

Ecosystem Services

Under the 2016 Forest Plan, timber management activities are governed by a number of rules and regulations designed to protect or mitigate adverse impacts to natural resources that provide ecosystem services. This is discussed further in the 2008 Forest Plan EIS (USDA Forest Service 2008b, pp. 3-553 to 3-556). These rules and regulations would remain in place under all of the alternatives evaluated in this DEIS. The effects of the alternatives on these types of services are assessed in the sections of this DEIS that address fisheries, wildlife and subsistence use, and timber and vegetation, among others. Monetary values are not assigned to these services, but this does not lessen their importance in the decision-making process. Decision-makers will consider the economic values discussed in the Key Issue 2 section within the context of the information presented elsewhere in this document, much of which cannot readily be translated into economic terms."

Cumulative Effects

Cumulative actions affecting the Roadless Rule have included modifications to the Roadless Rule as it applies to Idaho and Colorado. In addition to modifying the Roadless Rule, Colorado roadless lands were removed from roadless. In addition, Utah is seeking a state-specific modification to the Roadless Rule.

Table 3.1-5 summarizes the acres affected by modifications of the Roadless Rule, including past projects (Idaho and Colorado) and the alternatives being evaluated in this EIS for the Alaska Rule.

Under Alternative 1, 30 percent of the national roadless acres would have been modified as a result of the Idaho, Colorado, and Utah Rule modifications. However, the total acres of roadless areas nationally would remain at almost 100 percent. Under Alternatives 2, 3, 4, and 5, the percent of national roadless acres modified would be 42 to 46 percent, while about 30 percent would be modified under Alternatives 1 and 6. The total acres remaining in roadless areas nationally, under Alternatives 1, 2, 3, 4, and 5, would be 96 to almost 100 percent; however, this percentage would decrease to 84 percent under Alternative 6.

Table 3.1-5
Summary of Acres Affected Nationally by Modifications of the Roadless Rule along with the Acres Affected by the Proposed Alaska Rule Modifications by the Alternatives

	Modifications Proposed by Alaska Rule					
Category	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**	**Alt. 6**
Modifications by Idaho Rule	9,306,000	9,306,000	9,306,000	9,306,000	9,306,000	9,306,000
Modifications by Colorado Rule	4,186,000	4,186,000	4,186,000	4,186,000	4,186,000	4,186,000
Colorado Removals from Roadless (Net)	58,000	58,000	58,000	58,000	58,000	58,000
Proposed Alaska Rule Modifications	0	9,220,000	8,103,000	8,857,000	6,905,000	0
Proposed Alaska Removals from Roadless (Net)	0	20,000 (increase)	1,148,000	343,000	2,295,000	9,200,000
Total Acres Modified	13,492,000	22,712,000	21,595,000	22,349,000	20,397,000	13,492,000
Total Acres Removed	58,000	38,000	1,206,000	401,000	2,353,000	9,258000
Total Original Acres in Roadless Nationally[1]	58124000	58124000	58124000	58124000	58124000	58124,000
Percent of Original National Acres Modified	23.2%	39.1%	37.2%	38.5%	35.1%	23.2%
Percent of Original National Acres Removed	0.1%	0.1%	2.1%	0.7%	4.0%	15.9%
Percent of Original National Acres Remaining in Roadless	99.9%	99.9%	97.9%	99.3%	96.0%	84.1%

Source: National Datasets and Tongass GIS

[1] These acres are adjusted for administrative corrections to account for ownership changes, boundary alignment corrections (shorelines in Alaska), clerical errors, mapping errors, and changes in mapping technologies for Colorado and Alaska. Original acres were 58,453,000 and these adjustments amounted to 329,000 acres.

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Key Issue 2 – Support Local and Regional Socioeconomic Well-being, Alaska Native Culture, Rural Subsistence Activities, and Economic Opportunity Across Multiple Economic Sectors

Affected Environment

The Tongass National Forest stretches roughly 500 miles northwest from Ketchikan to Yakutat and includes approximately 80 percent of the land area in Southeast Alaska. The region is sparsely settled with an estimated 72,915 people living in more than 30 towns and villages located in and around the Forest in 2017, most of which are located on islands or along the narrow coastal strip (Alaska Department of Labor [DOL] 2018). The communities of Southeast Alaska depend on the Tongass National Forest in various ways, including employment in the wood products, commercial fishing and fish processing, recreation, tourism, and mining and mineral development sectors. Many residents depend heavily on subsistence hunting and fishing to meet their basic needs. In addition, natural amenities and recreation activities associated with the Tongass National Forest form an important part of the quality of life for many residents of Southeast Alaska. Since there is very little private land in the region to provide these resources and opportunities, appropriate management of the Tongass National Forest is extremely important to local communities and the overall regional economy.

The Tongass National Forest is also an important national and international resource. An estimated 1.2 million people visited Southeast Alaska in 2016, with most of these visitors (86 percent) arriving by cruise ship (McDowell Group 2017). For many, a visit to the Tongass is an once-in-a-lifetime experience and spending by these visitors helps drive the recreation and tourism sector. The Tongass National Forest contains large areas of essentially undisturbed forest lands, which represent increasingly scarce and, therefore, increasingly valuable ecosystems. These lands have value for many people who may never visit Southeast Alaska, but benefit from knowing that the Tongass National Forest is there. This type of value, often referred to as non-use value, includes existence, option, and bequest values. These values represent the value that individuals obtain from knowing that the Forest exists, knowing that it would be available to visit in the future should they choose to do so, and knowing that it will be left for future generations to inherit.

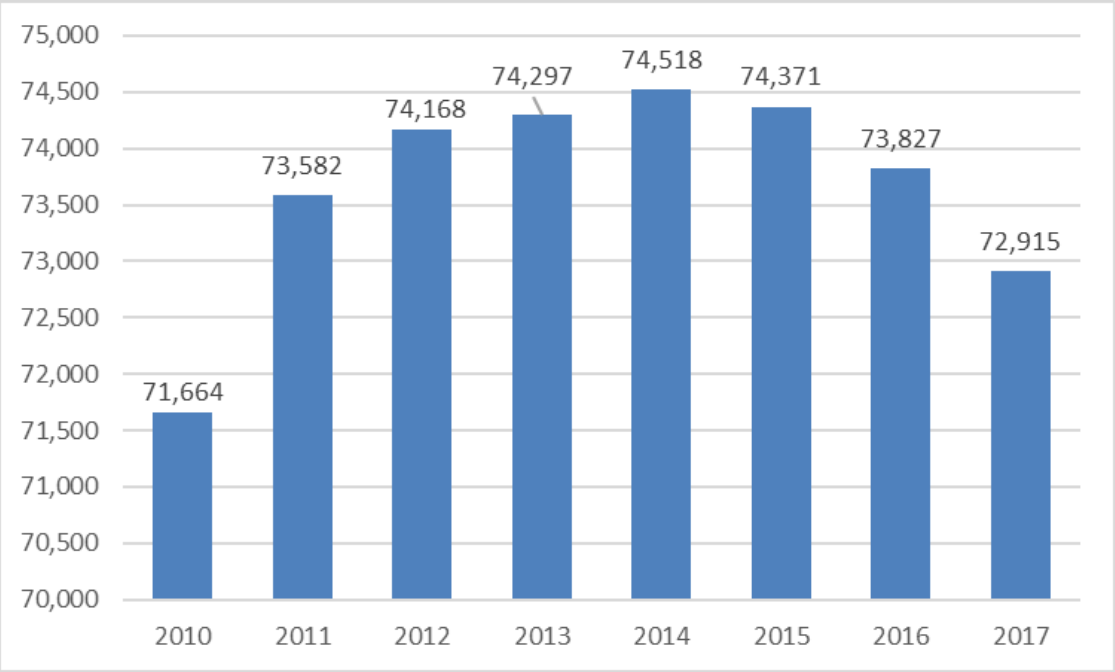
Regional Demographic Overview

Southeast Alaska is divided into eight boroughs and two census areas (CAs). The eight boroughs – Haines, Juneau, Ketchikan Gateway, Petersburg, Sitka, Skagway, Wrangell, and Yakutat – correspond with the county governments found elsewhere in the United States. The remaining areas that are not part of a borough are allocated to two CAs: the Hoonah-Angoon CA and Prince of Wales-Hyder CA. CAs are statistical units that are widely recognized from a data reporting standpoint by federal agencies and most state agencies as county equivalents. Boroughs and CAs are collectively referred to as “boroughs” in the remainder of this section.

Total regional population in Southeast Alaska peaked in 2014 and has since decreased three years in a row, by a combined total of 1,600 people (Figure 3.2-1). Population losses have been most dramatic in Juneau, with recent cuts in state sector employment contributing to a net reduction of 900 residents in 2016 and 2017. Much of these losses appear to be the result of young families moving away, with Juneau losing more than 300 children and 400 age 30 to 40 demographic. These reductions have been matched by a further decrease in K-12 enrollment in Southeast Alaska. Since 1997, annual enrollment has decreased by 3,400, a 23 percent decline (Southeast Conference 2018). This loss of young families has exacerbated the most pronounced regional demographic shift since 2010: the aging of the population,

with the 60-plus population increasing by more than a third over this period due to aging in place (Southeast Conference 2018).

Figure 3.2-1
Total Population in Southeast Alaska, 2010 to 2017

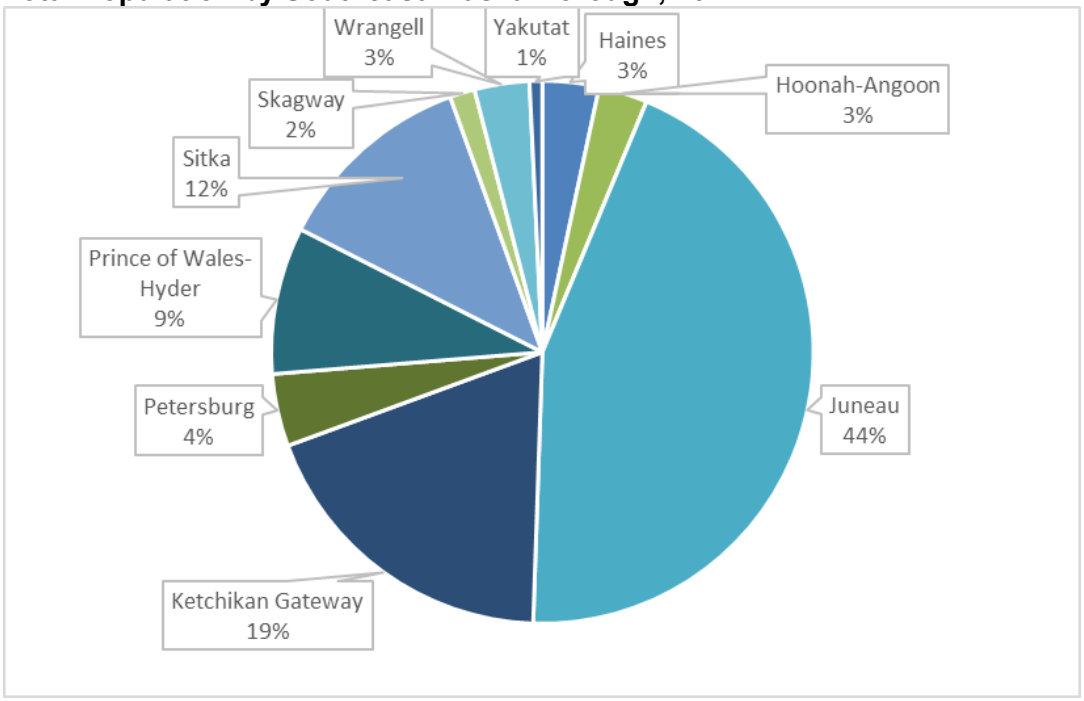


Note:
[1] Data for 2010 are from the 2010 Census (April). Data for 2011 to 2017 are annual estimates.
Source: Alaska DOL 2018

The three largest communities – Juneau, Ketchikan, and Sitka – together accounted for 75 percent of total regional population in 2017 (Figure 3.2-2). Juneau, which is the state capital and a regional trade center, accounted for 44 percent of Southeast Alaska's total population in 2017 (Figure 3.2-2). Ketchikan Gateway Borough, the second largest borough in Southeast Alaska, accounted for about 19 percent of the region's population. Ketchikan is a smaller regional trade center that serves Prince of Wales Island and the surrounding area.

Population is discussed in more detail in the *Subregional Overview and Communities* section of the 2016 Forest Plan FEIS (USDA Forest Service 2016b, pp. 3-525 to 3-535).

Figure 3.2-2
Total Population by Southeast Alaska Borough, 2017



Notes:
Total = 72,915 residents Source: Alaska DOL 2018

The remote nature of the region is reflected in a population density of approximately two persons per square mile, which is much lower than the United States' average of 92 persons per square mile. Many locations are accessible only by boat or plane, and landing strips or seaplane facilities are located in virtually all communities. The Alaska State ferry system transports people and vehicles between several ports in Southeast Alaska, and Prince Rupert, British Columbia, and Bellingham, Washington. Haines and Skagway, at the northern end of the Forest, and Hyder at the southern end, offer access to interior and Southcentral Alaska via the Alaska Highway, and Canada via the Cassiar Highway.

Regional Economic Overview

Southeast Alaska employment in 2017 is summarized by sector in Table 3.2-1. Government and the visitor sector were the largest employers' accounting for 29 percent and 17 percent of total employment, respectively. The government sector is the main source of year-round employment in all the communities in Southeast Alaska. In addition to direct employment in government, many of the area's private sector jobs are also dependent on government funding and contracts.

Private sector activities dependent on government funding include road construction and health care services.

State government employment has decreased significantly since 2012, with a loss of 850 state jobs in Southeast Alaska from 2012 through July 2018. Three-quarters of these losses occurred in Juneau. These losses have accompanied declining oil production and prices, with state revenues falling by 70 percent from fiscal year 2013 to fiscal year 2018, and the state budget decreasing by 40 percent. Federal government employment has also declined in Southeast Alaska over the past decade, with the loss of 600 jobs since 2005 (Southeast Conference 2018).

Table 3.2-1
Southeast Alaska Employment by Sector, 2017

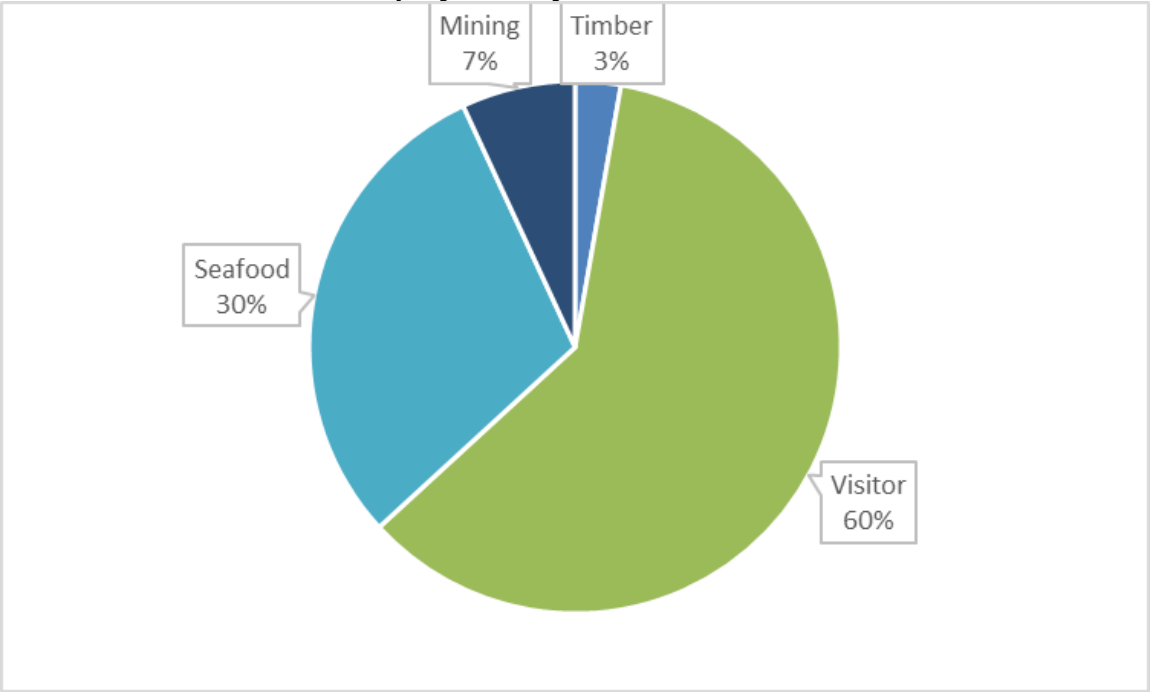
Economic Sector[1]	Total Employment (Jobs)	Total Earnings ($M)[2]	Percent of Total	
			Employment	Earnings
Government (includes Coast Guard)	13,256	769.0	29%	35%
Visitor	7,739	231.4	17%	11%
Seafood	3,829	216.5	8%	10%
Retail and Wholesale Trade	4,474	145.2	10%	7%
Health Care (private only)	2,732	150.1	6%	7%
Construction	1,932	121.9	4%	6%
Financial	1,964	118.5	4%	5%
Professional and Business Services	2,869	118.5	6%	5%
Social Services	1,580	46.1	3%	2%
Mining	886	90.5	2%	4%
Information[3]	571	23.9	1%	1%
Timber	354	18.7	1%	1%
Warehousing, Utilities, Transportation[4]	903	53.9	2%	2%
Other	2,551	91.8	6%	4%
Total	**45,640**	**2,195.9**	**100%**	**100%**

Notes:
[1] These data were compiled on behalf of Southeast Conference based on data collected by the Alaska DOL and the U.S. Census Bureau. The Alaska DOL data are for 2017 for non-agricultural wage and salary employment. These data do not include proprietors or self-employed workers, and are, therefore, supplemented using data from the 2016 US Census Nonemployer Statistics, which specifically count proprietors and the self-employed.
[2] Total earnings are expressed in millions of dollars.
[3] The Information sector, as defined here, includes publishing, broadcasting, and telecommunications.
[4] Includes non-visitor-related transportation only. Visitor-related transportation is included in the visitor sector.
Source: Southeast Conference 2018

Natural Resource-Based Industries

Direct employment in natural resource-based industries – timber, visitor, seafood, and mining – together accounted for an estimated 12,808 jobs in 2017, more than one-quarter (28 percent) of total employment in Southeast Alaska (Table 3.2-1). The estimated distribution of resource-dependent employment is shown by industry in Figure 3.2-3. The visitor industry accounted for more than half (60 percent) of this total, followed by the seafood sector, which accounted for almost one-third (30 percent). Mining accounted for 7 percent and wood products made up 3 percent (Figure 3.2-3).

Figure 3.2-3
Natural Resource-Based Employment by Sector, 2017



Notes:
Total = 12,808 Employees
Source: Southeast Conference 2018

Nonresident and Seasonal Employment

Nonresident and seasonal employment are two important and related aspects of resource-dependent employment in Southeast Alaska. Many nonresidents work a relatively short time in Alaska, often for just two or three months, generally spend the bulk of their earnings elsewhere, and, as a result, contribute less to the regional economy than resident workers.

Nonresidents accounted for more than one-quarter (26 percent) of total estimated employment in Southeast Alaska in 2016 (Krieger et al. 2018). Viewed by borough, the estimated nonresident share of total employment ranged from about 19 percent in Juneau to 65 percent in Skagway. Seafood processing had the highest percentage of nonresident workers, with almost three-quarters of the labor force (74 percent) composed of nonresidents. The Arts, Entertainment, and Recreation sector and the Accommodation and Food Services sector in Southeast Alaska also had relatively high nonresident shares, 51 percent and 41 percent, respectively, as did the Mining sector (47 percent) (Krieger et al. 2018).

Southeast Alaska's economy is highly seasonal. This is particularly the case with the salmon-harvesting and seafood-processing sectors. Seasonal variation in the leisure and hospitality sector (used here as a proxy for the visitor industry) is substantially lower than the salmon harvesting and seafood processing sectors, but more than twice the Southeast Alaska average. Annual seasonal variation for mining and logging are lower than the Southeast Alaska average. Nonresident and seasonal employment are discussed in more detail in the 2016 Forest Plan FEIS (USDA Forest Service 2016b, pp. 3-482 to 3-484).

Industry-Specific Descriptions

Forest Products

Employment

Southeast Alaska timber is primarily purchased and harvested from Tongass National Forest lands managed by the USDA Forest Service, from the State of Alaska (Division of Forestry, Alaska Mental Health Trust Land Authority, and University of Alaska Trust Land Office), and Alaska Native Village and Regional corporations (Alaska Native corporations). Sawmill employment has historically been supported by Forest Service timber sales, with state timber harvest also contributing. Logging employment is generated from all ownerships, including Alaska Native corporation lands.

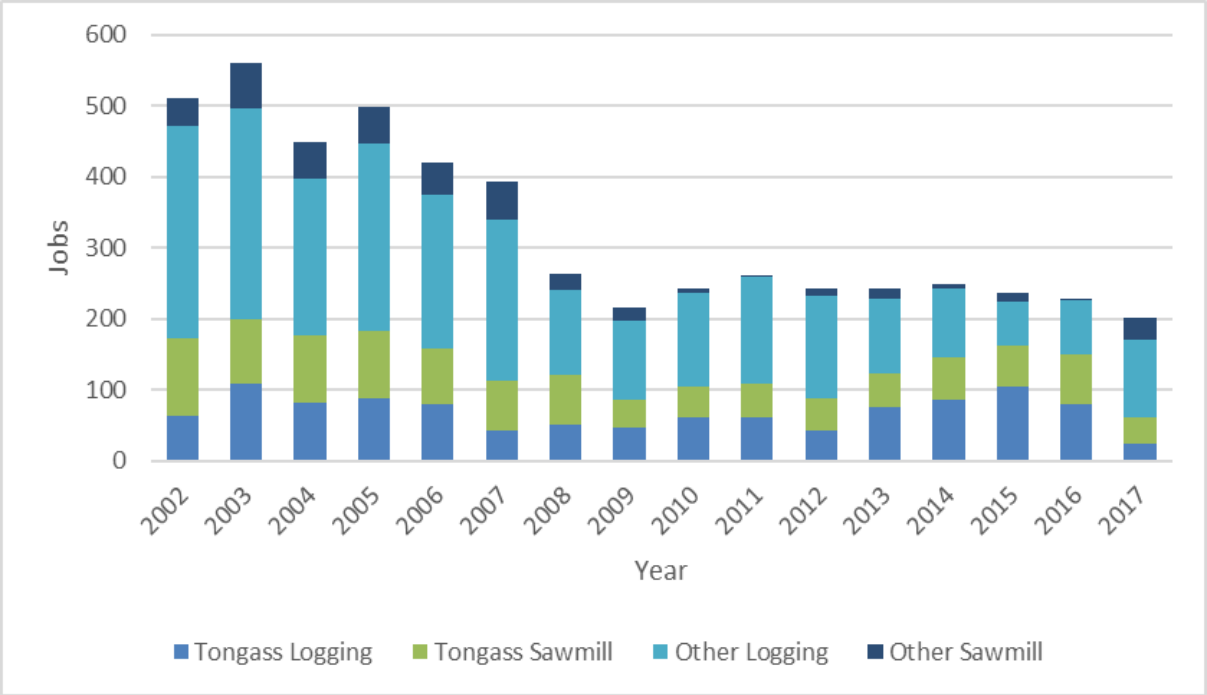
Timber industry employment in Southeast Alaska peaked at the end of the 1980s, before decreasing sharply in the 1990s. Much of this job loss was associated with closure of the large pulp mills in Sitka (1993) and Ketchikan (1997). Timber employment has continued to decline since the 1990s, falling from a recent high of 561 jobs in 2003 to 202 jobs in 2017 (Table 3.2-2; Figure 3.2-4). Tongass National Forest-related employment in logging and sawmilling declined from 199 jobs in 2003 to a low of 61 jobs in 2017. Non-Tongass timber employment also declined over this period, falling from a recent high of 362 jobs in 2003 to 109 jobs in 2017, a decrease of 70 percent (Table 3.2-2). From 2002 to 2017 harvest activities on the Tongass supported about 41 percent of timber jobs in Southeast Alaska, on average. Harvest activities supporting employment have included pre-commercial thinning, generally defined as a silvicultural treatment to reduce stand density, primarily to improve forest health.

Table 3.2-2
Timber Industry Employment in Southeast Alaska, 2002-2017

Year[1]	Tongass Logging	Tongass Sawmill	Total Tongass-Related Employment	Other Logging	Other Sawmill	Total Other Timber Employment	Total Timber Industry Employment
2002	63	110	173	299	40	339	512
2003	108	91	199	298	64	362	561
2004	82	95	177	220	53	273	450
2005	88	96	184	263	52	315	499
2006	81	77	158	217	46	263	421
2007	44	70	114	225	54	279	393
2008	52	70	122	118	24	142	264
2009	48	39	87	110	19	129	216
2010	61	43	104	133	7	140	244
2011	62	47	109	150	3	153	262
2012	42	47	89	144	11	155	244
2013	75	48	123	106	14	120	243
2014	86	60	146	96	7	104	249
2015	104	58	162	63	12	75	237
2016	81	70	151	76	1	77	228
2017	24	37	61	109	32	141	202

Note:
[1] Data are presented by calendar year. Source: USDA Forest Service 2018a

Figure 3.2-4
Timber Industry Employment in Southeast Alaska, 2002-2017



Source: USDA Forest Service 2018a

Harvest

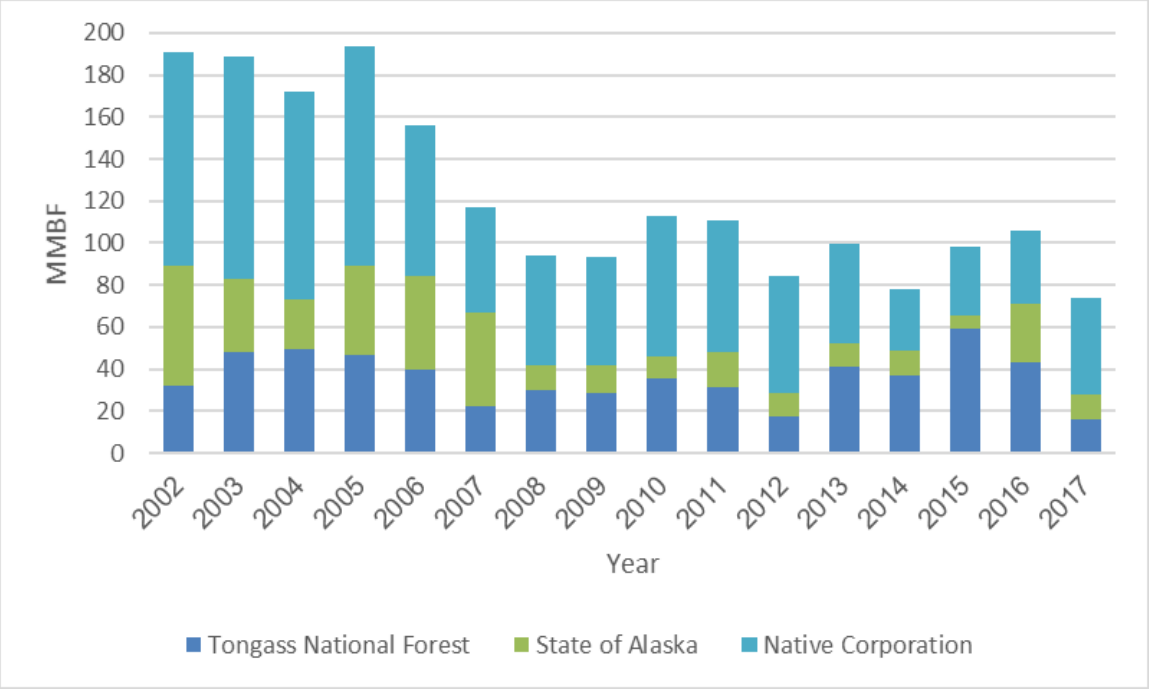
Timber harvest in Southeast Alaska also peaked in the late 1980s, with harvest levels slightly below 1 billion board feet. Total harvest in 2017 was 74.2 MMBF, about 8 percent of peak levels. Harvest on the Tongass accounted for about 21 percent (16.0 MMBF) of this total, with almost two-thirds (63 percent, 46.4 MMBF) of the overall total provided by Alaska Native corporation lands and 16 percent (11.9 MMBF) provided by the State of Alaska (Table 3.2-3; Figure 3.2-5).

Table 3.2-3
Timber Harvest in Southeast Alaska by Ownership, 2002–2017

Year[1]	Tongass National Forest	State of Alaska[2]	Alaska Native corporation	Total
2002	31.9	57.3	101.7	190.9
2003	48.1	34.8	105.7	188.6
2004	49.2	24.2	98.9	172.3
2005[3]	46.6	42.9	103.9	193.4
2006[3]	40.0	44.6	71.2	155.8
2007[3 4]	22.5	44.6	50.0	117.1
2008	30.0	11.9	52.3	94.2
2009	28.3	13.5	51.8	93.6
2010	35.7	10.5	66.4	112.6
2011	31.6	16.3	63.1	111.0
2012	17.5	10.8	56.1	84.4
2013	41.2	11.2	47.4	99.8
2014	36.7	12.0	29.3	78.0
2015	59.5	6.2	32.4	98.1
2016	43.5	27.5	34.6	105.6
2017	16.0	11.9	46.4	74.2

Notes:
[1] Timber harvest volume reported by calendar year, in million board feet (MMBF), and includes both sawlog and utility.
[2] State of Alaska includes Division of Forestry, Mental Health Trust, and University of Alaska Trust Lands.
[3] The relative increase in State harvest was an effort to provide additional timber to make up for a shortfall in supply from the Tongass.
[4] The relative decrease in Tongass harvest in 2007 was the result of an injunction that stopped Tongass logging over most of the operating season.
Source: USDA Forest Service 2018a

Figure 3.2-5
Timber Harvest in Southeast Alaska by Ownership, 2002-2017



Source: USDA Forest Service 2018a

2016 Forest Plan and the Tongass Timber Program

Annual Market Demand

The Tongass National Forest, in compliance with the Tongass Timber Reform Act (1990), seeks to provide an annual (and planning cycle) supply of timber to meet market demand to the extent consistent with providing for multiple use and sustained use of all renewable forest resources and other applicable laws. The formulas and procedures used to forecast annual market demand are described in a Forest Service report titled *Responding to the Market Demand for Tongass Timber: Using Adaptive Management to Implement Section 101 of the 1990 Tongass Timber Reform Act* (Morse 2000). These procedures, known as the "Morse Methodology," are based on the following premises:

- Forest product markets are volatile, especially in the short-term.
- Timber purchasers in Southeast Alaska have few alternative suppliers of timber if they cannot obtain it from the Tongass National Forest. Oversupplying the market has relatively few adverse economic effects; undersupplying it can have much greater negative consequences.
- It takes years to prepare NFS timber for sale, including completion of EISs.
- It is difficult to estimate demand for timber from the Tongass National Forest, even a year or two in advance.
- Industry must be able to respond to rapidly changing market conditions in order to remain competitive.

Following the 2016 Forest Plan FEIS, the derived demand projections from Daniels et al. (2016) were incorporated into the Morse Methodology and used to develop subsequent annual estimates of the Tongass National Forest timber sale offerings required to meet market demand (Grewe 2017). The resulting estimates for fiscal years 2017 and 2018 were 53 MMBF and 58 MMBF, respectively (USDA Forest Service 2017a, 2018b). These estimates are not intended to represent actual timber purchases. Rather, these annual estimates reflect the estimated volume of timber the Forest Service needs to offer to replace the volume expected to be harvested and to help build a 3-year supply of timber under contract. This 3-year supply allows the industry to respond to market fluctuations. In practice, the actual amount of timber that is offered and sold may be substantially less than the predicted timber purchases in the annual demand calculations. This is because the actual volume of timber offered in any year reflects a combination of factors, including final budget appropriations, completing the NEPA process, and volume affected by litigation. The planned annual timber volume could include a combination of new, previously offered, and reconfigured timber sales. Both old-growth and young-growth green timber and salvage sales are components of this program.

Timber Supply

The Tongass National Forest uses a five-year timber sale schedule for planning and scheduling purposes that is consistent with Forest Service Manual 2430. This five-year plan is based on completed and ongoing environmental analyses and can be adjusted in response to changing market conditions and the NEPA public involvement process on projects. Volumes for future timber sales are estimates that may be adjusted over time. The Tongass National Forest posts the five-year schedule on the public website at: www.fs.usda.gov/tongass/.

For fiscal year 2017, the annual demand goal for volume of timber to be offered from the Tongass National Forest was 53 MMBF (USDA Forest Service 2017a). A total of 30.7 MMBF was sold on the Tongass in fiscal year 2017, with the Good Neighbor Authority (GNA) Kosciusko Young Growth sale purchased by Alcan Forest Products accounting for 30 MMBF (98 percent) of the total (USDA Forest Service 2017b). The GNA Kosciusko Young Growth sale was the first timber sale awarded under a GNA agreement between the State of Alaska and USDA Forest Service. Under this agreement, the State Division of Forestry and its partners and contractors were authorized to prepare, award, harvest, and administer the sale. The sale area consisted of 1,500 acres of young-growth timber stands composed of approximately 75 percent Sitka spruce and 25 percent western hemlock, with stands to be harvested using a variety of methods (USDA Forest Service 2017c). The remaining volume sold in fiscal year 2017

consisted of 9 microsales and two other small sales, which together included less than 1 MMBF in volume (USDA Forest Service 2017b).

For fiscal year 2018, the annual demand goal for volume of timber to be offered from the Tongass National Forest was 58 MMBF (USDA Forest Service 2018b). This was not matched by the proposed sales identified for 2018 in the five-year timber sale plan for 2018, which estimated that a total volume of 32.4 MMBF would be made available for sale (USDA Forest Service 2018c). A total of 9.0 MMBF was sold on the Tongass in fiscal year 2018, with the Rough Luck sale purchased by Viking Lumber accounting for 7.6 MMBF (84 percent) of the total. The remaining 15 sales purchased that year consisted together of about 1.4 MMBF (USDA Forest Service 2018d).

The Final EIS for the Prince of Wales Landscape Level Analysis Project noted that there has been a lack of economic timber volume available for the Forest Service to offer across the Tongass National Forest (USDA Forest Service 2018e). Under the Consolidated Appropriations Act, 2018, timber sales that do not appraise positive using the current Region 10 RV (Residual Value) appraisal cannot be offered (USDA Forest Service 2018e).

Three other sales that were offered in fiscal year 2018 did not receive any bids. Combined these sales consisted of an estimated 23.6 MMBF that went unpurchased. The three sales were North Kuiu 2 (13.4 MMBF), Wrangell Island (7.4 MMBF), and Vallenar Young-Growth (2.8 MMBF).

North Kuiu 2 was the largest of the no-bid sales offered in 2018. A timber sale on Kuiu Island was originally authorized by the Forest Supervisor in 2008 and consisted of an estimated 31 MMBF from 1,200 acres of old-growth forest. A version of the sale was first offered in September 2016. This sale consisted of approximately 30 MMBF from 866 acres and did not receive any bids at that time. Following the 2016 Forest Plan FEIS, the proposed sale area was reduced and the sale was reoffered in 2018, this time consisting of 13.4 MMBF from 523 acres (Gullufsen 2018). No bids were received in 2018.

The Wrangell Island timber sale consisted of 7.4 MMBF of old-growth timber intended to provide a supply of “bridge” timber that would support local jobs and facilitate the young-growth transition. The project area consisted of approximately 428 acres on Wrangell Island (USDA Forest Service 2017d).

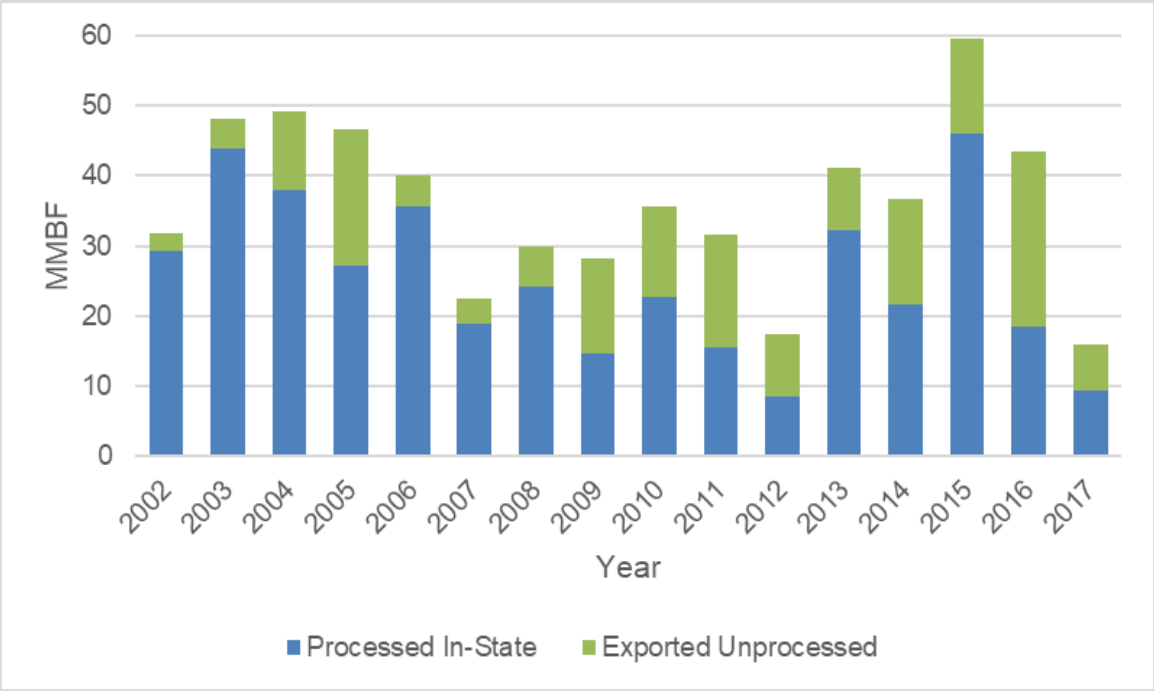
The Vallenar Young-growth Project, which consisted of approximately 2.8 MMBF of young-growth on Gravina Island near the Ketchikan airport, was subsequently sold in 2019 along with 13.2 MMBF of state-owned old-growth.

R10 Limited Export Shipment Policy

Initially established in 2007, the Limited Export Policy is intended to boost appraised timber values and provide economic sale opportunities and provide additional processing options for purchasers. The policy has continued since 2007 with modifications designed to provide additional opportunities. The limited export policy is reviewed on an annual basis. The Regional Forester noted in a 2015 review that, while improvements had occurred nationally over the preceding three years, challenges continued for purchasers seeking domestic markets for Alaska timber. The current policy allows the limited export of unprocessed western hemlock and Sitka spruce logs up to 50 percent of the total sale sawtimber volume upon Regional Office approval. In 2012, the Regional Forester agreed to begin reviewing requests to allow increased export of these species on a case-by-case basis, in exchange for purchasers providing an equivalent amount of Alaska yellow-cedar to small business operators who would process the timber locally. The Limited Export Policy is discussed in detail in Appendix H to the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

The share of total harvest on the Tongass exported as logs has varied over time, as shown in Figure 3.2-6. The export amount includes both international exports as well as domestic exports to the lower 48. With the exception of 2016, the majority of timber harvested from the Tongass has remained in-state for processing. In 2017, 6.6 MMBF (41 percent) of the total harvested (16.0 MMBF) was exported, with the majority exported to the Pacific Rim, rather than the lower 48 (USDA Forest Service 2018g).

Figure 3.2-6
Timber Harvest Exports from the Tongass National Forest, 2002-2017



Note: These data represent actual volume cut and processed by year, not volumes sold for the same year.
Source: USDA Forest Service 2018g

Timber Industry

Annual Mill Survey

The wood products industry in Southeast Alaska in its current form consists of individual- and family-owned sawmills and independent logging businesses. The Forest Service has conducted an annual on-site survey of sawmills in the region since 2000. To maintain consistency, the survey includes only those mills assessed in previous survey years. The original list of mills to be surveyed, initially identified in 2000, consisted of 20 sawmills that regularly operated and met established criteria for medium- to large-size classification. This total was subsequently increased to 22 in 2007. The annual survey for 2017 found that eight of these sawmills (36 percent) were still active; three (14 percent) remained installed with significant equipment on site, but were idle during 2017; and the remaining 11 (50 percent) were no longer in production, either decommissioned or uninstalled (Parrent and Grewe 2018). The eight active and three idle mills included in the survey are identified in Table 3.2-4.

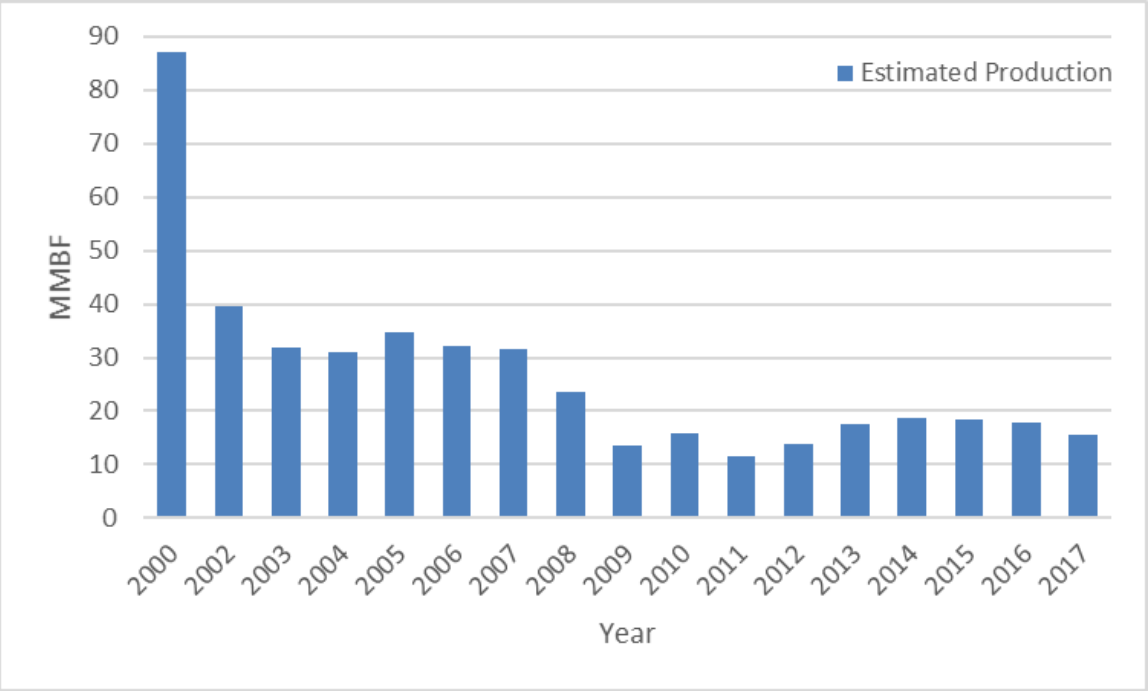
Estimated total production for the mills included in the annual mill survey fell by more than 50 percent from 2000 to 2002, decreasing from 87.1 MMBF to 39.7 MMBF. Production has varied from year-to-year since then, but has generally trended downward (Figure 3.2-7). Total estimated production from the remaining active saw mills was 15.5 MMBF in 2017, approximately 14 percent of total active and idle capacity (Table 3.2-3). The capacity utilization rate of the last operating medium-sized sawmill in Southeast Alaska (Viking Lumber) in 2017 was estimated at about 18 percent (Table 3.2-4). By comparison, sawmills in Idaho, Oregon, California, and Montana generally utilize more than 80 percent of their capacity, unless there is a severe economic downturn (USDA Forest Service 2011).

Table 3.2-4
Forest Service Mill Survey: Estimated Mill Capacity, Production, and Utilization, 2017

Mill Name[1],	Location	Estimated Capacity (MBF)[2]	Estimated Production (MBF)[3]	Percent Utilization
Viking Lumber Co.	Craig	80,000	14,000	18%
Icy Straits Lumber & Milling Co.[4]	Hoonah	3,000	500	17%
Good Faith Lumber Co. LLC[6]	Thorne Bay	6,250	200	3%
Western Gold Cedar Products	Thorne Bay	6,500	650	10%
D&L Woodworks	Hoonah	1,750	60	3%
Thuja Plicata Lumber	Thorne Bay	1,000	100	10%
The Mill	Petersburg	6,000	24	0%
Falls Creek Forest Products[5]	Petersburg	3,000	10	0%
Total Active	Southeast Alaska	107,500	15,544	14%
Porter Lumber Co.	Thorne Bay	2,500	NA	NA
St. Nick Forest Products[7]	Craig	1,150	NA	NA
Northern Star Cedar (NSC)	Thorne Bay	2,500	NA	NA
Total Idle	Southeast Alaska	6,150	NA	NA
Overall Total[8]	Southeast Alaska	113,650	15,544	14%

Notes:
MBF = thousand board feet; NA = not applicable
[1] Data are presented for those mills included in the Forest Service's annual on-site survey only.
[2] Estimated mill capacity is an estimate of the processing capability of the mill based on the amount of net sawlog volume (Scribner log scale) that could be utilized by the mill as currently configured, during a standard 250-day per year, two shifts per day, annual operating schedule, not limited by availability of employment, raw materials or market.
[3] Estimated Mill Production is the estimated net sawlog volume used during the year to manufacture sawn products.
[4] Estimated capacity for the Icy Straits mill was reduced from 21 MMBF as a result of a major mill fire in July 2010. Mill production occurred prior to the fire.
[5] Formerly Southeast Alaska Wood Products.
[6] Formerly Thorne Bay Wood Products.
[7] Formerly W.R. Jones & Son Lumber Co.
[8] Totals may not sum due to rounding.
Source: Parrent and Grewe 2018

Figure 3.2-7
Estimated Sawmill Production for Surveyed Mills, 2000 to 2017



Note: The annual survey was not conducted during 2001. Source: Parrent and Grewe 2018

The Tongass National Forest supplied about 8.4 MMBF or 54 percent of the total volume (15.5 MMBF) processed by the mills identified in Table 3.2-4 in 2017, with State lands responsible for most of the remaining volume (Parrent and Grewe 2018). The Tongass share of timber processed locally (8.4 MMBF) was equivalent to about 52 percent of the total (16.0 MMBF) harvested on the Tongass in 2017 (Table 3.2-3). Viking Lumber processed 14 MMBF, approximately 90 percent of the total (15.5 MMBF) processed in 2017 (Table 3.2-4).

Other Mills

As noted above, the annual Forest Service mill survey is not a comprehensive inventory of all sawmills in Southeast Alaska. While no new sawmills of sufficient size classification to be added to the annual mill survey have been established since 2007, many other smaller sawmills operate across the region, including facilities that operate on a seasonal, part-time, or contingent basis. The number of active mills and timber operators in Southeast Alaska varies at any given time. A review of business licenses in December 2018, for example, identified 22 additional sawmills in Southeast Alaska that are not included in the Forest Service survey (Table 3.2-5). The University of Montana's Bureau of Business and Economic Research (BBER), in conjunction with the PNW Inventory and Analysis Program of the Forest Service, conducted a census of timber processors in Alaska in 2011 and identified 27 sawmills in Southeast Alaska, with almost half this total (12 facilities) located on Prince of Wales Island (Berg et al. 2014). A point-in-time analysis of business license data in 2012 identified a total of 105 forest products businesses including wood products manufacturing businesses (32 percent), timber tract operations (32 percent), forestry support activities (19 percent), and sawmills (17 percent) (Alaska DCCED 2012). A comparable review in December 2018 identified a total of 152 active forest projects business licenses in Southeast Alaska communities (Alaska DCCED 2018).

Table 3.2-5
Additional Sawmills in Southeast Alaska Based on a Review of Business Licenses, 2018

Mill Name[1]	Location
Cedar Street Enterprises	Port Alexander
Chilkat Valley Sawmill	Haines
Crew Lumber	Edna Bay
CSL Farm & Services	Edna Bay
Cutting Edge Wood Products	Ketchikan
D and L Woodworks	Hoonah
Dale R. Bakula Construction	Ketchikan
Dark Horse Lumber	Haines
Fair & Square Milling	Coffman Cove
Falls Creek Forest Products	Petersburg
Glacier Bay Woodcraft	Gustavus
K & D Lumber	Thorne Bay
Mud Bay Lumber Company, LLC	Haines
Peavey Log	Thorne Bay
Pitch Enterprises	Thorne Bay
Seakwood.com	Petersburg
Spruce Point Mill	Petersburg
Tenakee Logging Company	Tenakee Springs
Windy Point Sawmill and Bobcat Service	Craig
Wood Marine	Klawock
The Woodshed	Petersburg
Yakutat Supply	Yakutat

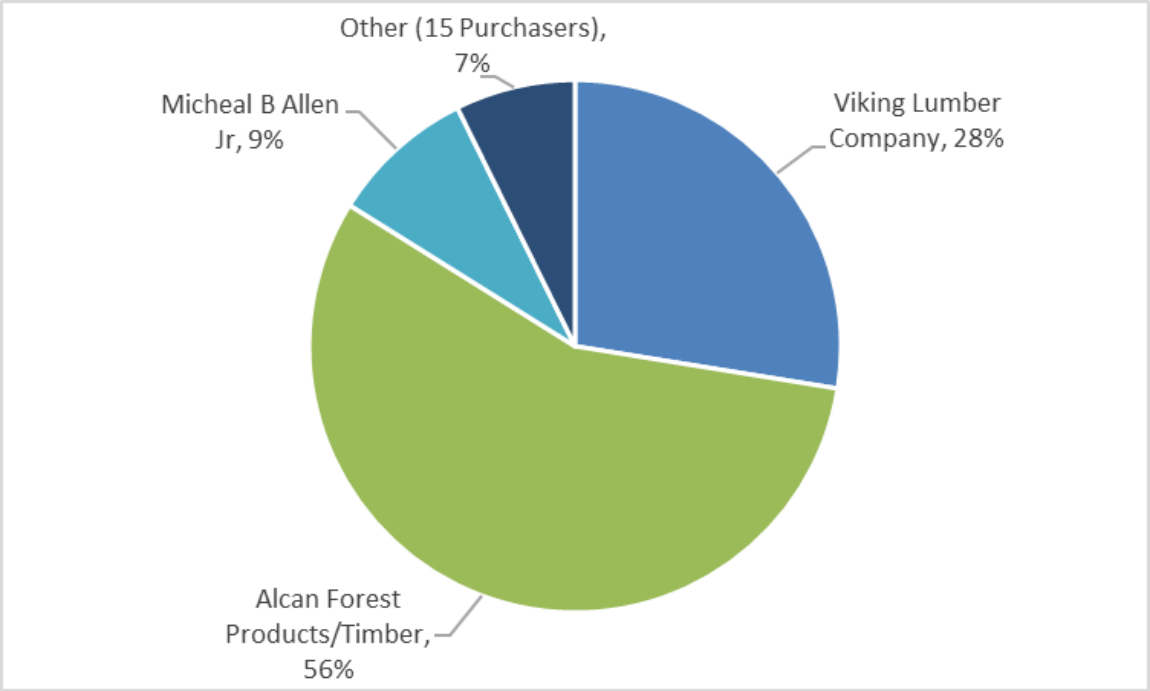
Note:
[1] These businesses were identified through a review of business licenses in December 2018 and includes businesses listed as sawmills (North American Industrial Classification System [NAICS] Code 321113 – Sawmills). This table identifies additional sawmills that are not included in the Forest Service's mill survey (see Table 3.2-4), but is not intended to be a comprehensive list of all sawmills in Southeast Alaska.
Source: Alaska DCCED 2018

Volume Under Contract

Volume under contract refers to the volume included in Forest Service timber sales that have been purchased, but not yet logged or only partially logged. Volume under contract is, therefore, essentially a measure of inventory that changes on a regular basis, increasing as timber is sold and added to the total and decreasing when sale volumes are harvested.

Various purchasers had an estimated total of 66.3 MMBF of uncut timber under contract with the Forest Service at the end of November 2018 (USDA Forest Service 2018d). Alcan Forest Products LLP/Timber Inc. had more than half of this total (56 percent; 37.4 MMBF) under contract, followed by Viking Lumber with 28 percent (18.3 MMBF), and Micheal B. Allen Jr with 9 percent (5.8 MMBF) (Figure 3.2-8). Fifteen other purchasers had a combined total of 4.8 MMBF in uncut volume under contract; in all but one case, the amount under contract was less than 1 MMBF (USDA Forest Service 2018d). Alcan Forest Products, based in Ketchikan, does not operate a processing facility in Southeast Alaska, but follows the Limited Export Shipment Policy, and must sell logs that are not approved for export to a processing facility in the state. The GNA Kosciusko Young Growth sale, which makes up much of the volume Alcan Forest Products has under contract, about 80 percent, was approved for 100 percent export.

Figure 3.2-8
Volume under Contract by Owner, 2018



Source: USDA Forest Service 2018d

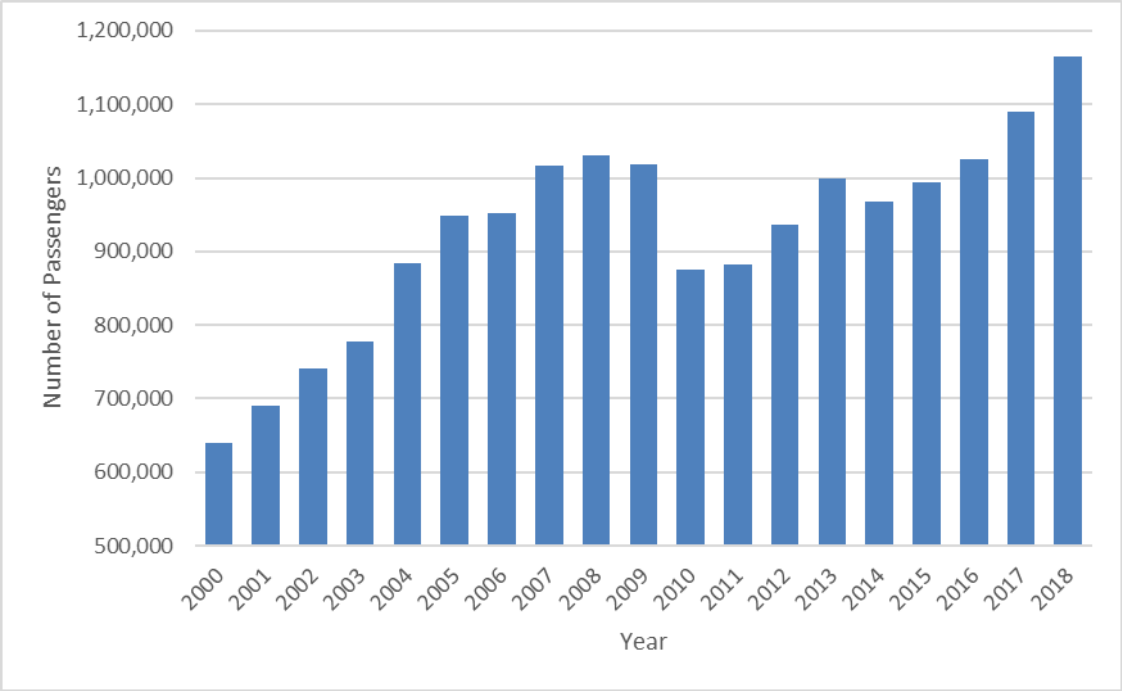
Recreation and Tourism

Recreation and Tourism in Southeast Alaska

Trends in Visitation
As noted above, an estimated 1.2 million people visited Southeast Alaska in 2016, with most of these visitors (86 percent) arriving by cruise ship (McDowell Group 2017).

Southeast Alaska Cruise Ship Visitor Volume
From 2000 to 2018, Southeast Alaska's total cruise passenger volume has averaged approximately 928,000 each year, with cruise ships visiting during the summer season (May to September). Cruise visitation to Southeast Alaska initially peaked with more than 1 million visitors per year from 2007 to 2009 before decreasing in 2010, as a result of the national economic recession. Volumes have gradually increased since then peaking with an all-time high of 1,090,000 cruise visitors in 2017, followed by another record year in 2018, with 1,165,000 cruise visitors (Figure 3.2-9). The number of cruise passengers visiting Southeast Alaska is expected to continue to grow with an estimated 1,361,400 cruise passengers anticipated for 2019 (Southeast Conference 2018).

Figure 3.2-9
Southeast Alaska Cruise Passengers, 2000-2018



Source: Southeast Conference 2018, USDA Forest Service 2016b

Almost all Southeast Alaska cruise passengers, 98 percent of the total, visited Juneau in 2016, followed by Ketchikan (92 percent) and then Skagway (80 percent) (Table 3.2-6). Hoonah and Sitka each received more than 120,000 cruise visitors in 2016 each (159,132 and 122,944, respectively), with Haines and Wrangell visited by 41,685 and 7,926 cruise passengers, respectively (Table 3.2-6). Trends in cruise visitation in the three communities with the largest number of visitors (Juneau, Ketchikan, and Skagway) mirrored regional trends over time, peaking in the years prior to the national recession, with visitation decreasing sharply in 2010. From lows in 2010 and 2011, visitation has gradually increased in all three communities and was similar to pre-recession levels by 2016 (Table 3.2-6).

Table 3.2-6
Southeast Alaska Cruise Passengers by Community, 2007-2016

Year	Haines	Hoonah	Juneau	Ketchikan	Sitka	Skagway	Wrangell
2007	27,659	161,920	1,017,341	901,595	233,936	820,829	5,192
2008	50,121	126,381	1,032,274	941,910	289,753	781,676	4,002
2009	43,550	134,575	1,019,507	936,220	224,335	785,034	3,842
2010	32,259	122,974	879,310	828,929	144,383	697,060	3,869
2011	27,176	127,866	875,947	844,412	129,380	708,981	4,719
2012	31,007	120,786	927,941	894,320	110,714	755,681	678
2013	32,378	124,320	978,559	948,685	99,920	821,874	6,417
2014	29,133	142,416	953,055	884,503	90,182	819,239	5,171
2015	42,515	150,434	976,367	944,525	117,546	815,541	7,471
2016	41,685	159,132	1,004,774	947,972	122,944	817,308	7,926

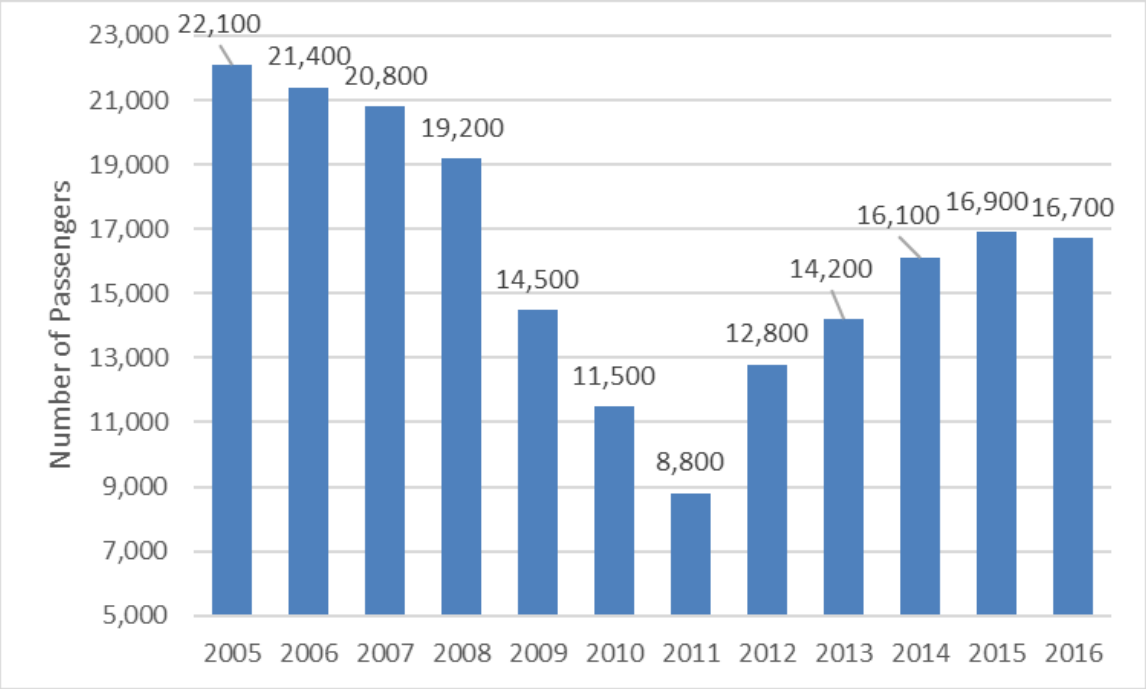
Source: Alaska DCCED 2017

Small Cruise Market
Alongside the international cruise lines, several small- and mid-size cruise operators are active in the region, often taking their customers to smaller places such as Metlakatla and Petersburg in addition to the

larger communities. Reliable data regarding the small cruise vessel industry is limited, but the Alaska Department of Economic Development (ADED) (2016) found that small cruise ships accounted for about 1.5 percent of Alaska's cruise passengers in 2015.

Although accounting for a small share of the overall market, this segment of the cruise market is important for smaller communities that do not have the infrastructure to accommodate larger vessels. Overall, small cruise vessel passenger capacity declined from a recent high in 2005. Capacity has gradually increased since a low of 8,800 estimated passengers in 2011, but remained below 2005 levels in 2016 (Figure 3.2-10). In 2015, Alaska's small cruise vessel fleet included 27 vessels (including vessels carrying fewer than 20 passengers), with a total of 344 scheduled sailings in 2015 (ADED 2016).

Figure 3.2-10
Southeast Alaska Small Cruise Vessel Passenger Capacity, 2005-2016

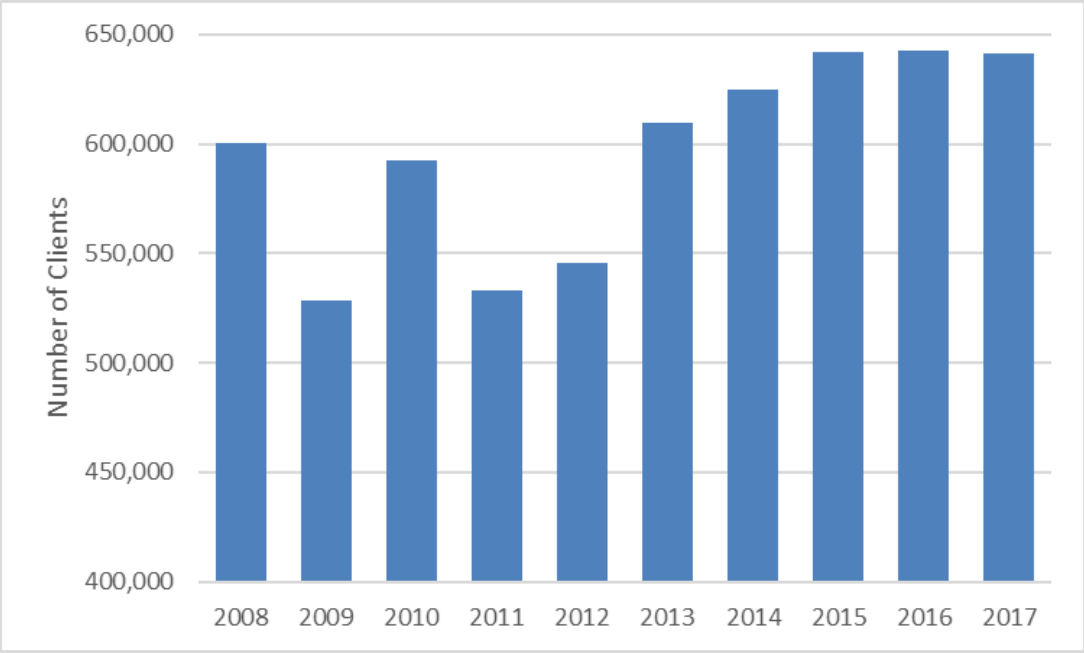


Note:
[1] Small cruise vessels are defined for the purposes of data collection as small, overnight commercial passenger vessels that carry less than 250 passengers. Estimates exclude vessels with capacity for less than 20 passengers.
[2] Data for 2016 was projected. Source: ADED 2016

Outfitter/Guide Use

A total of 242 permitted outfitter/guides provided services to Forest visitors during 2013 to 2017. More than half of these operators (132) uses the Forest consistently (at least four out of the five years). Outfitter/guides reported an annual average of 632,000 service days over this period, with a total of 614,149 service days or clients reported in 2017. A service day is defined as a day or any part of a day for which an outfitter or guide provides service to a client on NFS lands. Figure 3.2-11 shows reported outfitter/guide use on the Forest from 2004 to 2017. Outfitter/guide use is discussed in more detail in the *Recreation and Tourism* section of this EIS.

Figure 3.2-11
Tongass National Forest Outfitter/Guide Use, 2008 to 2017



Note:
[1] A service day is defined as a day or any part of a day for which an outfitter or guide provides service to a client on NFS lands.
Source: USDA Forest Service 2017e, 2018h

Employment and Contribution to the Regional Economy. Recreation and tourism-related employment is difficult to accurately quantify because visitors spend their money throughout the local economy. Recreation and tourism is not classified or measured as a standard industrial category. Components of travel and tourism activities are instead partially captured in other economic sectors, such as retail trade (e.g., grocery stores and gift shops), transportation, hotels and other lodging places, and amusement and recreation services. Information presented above for the visitor sector is considered generally representative of recreation and tourism-related employment in Southeast Alaska (see Table 3.2-1 and Figure 3.2-3).

According to the Alaska DOL (Bell 2015), visitor-related jobs in Southeast Alaska are concentrated in Juneau, Ketchikan, and Skagway, which together accounted for more than three-quarters of the regional total in 2014. Transportation is the largest visitor-related economic sector in Southeast Alaska making up about one-third of visitor-related employment, with jobs ranging from whale watching boats, to tour buses, to airlines. The highest paying visitor-related occupations are also in the transportation sector, including captains and mates of water vessels (Bell 2015).

A separate study prepared on behalf of the Alaska DCCED found that the visitor industry supported 11,925 jobs and $445 million in labor income in Southeast Alaska from October 2016 through September 2017 based on direct visitor spending of $705 million (McDowell Group 2018a). These estimates are for total employment and labor income, meaning that they include workers employed directly by the visitor industry (direct jobs and income), as well as jobs and income supported elsewhere in the economy (indirect and induced jobs and income).[15] A separate estimate of direct employment developed from Alaska DOL and U.S. Census data identified a total of 7,739 direct jobs supported by the visitor industry in 2017 (Table 3.2-1).

[15] Economic activity in one sector generates activity in others as firms purchase services and materials as inputs (termed “indirect” effects) and employees spend their earnings within the local economy (“induced” effects).

Nature-Based Tourism. A study prepared by the Institute of Social and Economic Research at the University of Alaska Anchorage provides insight into the contribution of nature-based tourism to the regional economy. This study, which involved field research conducted in the summers of 2005, 2006, and 2007, focused on a limited number of communities and sought to provide insight into revenues generated, the types of nature-based activities attracting tourists, and the resulting flows of money through the economy (Dugan et al. 2009). The findings of the study indicate that nature-based tourism generates substantial revenues in the region, with an estimated $277 million generated in annual direct business revenues for the companies surveyed in Sitka, Juneau, Chichagof Island, Prince of Wales Island, Petersburg, and Wrangell (Dugan et al. 2009).

Dugan et al. (2009) also found that nature-based tourism takes a number of different forms and the ratio of cruise ship passengers to independent travelers varies by location. Most nature-based activities that originate in Ketchikan, for example, fell into four general categories: flightseeing, marine charters, adventure experiences, and general sightseeing. In all cases, the majority of clients participating in these activities were cruise ship passengers. Nature-based tourism on Chichagof Island, on the other hand, included a mix of cruise ship passengers and independent travelers, depending on the location and activity involved (Dugan et al. 2009).

Another study, conducted on behalf of ADF&G, estimated that residents and visitors to Southeast Alaska spent $363 million hunting and viewing wildlife in 2011, with visitors viewing wildlife accounting for an estimated 59 percent of this total (ECONorthwest 2014). Based on these estimated expenditures, the study estimated that hunting and wildlife viewing, respectively, supported 390 and 1,390 direct jobs and a combined total of $107 million in labor income in Southeast Alaska in 2011, with additional indirect and induced jobs and income supported elsewhere in the economy (ECONorthwest 2014).

Recreation on the Tongass National Forest

While it is reasonable to assume that the majority of visitor recreation and tourism activity in the region is related to the natural environment, not all of the activity generating this employment can be directly linked to the Tongass National Forest. Many visitors experience the Tongass from the deck of a cruise ship without directly using the forest for recreation purposes. In addition, while the Tongass includes approximately 80 percent of the land area in Southeast Alaska, there are other lands that offer wildland recreation opportunities in the region, including 3.3 million acres of National Park Service (NPS) lands, and recreation lands managed by the State of Alaska. Further, other popular recreation and tourism activities, such as saltwater fishing, sea kayaking, and shopping, do not take place on the Tongass, although the forest may provide a backdrop for these activities.

The Alaska Region of the Forest Service (Region 10) has been participating in the Forest Service's National Visitor Use Monitoring (NVUM) program since 2000. Based on the results of the NVUM program for 2010 to 2014 and coefficients developed by White and Stynes (2010), the Forest Service (2017f) calculated a visitation estimate of 2,874,000 annual visits to the Tongass National Forest. The results of earlier surveys indicated that half of Alaska residents surveyed who live in Southeast Alaska reported using a boat or plane to access the national forest (White and Stynes 2010). Almost half (49.7 percent) of non-resident visits to the Tongass National Forest involved the use of a guide or outfitter at some point, with local cruises, wildlife viewing, and flightseeing reported most frequently. Alaska residents in contrast were found to very rarely use outfitters or guides (White and Stynes 2010). More detailed information on recreation use on the Tongass is presented in the *Recreation and Tourism* section of this EIS.

Spending profiles were estimated for residents and non-residents visiting the Forest based on data compiled during the NVUM surveys. Using coefficients developed by White and Stynes (2010), the Forest Service (2017f) estimated that 2,874,000 annual visits generated about $382 million in spending and supported 3,947 direct jobs and an additional 1,110 jobs elsewhere in the regional economy. This overall estimate is equivalent to about 42 percent of the regional visitor estimate developed for Alaska DCCED in 2017 (McDowell Group 2018a), and the direct component is about 51 percent of the direct visitor jobs estimated by Southeast Conference (2018).

Commercial Fishing and Seafood Processing

In 2017, an estimated 302 million pounds of seafood was harvested in Southeast Alaska with an ex-vessel value of $289 million. Viewed in terms of value, salmon accounted for more than half (56 percent) of the total commercial catch in Southeast Alaska in 2017, with the remainder divided among black cod (16 percent), halibut (15 percent), crab (8 percent), herring (2 percent), and other (5 percent) (Southeast Conference 2018). Total pounds landed and ex-vessel values in 2017 were similar to regional 10-year averages, and a substantial improvement over the 2016 season, which was the worst in more than a decade (Southeast Conference 2018).

Employment in the seafood harvesting and processing sectors varies from year-to-year, but remains relatively stable compared to the fluctuations in the volumes and value of salmon harvested each year. Salmon harvesting employed an estimated 1,283 people in Southeast Alaska in 2016, with an additional 992 people employed harvesting other fish (Alaska DOL 2017). A further total of 1,400 people were employed in fish processing in 2016 for a combined total of 3,675 jobs (Alaska DOL 2016). Seafood harvesting and fish processing employment trends are shown for 2000 to 2013 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b, pp. 3-501 to 3-503).

Unlike other basic sectors of Southeast Alaska's economy, components of the seafood industry are spread throughout the region with an important presence in virtually every community. Seafood processing workers, for example, were employed in all of the boroughs in 2015, ranging from 10 workers in Skagway to 1,023 workers in Ketchikan Gateway Borough and 1,102 in Sitka (Alaska DOL 2016).

The seafood processing sector is generally characterized by high seasonality and low resident hire, as well as low hourly wages, with a median annual wage of $24,689 in 2013 (Strong 2014). The industry does, however, have a number of higher paid occupations, including ship engineers, captains, mates, boat pilots, and general and operations mangers, which accounted for just 1.2 percent total employment, but 6 percent of wages, with a median annual wage of $66,720 (Strong 2014).

Mining and Mineral Development

Mineral exploration and mining have been a part of life in Southeast Alaska for more than a century. Estimates developed using Alaska DOL data found that a total of 886 workers were employed in the mining sector in Southeast Alaska in 2017 (Table 3.2-1). According to a recent economic impact study prepared for Alaska's mining industry, the Greens Creek and Kensington mines employed 414 workers and 325 workers in 2016, respectively, with the Kensington Mine employing an additional 90 contractors (McDowell Group 2018b). Mining jobs are the highest-paying jobs in the region, with annual wages of $102,000 in 2017 (Southeast Conference 2018). The high wages in this sector reflect the skilled nature of the job, as well as the demands of working in remote locations (Abrahamson 2013). Mining employment in Southeast Alaska increased in 2017, up 11 percent from the preceding year, with the region's two large mines (Greens Creek and Kensington) accounting for the majority of this employment. Despite increasing employment, production decreased at both mines in 2017 (Southeast Conference 2018).

Both the Greens Creek and Kensington mines are located in the City and Borough of Juneau, mostly on Tongass NFS lands. Greens Creek Mine is a primary silver mine located on Admiralty Island; Kensington Mine is a gold mine located on the mainland approximately 45 miles north of Juneau. Alaska residents make up about two-thirds of the total labor force at each mine, 66 percent at Greens Creek and 67 percent at Kensington. Alaska resident employees of both mines live throughout the region. More than two-thirds of Greens Creek's Alaska resident employees live in Juneau. The other third live in other Southeast Alaska communities or elsewhere in the region (McDowell Group 2018b).

Two proposed underground mine projects on NFS lands on Prince of Wales Island received approval for financial assistance through the Alaska Industrial Development and Export Authority in June 2014 (Bradner 2014). Senate Bill 99 authorized $145 million and $125 million in infrastructure and construction financing, respectively, for the proposed Bokan Mountain and Niblack projects. The Bokan Mountain project is a rare earths mine that would include on-site ore processing facilities. The McDowell Group (2013) in a study prepared for the Bokan Mountain project estimated that construction of the project would last 2 years and employ an average construction workforce of 200, with peak employment

potentially reaching 300 workers. Operation would be expected to employ 190 workers with approximately $18 million in annual payroll (McDowell Group 2013). The Niblack Project is a proposed underground copper-gold-zinc-silver mine. The project owners estimate that the construction and operation phases of the project would both employ approximately 200 workers (Niblack Project LLC 2015). No exploration activity was reported for either project in 2016 and 2017 (McDowell Group 2018b).

Payments to the State

Prior to 2000, in states with national forests, 25 percent of the returns to the U.S. Treasury from revenue producing Forest Service activities such as timber sales, were returned to each state for distribution back to counties (or in Alaska, boroughs) having acreage within a national forest. Those payments were called the "25 percent fund payments" and were dedicated by law to be used for roads and schools. In October 2000, the *Secure Rural Schools and Community Self Determination Act of 2000* was enacted to stabilize federal payments to states in response to declining federal receipts.

The legislation was authorized for implementation for fiscal years 2001 through 2007 and allowed counties and/or boroughs to choose between 25 percent of current receipts or a full payment amount based on the average of the highest three payments made to the state during the 14-year period between 1986 and 1999. Alaska boroughs and communities have elected to receive a full payment amount rather than 25 percent of receipts since enactment of this legislation.

Those annual full payment amounts are primarily dedicated to roads and schools, with provisions for special project funding under certain conditions. Under the full payment approach, Forest Service payments to the State of Alaska have been based on the high 3-year historic average, rather than linked to annual Forest Service revenue.

The Secure Rural Schools Act has been reauthorized since 2008, most recently in March 2018 for Fiscal Years 2017 and 2018. The program was not reauthorized for Fiscal Year 2016, resulting in a substantial decrease in payments. Tongass-related secure rural schools payments to Southeast Alaska by borough for 2013 through 2017 are presented in Table 3.2-7.

Table 3.2-7
Federal Secure Rural Schools Payments to Southeast Alaska Boroughs, 2013 to 2017

Borough/Area	2013	2014	2015	2016	2017
Haines	131,581	124,386	145,551	30,166	376,567
Juneau	670,595	637,211	624,947	43,275	555,618
Ketchikan Gateway	1,045,870	1,059,007	993,053	91,316	905,127
Petersburg	1,255,586	1,204,494	577,743	41,876	544,597
Sitka	800,509	752,083	544,967	49,389	567,243
Skagway	22,105	21,595	17,122	2,664	18,625
Wrangell	1,117,867	1,052,610	922,953	47,826	845,691
Yakutat	560,798	539,527	623,842	36,682	473,738
Unorganized[1]	3,253,421	3,125,381	2,674,447	110,116	2,476,673
Total	**8,858,332**	**8,516,294**	**7,124,625**	**453,310**	**6,763,879**

Note:
[1] Unorganized represents payments to the Hoonah-Angoon and Prince of Wales-Hyder CAs.
Sources: USDA Forest Service 2015a, 2015b, 2016d, 2018h, 2018i

Environmental Consequences

Forest Products

This DEIS provides an assessment of the potential impacts that may result from the alternatives considered for a proposed Alaska Roadless Rule. This analysis is programmatic, meaning that it examines potential effects of alternative forms of management direction for broad land areas, rather than schedule

specific activities in specific locations. Specific timber sales would be developed over time in accordance with established Forest Service procedures, with site-specific impacts evaluated through project-level environmental analysis, as appropriate. Overall timber harvest levels and composition (old-growth versus young-growth) are expected to remain unaffected by the final rule. Timber program output levels are expected to remain constant and involve a similar number of acres under all alternatives, varying only by the location of timber harvest.

Factors Affecting the Economics of Timber Offers

In practice, many factors can influence the cost of timber harvest, adding economic risks for potential purchasers and affecting the ability of the Forest Service to offer timber sales. Road construction, helicopter yarding, complex silvicultural prescriptions, setting size, and other factors may increase costs, which then decrease the value of the offering. The value of the timber offered must be sufficient to cover costs and include profit for the purchaser. Under the Consolidated Appropriations Act, 2018, timber sales that do not appraise positive using the current Region 10 RV (Residual Value) appraisal cannot be offered (USDA Forest Service 2018d). Estimated costs per thousand board feet vary substantially across the Forest. Transportation infrastructure costs and haul distances are typically higher in more remote areas, i.e., those areas that are further from existing infrastructure and markets. Market in this context may include a mill or export yard.

None of the action alternatives would result in changes to the PTSQ, and the timber objectives of the Forest Plan would continue to involve the transition to primarily young-growth harvest. While harvest levels are not expected to vary significantly among the alternatives, the alternatives do vary in terms of the amount and location of acres suitable for timber production. Young-growth suitable acres would increase only slightly (3 to 6 percent) under the action alternatives (Table 3.2-8) and, as a result, the following assessment focuses on changes in old-growth suitable acres. Summary information is, however, also provided for changes in young-growth suitable acres by alternative.

The Record of Decision for the 2016 Forest Plan estimated that a total of approximately 24,000 old-growth acres would be harvested Forest-wide after 25 years, with a total of 42,500 old-growth acres harvested after 100 years (USDA Forest Service 2016c). These estimates represent an approximate upper ceiling of the number of roadless acres that could be potentially harvested under any of the alternatives. The 2016 Forest Plan FEIS estimated that approximately 5 MMBF of small and micro-sales of old-growth timber is required each year to meet the needs of existing small old-growth mills that produce high value products such as appearance grade lumber and cedar shingles. This annual small and micro-sale demand (5 MMBF) is anticipated to be met for the duration of the planning period under all of the alternatives, including Alternative 1 – No Action.

For larger sales, more acres of suitable old-growth land would allow the Forest Service greater flexibility in the selection of future timber sale areas, as well as the potential for more flexibility in sale design, depending on the planning areas selected. This improved flexibility could, in turn, potentially improve the Forest Service's ability to offer economic sales that meet the needs of industry. This greater flexibility could be especially beneficial during the first two decades of the 2016 Forest Plan (the transition period), when most old-growth harvest would take place. While many factors can influence the cost of timber harvest, as noted above, areas along existing roads are typically more economically efficient, followed by areas where existing roads can be easily extended. Transportation infrastructure costs can include road construction, reconditioning, reconstruction, and maintenance, as well as log transfer facility (LTF) development. Road construction, reconditioning, reconstruction, and maintenance involve substantial costs and have the potential to strongly influence timber sale economics.

Areas closer to markets, either a mill or export facility, are also more likely to offer more economic timber sale options. Existing old-growth mills in Southeast Alaska are primarily located in the south part of the region, with a concentration of mills, including the last remaining medium-sized mill (Viking Lumber), on Prince of Wales Island. Sales on the south part of the Forest are, therefore, more likely to appraise positive. In cases where the Regional Forester allows 100 percent export, which is permissible on a case-by-case basis (as discussed above), proximity to an export facility may also result in sales being more likely to appraise positive.

Areas not covered by existing NEPA decisions require additional NEPA analysis, adding cost, as well as several years planning time. The projects identified in the most recent 5-year timber sale plan for the Tongass (2018 to 2022) are assumed to be made available to meet short-term (4 to 5 year) demand under all alternative (USDA Forest Service 2018c).

Factors Common to the Action Alternatives

Additional timber harvest opportunities under the action alternatives would primarily be provided by removing regulatory roadless prohibitions for areas that are currently designated under the 2001 Roadless Rule (i.e., the removal of acres from roadless in the transition from 2001 Inventoried Roadless Areas [IRAs] to Alaska Roadless Areas [ARAs]).[16] Timber harvest would also be allowed in Timber Priority and Community Priority ARAs.[17] The removal of prohibitions in either of these ways would convert areas of previously identified unsuitable lands to suitable old-growth lands that would be available for harvest.

Suitable old-growth lands would be incrementally added by alternative, with total net increases ranging from about 18,000 acres (Alternative 2) to 165,000 acres (Alternatives 5 and 6) (Table 3.2-8, Figure 3.2-12). Viewed as a share of existing suitable old growth, these increases would range from 8 percent (Alternative 2) to 72 percent (Alternatives 5 and 6). Suitable old-growth acres would be added in three broad categories or areas: roaded roadless (Alternatives 2 to 6); logical extension areas (Alternatives 3 to 6); and areas more distant from roads (Alternatives 4 to 6). In addition, suitable old-growth acres would be added in Community Priority ARAs (Alternative 3). For the locations of suitable areas, refer to the Timber Suitability maps (see Maps 7 through 12 on thumb drive or website).

Roaded Roadless. All action alternatives would remove roadless designations for 96,000 acres that currently have roads (i.e., "roaded roadless"). These areas are considered likely locations for future timber harvest. The removal of roaded roadless acres from roadless designation would convert about 18,000 acres of previously identified unsuitable lands to suitable old-growth lands that would be available for harvest, including an estimated 6,000 acres of high-volume old growth (Table 3.2-8). High volume old-growth acres are based on the size density model (SDM), as described in the *Timber Resources* section, below. In addition, an estimated 10,000 acres of previously unsuitable lands would be converted to suitable young-growth lands that would be available for harvest.

Logical Extensions. Alternatives 3 to 6 would also remove roadless designations for "logical extension areas." These are areas that are considered the logical extension of existing road and harvest systems, and typically include areas within the same watershed (14th-field hydrologic unit) as an existing road system. These areas were identified by forest staff as the most likely locations for future timber harvest, following roaded roadless. The removal of logical extension acres from roadless designation would convert an estimated 50,000 acres of previously identified unsuitable lands to suitable old-growth lands, including an estimated 20,000 acres of high-volume old growth (Table 3.2-8). In addition, an estimated 2,000 acres of previously unsuitable lands would be converted to suitable young-growth lands.

More Distant Areas. Alternatives 4 to 6 would also remove roadless areas considered more distant from existing road systems (i.e., roadless areas outside the "roaded roadless" and "logical extension" areas). These acres are added in different ways, as discussed below, by alternative. However, when viewed in terms of changes in suitable old-growth acres that would be available for harvest, the alternatives are very similar. This is especially true for Alternatives 5 and 6, which would result in the same increase in areas more distant from roads, about 98,000 acres, including 33,000 acres of high-volume old growth (Table 3.2-8). Changes in suitable young-growth acres in areas more distant from roads would range from approximately 3,000 acres (Alternative 4) to 8,000 acres (Alternative 6).

[16] Alternative 6 would remove all regulatory roadless prohibitions on the Tongass, which would be exempt from the 2001 Roadless Rule under this alternative.

[17] Timber harvest in Community Priority ARAs would be limited to micro sales, salvage sales, and small commercial sales less than one MMBF in size.

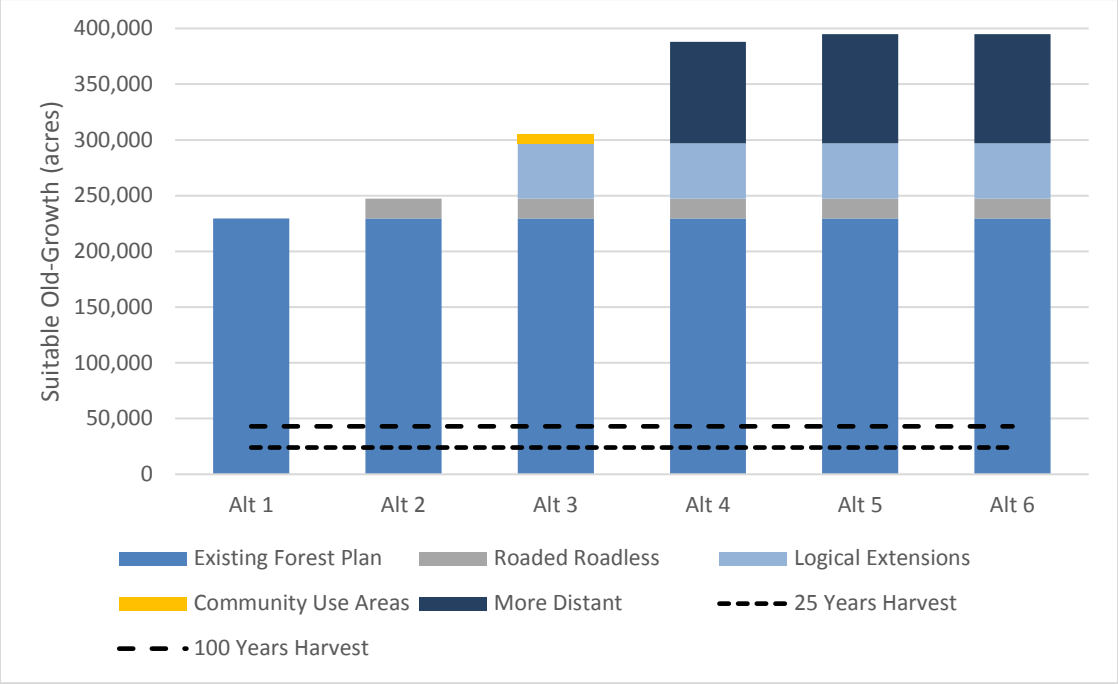
In addition, 8,000 suitable old-growth acres, including 2,000 acres of high-volume old growth, and 2,000 suitable young-growth acres would be added in Community Priority ARAs (Alternative 3) (Table 3.2-8).

Table 3.2-8
Suitable and High Volume Suitable Old-Growth Acres by Geographic Area and Alternative

	Alternative					
	1	2	3	4	5	6
Forest Land Suitable for Timber Production	No Action	Roaded Roadless	Logical Extension	Partial Dev LUDs[1]	All Dev LUDs	Full Exemption
Old Growth	230,000	247,000	305,000	388,000	395,000	395,000
Young Growth	334,000	344,000	348,000	349,000	351,000	354,000
Increase in Suitable Old Growth						
In Roaded Roadless Areas	0	18,000	18,000	18,000	18,000	18,000
In Logical Extension Areas	0	0	50,000	50,000	50,000	50,000
In Community Priority Areas	0	0	8,000	0	0	0
In More Distant Areas	0	0	0	91,000	98,000	98,000
Total[2]	**0**	**18,000**	**76,000**	**158,000**	**165,000**	**165,000**
Increase in High-Volume Suitable Old Growth						
In Roaded Roadless Areas	0	6,000	6,000	6,000	6,000	6,000
In Logical Extension Areas	0	0	20,000	20,000	20,000	20,000
In Community Priority Areas	0	0	2,000	0	0	0
In More Distant Areas	0	0	0	30,000	33,000	33,000
Total[2]	**0**	**6,000**	**28,000**	**55,000**	**59,000**	**59,000**

[1] Includes Timber Production and Modified Landscape LUDs, but not Scenic Viewshed.
[2] Totals may not sum due to rounding.

Figure 3.2-12
Suitable Old-Growth Acres by Alternative



Note:
[1] Harvest levels for 25 years and 100 years represent the total estimated old-growth acres that would be harvested to

meet the ASQ established for the 2016 Forest Plan.

Alternative 1 – No Action

Under Alternative 1 there would be no change in the boundaries of the IRAs identified in 2001 Roadless Rule and no changes in the availability of suitable old-growth acres for harvest. Under the current Forest Plan, there are an estimated 230,000 acres of suitable old growth available for harvest, almost 10 times the area expected to be harvested over the next 25 years (Table 3.2-8, Figure 3.2-12).

Alternative 2

Under Alternative 2, additional timber harvest opportunities would be provided in roaded roadless areas, with an estimated net gain of about 18,000 acres of suitable old-growth, including 6,000 acres of high-volume suitable old-growth (Table 3.2-8, Figure 3.2-12). This estimated gain (18,000 acres) is equivalent to about 8 percent of the acres available under Alternative 1 and three-quarters (75 percent) of old-growth acres expected to be harvested over the next 25 years (24,000 acres). The added suitable acres would be in areas where roads already exist and are, therefore, generally considered relatively economic to harvest. Further, the majority (94 percent) of the added acres would be located on the south part of the Forest, with slightly more than one-third (34 percent) on Prince of Wales Island (Craig and Thorne Bay Ranger Districts) (Table 3.2-9).

Alternative 2 would also result in an estimated net gain of about 10,000 acres of suitable young-growth, the majority of which (87 percent) would be located on the south part of the Forest. These acres would also be in areas where roads already exist.

Table 3.2-9
Increase in Suitable Old-Growth Acres by Ranger District and Alternative

Ranger District	Alternative				
	2	3	4	5	6
South					
Craig	4,000	8,000	14,000	15,000	15,000
Ketchikan-Misty Fjords	3,000	15,000	23,000	24,000	24,000
Petersburg	4,000	17,000	37,000	37,000	37,000
Thorne Bay	2,000	14,000	20,000	21,000	21,000
Wrangell	4,000	14,000	23,000	24,000	24,000
Subtotal	***17,000***	***68,000***	***117,000***	***122,000***	***122,000***
North					
Hoonah	0	4,000	15,000	16,000	16,000
Juneau	0	0	3,000	4,000	4,000
Sitka	0	4,000	22,000	23,000	23,000
Yakutat	0	0	0	0	0
Subtotal	***1,000***	***7,000***	***41,000***	***43,000***	***43,000***
Overall Total	**18,000**	**76,000**	**158,000**	**165,000**	**165,000**

Note:
[1] Totals may not sum due to rounding.

Alternative 3

Under Alternative 3, additional timber harvest opportunities would be provided in roaded roadless and logical extension areas, with an estimated net gain of about 76,000 acres of suitable old-growth, including 28,000 acres of high volume suitable old-growth (Table 3.2-8, Figure 3.2-12). This estimated gain (76,000 acres) is equivalent to about 33 percent of the acres available under Alternative 1 and more than three times the old-growth acres expected to be harvested over the next 25 years (24,000 acres). The added suitable acres would be in areas where roads already exist or could be logically extended and are, therefore, generally considered relatively economic to harvest. Alternative 3 also includes a net increase

of approximately 8,000 acres in Community Priority ARAs. Similar to Alternative 2, the majority (90 percent) of the added acres would be located on the south part of the Forest, with almost one-third (29 percent) on Prince of Wales Island (Table 3.2-9).

Alternative 3 would also result in an estimated net gain of about 14,000 acres of suitable young-growth, the majority of which (76 percent) would be located on the south part of the Forest. These acres would also be in areas where roads already exist or could be logically extended.

Alternative 4

Alternative 4 would provide additional timber harvest opportunities in roaded roadless and logical extension areas, as well as areas more distant from roads, with an estimated net gain of about 158,000 acres of suitable old growth, including 55,000 acres of high-volume suitable old growth (Table 3.2-8, Figure 3.2-12). This estimated gain (158,000 acres) is equivalent to about 69 percent of the acres available under Alternative 1 and more than six times the old-growth acres expected to be harvested over the next 25 years (24,000 acres).

This alternative makes available all Timber Production and Modified Landscape LUDs that were in roadless, outside of T77 Watersheds and TNC/Audubon Conservation Priority Areas. On average, these areas are more distant from roads compared with Alternative 3 and would include extensive areas designated as Timber Priority ARA. Approximately 91,000 acres of the previously identified unsuitable lands that would be converted to suitable old-growth lands are located in more distant areas. Because these areas are more distant from existing road systems, on average, they are likely to be relatively expensive to harvest and less likely to be accessed for timber production under the current Forest Plan. Less than two-thirds (63 percent) of the more distant acres added under this alternative would be located on the south part of the Forest, with 14 percent on Prince of Wales Island (Table 3.2-9).

Alternative 4 would also result in an estimated net gain of about 15,000 acres of suitable young-growth, including 3,000 acres more distant from roads. The majority of the total added young-growth suitable acres (77 percent) would be located on the south part of the Forest.

Alternative 5

Alternative 5 would provide additional timber harvest opportunities in roaded roadless and logical extension areas, as well as areas more distant from roads (Table 3.2-8, Figure 3.2-12). In addition to roaded roadless and logical extension areas, this alternative would remove all other Timber Production, Modified Landscape, and Scenic Viewshed LUDs identified in the 2016 Forest Plan from roadless designation, including T77 Watersheds and TNC/Audubon Conservation Priority Areas within those development LUDs. In addition, areas with mineral potential as defined by the “minerals overlay” defined in the Tongass Forest Plan are removed from roadless designation. Viewed in terms of suitable old-growth acres, this alternative would have the same effect as removing regulatory roadless designation from all lands (Alternative 6).

Alternative 5 would also result in an estimated net gain of about 17,000 acres of suitable young-growth, including 5,000 acres more distant from roads. The majority of the total added young-growth suitable acres (78 percent) would be located on the south part of the Forest.

Alternative 6

Under Alternative 6, the full exemption alternative, regulatory roadless designations would be removed from all areas on the Tongass, resulting in a net reduction of 9.2 million acres of designated roadless (Table 3.2-8, Figure 3.2-12). Former roadless areas would be managed in accordance with the 2016 Forest Plan, with an estimated net gain of about 165,000 acres of suitable old growth, including 59,000 acres of high-volume suitable old growth (Table 3.2-8, Figure 3.2-12). This estimated gain (165,000 acres) is equivalent to about 72 percent of the acres available under Alternative 1 and almost seven times the old-growth acres expected to be harvested over the next 25 years (24,000 acres). As with Alternative 4, much of the gain in suitable old-growth acres relative to Alternative 3 would be in areas more distant from roads (approximately 98,000 acres) and would provide additional opportunities for harvest. These more distant areas would be relatively expensive to harvest and less likely to be accessed under the

current Forest Plan. Less than two-thirds (63 percent) of the more distant acres added under this alternative would be located on the south part of the Forest, with 15 percent on Prince of Wales Island (Table 3.2-9).

Alternative 6 would also result in an estimated net gain of about 20,000 acres of suitable young-growth, including 8,000 acres more distant from roads. The majority of the total added young-growth suitable acres (71 percent) would be located on the south part of the Forest.

Employment and Income

Timber program output levels are expected to remain constant and involve a similar number of acres under all alternatives, varying only by the location of timber harvest. The proportion of cutting activity occurring within versus outside of roadless areas would vary by alternative, but overall economic impacts are assumed to remain constant. These impacts were estimated for the first decade following implementation in the 2016 Forest Plan FEIS (USDA Forest Service 2016b), with all six alternatives based on an annual average harvest of 46 MMBF. In the 2016 Forest Plan FEIS, the ratio of young growth to old growth varied by alternative and over time in the years prior to the transition to young growth (defined as the time that the young-growth supply reaches 41 MMBF).

Alternative 1 within this DEIS and all alternatives are assumed to support a similar range of direct jobs and income. Based on the 2016 Forest Plan EIS assessment, all of the alternatives would support an estimated 92 jobs in logging, 49 to 100 jobs in sawmilling, and 29 to 46 jobs related to transportation and other services, with direct income ranging from $9.8 million to $10.4 million.

The local sawmilling and transportation-related employment estimates presented in the 2016 Forest Plan EIS were based on a range, from maximum possible shipment out of state (export of all Alaska yellow-cedar and western redcedar plus hemlock and Sitka spruce export equal to 50 percent of total sale net sawlog volume), to no shipment of western redcedar, hemlock, or Sitka spruce, and export of 100 percent Alaska yellow cedar. Transportation and other services include water transportation, independent trucking, stevedoring, scaling, and export marking and sort yard employment for export volume, and water transportation, scaling, and independent trucking for locally sawn volume. Export employs more workers in transportation and other services per million board feet harvested than domestic production, which is reflected in the range of values estimated for transportation and related services.

Actual employment and income in Southeast Alaska would depend on choices made by purchasers; those choices may change as markets and prices shift. Under current market conditions, purchasers are likely to export as much as they can while processing enough material locally to keep manufacturing facilities open, and take advantage of opportunities to produce high-value sawn material in Southeast Alaska. In addition, the Regional Forester has allowed increased export on a case-by-case basis, as discussed above and explained in Appendix H of the 2016 Forest Plan (USDA Forest Service 2016a). If purchasers were allowed on a case-by-case basis to export a larger share of a particular sale in unprocessed form, there would be a commensurate reduction in sawmilling jobs and an increase in transportation-related jobs.

Recreation and Tourism

Potential impacts to recreation and tourism are assessed in the *Recreation and Tourism* section of this EIS. Potential impacts are evaluated with respect to ROS settings, recreation places, and recreation use. The *Recreation and Tourism* section also assesses impacts to outfitter/guide businesses and clients.

Under Alternative 1, most projected harvest is expected to occur in ROS settings where some modification of the natural environment is expected. Less than 1 percent of the acres currently allocated to Primitive (P), Semi-Primitive Non-Motorized (SPNM), and Semi-Primitive Motorized (SPM) ROS settings would be harvested after 100 years, assuming the maximum allowable levels of harvest were to occur. Assuming that the estimated total number of acres harvested would be the same for each alternative and that harvest would be evenly distributed across the available suitable acres, Roaded Modified (RM) as a share of the estimated total would decrease relative to Alternative 1 under all alternatives, decreasing from almost 90 percent under Alternative 1 to 67-68 percent under Alternatives 4

to 6. Much of this decrease would be made up by an increase in SPNM acres. SPNM as a share of the estimated total would range from about 6 percent under Alternatives 1 and 2 to 23 percent under Alternatives 4 to 6. This analysis is discussed further in the *Recreation and Tourism* section of this EIS.

Changes in land management have the potential to affect outfitter/guide operations that provide commercial recreation opportunities on the Forest. Impacts to existing outfitter/guide use are likely to be greatest where changes in roadless designations allow development in remote areas that are used for outfitter/guide activities dependent on high scenic integrity and undisturbed landscapes. Changes in roadless area designations could also affect outfitter/guide use in other adjacent or nearby areas as outfitter/guides displaced from one location seek other places to take clients. Some use areas are presently at capacity, which could serve to exacerbate potential displacement effects. Long-term changes in roadless area management could affect the Forest's ability to meet future outfitter/guide demand, especially for operators seeking more remote areas.

The outfitter/guide analysis prepared for this EIS used changes in suitable old-growth acres in conjunction with information on existing outfitter/guide use to help focus on potentially affected areas. The resulting analysis identified 15 outfitter/guide use areas where potential conflicts between existing outfitter/guide use and future management could occur. In most of these areas, existing outfitter/guide use occurs near areas where development has occurred in the past, either near or along shorelines and/or Forest road systems. Similarly, in most cases, harvest that could already occur in these areas (under Alternative 1) has the potential to conflict with existing outfitter/guide use. Viewed in terms of increases in acres suitable for harvest, impacts under Alternatives 2 and 3 would be minimal in all areas, with increases in roadless acres and reductions in suitable acres occurring in some areas under these alternatives. By expanding the acres available for harvest, Alternatives 4 to 6 could add to these potential impacts by increasing the number and geographic extent of the acres affected. In some locations, new road construction could create new opportunities for operators who use Forest roads for access. However, nearly all new roads constructed under the alternatives would be closed following harvest. These potential impacts are discussed in more detail in the *Recreation and Tourism* section.

Salmon Harvesting and Processing

None of the alternatives are expected to have a significant change to the commercial fishing or fish-processing industries over the planning period. Riparian Management standards and guidelines established in the 2016 Forest Plan would remain in place under all of the alternatives. While there would be some variation in the level of protection, these variations are not expected to affect the fishing industry. The future of the fishing industry in Southeast Alaska is more likely to depend upon occurrences outside of the Tongass National Forest such as hatchery production, offshore harvest levels, and changes in ocean conditions.

The 1997 FEIS (USDA Forest Service 1997a) noted that the amount of acreage of timber harvest was at most less than 20,000 acres per year, representing approximately 0.5 percent of the total remaining productive old growth (or 5 percent over the next decade) and less than 0.02 percent of the entire Forest. That EIS concluded that this was not expected to result in a significant change to commercial fishing employment. All of the alternatives that are presently being evaluated in this EIS would allow considerably less timber harvest and new road construction than the alternatives evaluated in the 1997 FEIS. Total annual old-growth harvest allowed over the 100-year planning period would be approximately 42,500 acres, substantially lower than the maximum proposed in the 1997 FEIS. Impacts to fish are discussed in detail in the Key Issue 3 section of this EIS.

Mining and Mineral Development

The Forest Service divides minerals resources into three groups: locatable minerals, leasable minerals, and salable minerals. A locatable mineral is any mineral that is "valuable" in economic terms or has a property that gives it distinct and special value. Examples of locatable minerals on the Tongass include gold, silver, copper, molybdenum, iron, nickel, lead, and zinc. The General Mining Law of 1872, as amended, grants every United States citizen the right to prospect and explore public domain lands open to mineral entry. The right of access is guaranteed and is not at the discretion of the Forest Service.

Exploration, mining, and mineral processing activities, including road construction and reconstruction, are presently allowed in IRAs and would continue to be allowed under all alternatives. Changes in roadless management are, therefore, not expected to affect existing or future locatable mineral exploration or mining activities on the Forest.

Leasable minerals are certain types of minerals, primarily energy resources (e.g., oil, gas, coal, and geothermal resources) that are not subject to mining claim location but are available for exploration and development under provisions of the Mineral Leasing Act of 1920. Roadbuilding is currently prohibited for any new leasable projects, including geothermal projects, within IRAs. For Alternatives 2, 3, 4, and 5, this prohibition would continue Watershed Priority (Alternative 2) and LUD II Priority ARAs. Following project-specific analyses, roads could be approved for leasable projects within Timber Priority (Alternative 4) or Roadless Priority ARAs. The Tongass has no current leasable mineral activity and the anticipated demand for leasable minerals is expected to remain low. As a result, changes in roadless management are expected to have limited impacts on related economic activity.

Salable minerals on the Forest are mainly used to construct NFS roads. Since road construction is not expected to vary much between alternatives, there would be little difference in salable mineral development between the alternatives.

Infrastructure Development

With some exceptions, Federal and state road development is presently limited in IRAs. Exceptions include roads with reserved or outstanding rights, roads provided for by statute or treaty, or road development related to a Federal Aid Highway. Roadless designation would be removed to various degrees under the action alternatives with corresponding implications for regional highway development. In most cases, changes in roadless management, as well as changes in the number of acres managed as roadless, would be more permissive with respect to regional road systems. In addition to those roads presently excepted, Roadless Priority ARAs would also allow roads needed for the connection of communities and development of the regional transportation system as identified in the State of Alaska's Southeast Alaska Transportation Plan. Timber Priority ARAs and areas removed from roadless designation would not have roadless rule-related prohibitions on road building. More areas would be available for additional types of regional road development under Alternatives 4 to 6. Future road projects would be subject to funding constraints and evaluated in detail on a project-by-project basis. Potential transportation effects are discussed in more detail in the *Transportation, Energy, Communications, and Infrastructure* section of this EIS.

None of the alternatives are expected to substantially affect the development of energy projects or related infrastructure. Removing roadless designations in areas under Alternatives 2 through 6 would simplify the process for projects but would not necessarily result in an increase in the number of projects developed.

In areas where new roadless areas are added or expanded, the permitting process could be more complicated, but projects would not be prohibited. An exemption for utility systems in Roadless Priority ARAs under Alternatives 2, 3, 4, and 5 and Community Priority ARAs (Alternative 3) would allow for timber harvest and road construction. Under Alternative 4, Roadless Areas with timber priority would not prohibit timber harvest or road construction at all. Where restrictions are removed, or exemptions added, the greatest effect may be in making the permitting process for developers less burdensome, resulting in more a rapid permitting process rather than an increase in the number of sites developed.

Payments to the State

As noted in the *Affected Environment* discussion, the Secure Rural Schools Act has been reauthorized since 2008, most recently in March 2018 for fiscal years 2017 and 2018. The amount of these payments would not be affected by any of the alternatives considered in this EIS.

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Key Issue 3 – Conserve Terrestrial Habitat, Aquatic Habitat, and Biological Diversity

Biological Diversity

Affected Environment

This section provides a summary of the Old-growth Habitat Conservation Strategy, ecosystem-based landscape delineations or biogeographic provinces on the Tongass, and past timber harvest. Landscape connectivity and fragmentation and invasive species are also discussed. Additional information on the background of the Old-growth Habitat Conservation Strategy and its components can be found in the 2016 Forest Plan FEIS (USDA Forest Service 2016b, Appendix D).

Ecosystem Classification

Southeast Alaska is divided into 23 biogeographic provinces (21 of which coincide with the Tongass) and characterized by 1) similarities in terrestrial wildlife species composition, 2) similarities in distributional patterns for many of these species, 3) geologic and water barriers stemming from past events, such as glaciation, and 4) generally similar climatic conditions and physiographic characteristics (USDA Forest Service 2003a). Biogeographic provinces provide an appropriate scale for the analysis of impacts to biological diversity because they are ecosystem-based and vary in the level of resource development that has taken place and is allowed within them (see the 2016 Final EIS Suitable Land maps in the Map Packet for the distribution of suitable old growth and young growth across the Planning Area). Biogeographic provinces in Southeast Alaska are described in Table 3.9-1 and shown on Figure 3.9-1 of the 2016 Forest Plan FEIS (USDA Forest Service 2016b; see also Table 3.9-1 in Appendix C of this EIS).

Cover Types

The vegetation of Southeast Alaska and the Tongass is dominated by temperate coastal rain forests at lower elevations (less than about 2,000 feet). Interspersed within the forest are muskegs, other wetlands, and other non-forest types. At higher elevations, alpine vegetation, rock, glaciers, and snowfields dominate. Table 3.3a-1 summarizes the breakdown of cover types by biogeographic province. Each of these cover types is described below.

Approximately 60 percent of the Tongass consists of forest land (including harvested areas). Approximately 5.5 million acres of the forest land is considered “productive forest land,” defined as land capable of producing at least 20 cubic feet of wood fiber per acre per year or having greater than 8,000 board feet per acre of standing volume (see the *Timber* section for additional discussion). The remaining 4.4 million acres of forest lands are considered unproductive forest because they do not meet the above criteria.

Productive forest land is divided into POG and young growth. Young growth includes those stands resulting from past timber harvest, as well as natural young growth (e.g., created by wind, fire, or glacial retreat).

Table 3.3a-1
Major Cover Types on the Tongass National Forest by Biogeographic Province (NFS Lands Only)

		Productive Forest (acres)			Unproductive Forest (acres)			Non-Forest (acres)		
	Biogeographic Province	POG[3]	Young-growth[1,3]	Total Productive Forest	Forested Muskeg[3]	Other Unproductive Forest[3]	Total Unproductive Forest	Land[2,3]	Water[3]	Total Non-Forest
1	Yakutat Forelands	95,063	40,262	135,325	101,827	25,703	127,530	34,339	7,255	41,595
2	Yakutat Uplands	44,014	13,242	57,256	5,241	14,807	20,048	818,834	20,009	838,843
3	East Chichagof Island	399,206	47,331	446,537	108,710	203,798	312,507	276,080	6,800	282,880
4	West Chichagof Island	72,643	329	72,972	45,204	82,691	127,895	72,722	8,430	81,152
5	East Baranof Island	88,668	14,283	102,951	12,198	90,057	102,255	177,699	6,323	184,022
6	West Baranof Island	214,457	17,716	232,173	70,549	193,754	264,303	242,254	19,678	261,931
7	Admiralty Island	595,432	14,103	609,535	85,110	190,234	275,345	148,513	13,267	161,780
8	Lynn Canal	157,988	8,320	166,309	20,617	100,240	120,857	349,501	2,803	352,305
9	North Coast Range	322,684	5,930	328,614	19,697	159,444	179,141	478,694	15,363	494,057
10	Kupreanof/Mitkof Island	307,752	39,036	346,788	176,592	212,256	388,848	15,478	3,822	19,300
11	Kuiu Island	291,839	30,934	322,773	44,128	88,402	132,530	19,494	2,571	22,065
12	Central Coast Range	246,153	9,269	255,422	27,199	152,597	179,796	268,001	10,612	278,612
13	Etolin Island	221,055	41,419	262,474	71,848	130,102	201,950	22,106	4,836	26,941
14	North Central Prince of Wales	486,160	170,306	656,466	152,189	270,927	423,116	45,859	21,953	67,812
15	Revilla Island/Cleveland Peninsula	504,827	49,119	553,946	175,045	311,591	486,636	91,126	36,079	127,205
16	Southern Outer Islands	112,035	18,114	130,149	27,148	44,386	71,535	4,926	909	5,835
17	Dall Island and Vicinity	66,951	1,299	68,249	6,467	26,553	33,020	9,773	2,962	12,735
18	South Prince of Wales	151,074	4,275	155,349	45,287	105,889	151,176	27,438	10,902	38,340
19	North Misty Fjords	198,210	6,549	204,759	21,227	264,636	285,863	461,818	14,394	476,212
20	South Misty Fjords	309,132	2,405	311,537	80,097	292,249	372,346	204,948	14,714	219,663
21	Ice Fields	116,893	10,006	126,899	8,628	171,804	180,432	2,606,398	15,588	2,621,986
Forest-wide		**5,002,255**	**544,250**	**5,546,504**	**1,305,009**	**3,132,122**	**4,437,131**	**6,376,478**	**239,272**	**6,615,750**

[1] Includes 83,000 acres of natural young growth, 422,000 acres of even-aged harvested stands, and about 40,000 acres of partial harvested stands.
[2] Non-forest land classes primarily include alder brush, brush, alpine, ice and snow fields, muskeg meadow, recurrent slide, and rock.
[3] Totals may not sum or match exactly to other tables in this section due to rounding.

Source: Data are from Table 3.9-2 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

The remaining 40 percent of the Tongass National Forest (about 6.6 million acres) is classified as non-forest land and includes shrub and herbaceous habitats (e.g., muskeg, alpine, estuaries), sparsely vegetated and non-vegetated areas (e.g., snow, rock, ice), and aquatic habitats (e.g., streams, ponds, and lakes).

Productive Old-Growth Forest

Old-growth forests support biological diversity due to their structural and ecological complexity. In Southeast Alaska, old-growth forests are greater than 150 years old, and are characterized by multiple canopy layers; an interspersion of trees of multiple age classes; the presence of snags, decadent trees, and fallen trees; presence of forbs; and variation in the amounts and distribution of live trees (USDA-FS R10-TP-28). These features create intricate habitat niches that support many plant and animal species (Spies 2004). In Southeast Alaska, old-growth forests have been the focus of past timber harvest making them the most susceptible ecosystem to changes caused by forest management activities.

Seven POG types have been defined, based on land form and forest condition, and used to develop a hierarchical mapping model for predicting tree sizes and densities on the Tongass. Old-growth forest classification is described in greater detail in Section 3.9 and Figure 3.9-2 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

From a biological diversity standpoint, high-volume POG and large tree POG are thought to have the highest importance for diversity. High-volume POG is defined as the grouping of the three tree size and density classes that represent the highest volume strata—SD5S, SD5N, and SD67 types. Large-tree POG is defined as the SD67 class, representing the most productive of the POG types, and typically containing the highest density of large trees.

There are approximately 5 million acres of POG forest on the Tongass. Of this amount, approximately 16 percent is low-volume POG (SD4H type), 42 percent is medium volume POG (SD4N, 4S, and 5H types), and 42 percent is high-volume POG (SD5S, 5N, and 67 types). Large-tree POG (SD67 type) makes up almost 11 percent of all POG. Table 3.9-3 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b; the table is reproduced in Appendix C of this EIS) provides the distribution of existing POG forest by biogeographic province and is summarized below.

Elevation is considered a landscape variable influencing the distribution and availability of POG forest. Lower elevation stands (at or below 800 feet) hold the highest value for many wildlife species because they remain relatively accessible during winter (see the *Wildlife* section for additional discussion). Forest-wide, approximately 59 percent of POG forest occurs at low elevations (see Table 3.9-4 in Appendix C of this EIS).

Young-Growth Forest

There are approximately 544,000 acres of young-growth forest on the Tongass, of which approximately 84 percent is a result of past timber harvest and approximately 15 percent a result of natural processes (e.g., wind, fire, glacial retreat). Over 90 percent of the harvested young growth is from even-age harvest. Approximately 20 percent of young growth from even-age harvest is 25 years old or younger, in the stand initiation stage. Of this age class, stands up to about 10 years tend to have high species diversity, in particular their shrub layer, which expands as a result of the open canopy after harvest. The remaining approximately 80 percent of young growth is older and mostly in the stem exclusion stage. This type of stand condition has very low species diversity.

Some of these older young-growth stands are considered suitable for timber harvest, and could help support the Tongass transition to young-growth harvest (see the *Timber* section for additional discussion of young-growth harvest and suitability). Approximately 90,000 acres of young-growth (harvested and natural) occur in Riparian Management Areas (RMAs) and an additional 68,000 acres occur in Beach and Estuary Fringe outside of RMAs. In addition, approximately 32,000 acres of young growth (harvested and natural) occur within the Old-growth Habitat LUD and outside of RMAs and Beach and Estuary Fringe.

Unproductive Forest and Non-Forested Lands

Approximately 27 percent of the Tongass is classified as unproductive forest (Table 3.3a-1). Many unproductive forest stands meet the definition of old growth, but the trees are typically small and stunted (under 40 feet in height) and the canopy is open (10 to 40 percent canopy closure). Hemlock, cedar, and lodge pole pine are the most common trees; blueberry and rusty menzesia are the most common shrubs. Past disturbance to this habitat type has occurred primarily as a result of road construction, which has resulted in some permanent reduction in total acres of these unproductive forest types.

Non-forest ecosystems provide valuable habitat types that include wetland and other areas of shrub and herbaceous types (e.g., muskegs, alder and willow brush, alpine, estuaries), non-vegetated areas (e.g., snow, rock, ice), and aquatic sites (e.g., streams, ponds, and lakes) and contribute greatly to the species diversity on the Tongass National Forest by providing unique microsites and openings that contain shrub and herbaceous vegetation within forested stands.

Approximately 40 percent of the Tongass National Forest consists of non-forest lands (Table 3.3a-1).

Overview of Existing Levels of POG Forest on NFS Lands

This section provides a brief summary of past timber harvest as provided in the 2016 Forest Plan FEIS (USDA Forest Service 2016b) and focuses on the amount of POG forest compared to the amount present in 1954 prior to large-scale commercial timber harvest because management activities are most likely to affect productive forest. Other habitat types are expected to be maintained and will contribute toward overall biological diversity.

Approximately 92 percent of the estimated original (prior to 1954) 5.4 million acres of POG that occurred on Tongass remains today (Table 3.3a-2). Forest-wide, 86 percent of the original high-volume POG and 82 percent of the original large-tree POG remains (Table 3.3a-2). The greatest amount of timber harvest has occurred in the North Central Prince of Wales biogeographic province (74 percent of the total original POG forest remaining), followed by Etolin Island, East Baranof, Southern Outer Islands, East Chichagof Island and Kupreanof/Mitkof Islands biogeographic provinces (85, 87, 86, 90, and 89 percent of the original total POG forest remaining, respectively; Table 3.3a-2).

These biogeographic provinces, in addition to West Baranof Island biogeographic province, have also had the most harvest of high-volume and large-tree POG forest harvested. The Revilla Island/Cleveland Peninsula province also ranks among the highest when considering large-tree POG harvest. For additional discussion of past harvest on the Tongass, see the *Timber* section in this EIS and Appendix C in USDA Forest Service (2016b).

Of the 947 Value Comparison Units (VCUs) on the Tongass, percent are considered intact (for National Forest System [NFS] lands only) and are thus likely to maintain a high degree of biological diversity. Although landscapes with higher amounts of past harvest likely remain functional, this index represents areas that are in relatively pristine conditions and thus have the highest ecological integrity.

Landscape Connectivity and Fragmentation

The Tongass is characterized by an inherent level of fragmentation due to its island geography. The natural distribution of POG forest is also patchy and linear in many areas, as a result of the mosaic condition of the landscape created by muskeg, forested wetlands, alpine areas, other unproductive forest, and other non-forested habitats. This section provides an overview of the concepts of landscape connectivity and fragmentation and existing conditions on the Tongass.

Landscape connectivity has been defined as the degree to which the structure of a landscape helps or hinders the movement of wildlife species (Taylor et al. 1993). A landscape with a high degree of connectivity is one in which wildlife and other species can move readily between habitat patches over the long term (USDA Forest Service 2008a). On the Tongass, connectivity between areas of similar habitats (for example, between two patches of old-growth forest) or between high and low elevation habitats is important to maintaining well-distributed, viable wildlife populations and thus contributing to the ecological integrity of the landscape. Empirical studies to date suggest that habitat loss has large, consistently

negative effects on overall biological diversity. Fragmentation, both natural (e.g., windthrow, landslides, insects and diseases, and avalanches) and human-caused (e.g., timber harvest, road building, and powerline development), reduces landscape connectivity by breaking apart larger contiguous blocks of habitat into smaller patches. The degree to which impacts to some species habitat requisites depends on species-specific dispersal capabilities, the distance between habitat patches, and conditions within the matrix between habitat patches.

When fragmentation occurs, there is an increase in the amount of forest edge habitat and a decrease in the amount of interior old-growth forest habitat, with which many wildlife species are associated (see the *Wildlife* section).

Fragmentation is often accompanied by a decline in native species diversity because habitat conditions along the edge (edge effects) may favor some species over others. Edge effects may include changes to vegetation structure, species composition (both plants and animals), predation rates, and disturbance (Murcia 1995; Nilon et al. 1995; As 1999). Although the number of species may be higher along edges (often favoring invasive species), the number of habitat specialists (such as those associated with interior old growth forest conditions and those that tend to be more sensitive or at-risk) decreases (As 1999; Nilon et al. 1995; Kissling and Garton 2008).

Past analysis has looked at biological diversity at the large watershed scale. Intact, undeveloped landscapes, even at this scale, are assumed to function in a way that maintains plant communities, unique habitat, and other supporting ecological processes for increased biological diversity. Intact watersheds are defined as those having less than 5 percent of their POG harvested, which is consistent with a similar analysis conducted by Audubon Alaska and The Nature Conservancy (Albert and Schoen 2007). Based on this definition, a VCU, roughly equivalent to a large watershed, with at least 95 percent of the original POG remaining would be considered to be intact.

Forested corridors along streams and between old-growth habitats at different elevations have been reduced in size by past harvest in many areas of the Tongass. Remaining patches of old-growth forest may serve as the only habitat in a landscape for many lichens, fungi, bryophytes, plants, and small-bodied animals, all of which contribute to the biological diversity and productivity of the old-growth forest ecosystem. These patches may be critical for species that are locally endemic, occur only in very specific conditions of forest structure or soil type, or have limited dispersal capabilities. Biogeographic provinces with the greatest levels of past timber harvest (Table 3.3a-2) are at a higher risk of not maintaining a full range of natural biological diversity (ecological integrity) and have the greatest reductions in overall landscape connectivity. Other biogeographic provinces are naturally fragmented by unproductive forest and non-forest habitats. Detailed analyses of landscape connectivity and fragmentation are typically conducted at the project level where individual patches of contiguous old-growth forest habitat and movement corridors can be identified. For this DEIS, landscape connectivity and fragmentation are discussed qualitatively at the biogeographic province scale.

Table 3.3a-2
Original and Percent Remaining Total POG, High-Volume POG (SD5S, SD5N, SD67) Total and Below 800 feet, and Large-Tree POG (SD67) Total and Below 800 feet by Biogeographic Province (NFS Lands Only)

		Acres Original POG[1, 2]					% Original POG remaining				
	Biogeographic Province	Total POG	High-Volume POG	High-Vol. POG <800 ft	Large-tree POG	Large-tree POG <800 ft	Total POG	High-Vol. POG	High-Vol. POG <800 ft	Large-tree POG	Large-tree POG <800 ft
1	Yakutat Forelands	98,656	61,377	61,240	45,164	45,073	96%	96%	96%	98%	98%
2	Yakutat Uplands	45,387	15,335	14,825	3,834	3,595	97%	93%	93%	89%	89%
3	East Chichagof Island	443,241	191,888	121,364	47,460	35,953	90%	83%	77%	72%	69%
4	West Chichagof Island	72,643	18,480	14,532	2,021	1,916	100%	100%	100%	100%	100%
5	East Baranof Island	102,083	40,159	30,513	6,023	5,492	87%	75%	70%	33%	33%
6	West Baranof Island	231,308	68,304	52,778	9,150	8,611	93%	81%	77%	45%	43%
7	Admiralty Island	604,254	308,323	175,317	100,229	63,447	99%	98%	96%	97%	96%
8	Lynn Canal	163,358	65,061	37,150	13,563	8,901	97%	94%	91%	88%	85%
9	North Coast Range	323,361	137,818	64,615	22,549	13,457	100%	100%	99%	99%	99%
10	Kupreanof/Mitkof Island	345,136	134,319	83,651	30,802	23,018	89%	79%	73%	64%	61%
11	Kuiu Island	319,310	183,616	127,805	42,768	27,964	91%	89%	86%	81%	74%
12	Central Coast Range	252,672	114,465	69,176	21,982	16,569	97%	96%	93%	91%	89%
13	Etolin Island	259,071	109,059	67,742	23,888	16,224	85%	74%	67%	52%	46%
14	North Central Prince of Wales	656,415	348,976	237,337	152,999	113,327	74%	63%	57%	67%	64%
15	Revilla Island/ Cleveland Peninsula	553,391	269,121	139,818	46,506	27,341	91%	86%	81%	69%	62%
16	Southern Outer Islands	129,891	61,801	44,041	17,807	12,997	86%	78%	74%	70%	65%
17	Dall Island and Vicinity	68,249	34,469	22,636	8,310	5,764	98%	97%	96%	95%	94%
18	South Prince of Wales	155,349	75,089	50,954	40,113	29,871	97%	96%	94%	97%	96%
19	North Misty Fjords	204,479	71,334	41,509	14,623	10,816	97%	93%	91%	87%	85%
20	South Misty Fjords	311,537	101,292	62,544	14,811	11,629	99%	98%	98%	95%	96%
21	Ice Fields	123,566	43,245	21,327	7,877	5,604	95%	88%	80%	75%	69%
Forest-wide		**5,463,379**	**2,453,537**	**1,540,877**	**672,481**	**487,571**	**92%**	**86%**	**82%**	**79%**	**77%**

[1] Original total POG acreages based on Forest Service GIS layer. Data from 2016 Tongass GIS.
[2] To determine amount of high-volume POG, assumed 75% of total past harvest consisted of high-volume POG. To determine amount of large-tree POG (SD67 type), assumed 30 percent of total past harvest consisted of large-tree POG.

Source: Data are from Table 3.9-6 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

Tongass Forest Plan Old-growth Habitat Conservation Strategy

The Tongass Forest Plan Old-growth Habitat Conservation Strategy was developed to maintain the integrity of the old-growth forest ecosystem, and thereby conserve biological diversity across the Forest, by retaining intact, largely undisturbed habitat. This strategy, initially incorporated into the 1997 Forest Plan, was reviewed and amended for incorporation into the 2008 and 2016 Forest Plans. The Old-growth Habitat Conservation Strategy includes two major components: (1) a forest-wide network of variably sized old-growth reserves (OGRs) allocated to the Old-growth Habitat LUD plus other non-development LUDs and all small islands less than 1,000 acres, and (2) a series of standards and guidelines applicable to lands where timber harvest is permitted, also known as the matrix (USDA Forest Service 2008a, 2008b).

The reserve network was designed to maintain habitats of the species that have the highest viability concerns (USDA Forest Service 2008b), particularly those associated or dependent upon old-growth forest characteristics. The reserve network includes other non-development LUDs such as Wilderness, LUD II, Remote, and Semi-Remote Recreation. These non-development LUDs contribute to maintaining a variety of habitats important for species not necessarily dependent on old growth ecosystems. The intent of the reserve system is to help ensure the maintenance of well-distributed viable populations of all old-growth associated wildlife species across the Tongass, with focus on those species that are most sensitive to habitat loss and fragmentation. For a complete review of the Old-growth Habitat Conservation Strategy, including assumptions underlying the design of the OGR system, refer to Appendix D of the 2008 Forest Plan FEIS (USDA Forest Service 2008b).

Within the matrix areas outside of reserves, components of the old-growth ecosystem are maintained through standards and guidelines designed to provide for important ecological functions such as dispersal of organisms, movement between forest stands, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees. Matrix lands where commercial timber harvest occurs include Modified Landscape, Scenic Viewshed, and Timber Production LUDs.

Matrix management complements the reserve system by providing habitat at smaller spatial scales, increasing the effectiveness of reserves, and maintaining landscape connectivity (USDA Forest Service 2008b). Standards and guidelines applicable to these lands include maintenance of the 1,000-foot beach and estuary buffer, variable-width stream buffers, project-level legacy forest structure retention requirements, high-hazard soils, steep slopes, karst terrain, and visually sensitive travel routes and use areas, and requirements for connectivity. These are all considered contributing elements of the Old-growth Habitat Conservation Strategy. Finally, a number of species-specific standards and guidelines, such as raptor nest and wolf den buffers, set aside old growth buffers, are implemented to avoid impacts to these species. These standards and guidelines are also addressed in the *Wildlife* section of this DEIS. Table 3.3a-3 shows the distribution of POG and young-growth forest within the reserve system and matrix lands.

Table 3.3a-3
Distribution of Existing POG and Young Growth within the Reserve System and Matrix Lands (NFS Lands Only)

Biogeographic Province	Within Reserves (Non-Development LUDs; acres)				Within Matrix (Development LUDs; acres)			
	Productive Old-growth				Productive Old-growth			
	Total	High-volume (SD 5N, 5S, 67)	Large-tree (SD 67)	Young-growth[1]	Total	High-volume (SD 5N, 5S, 67)	Large-tree (SD 67)	Young-growth[1]
1	74,371	42,876	30,916	24	20,691	15,806	13,171	3,569
2	43,193	13,850	3,185	254	821	455	237	1,119
3	230,146	94,783	23,185	10,341	169,060	64,079	11,064	33,694
4	72,639	18,480	2,021	-	5	-	-	-
5	53,694	16,444	1,214	1,767	34,974	13,654	785	11,648
6	181,273	47,481	3,551	6,323	33,184	8,185	543	10,529
7	595,432	301,706	97,582	8,823	-	-	-	-
8	116,162	44,024	8,650	1,093	41,827	17,010	3,302	4,277
9	215,920	90,802	14,521	354	106,763	46,508	7,824	323
10	135,284	49,737	9,467	5,992	172,467	56,544	10,120	31,392
11	197,425	105,819	17,633	4,672	94,414	57,193	16,894	22,799
12	163,813	72,362	12,305	662	82,340	37,214	7,721	5,858
13	102,207	37,434	6,067	4,192	118,848	43,113	6,416	33,824
14	257,676	121,130	55,795	29,811	228,483	100,154	46,128	140,445
15	344,679	160,998	21,401	9,384	160,148	71,700	10,536	39,180
16	89,536	36,703	8,468	4,155	22,498	11,706	3,982	13,701
17	57,671	29,772	7,557	1,269	9,279	3,723	363	30
18	105,567	49,825	27,651	1,667	45,507	22,058	11,179	2,608
19	184,661	61,354	11,542	5,265	13,549	5,278	1,201	1,004
20	309,132	99,488	14,089	2,405	0	-	-	-
21	99,184	33,666	5,634	4,476	17,709	4,574	241	2,197
Forest-wide	**3,629,686**	**1,528,738**	**382,437**	**102,928**	**1,372,569**	**578,956**	**151,706**	**358,196**

[1] Previously harvested young growth, which could help contribute to the transition to young-growth harvest.
Source: Data are from Table 3.9-8 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

Environmental Consequences

Effects Common to All Alternatives

Effects on the Old-Growth Forest Ecosystem

A functional and interconnected old-growth ecosystem is essential to maintaining ecological integrity of several biological diversity components, including: structural complexity (within-stand and landscape level); connectivity (unfragmented contiguous blocks of old growth, as well as functional connectivity within the matrix); stand age and species composition; and various ecological functions (tree establishment, disturbance, and nitrogen fixation [USDA Forest Service 2008b]). Timber harvest in POG may reduce biological diversity by shifting the age-structure of the forest by replacing old growth trees with younger trees (Franklin et al. 1997); changing the composition of understory vegetation (Deal and Tappeiner 2002); and removing key habitat features such as large decadent trees, snags, and downed logs.

Although many other cover types contribute to the overall biological diversity on the Tongass, the emphasis throughout this section is placed on old-growth forest because this is the focus of the Old-growth Habitat Conservation Strategy, and the cover type that has been most affected by timber

management activities on the Tongass. The amount of POG remaining and its distribution across the landscape provides a method to estimate the effects of the alternatives on biological diversity and was analyzed in detail in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

Within matrix lands, there may be slightly more high-volume and large-tree POG harvested under the action alternatives than was predicted for the Forest Plan because of the increased options for creating positive timber sales. However, this is speculative and depends also on harvest levels reaching predicted decadal levels. In addition, the proportion of high-volume and large-tree POG in the added suitable acres under the action alternatives is lower than in the Alternative 1 suitable acres (see *Effects Specific to Each Alternative*). Regardless, potential impacts would be analyzed at the project level and under a separate NEPA process.

Young-growth harvest, depending on treatment type and rotation, may reduce the range of habitats that support diverse plant and animal communities and alter the ecological functions supported by the old-growth ecosystem. However, treatments such as pre-commercial and commercial thinning can result in benefits to biological diversity by increasing understory growth over the short term, and by promoting the development of old-growth stands over the long term when stands are allowed to mature. The effects of young-growth harvest discussed throughout this section, as well as in the *Wildlife* section, represent the trade-off associated with the proposed transition to predominantly young-growth harvest.

Young growth suitable for timber harvest occurs in a number of special habitats under the Forest Plan, including RMAs, beach and estuary fringe, and the Old-growth Habitat LUD. Young growth on specific portions of these areas may be harvested under required prescriptions and following specific guidelines. The suitable acres of young growth on these special areas will increase slightly under the action alternatives, but only slightly because the vast majority of existing young-growth stands are not in roadless areas. Therefore, little to no difference among the alternatives is expected.

Effects on the Old-growth Habitat Conservation Strategy

Under all of the alternatives, long-term protection of POG would continue to occur under the Old-growth Habitat Conservation Strategy. The system of OGRs and other non-development LUDs is intended to maintain the ecological integrity of the old-growth ecosystem; all non-development LUDs would remain intact across all alternatives. Within the matrix, old-growth between reserves is maintained through Forest-wide standards and guidelines for stream buffers, the beach and estuary fringe, legacy forest structure, and other features that preclude or limit POG timber harvest under all alternatives (USDA Forest Service 2016b).

Collectively, these measures would facilitate organism dispersal and maintain the functionality and interconnectedness of the old-growth ecosystem (USDA Forest Service 2008b). In addition, the substantial reduction in old-growth harvest relative to the 1997 Forest Plan (under which the Old-growth Habitat Conservation Strategy was developed) through the transition to predominantly young-growth harvest would enhance biological diversity and the functioning of the Old-growth Habitat Conservation Strategy over the long-term. No changes to these Forest Plan features are proposed under any of the alternatives.

Effects Specific to Each Alternative

Alternative 1 (No Action)

Alternative 1 represents continued implementation of the Forest Plan under the 2001 Roadless Rule. Under Alternative 1, there would be no effects related to additional or modified Forest Plan components because none are proposed.

Alternative 1 would maintain the current Forest Plan harvest levels consisting of about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would be about 334,000 acres and old growth suitable acres would be about 247,000 acres. Suitable high-volume POG and suitable large-tree POG would be about 97,000 acres and 31,000 acres, respectively.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. Suitable young growth in RMAs consist of about 27,000 acres; in beach fringe about 29,000 acres; and in Old-growth Habitat LUDs about 26,000 acres. Harvest is limited to a maximum of 10-acre openings or commercial thinning. RMA harvest is only allowed outside of TTRA buffers, and beach fringe harvest is only allowed outside of a 200-foot buffer along the shoreline. A one-time entry stipulation is also implemented.

Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Forest Plan modeling projected harvest levels of 1,089 acres in RMAs, 3,903 acres in beach fringe, and 1,811 acres in Old-growth Habitat LUDs after 100 years (USDA Forest Service 2016b, Table 2-18).

Assuming full implementation of the Forest Plan after 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this DEIS). By biogeographic province, approximately 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Etolin Island & Vicinity and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Table 3.3a-4 shows the projected harvest over the next 100 years of Forest Plan implementation.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 1, overall impacts due to fragmentation and on the Old-growth Habitat Conservation Strategy are expected to be minor and consistent with the existing Forest Plan. Under the current Forest Plan, there would be a slight reduction in the number of intact watersheds, and acreage within intact watersheds, over the planning horizon. After 100+ years of Alternative 1 implementation, there would be three fewer intact watersheds considering NFS lands only. This means 72.0 percent of the 947 large watersheds would remain intact.

Alternative 2

This alternative would remove roadless designation from areas identified as roaded roadless, which would allow access to areas that already have a road system for harvest of old growth and existing young growth. In addition, although 113,000 acres would have the roadless designation removed, about 133,000 acres would have the roadless designation added, resulting in a net increase in roadless area.

Suitable high-volume POG and suitable large-tree POG base would increase by about 6,100 acres (6 percent) and 600 acres (2 percent), respectively. However, the proportion of high-volume and large-tree POG in the added suitable acres under Alternative 2 is lower than in the Alternative 1 suitable acres.

Implementation of the Forest Plan under Alternative 2 would have harvest levels similar to the level projected under Alternative 1, the current Forest Plan, about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would increase by about 10,000 acres or about 3 percent relative to Alternative 1 and old-growth suitable acres would increase by about 18,000 acres or about 8 percent.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. The suitable young-growth acres in these three special areas would change by less than 1 to 3 percent, relative to Alternative 1.

Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Therefore, there would be little to no difference in the amount of young-growth harvest in RMAs, beach fringe, or Old-growth Habitat LUDs under Alternative 2.

Table 3.3a-4
Projected Harvest of Young Growth[1] and Old Growth Over 100 Years by Biogeographic Province by Alternative

		Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6	
No.	Biogeographic Province	Young Growth	Old Growth	Young Growth	Old Growth	Young Growth	Old Growth	Young Growth	Old Growth	Young Growth	Old Growth	Young Growth	Old Growth
1	Yakutat Forelands	4,322	12	4,474	11	5,761	8	5,518	7	5,464	7	5,673	7
2	Yakutat Uplands	951	0	923	0	1,161	0	1,158	0	1,050	0	1,141	0
3	East Chichagof Island	30,611	6,470	29,985	6,124	29,691	5,846	29,743	6,945	29,670	6,957	30,216	6,957
4	West Chichagof Island	0	0	0	0	0	0	0	0	0	0	0	0
5	East Baranof Island	9,614	607	9,302	571	9,205	463	9,213	1,082	9,160	1,063	9,078	1,063
6	West Baranof Island	8,984	433	8,716	401	8,624	325	8,609	533	8,559	524	8,549	524
7	Admiralty Island	0	0	0	0	0	0	0	0	0	0	0	0
8	Lynn Canal	3,787	1,193	4,242	1,152	4,197	933	4,231	1,081	4,527	1,161	4,617	1,161
9	North Coast Range	154	25	155	23	153	19	172	15	213	15	394	15
10	Kupreanof/Mitkof Island	23,062	6,052	24,753	6,637	24,510	6,450	24,512	6,364	24,582	6,318	24,448	6,318
11	Kuiu Island	17,797	2,787	17,195	2,368	17,014	2,257	17,099	2,152	17,100	2,113	16,974	2,113
12	Central Coast Range	4,099	528	3,976	364	3,934	677	3,927	986	3,957	973	4,069	973
13	Etolin Island & Vicinity	26,829	4,984	27,472	5,211	27,327	5,702	27,341	5,258	27,553	5,297	27,592	5,297
14	North Central Prince of Wales	109,254	12,410	108,782	12,557	108,506	12,322	108,703	10,743	108,166	10,757	107,352	10,757
15	Revilla Island/ Cleveland Pen.	27,531	5,303	27,337	5,505	27,405	6,132	27,239	5,888	27,457	5,894	27,444	5,894
16	Southern Outer Islands	11,368	1,044	11,057	965	10,941	804	10,934	821	10,877	807	10,826	807
17	Dall Island and Vicinity	0	0	0	0	0	0	0	0	20	0	23	0
18	South Prince of Wales	1,909	619	2,020	578	1,999	479	2,014	533	2,037	524	2,043	524
19	North Misty Fjords	873	4	846	4	838	3	836	3	856	3	855	3
20	South Misty Fjords	0	0	0	0	0	0	0	0	0	0	0	0
21	Ice Fields	3,000	8	2,910	7	2,880	60	2,895	67	2,879	67	2,852	67
Totals[1]	**Forest-wide**	**284,144**	**42,484**	**284,144**	**42,479**	**284,144**	**42,479**	**284,144**	**42,479**	**284,144**	**42,479**	**284,144**	**42,479**

[1] Numbers may not appear to sum correctly due to rounding.

Assuming full implementation of the Forest Plan after 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass National Forest (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this EIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Kupreanof/Mitkof Island, Etolin Island & Vicinity, and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Under Alternative 2, the overall harvest level would be maintained, but the distribution of harvest could be different. Assuming harvest patterns follow the distribution of suitable old growth, the provinces where old-growth harvest is likely to increase by 200 acres or more over 100 years include Kupreanof/Mitkof Island, Etolin Island & Vicinity, and Revilla Island/Cleveland Peninsula. Harvest in 11 provinces is expected to decline. Because the projected changes in suitable acres are less than 600 acres in each province, overall effects are expected to be insignificant. Table 3.3a-4 shows the estimated maximum harvest over the next 100 years by province.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 2, there would be little change in the distribution of timber harvest, roads, and other facilities relative to Alternative 1. After 100+ years of Alternative 2 implementation, there would be three fewer intact watersheds considering NFS lands only. This means 72.0 percent of the 947 large watersheds would remain intact or the same percentage as under Alternative 1. Therefore, overall, impacts due to fragmentation and the Old-growth Habitat Conservation Strategy are expected to be minor and are not expected to be noticeably different from Alternative 1 (existing Forest Plan).

Alternative 3

This alternative would remove roadless designation from areas identified as roaded roadless and include areas identified as logical extensions of existing roads. Alternative 3 would be less protective because it would result in a net reduction of approximately 1.1 million total acres of roadless designations but would still rank relatively high overall because it would maintain substantial roadless designations within development LUDs. Approximately 3.2 million acres would be managed under a Watershed Priority ARA, 4.7 million acres would be managed under a Roadless Priority designation, and 0.2 million acres would be managed under a Community Priority ARA. A benefit of Alternative 3 would be the designation of nearly 0.4 million acres of T77 and TNC/Audubon Conservation Priority Areas outside of roadless to have long-term protection from old-growth harvest under the ARA. The majority of lands removed from roadless designation are managed as LUD II lands, which are intended to be managed in a roadless state to retain their wildland character (see current Forest Plan, Land Use Designation II goal description). Therefore, the roadless designation on LUD II lands provides little additional protection of roadless characteristics.

Implementation of the Forest Plan under Alternative 3 would have harvest levels similar to the level projected under Alternative 1, the current Forest Plan; about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would increase by about 14,000 acres or about 4 percent relative to Alternative 1 and old-growth suitable acres would increase by about 76,000 acres or about 33 percent.

Suitable high-volume POG and suitable large-tree POG base would increase by about 27,800 acres (29 percent) and 4,300 acres (14 percent), respectively, relative to Alternative 1. There could be a very slight increase in high-volume and large-tree POG harvested under Alternative 3 than was predicted for the Forest Plan because of increased options for creating positive timber sales. However, this is speculative and also depends on harvest levels reaching predicted decadal levels, as well as on being able to economically access these stands. In addition, the proportion of high-volume and large-tree POG in the added suitable acres under Alternative 3, is lower than the proportion in the Alternative 1 suitable acres.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. The suitable young growth acres in these three special areas would change by less than 0.5 percent to almost 5 percent, relative to Alternative 1.

Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Therefore, there would be little to no difference in the amount of young-growth harvest in RMAs, beach fringe, or Old-growth Habitat LUDs under Alternative 3.

Assuming full implementation of the Forest Plan for 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass National Forest under Alternative 1 (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this EIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Kupreanof/Mitkof Island, Etolin Island & Vicinity, and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Under Alternative 3, the overall harvest level would be maintained, but the distribution of harvest could be different. Assuming harvest patterns follow the distribution of suitable old growth, the provinces where harvest is likely to increase more than 200 acres over 100 years include Kupreanof/Mitkof Island, Central Coast Range, Etolin Island & Vicinity, and Revilla Island/Cleveland Peninsula. Harvest in 11 provinces is expected to decline. The projected increases in suitable acres are less than 900 acres in each province so overall effects are expected to be relatively minor. Table 3.3a-4 shows the estimated maximum harvest over the next 100 years.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 3, there would be little change in the distribution of timber harvest, roads, and other facilities relative to Alternative 1. After 100+ years of Alternative 3 implementation, there would be four fewer intact watersheds considering NFS lands only. This means 71.9 percent of the 947 large watersheds would remain intact; one less watershed than under Alternative 1. Therefore, overall, impacts due to fragmentation and on the Old-growth Habitat Conservation Strategy are expected to be relatively minor and are not expected to be noticeably different from Alternative 1 (existing Forest Plan).

Alternative 4

This alternative would remove the roadless designation on areas identified as roaded roadless, on areas identified as logical extensions of existing roads, and on some additional acres of development LUDs. Alternative 4 would be substantially less protective than Alternative 3 but would still include a high number of roadless acres within development LUDs. However, 749,000 roadless acres are designated as Timber Priority, which provides little or no protection of roadless characteristics and essentially eliminates the roadless designations provided in these development LUDs.

Implementation of the Forest Plan under Alternative 4 would have harvest levels similar to the level projected under Alternative 1, the current Forest Plan, about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would increase by about 15,000 acres or about 4 percent relative to Alternative 1 and old-growth suitable acres would increase by about 158,000 acres or about 69 percent.

Suitable high-volume POG and suitable large-tree POG base would increase by about 55,000 acres (57 percent) and 9,100 acres (29 percent), respectively, relative to Alternative 1. There could be a slight increase in high-volume and large-tree POG harvested under Alternative 4 than was predicted for the Forest Plan because of increased options for creating positive timber sales. However, this is speculative and also depends on harvest levels reaching predicted decadal levels, as well as on being able to economically access these stands. In addition, the proportion of high-volume and large-tree POG in the added suitable acres under Alternative 4, is lower than the proportion in the Alternative 1 suitable acres.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. The suitable young growth acres in these three special areas would change by 1 percent to 4 percent, relative to Alternative 1. Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Therefore, there would be little to no difference in the amount of young-growth harvest in RMAs, beach fringe, or Old-growth Habitat LUDs under Alternative 4.

Assuming full implementation of the Forest Plan for 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass National Forest under Alternative 1 (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this EIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Kupreanof/Mitkof Island, Etolin Island & Vicinity, and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Under Alternative 4, the overall harvest level would be maintained, but the distribution of harvest could be different. Assuming harvest patterns follow the distribution of suitable old growth, the provinces where harvest is likely to increase more than 200 acres over 100 years include East Chichagof Island, East Baranof Island, Kupreanof/Mitkof Islands, Central Coast Range, Etolin Island & Vicinity, and Revilla Island/Cleveland Peninsula. Harvest in the other provinces would remain at the same level or decline. However, the projected increases in suitable acres are less than 600 acres in each province so overall effects are expected to be minor. Table 3.3a-4 shows the estimated maximum harvest over the next 100 years by biogeographic province.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 4, there would be some change in the distribution of timber harvest, roads, and other facilities relative to Alternative 1. Under this alternative, roads and timber harvest are likely to penetrate further into currently roadless areas than under Alternatives 1, 2, or 3, resulting in a greater degree of fragmentation. After 100+ years of Alternative 4 implementation, there would be 11 fewer intact watersheds considering NFS lands only. This means 71.1 percent of the 947 large watersheds would remain intact, nine fewer watersheds than under Alternative 1. Nevertheless, because overall harvest levels would not change relative to Alternative 1, the effects due to fragmentation and on the Old-growth Habitat Conservation Strategy are expected to be relatively low and slightly greater than expected under Alternative 1 (existing Forest Plan).

Alternative 5

Under Alternative 5, approximately 6.9 million acres would be maintained and managed as Roadless Priority or LUD II Priority. Roadless designations would be removed on all development LUDs and mineral overlay areas and, as a result, it would rank the second lowest in terms of roadless designations. However, it would still be moderate in terms of overall protection due to the degree of protections provided by the underlying Forest Plan LUDs and Forest Plan standards and guidelines, which would not change.

Implementation of the Forest Plan under Alternative 5 would have harvest levels similar to the level projected under Alternative 1, the current Forest Plan, about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would increase by about 17,000 acres or about 5 percent relative to Alternative 1 and old-growth suitable acres would increase by about 165,000 acres or about 72 percent.

Suitable high-volume POG and suitable large-tree POG would increase by about 59,000 acres (60 percent) and 9,800 acres (31 percent), respectively, relative to Alternative 1. There could be a slight increase in high-volume and large-tree POG harvested under Alternative 5 than was predicted for the Forest Plan because of increased options for creating positive timber sales. However, this is speculative and also depends on harvest levels reaching predicted decadal levels, as well as on being able to economically access these stands. In addition, the proportion of high-volume and large-tree POG in the added suitable acres under Alternative 5 is lower than the proportion in the Alternative 1 suitable acres.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. The suitable young-growth acres in these three special areas would increase by 3 to 5 percent, relative to Alternative 1. Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Therefore, there would be little to no differences in the amount of young-growth harvest relative to Alternative 1 in RMAs, beach fringe, or Old Growth Habitat LUDs under Alternative 6.

Assuming full implementation of the Forest Plan for 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass under Alternative 1 (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this EIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Kupreanof/Mitkof Island, Etolin Island & Vicinity, and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Under Alternative 5, the overall harvest level would be maintained, but the distribution of harvest could be different. Assuming harvest patterns follow the distribution of suitable old growth, the provinces where harvest is likely to increase more than 200 acres over 100 years include East Chichagof Island, East Baranof Island, Kupreanof/Mitkof Islands, Central Coast Range, Etolin Island & Vicinity, and Revilla Island/Cleveland Peninsula. The projected increases in suitable old-growth acres are less than 600 in each province so overall effects are expected to be minor. Table 3.3a-4 shows the estimated maximum harvest over the next 100 years by biogeographic province.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 5, there would be some change in the distribution of timber harvest, roads, and other facilities relative to Alternative 1. Under this alternative, roads and timber harvest are likely to penetrate much farther into currently roadless areas than under Alternatives 1, 2, or 3, resulting in a greater degree of fragmentation. After 100+ years of Alternative 5 implementation, there would be 10 fewer intact watersheds considering NFS lands only. This means 71.2 percent of the 947 large watersheds would remain intact, eight fewer watersheds than under Alternative 1. Nevertheless, because overall harvest levels would not change relative to Alternative 1 and because the broader Old-growth Habitat Conservation Strategy for the Tongass was developed prior to the roadless rule and would be maintained under the Forest Plan, the effects due to fragmentation and on the Old-growth Habitat Conservation Strategy are expected to be relatively low and slightly greater than projected under Alternative 1 (existing Forest Plan).

Alternative 6

Whereas the roadless rule language under Alternatives 2, 3, 4, and 5 would be modified, all regulatory roadless designations would be removed from on the Tongass under Alternative 6 and, therefore, it would rank the lowest in terms of roadless designations. However, it would still be moderate in terms of overall protection due to the degree of protections provided by the underlying Forest Plan LUDs and Forest Plan standards and guidelines, which would not change.

Implementation of the Forest Plan under Alternative 6 would have harvest levels similar to the level projected under Alternative 1, the current Forest Plan, about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. The total suitable acres of young growth would increase by about 20,000 acres or about 6 percent relative to Alternative 1 and old-growth suitable acres would increase by about 165,000 acres or about 72 percent.

Suitable high-volume POG and suitable large-tree POG base would increase by about 59,000 acres (60 percent) and 9,800 acres (31 percent), respectively, relative to Alternative 1. There could be a slight increase in high-volume and large-tree POG harvested under Alternative 6 than was predicted for the Forest Plan because of increased options for creating positive timber sales. However, this is speculative and also depends on harvest levels reaching predicted decadal levels, as well as on being able to economically access these stands. In addition, the proportion of high-volume and large-tree POG in the added suitable acres under Alternative 6 is lower than the proportion in the Alternative 1 suitable acres.

Harvest of young growth in RMAs, beach fringe, and Old-growth Habitat LUD would remain restricted to the first 15 years and under restrictive harvest prescriptions. The suitable young-growth acres in these three special areas would increase by 5 to 6 percent, relative to Alternative 1, in RMAs and beach fringe, but by 12 percent in Old-growth Habitat LUDs, which is the largest increase among the action alternatives. Because of the restrictive prescriptions required in these areas, they are harvested at a lower rate than other young-growth areas. Therefore, there would be no more than minor differences in

the amount of young-growth harvest relative to Alternative 1 in RMAs, beach fringe, or Old-growth Habitat LUDs under Alternative 6.

Assuming full implementation of the Forest Plan for 100 years, approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG would be maintained on the Tongass under Alternative 1 (see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this EIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. The reduction of biological diversity associated with old-growth forest and fragmentation would be greatest in the Kupreanof/Mitkof Island, Etolin Island & Vicinity, and North Central Prince of Wales biogeographic provinces, where the amount of POG remaining is estimated to be reduced by 2 to 3 percent over 100 years. Under Alternative 6, the overall harvest level would be maintained, but the distribution of harvest could be different. Assuming harvest patterns follow the distribution of suitable old growth, the provinces where harvest is likely to increase more than 200 acres over 100 years include East Chichagof Island, East Baranof Island, Kupreanof/Mitkof Islands, Central Coast Range, Etolin Island & Vicinity, and Revilla Island/Cleveland Peninsula. However, the projected increases in suitable old-growth acres are less than 600 in each province so overall effects are expected to be minor. Table 3.3a-4 shows the estimated maximum harvest over the next 100 years by biogeographic province.

As noted previously, fragmentation can be caused by timber harvest, road building, and powerline and facility development. Under Alternative 6, there would be some change in the distribution of timber harvest, roads, and other facilities relative to Alternative 1. Under this alternative, roads and timber harvest are likely to penetrate much farther into currently roadless areas than under Alternatives 1, 2, or 3, resulting in a greater degree of fragmentation. After 100+ years of Alternative 6 implementation, there would be 10 fewer intact watersheds considering NFS lands only. This means 71.2 percent of the 947 large watersheds would remain intact; eight fewer watersheds than under Alternative 1. Nevertheless, because overall harvest levels would not change relative to Alternative 1 and because the broader Old-growth Habitat Conservation Strategy for the Tongass was developed prior to the roadless rule and would be maintained under the Forest Plan, the effects due to fragmentation and on the Old-growth Habitat Conservation Strategy are expected to be relatively low and slightly greater than projected under Alternative 1 (existing Forest Plan).

Cumulative Effects

The cumulative effects analysis for old-growth ecosystem biological diversity takes into account all of Southeast Alaska, including all lands within the Tongass boundary from the Yakutat area to the south of Ketchikan, the area of Glacier Bay National Park, and the areas around Haines and Skagway, as well as non-NFS lands, and was analyzed in detail in the 2016 Forest Plan FEIS (USDA Forest Service 2016b; see Table 3.9-16 in Appendix C of this DEIS), which has not changed substantially to date. A list of all projects considered in the cumulative effects analysis is provided in Appendix B of this DEIS.

Approximately 875,700 acres of POG have been harvested across the Tongass, including both NFS lands and non-NFS lands, resulting in a reduction to 86, 79, and 68 percent of the original total, high-volume, and large-tree POG in Southeast Alaska, respectively (see Tables 3.9-16, 3.9-17, and 3.9-18 in Appendix C of this EIS). Approximately 83 percent of the original POG would remain on the Tongass after full implementation of the 2016 Forest Plan (Alternative 1) and future non-NFS harvest in 100+ years. Future representation of high-volume POG and large-tree POG would be expected to be approximately 76 and 63 percent of the original amount, respectively, after 100+ years under the 2016 Forest Plan.

Harvest associated with all action alternatives would contribute to the cumulative reduction in POG and associated increase in fragmentation and loss of connectivity, which has the potential to reduce biological diversity. Timber harvest on non-NFS lands would result in similar effects; however, it would not contribute above what was analyzed for the current Forest Plan. Collectively, the implementation of the Forest Plan under all of the alternatives in combination with ongoing and foreseeable projects would increase the number of smaller patches on the landscape, reducing the amount of interior forest and increasing the occurrence of forest edge habitat. Edge effects such as shifts in species composition may reduce natural biological diversity over time by favoring some species over others; however, effects would be lessened by the Forest Plan, including the action alternatives, which continue to propose a transition to

predominantly young-growth harvest. This would reduce the long-term cumulative effects to old-growth ecosystem diversity by reducing the total amount of POG harvest and associated fragmentation. Note that the actual amount of timber harvest that has occurred on the Tongass since the 2016 Forest Plan was adopted is less than that projected under the Forest Plan FEIS, and may continue to be less under all of the alternatives (see the *Timber* section of this DEIS for additional discussion).

Overall, biological diversity on the Tongass and in Southeast Alaska remains in good condition and the landscape continues to be dominated by old-growth forest ecosystems. As development continues through timber harvest and associated activities such as road building, mining activities, energy development, and community expansion, particularly in areas where extensive development has already occurred (i.e., Prince of Wales Island), maintaining connectivity and roadless refugia will become increasingly important, particularly for wide-ranging species whose distribution depends on some level of connectivity across the landscape. In addition, the management of human resources will continue to play a role in maintaining biological diversity across the Tongass. Within the Tongass boundary, the Old-growth Habitat Conservation Strategy was designed to address the more extensive harvest on non-NFS lands through the old-growth reserve system and Forest-wide standards and guidelines, both of which were intended to maintain ecological components needed to maintain the ecological integrity important to a variety of organisms and maintain connectivity across the landscape, with or without much contribution from non-NFS lands. The overall Old-growth Habitat Conservation Strategy approach was developed prior to roadless designations and would be maintained regardless of the alternative selected.

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Wildlife

Affected Environment

Wildlife species and their habitat on the Tongass were described in the recently developed 2016 Forest Plan FEIS (USDA Forest Service 2016b). This section summarizes the wildlife resources, but relies extensively on that information to characterize the current affected environment and refers the reader to that document for further details. The following subsections summarize the old-growth habitat conservation strategy; threatened, endangered, and candidate species; Management Indicator Species (MIS); Alaska Region Sensitive Species; migratory birds; endemic species; and invasive species. Consumptive uses of wildlife on the Tongass are discussed in the *Subsistence* section.

Old-Growth Habitat and the Old-growth Habitat Conservation Strategy

Typical of Southeast Alaska, vegetation on the Tongass is dominated by temperate coastal rain forests at lower elevations (less than 2,000 feet elevation), with interspersed muskegs, other wetlands, and other non-forest types. At higher elevations, alpine vegetation, rock, glaciers, and snowfields dominate. Although many wildlife species on the Tongass are associated with more than one habitat type, most inhabit old-growth forests or prey on species that inhabit old-growth forests. Therefore, this analysis focuses on the old-growth forest ecosystem.

The reserve system of the Tongass Old-growth Habitat Conservation Strategy was first designed and implemented for the 1997 Forest Plan to maintain habitats of the old-growth associated and dependent species in a well-distributed and viable manner across the Tongass (see USDA Forest Service 2016b, Appendix D). This strategy is described in greater detail, along with the Forest Plan standards and guidelines and the management of the matrix lands outside of reserves, in the *Biological Diversity* section of this DEIS.

There are currently approximately 5.0 million acres of POG forest on the Tongass, of which 2.1 million acres are high-volume POG including 0.53 million acres of large-tree POG. These existing acreages represent 92, 84, and 82 percent, respectively, of these forest types that existed in 1954, prior to the beginning of industrial-scale timber harvest (see *Biological Diversity* section; Table 3.3a-2). There are approximately 0.56 million acres of young-growth forest on the Tongass, of which about 85 percent are a result of past harvest and 15 percent are natural young-growth. The *Biological Diversity* section briefly describes POG and other cover types and provides a discussion of past timber harvest on the Tongass (see also the *Timber* section).

Landscape Connectivity and Fragmentation

The concepts of landscape connectivity and fragmentation are described in the *Biological Diversity* section but are summarized here as they relate to wildlife and their habitat requirements. On the Tongass, connectivity between areas of similar habitats (i.e., old-growth forest) or between high- and low-elevation habitats is important to maintaining well-distributed, viable wildlife populations of some species.

Fragmentation of suitable habitats across the landscape through both natural and human-caused actions reduces larger contiguous blocks of habitat into smaller patches, which may cause some species populations to become isolated, and therefore may pose a greater risk of local extirpation.

Wildlife Species

The following sections summarize information on threatened and endangered species, candidates for listing, MIS (1982 planning rule), Alaska Region sensitive species, and other species of interest that were analyzed in detail for the 2016 Forest Plan (USDA Forest Service 2016a). Table 3.3b-1 provides a comprehensive list of the threatened, endangered, candidate, and sensitive species and identifies any updates of species listing status or occurrences since the completion of the 2016 Forest Plan FEIS. Some species are grouped based on habitat similarities where possible or referenced back to the 2016 Forest Plan FEIS, and corresponding Biological Assessment (BA), or Biological Evaluation (BE) for Wildlife and Fish as appropriate.

Threatened, Endangered, and Candidate Species

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) under authority of the Endangered Species Act of 1973 (ESA), as amended. Some federally-listed species in the table are not addressed further because the Tongass is outside of their known range or suitable habitat is not present (Table 3.3b-1). Informal programmatic consultation was completed for the 2016 Tongass Plan Amendment. The NMFS reviewed the biological assessment for threatened and endangered species under their regulatory jurisdiction and concluded that the 2016 Forest Plan FEIS was "not likely to adversely affect" threatened or endangered species occurring on the Tongass (NMFS 2016).

Also listed in the table are listed fish species that are addressed in the *Fish* section of this EIS. Currently, no candidates for federal listing occur within the boundary of the Tongass (Table 3.3b-1).

Short-tailed Albatross

The short-tailed albatross is a pelagic seabird species that forages offshore and in shelf-break waters throughout the North Pacific Ocean and Bering Sea and is listed under the ESA as Endangered. The short-tailed albatross primarily breeds in Japan, but single nest sites have been documented on Midway Island, Hawaii.

Previously, the waters adjacent to the Tongass were thought to be outside of the range of this species; however, more recent satellite tracking indicates that albatrosses, particularly juveniles and sub-adult birds, travel to the west coast, including the outer coast of southeast Alaska (USFWS 2014). This species may forage in nearshore waters adjacent to the outer coastal islands of the Tongass, particularly where the continental shelf break is close to shore. Therefore, it could be exposed to water quality effects associated with land management activities on the Tongass.

Humpback Whale, Fin Whale, and Sperm Whale

The federally listed wildlife species within the boundary of the Tongass include the humpback whale, while fin and sperm whales typically occurring in offshore marine waters of the Bering Sea, Chukchi Sea, North Pacific Ocean and/or Gulf of Alaska (NMFS 2009a) and are rare visitors to the waters surrounding the Tongass (Dahlheim et al. 2009).

The ESA for the State of Alaska authorizes the Commissioner of ADF&G to list Alaska endangered species. Species listed as endangered by the State of Alaska include humpback whale, right whale, and blue whale. With the exception of the humpback whale, none of these species occur in Southeast Alaska and therefore are not considered further here. Pursuant to Section 7 of the ESA, a BA was prepared to assess the effects of the 1997, 2008, and 2016 Forest Plans on endangered or threatened species and ensure that proposed actions would not jeopardize the continued existence of listed species (specifically, humpback whale and the Steller sea lion). Only the humpback whale and Steller sea lion will be addressed further in this document.

Table 3.3b-1
Federally Listed Threatened and Endangered Species and Candidate Species under the ESA, Forest Service Alaska Region Sensitive Species with Potential for Occurrence on the Tongass National Forest

Common Name	Scientific Name	Habitat Association	Potential for Occurrence in the Analysis Area	Status[1]
ESA Species Under USFWS Jurisdiction				
Eskimo curlew	*Numenius borealis*	Arctic tundra.	No, outside of species' range.	E
Short-tailed albatross	*Phoebastria albatrus*	Winters in waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska; breeds in Japan (USFWS 2012a).	Yes, may occur in nearshore waters near islands and mainland coastlines of southeast Alaska.	E
Spectacled eider	*Somateria fischeri*	Coastal waters in northern and western Alaska (USFWS 2012b).	No, outside of species' range.	T
Steller's eider	*Polysticta stelleri*	Occurs in northern and western Alaska (USFWS 2012c).	No, outside of species' range.	T
Polar bear	*Ursus maritimus*	Sea ice and coastlines of western Alaska and along the North Slope.	No, outside of species' range.	T
ESA Species Under NMFS Jurisdiction				
Blue whale	*Balaenoptera musculus*	Off-shore (pelagic) marine waters of the Bering Sea, Chukchi Sea, North Pacific Ocean and/or Gulf of Alaska (NMFS 2009a). Critical habitat designated for North Pacific right whales in the Bering Sea and the Gulf of Alaska (NMFS 2009a).	No, very rarely observed in Southeast Alaska.	E
Beluga whale	*Delphinaperus leucas*			
Bowhead whale	*Balaena mysticetus*			
Northern Pacific right whale	*Eubalaena japonica*			
Sei whale	*Balaenoptera borealis*			
Humpback Whale	*Megaptera novaeangliae*	Common in the inside waters of the Alexander Archipelago and are regularly sighted in the Inside Passage and coastal waters of the Southeast Alaska panhandle (NMFS 1991; Muto et al. 2018).	Yes, likely to occupy marine waters surrounding the Tongass. May occur in shallow coastal areas.	E
Fin whale	*Balaenoptera physalus*	Typically, off-shore (pelagic) marine waters of the Bering Sea, Chukchi Sea, North Pacific Ocean and/or Gulf of Alaska (NMFS 2009a); two more recent sightings in lower Clarence Strait (Dahlheim et al. 2009).	Yes, may occur seasonally in marine waters surrounding the Tongass, but in proximity to the open ocean.	E
Sperm whale	*Physeter macrocephalus*	Typically, off-shore marine waters of the Bering Sea, Gulf of AK, Southeast AK and Aleutian Islands (Allen and Angliss 2014).	Yes, may occur seasonally in marine waters around Tongass, but in proximity to the open ocean.	E

Table 3.3b-1 (continued)
Federally Listed Threatened and Endangered Species and Candidate Species under the ESA, Forest Service Alaska Region Sensitive Species with Potential for Occurrence on the Tongass National Forest

Common Name	Scientific Name	Habitat Association	Potential for Occurrence in the Analysis Area	Status[1]
Threatened or Endangered Species				
Bearded seal	*Erignathus barbatus*	Sea-ice habitats in Bering Sea, Chukchi Sea, Beaufort seas (77 FR 76740-76768, 77 FR 76706-76738).	No, outside of species' range.	T – bearded seal; T – ringed seal
Ringed Seal	*Phoca hispida*			
Northern sea otter, SW Alaska population	*Enhydra lutris kenyoni*	Coastal marine habitats.	No, outside of species range.	T
Steller sea lion – Western AK DPS[2]	*Eumetopias jubatus*	Marine and terrestrial areas from Prince William Sound westward (west of 144° west longitude).	Yes, DPS occurs in waters surrounding the Tongass. Critical habitat has also been designated.	E
Green sea turtle	*Chelonia mydas*	Occur in the Gulf of Alaska and some species are found as far west as the Aleutian Islands. Adults are highly migratory, but the details and locations of migrations are largely unknown (NMFS 2009b).	No, only rarely observed in Southeast Alaska.	T
Loggerhead sea turtle	*Caretta*			T
Olive Ridley sea turtle	*Lepidochelys olivacea*			T
Leatherback sea turtle	*Dermochelys coriacea*			E
Forest Service Alaska Region Sensitive Species[3]				
Steller sea lion – Eastern AK DPS[3]	*Eumetopias jubatus*	Marine and terrestrial areas in Southeast Alaska (east of 144° west longitude).	Yes, occurs in waters surrounding the Tongass.	S
Queen Charlotte goshawk	*Accipiter gentiles laingi*	Mature/old-growth forests.	Yes, known to occur on the Tongass.	S
Aleutian Tern	*Sterna aleutica*	Nests on islands, shrub-tundra, grass or sedge meadows and freshwater and coastal marshes.	Yes, known to occur on the Tongass.	S
Black oystercatcher	*Haematopus bachmani*	Rocky shorelines along the coast; forages in sheltered areas where low-sloping gravel or rock beaches with abundant prey occur.	Yes, known to occur on the Tongass.	S
Kittlitz's murrelet	*Brachyramphus brevirostris*	Breeds in the vicinity of glaciers and cirques in high elevation alpine areas with little or no vegetative cover; northern Gulf of Alaska and Bering Sea coast (Day et al. 1999).	Yes, known to occur on the Tongass.	S

[1] T = Federally threatened; E = Federally endangered; C = candidate for Federal listing; S = Alaska Region Sensitive Species
[2] DPS = Distinct Population Segment.
[3] Regional Forester's Sensitive Species List (February 2009). The Steller sea lion Eastern DPS was added as a sensitive species after federal ESA delisting. The Western DPS remains federally endangered.

Humpback whales are currently listed as endangered under the ESA and have been protected since 1965. Humpback whales generally migrate between temperate and tropical waters in the winter and spring where they mate and calve, and cooler northern coastal waters where they feed. Feeding occurs near the highly productive fjords of the Southeastern Alaskan panhandle and Prince William Sound, from

approximately May through December, although some individuals can be seen every month of the year (Calkins 1986). Peak numbers of whales are usually found in nearshore waters during late August and September, but substantial numbers usually remain until early winter.

Humpbacks summering in Southeast Alaska have been linked to three wintering areas: the coastal waters along Baja California and mainland Mexico, the main islands of Hawaii, and the islands south of Japan (NMFS 1991). Those whales that feed in Southeast Alaska and migrate to Hawaii are referred to as the central North Pacific stock (Muto et al. 2018). The local distribution of humpbacks in Southeast Alaska appears to be correlated with the density and seasonal availability of prey, particularly herring (*Clupea harengus*) and euphausiids (small shrimp-like crustaceans such as krill), and adults consume up to 3,000 pounds a day outside the breeding season. Important feeding areas include Glacier Bay and adjacent portions of Icy Strait, Stephens Passage/Frederick Sound, Seymour Canal, and Sitka Sound.

Glacier Bay and Icy Strait appear to be an important feeding area 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 Southeastern Alaska may also be important for humpbacks and need to be evaluated. These include Cape Fairweather, Lynn Canal, Sumner Strait, Dixon Entrance, the west coast of Prince of Wales Island, and offshore banks such as the Fairweather Grounds.

Recent estimates of the Central North Pacific stock of humpback whales found 1,115 unique identifications in Southeast Alaska and 583 in northern British Columbia, for a total of 1,669 individual whales (Calambokidis et al. 2008 [referred to as the SPLASH study]; Muto et al. 2018). From the SPLASH study, the estimates of abundance for Southeast Alaska/northern British Columbia ranged from 2,883 to 6,414. The estimates from SPLASH are considerably larger than previous estimates. The population rate of increase was estimated at 7 percent for Pacific humpback whales (Muto et al. 2018).

Although the final rule for humpback whale ESA listing (81 FR 62259, 8 September 2016) established 14 Distinct Population Segments (DPSs) with different listing statuses, the DPSs that occur in waters under the jurisdiction of the United States do not equate to the existing Marine Mammal Protection Act (MMPA) stocks. Some of the listed DPSs partially coincide with the currently defined Central North Pacific stock. Because NMFS cannot manage one portion of an MMPA stock as ESA-listed and another portion of a stock as not ESA-listed, until such time as the MMPA stock delineations are reviewed in light of the DPS designations and Bettridge et al. (2015), NMFS will continue to use the existing MMPA stock structure and considers this stock to be endangered and depleted for MMPA management purposes. As a result, the Central North Pacific stock continues to be classified as a strategic stock.

Humpback whales are regularly sighted in the Inside Passage and coastal waters of the Southeastern Alaska panhandle from Yakutat Bay south to Queen Charlotte Sound (USDA Forest Service 1997a). Because the humpback inhabits shallow coastal areas, it is increasingly exposed to human activity. Consequently, these whales may be more susceptible to confrontational disturbance, displacement, and loss of habitat from environmental degradation than some other whale species. Specifically, the greatest threats to humpback whales today are entanglements in fishing gear, ship strikes, and coastal habitat pollution.

Marine mammals are protected under the MMPA as well as the Forest Plan standards and guidelines that ensure protection and maintenance of whale habitats and that permitted or approved activities are conducted in a manner consistent with the MMPA, ESA, and NMFS regulations for approaching whales, dolphins, and porpoise.

Steller Sea Lion, Western and Eastern DPS

The Steller sea lion (*Eumetopias jubatus*) was emergency-listed as threatened under the ESA in April 1990 by NMFS due to rapid population declines in the western portion of its range (55 FR 12645). In 1997, the NMFS designated two DPSs, occurring west and east of 144 degrees west longitude, respectively. Due to persistent decline, the western DPS was reclassified as endangered, while the increasing eastern DPS was delisted in November 2013. On November 4, 2013, NMFS issued a final rule (78 FR 66140) to remove the eastern DPS of Steller sea lion from the List of Endangered and Threatened

Wildlife. A species removed from listing under the ESA because recovery criteria have been met will be automatically added to the Alaska Region Sensitive Species list for at least 5 years (FSM 2672.11, R-10 2600-2005-1). Until the Alaska Region Sensitive Species list is updated, the Steller sea lion will continue to be analyzed as a sensitive species. The western DPS is analyzed as an endangered species.

Steller sea lions are widely distributed over the continental shelf and throughout the coastal waters of the Gulf of Alaska. The Eastern DPS is known to occur in the waters surrounding the Tongass, although inter-migration between the eastern and western populations has been documented, particularly north of Frederick Sound.

Critical habitat was designated for the Steller sea lion by NMFS in 1993 and represents areas considered essential for the continued survival and recovery of this species (50 CFR 226.202). Adult Steller sea lions congregate at rookeries for breeding and pupping which are generally located on relatively remote islands, often in exposed areas that are not easily accessed by humans or mammalian predators. These rookeries, as well as haulouts, have been officially designated as critical habitat in Southeast Alaska (50 CFR 226.202).

To date, 3 major rookeries and 11 major haulouts have been identified as critical habitat on or adjacent to the Tongass. Two additional haulouts have been identified in Southeast Alaska (Cape Fairweather and Graves Rock) but these locations are within Glacier Bay National Park. In light of the delisting of the Eastern DPS and listing of the Western DPS as endangered, as well as availability of new science, NMFS is currently conducting a review of critical habitat for this species.

Steller sea lions are sensitive to disturbance and harassment or displacement from haulouts and rookeries. Human activities such as boating, recreation, aircraft, log transfer facilities (LTFs), and log raft towing are concerns related to the long-term conservation of the sea lion in Southeast Alaska (Muto et al. 2018). Forest Plan standards and guidelines for Steller sea lions provide protection to sea lion habitats and regulate activities in proximity to this species (USDA Forest Service 2016a; WILD 1-Section X and WILD 4-Section A). Steller sea lions are also protected by the MMPA.

Alaska Region Sensitive Species

The Alaska Region Sensitive Species list was updated in 2009 and supersedes previous lists (USDA Forest Service 2009a). The current Alaska Region Sensitive Species list for animal species that occur on the Tongass includes the Queen Charlotte goshawk, Kittlitz's murrelet, black oystercatcher, Aleutian tern, and Steller sea lion (Eastern DPS), which was discussed above.

Although not on the 2009 list, the Steller sea lion (Eastern DPS) is now an Alaska Region Sensitive Species. On November 4, 2013, NMFS issued a final rule (78 FR 66140) to remove the Eastern DPS of Steller sea lion from the List of Endangered and Threatened Wildlife and, therefore, it continues to be analyzed as a sensitive species.

Queen Charlotte Goshawk

The Queen Charlotte goshawk (*Accipiter gentilis laingi*) 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. The British Columbia DPS of the Queen Charlotte goshawk was listed as threatened under the ESA (FR 45870-45893) in August 2012; however, the Alaska DPS was not listed in part due to the protections provided by the Old-growth Habitat Conservation Strategy.

The goshawk is a year-round resident in Southeast Alaska and may occupy different or overlapping breeding and winter territories. Goshawk breeding territories can be described hierarchically in terms of the nest site, the nest area, post-fledging area, and foraging area (see Reynolds et al. 1992 and USDA Forest Service 2008b). Goshawks in Southeast Alaska typically nest in large patches of tall, mature, and old trees with dense canopies. When mature and old-growth habitats are not available, they will nest in maturing young growth with sufficient structure (Reynolds et al. 2006; Boyce et al. 2006). Nesting in mature young growth is less common, and occurs in proportion to the amount of this habitat available on the landscape, suggesting goshawks neither prefer nor avoid its use (USFWS 2007).

Goshawk foraging areas typically consist of mature and old-growth forest stands, though they will also forage in young forest as well as along edges and in openings as long as suitable perches from which to observe and attack prey are present (Iverson et al. 1996; Bosakowski et al. 1999; McClaren 2004; Boyce et al. 2006; Reynolds et al. 2006). Prey species vary geographically, and include blue grouse, red squirrels, and a variety of forest-dwelling birds (spruce grouse, Steller's jay, and ptarmigan; Lewis 2001). High-volume POG represents optimal nesting and foraging habitat for goshawks due to the presence of large trees and snags. Existing amounts of this forest type on the Tongass are discussed in the *Biological Diversity* section. Approximately 84 percent of the original high-volume POG existing in 1954 remains on the Tongass (see Table 3.9-6 in Appendix C of this EIS).

Kittlitz's Murrelet

The Kittlitz's murrelet (*Brachyramphus brevirostris*) was retained as a 2009 sensitive species because it was a USFWS candidate for ESA listing. On October 3, 2013, the USFWS issued a 12-month finding (78 FR 61763) that listing the Kittlitz's murrelet was not warranted. However, until the Alaska Region Sensitive Species list is updated, the Kittlitz's murrelet will continue to be analyzed as a sensitive species (USDA Forest Service 2016b).

More than 95 percent of the global population is estimated to breed in Alaska, with the remainder occurring in the Russian Far East. The largest breeding populations are believed to be in Glacier Bay National Park and Preserve, Prince William Sound, Kenai Fjords, and Icy Bay (Kendall and Agler 1998 as cited in Day et al. 2000). Breeding season core population centers adjacent to the Tongass include Icy Bay, Malaspina Forelands, and Yakutat Bay where the species is closely associated with glacial habitats (Kissling et al. 2011). The Forest Plan contains direction to "provide for the protection and maintenance of known Kittlitz's murrelet nesting habitat."

Black Oystercatcher

The black oystercatcher (*Haematopus bachmani*) was added to the Alaska Region Sensitive Species list in 2009. The Alaska Shorebird Conservation Plan also notes it as a species of high concern due to concerns with population size, breeding and nonbreeding threats, and nonbreeding distribution (Alaska Shorebird Group 2008). It is also a Bird of Conservation Concern, and is on the Audubon Society's Watch List (Tessler et al. 2007).

The black oystercatcher occurs along the North American Pacific coast from the Aleutian Islands to Baja California (Andres and Falxa 1995), with over half of the global population residing in Alaska primarily in Prince William Sound and the Kodiak Archipelago (Tessler et al. 2007). Historically, they have been documented in Sitka Sound/Necker Islands, the Myriad Islands, the outer coast of Baranof Island, and the Forrester Island group but breeding birds are generally sparsely distributed (Tessler et al. 2007). They favor rocky shorelines and forage exclusively on intertidal macroinvertebrates (e.g., limpets and mussels).

Breeding oystercatchers are highly territorial and breeding pairs tend to be widely distributed but Kodiak Island is currently the only documented area in Alaska that supports large concentrations of black oystercatchers (Tessler et al. 2007). Limited surveys specifically targeting black oystercatchers in Alaska have occurred, but they have been observed and are known to nest in low densities along shorelines and intertidal areas adjacent to the Tongass. After breeding, black oystercatchers aggregate into winter flocks ranging from tens to hundreds of individuals. Winter flocks typically concentrate on protected, ice-free tidal flats or rocky islets with dense mussel beds. Because black oystercatchers solely use the intertidal zone, where they may congregate in large numbers, they are especially vulnerable to disturbance from marine industrial pollution and human disturbance from tourism and fishing. Threats include predation, recreational disturbances, flooding, vessel wakes, and shoreline contamination (Tessler et al. 2007).

Aleutian Tern

The Aleutian tern (*Sterna aleutica*) is a migratory seabird that breeds exclusively in Alaska and eastern Siberia. It is a USFWS Bird of Conservation Concern and is protected under the Migratory Bird Treaty Act (MBTA) and is listed as an Alaska Region sensitive species by the Forest Service. In Alaska, Aleutian tern colonies are located throughout the Aleutian Islands, north to the southeastern Chukchi Sea and east to the Alaska Peninsula, Yakutat, and Glacier Bay (USFWS 2012d).

Aleutian terns are ground nesters that breed in loose colonies, often in association with Arctic terns, in coastal sites located at the heads of bays, reefs, island, estuaries, and river mouths (USFWS 2012d). One of the largest breeding colonies of Aleutian terns occurs on Black Sand Spit in the Yakutat Forelands, which supports approximately one third of Alaska's population. Due to its importance as a breeding colony, Black Sand Spit has been identified as an Audubon Important Bird Area and is included in conservation priority areas identified by The Nature Conservancy (TNC) and Audubon Alaska (Audubon Alaska and The Nature Conservancy 2007).

Management Indicator Species

The 1982 Planning Rule directed the use of MIS in forest planning to help display the effects of forest management. The 1997 Forest Plan selected 13 wildlife MIS which carried through to the 2008 Forest Plan Amendment. Because the 2016 Forest Plan EIS analyzed an amendment to the 2008 Forest Plan done under the 1982 Planning Rule, these species were carried forward and analyzed even though the 2012 Planning Rule does not use MIS for evaluating effects. MIS are also addressed in this EIS, which summarizes, where appropriate, the detailed analysis completed for the 2016 Forest Plan FEIS (USDA Forest Service 2016b). Most of these species are associated with POG forests of Southeast Alaska either directly or rely on prey species associated with these habitats.

Sitka Black-Tailed Deer

Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are indigenous to the coastal regions of Southeast Alaska and northwest British Columbia. They are an important big game hunting and subsistence species. They are also an important prey species for the Alexander Archipelago wolf (discussed below).

Sitka black-tailed deer use lower elevation (below 800 feet elevation) POG forest habitats during the winter period. The quantity, quality, distribution and arrangement of winter habitat are considered the most important limiting factors for Sitka black-tailed deer in Southeast Alaska. However, spring, summer, and fall habitats (non-winter) are also important for deer reproduction and population recovery following severe winters, and for building up pre-winter body reserves. During these seasons, and during mild winters, deer will forage in young-growth stands less than about 25 years old and other open non-forested habitats.

As part of the 2016 Forest Plan FEIS, the interagency deer habitat capability model was used to assess existing habitat capability within the planning area (see USDA Forest Service 2016b; *Wildlife* section). Table 3.3b-2 summarizes the modeled deer habitat capability by biogeographic provinces. Forest-wide, approximately 89 percent of the original (1954) habitat capability remains, ranging from 72 to 100 percent depending on the biogeographic province. The greatest reductions in deer habitat capability have occurred in provinces where timber harvest has been concentrated (the North Central Prince of Wales, East Baranof, and Etolin Island and vicinity biogeographic provinces).

In addition to the interagency deer model, the Forage Resource Evaluation System for Habitat (FRESH) model developed by the USDA Forest Service Pacific Northwest Research Station (Hanley et al. 2012; http://cervid.uaa.alaska.edu/deer/Home.aspx) was also used to quantify the relative value of available deer forage under different alternatives and described in detail in the 2016 Forest Plan FEIS. The output of the model provides a "snapshot" of habitat conditions based on estimated food availability and quality at one point in time, which was used to make a relative comparison of conditions within a habitat patch or landscape under different conditions (i.e., before and after implementation of a management activity).

More detailed information on the FRESH model inputs and results can be found in the 2016 Forest Plan FEIS, *Wildlife* section, and the model is not discussed further here.

Table 3.3b-2
Existing Forest-wide Deer Habitat Capability Using the Interagency Deer Model (NFS Lands Only)

	Biological Province	Existing Habitat Capability 2015 (Deer per Square Mile)	Original (1954) Habitat Capability (Deer per Square Mile)	% Original Habitat Capability Remaining	No. WAAs with Modeled Deer Density of at least 18 Deer per Square Mile[1]
1	Yakutat Forelands	13.3	13.7	97%	2
2	Yakutat Uplands	2.3	2.4	98%	0
3	East Chichagof Island	11.7	13.7	86%	1
4	West Chichagof Island	14.5	14.5	100%	1
5	East Baranof Island	7.0	8.5	82%	0
6	West Baranof Island	12.2	13.7	89%	4
7	Admiralty Island	17.6	17.9	98%	10
8	Lynn Canal	5.5	5.8	95%	1
9	North Coast Range	6.2	6.2	100%	0
10	Kupreanof/Mitkof Island	16.9	19.2	88%	7
11	Kuiu Island	25.5	28.1	91%	7
12	Central Coast Range	9.0	9.5	96%	1
13	Etolin Island	15.7	18.9	83%	3
14	North Central Prince of Wales	17.7	24.5	72%	11
15	Revilla Island/Cleveland Peninsula	13.5	15.0	90%	7
16	Southern Outer Islands	28.1	32.1	88%	9
17	Dall Island and Vicinity	30.4	30.6	99%	3
18	South Prince of Wales	21.8	22.2	98%	5
19	North Misty Fjords	3.7	3.8	99%	2
20	South Misty Fjords	8.4	8.4	100%	0
21	Ice Fields	0.7	0.8	94%	0
	Forest-wide	**10.1**	**11.3**	**89%**	**57**

[1] For WAAs that overlap a biological province boundary only the overlapping portion counted toward the total.
[2] Note that the model treats harvested stands in the stem exclusion stage (25 years old or older) the same value regardless of thinning treatments that are implemented.[3] Note that wolves very rarely occur on Admiralty, Baranof, and Chichagof Islands.

Mountain Goat

Mountain goats (*Oreamnos americanus*) inhabit alpine and subalpine areas and adjacent POG forests on the mainland portions of the Tongass and have been introduced to several islands. Steep glacial valleys and peaks provide escape terrain from predation by wolves and bears. Adjacent meadows provide forage and, at lower elevations, POG forests provide cover as well as evergreen shrubs and forbs for winter forage (Porter 2010).

Mountain goats are sensitive to human disturbance, which can cause the temporary or permanent abandonment of habitat, increased stress, altered behaviors, and potentially excess energy expenditure (Goldstein et al. 2005; Olliff et al.1999). Industrial activities such as timber harvest, mining, road construction, and hydroelectric development have the potential to have adverse effects on mountain goat populations through disturbance or removal of habitat. However, this species spends much of its time outside of areas where timber harvest has occurred or are likely to occur in the future. Existing Forest Plan standards and guidelines were developed to reduce the impacts of other activities (e.g., helicopter over-flights for recreation) and impacts associated with facilities.

Black Bear

Black bears are an important species for hunting, recreation, and tourism. In Southeast Alaska, black bears are present throughout the mainland and on the islands south of Frederick Sound. Black bears in

Southeast Alaska are part of a population (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). Black bears will use habitats from sea level to the alpine but appear to prefer estuarine, riparian, and forested coastal habitats (USDA Forest Service 2008b). Black bears use small openings and areas such as wetlands, clearcuts, and subalpine meadows for foraging.

Past timber harvest, especially in areas adjacent to salmon streams, has decreased black bear habitat suitability through the removal of POG forest. While early successional habitats may provide abundant food (berries), over the long term dense young-growth stands provide poor habitat for black bears due to the lack of forage and large hollow trees for denning. Also, over the long term, reduction of den sites may result from a lack of availability of large tree root structures (Davis et al. 2012). Approximately 90,000 acres of young-growth (harvested and natural) occur in Riparian Management Areas (RMAs) and an additional 68,000 acres occur in Beach and Estuary Fringe outside of RMAs. Small old-growth reserves (OGRs) and other Non-development Land Use Designations (LUDs) provide some connectivity on a local scale to shoreline and riparian habitats preferred by black bears.

Timber harvest may also impact black bears through increased human access on roads. This can result in increased harvest-related mortality; however, it should be noted that black bear harvest risk has not been linked to a particular road density level.

River Otter

River otter (*Lutra canadensis*) are associated with coastal and freshwater aquatic environments and the immediately adjacent (within 100 to 500 feet) upland habitats. River otters are distributed throughout Southeast Alaska, and across the Tongass, along coastal and inland waters (MacDonald and Cook 2007).

Old-growth forests have the highest habitat value for river otters, providing canopy cover, large-diameter trees and snags, and burrow and den sites. River otters rest in cavities or beneath the roots of large conifers or snags in POG forests with open understories (high-volume POG forest; Ben-David et al. 1996; Bowyer et al. 2003). Young-growth forests provide lower quality habitat. There are approximately 2.1 million acres of high-volume POG forest on the Tongass. Approximately 90,000 acres of young-growth (harvested and natural) occur in Riparian Management Areas (RMAs) and an additional 68,000 acres occur in Beach and Estuary Fringe outside of RMAs. Protection under the Forest Plan is provided through standards and guidelines for beaches, estuaries, and riparian areas (USDA Forest Service 2016a).

American Marten

The American marten (*Martes americana*) is an important furbearer that is associated with old-growth forests. Coastal habitats (beach fringe) and riparian areas have the highest habitat value for marten, followed by upland forested habitats below 1,500 feet in elevation (USDA Forest Service 2008a). Marten favor large- and medium-sized old-growth forests because they intercept snow, provide cover and denning sites, and provide habitat for marten prey species (Flynn and Schumacher 2001; Flynn et al. 2004). The quantity and quality of winter habitat is a limiting factor for marten in Southeast Alaska. Therefore, the availability of deep-snow marten habitat, defined as high-volume POG below 800 feet in elevation, provides a measure of habitat quality for marten. There are approximately 2 million acres of high-volume POG forest below 800 feet elevation on the Tongass (see Table 3.9-4 in Appendix C of this EIS).

Old-growth timber harvest reduces habitat quality for marten through the removal of forest cover, fragmentation of old-growth habitat (reductions in travel corridors and/or functional connectivity between spatially isolated populations), and reductions in habitat for some prey species. Increased human access associated with new roads may result in increased marten harvest-related mortality.

Although closed roads still facilitate access (e.g., off-highway vehicle, pedestrian), open roads that receive the highest and most consistent use are likely to have the greatest effect on martens. Existing road densities (all elevations included) on the Tongass are listed in Table 3.3b-3.

Table 3.3b-3
Existing Estimated Average Road Densities and Percentage of WAAs in Road Density Categories on NFS Lands and All Lands Combined for All Roads and Open Roads Only within the Tongass National Forest Boundary (All Elevations)

Road Density Category (miles per square mile)	Existing Road Densities (percentage of WAAs)	
	NFS Lands	All Lands[1]
All Roads		
0	47.6%	43.5%
0 to 0.7	37.7%	35.1%
0.7 to 1.0	6.3%	5.8%
1.0 to 2.0	7.9%	12.6%
2.0 to 3.0	0.5%	3.1%
>3.0	0.0%	0.0%
Total	100%	100%
Average Total Road Density – All WAAs	0.195	0.334
Open Roads[2]		
0	57.1%	49.7%
0 to 0.7	39.3%	37.7%
0.7 to 1.0	2.6%	4.7%
1.0 to 2.0	1.0%	6.3%
2.0 to 3.0	0.0%	1.6%
>3.0	0.0%	0.0%
Total	100%	100%
Average Open Road Density – All WAAs	0.089	0.218

[1] Percentages are based on all 191 Wildlife Analysis Areas (WAAs) inside the Forest boundary, including Annette Island; includes roads and streets within municipalities.
[2] Open roads on NFS land were calculated using Maintenance Levels 2, 3, 4, and 5 (see *Transportation* section for maintenance level description).
Source: GIS data from 2016 Tongass EIS.

Roadless areas and OGRs and other non-development LUDs provide refugia for marten from trapping pressure. However, marten home ranges are well-distributed across the landscape and include areas with timber harvest and roads, emphasizing the importance of habitat within matrix lands. Legacy Forest Structure standards and guidelines, in combination with the beach fringe and riparian buffers, aid in providing habitat and connectivity for marten on NFS lands.

Brown Bear

Southeast Alaska is home to one of the highest concentrations of brown bears (*Ursus arctos*) in the world (ADF&G 2000). Brown bears are present on the mainland and on most the islands north of Frederick Sound. They are occasionally reported on Mitkof, Etolin, Revillagigedo, and Wrangell Islands south of Frederick Sound, but are not found on any of the other islands in Southeast Alaska. Admiralty, Baranof, Chichagof, Kruzof, Yakobi, and neighboring islands consistently support the highest densities of brown bears on the Tongass (Game Management Unit [GMU] 4).

Brown bears are important both for hunting (including both outfitter guided and non-guided hunting) and to the recreation and tourism industry of Southeast Alaska. On the Tongass, ADF&G permits harvest of brown bears in GMUs 1, 3, 4, and 5. As tourism grows in Southeast Alaska, there is increasing demand for more bear viewing opportunities such as those provided by Pack Creek and Anan Creek.

Brown bears use areas from sea level to the alpine and are habitat generalists. The late-summer season has been identified as the most critical or limiting period for brown bears when they must build up energy reserves that are adequate to survive the winter and successfully reproduce (Hilderbrand et al. 1999). During this season, many brown bears concentrate along low elevation valley bottoms and salmon streams, with most use occurring within 500 feet of streams (Schoen and Beier 1990; Titus and Beier 1999), where their efforts focus on consuming large quantities of fish in order rebuild their body condition

and lay on essential fat reserves. These are often the same areas of highest human use and most intense resource development activities (Flynn et al. 2007).

Roads and other human developments can also be detrimental to bears because they increase the opportunity for human-induced mortality of bears through legal hunting, defense of life or property kills, and illegal killing. Additionally, poorly maintained or constructed roads can affect water quality and productivity of salmon streams.

Alexander Archipelago Wolf

The Alexander Archipelago wolf (*Canis lupus ligoni*) is thought to be a subspecies of gray wolf endemic to Southeast Alaska and British Columbia. It inhabits the mainland of Southeast Alaska and coastal British Columbia west of the Coast Mountain Range, and larger islands (those south of Frederick Sound) except Admiralty, Baranof, Chichagof islands, and all of the Haida Gwaii or the Queen Charlotte Islands (USFWS 2015). Approximately 38 percent of the range-wide population of Alexander Archipelago wolves inhabits Southeast Alaska, where population trends are largely unknown, except for the population on Prince of Wales Island and the surrounding islands (collectively GMU 2), which appears to have declined in abundance over the past 20 years. A portion of Prince of Wales Island was sampled, and estimates expanded to the entire GMU 2 suggesting an apparent decline of potentially 75 percent. However, because GMU 2 constitutes approximately 4 percent of the range of the Alexander Archipelago wolf and 6 percent of the range-wide population, negative population impacts in GMU 2 likely do not affect the range-wide population significantly (USFWS 2015). The majority (62 percent) of the Alexander Archipelago wolf population occurs in coastal British Columbia and is thought to be stable (USFWS 2015). Although some research suggests that wolves inhabiting Prince of Wales Island may be genetically isolated from other populations in Southeast Alaska (Person 2001; Weckworth et al. 2005, 2010, 2011), there remains uncertainty about the degree of isolation (see the Alexander Archipelago Wolf Species Status Assessment [USFWS 2015] for more information).

In August 2011, the USFWS received a petition to list the subspecies as threatened or endangered, and to recognize Prince of Wales Island as a significant portion of its range (Center for Biological Diversity and Greenpeace 2011). The petition also requested that the USFWS consider those wolves found on Prince of Wales Island and adjacent islands (including Kosciusko, Tuxekan, Heceta, Suemez, Dall, and others proximate to Prince of Wales) as a DPS based on unique genetic, physical, and ecological characteristics. In March 2014, the USFWS issued a 90-day finding that the petition to list the subspecies presented substantial information indicating that listing may be warranted (79 FR 17993). A status review of the Alexander Archipelago wolf to determine if listing is warranted was published in November 2015. In January 2016, the USFWS published a 12-Month finding that listing of the subspecies was not warranted. The 2016 amended Forest Plan facilitates a transition from harvesting old-growth forest to predominantly harvesting young-growth forest. After the USFWS decision in 2016 that listing was not warranted, and based on continued GMU 2 wolf population concerns, Forest Service leadership within the Tongass and Alaska Region directed staff to proceed with developing the Wolf Habitat Management Program and wolf management recommendations for GMU 2 (see Wolf Technical Committee 2017).

Wolves feed primarily on deer in certain areas (especially in GMUs 1, 2, 3, and 4), though waterfowl, beaver, spawning salmon, sea otter, squirrels, mountain goat, and black bear represent important prey when available (Lafferty et al. 2014; Darimont and Reimchen 2002; Szepanski et al. 1999; ADF&G 2017). Wolves in Southeast Alaska also prey on moose and elk where available. Suitable habitats for wolves are those capable of supporting this prey base. Therefore, wolves in Southeast Alaska use a wide variety of prey habitats but spend most of their time in productive and unproductive old-growth forests at low elevations (below 270 feet); young-growth forests and clearcuts are typically avoided (Person 2001). Dens on Prince of Wales Island are located in root wads of large living or dead trees within old-growth forest stands less than 495 feet (150 meters) from freshwater (Person and Russell 2009). Roffler and Gregovich (2018) monitored 13 radio-collared wolves between 2012 and 2016 and documented 11 den sites. Although the mean minimum and maximum distance from the core area edge to the active den site (0.73 mile – 3.93 miles) varied widely, it was smaller for breeding wolves (0.46 mile – 1.43 miles), and all distances exceeded the existing recommended den buffer distance (1,200 feet or 0.23 mile).

Deer winter habitat was considered by Person et al. (1996) and Person (2001) to be a good measure of habitat quality for wolves in southern Southeast Alaska. Black-tailed deer are present in all Southeast Alaska GMUs where wolves occur. Forest Plan standards and guidelines state that, where possible, sufficient deer habitat capability should first be maintained to sustain 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 interagency deer habitat capability model outputs; USDA Forest Service 2008a). However, other factors (e.g., local knowledge of habitat conditions, inherent capability of the landscape, spatial extent of the analysis) are to be considered by the biologist, as well, rather than solely relying upon model outputs (USDA Forest Service 1997b-Appendix N; 2016a).

The interagency deer habitat capability model was used to evaluate wolf habitat capability based on modeled deer habitat capabilities (see the 2016 Forest Plan FEIS for discussion of model limitations and assumptions). Table 3.3b-4 summarizes existing conditions by biogeographic province. Forest-wide approximately 89 percent of the original (1954) habitat capability remains, ranging from 72 to 100 percent by biogeographic province.

Table 3.3b-4
Modeled Deer Habitat Capability Using the Interagency Deer Model for Comparison to Forest Plan 18 Deer per Square Mile Standard and Guideline (NFS Lands Only)

	Biological Province	Existing Habitat Capability 2015 (Deer per Square Mile)	Original (1954) Habitat Capability (Deer per Square Mile)	% Original Habitat Capability Remaining	No. WAAs with Modeled Deer Density of at least 18 Deer per Square Mile[1]
1	Yakutat Forelands	13.3	13.7	97%	2
2	Yakutat Uplands	2.3	2.4	98%	0
3	East Chichagof Island	11.7	13.7	86%	1
4	West Chichagof Island	14.5	14.5	100%	1
5	East Baranof Island	7.0	8.5	82%	0
6	West Baranof Island	12.2	13.7	89%	4
7	Admiralty Island	17.6	17.9	98%	10
8	Lynn Canal	5.5	5.8	95%	1
9	North Coast Range	6.2	6.2	100%	0
10	Kupreanof/Mitkof Island	16.9	19.2	88%	7
11	Kuiu Island	25.5	28.1	91%	7
12	Central Coast Range	9.0	9.5	96%	1
13	Etolin Island	15.7	18.9	83%	3
14	North Central Prince of Wales	17.7	24.5	72%	11
15	Revilla Island/Cleveland Peninsula	13.5	15.0	90%	7
16	Southern Outer Islands	28.1	32.1	88%	9
17	Dall Island and Vicinity	30.4	30.6	99%	3
18	South Prince of Wales	21.8	22.2	98%	5
19	North Misty Fjords	3.7	3.8	99%	2
20	South Misty Fjords	8.4	8.4	100%	0
21	Ice Fields	0.7	0.8	94%	0
	Forest-wide	10.1	11.3	89%	57

[1] For WAAs that overlap a biological province boundary only the overlapping portion counted toward the total.
[2] Note that the model treats harvested stands in the stem exclusion stage (25 years old or older) the same value regardless of thinning treatments that are implemented.
[3] Note that wolves very rarely occur on Admiralty, Baranof, and Chichagof Islands.
Source: Data from 2016 Tongass GIS.

Wolves are also a furbearer in Southeast Alaska. Harvesting of wolves is regulated by the Federal Subsistence Board and the State of Alaska Board of Game. Harvest regulations, both subsistence and sport, are intended to help ensure sustainable wolf populations. The ADF&G works cooperatively with the

Alaska Board of Game and with federal land managers, including the Forest Service, to identify and address conservation concerns and propose regulation changes as needed for all wildlife in Southeast Alaska, including wolves.

Although wolves are often harvested by hunters and trappers working from boats (approximately 59 percent of harvest in GMU 2), harvest-related wolf mortality (both legal and illegal) is correlated with roads and other habitat features, which influence their vulnerability to harvest (Person and Russell 2008; Person and Logan 2012).

The 2016 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 through interagency analysis (USDA Forest Service 2008a, p. 4-95; Person et al. 1996). Existing road densities are presented in Table 3.3b-3. Approximately 15.8 percent of WAAs exceed this guideline (all roads included), and approximately 7 percent exceed 1.5 mile per square mile. Current Standards and Guidelines provide protection for active den sites through the establishment of a 1,200-foot forested buffer and avoid road construction within established buffer where feasible (USDA Forest Service 2016a).

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is associated with beach, estuary fringe, and riparian habitats. Bald eagles typically nest in large trees in spruce-hemlock forest, and over 90 percent of the nests are within 500 feet of a saltwater beach. Nests are located within beach, estuary fringe, and riparian habitats. Since 1967, the USFWS has monitored, via aerial surveys, bald eagle populations along the north Pacific coast from southern British Columbia to the Alaska Peninsula (Hodges 2011). In Southeast Alaska, the population increased until the 1980s, but since then has remained stable, with an adult population of approximately 13,000 to 26,000 birds (Hodges 2011).

Bald eagles are especially sensitive to disturbance early in the breeding season. Activities associated with timber harvest can result in reproductive failure or cause bald eagles to abandon their nests completely (Fraser et al. 1985 as cited in Isaacs et al. 2005). They are also susceptible to water quality impacts that adversely impact their prey populations (e.g., herring, flounder, pollock, and salmon). Under the 2016 Forest Plan, the availability of nesting habitat is not seen as a significant limiting factor, in part due to the current protection of the 1,000-foot shoreline beach buffer on the Tongass (Hodges 2011). Further protection to bald eagles is afforded by Forest-wide standards and guidelines that require the maintenance of estuarine and riparian buffers, raptor nest protection standards and guidelines (USDA Forest Service 2016a). Bald eagles are managed by the USFWS under the National Bald and Golden Eagle Protection Act and through the Bald Eagle Take Permit Program (74 [175] FR 46836).

Red Squirrel

The red squirrel is abundant on many of the islands and mainland and are an important prey species for American marten and goshawk. It is an MIS because of its preference for cone-producing trees and tree cavities and snags, which they use for denning and nesting (USDA Forest Service 2016b). Red squirrels are abundant on many of the islands in the Alexander Archipelago and the mainland.

Red squirrels use POG forests, but may also use young-growth stands once cone production begins about 40 years after timber harvest (USDA Forest Service 2016b). There are approximately 9.9 million acres of forested land (including all age classes and types of conifer forests) on the Tongass that provide potential habitat for red squirrels (see *Biological Diversity* section; Table 3.3a-1).

Old-growth timber harvest reduces habitat quality for red squirrels through the removal of forest cover and fragmentation of forest habitats. However, recovery of habitat capability after timber harvest is much faster for red squirrels than other species because although post-harvest formation of structures favored for nesting and food storage (cavities) takes longer, the majority of habitat capability (food availability) is restored quickly as cone production typically begins 40 years after harvest. Commercial even-aged young-growth harvest returns stands to an early seral condition so would also delay development of habitat capability for red squirrels. Forest Plan Reserve Tree/Cavity-Nesting Habitat and Legacy Forest Structure standards and guidelines maintain habitat for this species.

Red-breasted Sapsucker, Hairy Woodpecker, and Brown Creeper
The red-breasted sapsucker (*Sphyrapicus ruber*), hairy woodpecker (*Leuconotopicus villosus*), and brown creeper (*Certhia americana*) are old-growth associated and snag-dependent species. Hairy woodpeckers and red-breasted sapsuckers are primary cavity excavators that require snags and dying trees for foraging and nesting. Although they may be found in a variety of forested habitats, the brown creeper prefers large diameter old-growth trees (Hejl et al. 2002). Although no historic population estimates exist, it is likely that timber harvest and associated activities have reduced populations from historic levels (Hejl et al. 2002). North American Breeding Bird Survey data collected between 2003 and 2013 suggest populations of all three species are increasing within the Northern Pacific Rainforest region, though none of the trends were statistically significant (Sauer et al. 2014).

All three species are associated with interior old-growth forest conditions (Kissling and Garton 2008). Old-growth timber harvest activities that remove large, live trees and dead or dying trees reduce nesting and foraging habitat for these species and may reduce local habitat quality by creating fragmented forest patches and thereby reducing the amount of interior old-growth forest habitat with which these species are associated.

Past timber harvest has reduced and altered the habitat used by the red-breasted sapsucker, hairy woodpecker, and brown creeper. Of the 5.0 million acres of POG forest on the Tongass, approximately 2.1 million acres are high-volume POG, and 790,000 acres are low-volume POG that provide potential habitat for these species (see *Biological Diversity* section; Table 3.3a-2). Maintenance of habitat for these species under the Forest Plan is provided through the reserve tree and legacy standards and guidelines, beach and riparian buffers, and the Old-growth Habitat Conservation Strategy (USDA Forest Service 2016a).

Vancouver Canada Goose
The Vancouver Canada goose (*Branta canadensis fulva*) is associated with wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the Forest (USDA Forest Service 2016a). The Vancouver Canada goose is primarily a non-migratory subspecies of Canada goose that occurs year-round throughout Southeast Alaska, with an estimated resident population of 25,000 birds (Hupp et al. 2010). This species nests in forested habitats associated with beach and estuary buffers, and riparian habitats. Hupp et al. (2010) documented nests in forests adjacent to muskegs. During winter, marine grasses and salt marsh plants commonly found in intertidal areas are important forage resources, and Vancouver Canada geese exhibit strong fidelity, returning repeatedly to such winter sites.

Timber harvest activities may result in disturbance to geese, particularly if they occur in the vicinity of nest sites or brood rearing areas, and habitat removal. However, timber harvest in these areas has generally been minimal because these sites are fairly unproductive. Modifications to shoreline and riparian habitats can occur in association with young-growth harvest and roads and utility corridors if these habitats are crossed. Protection from direct impact to habitat is provided by Forest Plan Standards and Guidelines for waterfowl and shorebird, wetland, and riparian standards and guidelines; overall goose habitat is provided by the Old-growth Habitat Conservation Strategy (USDA Forest Service 2016a).

Other Species

Migratory Birds
Executive Order 13186 provides for the conservation of migratory birds and their habitats and requires the evaluation of the effects of Federal actions on migratory birds, with an emphasis on species of concern. The Executive Order directs agencies to take certain actions to further comply with the migratory bird conventions, the MBTA, the Bald and Golden Eagle Protection Act, and other pertinent statutes. 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 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. The Tongass is located in the Northern Pacific Rainforest Bird Conservation Region (BCR 5). The Northern Pacific Rainforest BCR is one of five BCRs designated in Alaska to provide a framework to facilitate coordinated conservation efforts (U.S. NABCI Committee, September 2000; Rich et al. 2004).

Priority migratory bird species identified in the Landbird Conservation Plan (BPIF 1999; Rich et al. 2004; Rosenberg 2016) for Southeast Alaska with the potential to occur on the Tongass are listed and discussed in detail (See USDA Forest Service 2016b, *Wildlife* section; and Table 3.10-6 in Appendix C of this EIS). Migratory birds are likely to be present in upland forest, riparian, and coastal habitat. There are 5.0 million acres of POG on the Tongass that provide primary or secondary habitats for these species (note that many of these species are also shrub nesters and may use young-growth as well as unproductive forest types).

The main management issue for migratory birds in BCR 5 is the harvest of old-growth coniferous forests. Timber harvest directly removes perching, foraging, and nesting habitat and results in habitat fragmentation, which may reduce the suitability of remaining forest stands for species associated with old-growth interior forest conditions. Fragmentation may increase the exposure of birds to edge-related predators and parasites. As the landscape becomes more fragmented, forest buffers become increasingly important for migratory birds to mitigate the effects of habitat loss (Kissling 2003). There is already an existing level of fragmentation on the Tongass, both natural in association with the distribution of forested and non-forested cover types, and in association with past timber harvest and other development activities. Timber harvest and related activities may also directly impact migratory birds through disturbances of adults or young through the removal of active bird nests or by causing nest abandonment. Protection under the Forest Plan is provided by beach fringe and riparian buffers and standards and guidelines for waterfowl, shorebirds, raptors, legacy forest structure, and the Old-growth Habitat Conservation Strategy.

Bats

There are seven species of bats that are known to occur in Alaska (Parker et al. 1996; Olson et al. 2014). Of the bat species that occur in Southeast Alaska, the little brown bat (*Myotis lucifugus*) is the most common and wide spread. Others include the silver-haired bat (*Lasionycteris noctivagans*), Keen's myotis (*M. keenii)*, California myotis (*M. californicus*), the long-legged myotis (*M. californicus*), Yuma myotis (*M. yumanensis*), and the big brown bat (*Eptesicus fuscus*). All species are associated with mature forested habitats which provide roosting, breeding, and foraging sites, and bat activity appears rare, for most species, in second-growth forest (Tessler et al. 2014; Walton et al. 2013a-e; Parker et al. 1996). Tree-roosting species, such as the Keen's myotis and silver-haired bat, often roost in mature forest patches with large numbers of suitable cavity trees. Other species, such as the little brown bat, roost in caves associated with the karsts systems. Foraging activities vary depending on vegetation density, and studies have found higher foraging activity from bats in intact forest patches and along the patch edges, with less activity in clear-cut areas (Patriquin and Barclay 2003). Throughout its range, the little brown bat has undergone dramatic declines due to white-nose syndrome (a fungal infection that affects bats while in hibernation) and is of particular management interest as white-nose syndrome has not yet been detected in Alaska. Bats are relatively rare in Alaska and reproductive rates for bats in higher latitudes are generally lower than farther south. These factors may make these species more susceptible to habitat loss and other factors; however, further research is needed to better understand current bat populations and how they respond to habitat loss and other factors (Boland et al. 2009). Timber harvest, particularly even-aged harvest, has the potential to remove roosting and foraging habitat for bats.

Marbled Murrelet

In March 2006, a status review for the marbled murrelet was initiated by the USFWS for the northern part of the species range to support ESA deliberations over the listing of the species as threatened in the southern part of its range (California, Oregon, and Washington; Piatt et al. 2007). Genetic analysis conducted as part of the review identified three distinct population segments: one in the central and western Aleutian Islands; one ranging from the eastern Aleutians to northern California; and one in central California.

Marbled murrelets are widely distributed across marine waters in Southeast Alaska. They spend the majority of their lives at sea, but travel inland up to 50 miles to nest in old-growth forest stands (Piatt et al. 2007). Marbled murrelets typically nest on mossy-limbed branches of large, mature coniferous trees within stands of structurally complex, coastal high-volume old-growth forest (DeGange 1996; Kuletz et al. 1995; Ralph and Miller 1995). However, on some treeless islands in Southeast Alaska marbled murrelets lay eggs on bare talus slopes in mountainous areas (Piatt et al. 2007).

Timber harvest, through the removal of POG forest, can directly remove nest trees, and also increases habitat fragmentation and associated edge effects, such as increased rates of nest predation (Andren 1994; Chalfoun et al. 2002). Some avian predators of murrelets, especially corvids (i.e., ravens, crows, jays), are known to increase with both forest fragmentation and proximity to human activity (Burger 2002). In a study of the edge effects and nest predation risk on marbled murrelets, Malt and Lank (2007) found that disturbances by avian predators at nests were significantly more frequent at hard edges (clearcuts) relative to interiors, but less frequent at soft edges (regenerating forest); there were no edge effects at natural-edged (riparian) sites. Thus, edge-associated predation risk may subside with the progression of forest succession. Forest Plan standards and guidelines pertaining to marbled murrelets include maintaining a 600-foot radius no-cut buffer zone around identified murrelet nests; however, habitat protection is also provided through beach and estuary fringe buffers and riparian standards and guidelines (USDA Forest Service 2016a), as well as the overall system of OGRs and other non-development LUDs.

Amphibians

There are eight species of amphibians known to occur in Southeast Alaska, two of which, the Pacific chorus frog *(Pseudacris regilla)* and the red-legged frog *(Rana Aurora),* are introduced (MacDonald and Cook 2007). Native species include the western toad (*Bufo boreas*), wood frog (*Rana sylvatica*), Columbia spotted frog (*Rana luteiventris*), rough-skinned newt (*Taricha granulosa*), long-toed salamander (*Ambystoma macrodactylum*), and northwestern salamander (*Ambystoma gracile*). Within Alaska, most of these species are confined to the southeast, with the exception of the western toad which ranges as far north as Prince William Sound (MacDonald and Cook 2007), and the wood frog, which is widespread throughout Alaska, and persists north of the arctic circle (Lee-Yaw et al. 2008). Amphibians have specific requirements for both aquatic and terrestrial habitats in order to complete their life-cycle. This makes them useful indicator taxa of forest change and effects on habitat elements such as canopy shade, soil moisture, and coarse woody material. Clearing of trees can result in increased solar radiation to the forest floor, resulting in changes in moisture and soil temperatures; these effects can be reduced using selective thinning (Verschuyl et al. 2011). Amphibians are often vulnerable to road construction and increased road traffic as many species migrate from streams and other waterbodies to upland habitats.

Endemism

The USFWS defines endemic as “a species native and confined to a certain region; having comparatively restricted distribution” (http://www.fws.gov/endangered/about/glossary.html). The 2016 Forest Plan standards and guidelines for endemic mammals direct the Forest to “maintain habitat to support viable populations and improve knowledge of habitat relationships of rare or endemic terrestrial mammals that may represent unique populations with restricted ranges.” Likewise, the National Forest Management Act (NFMA) directs that management prescriptions “provide for diversity of plant and animal communities.”

Centers of endemism (areas with the presence of a high number of endemic species) have been identified in Southeast Alaska which are thought to have been refugia during the last glacial event (Cook et al. 2001, 2006). Some of these locations coincide with areas that have also experienced high levels of timber harvest and which may be ready for young-growth harvest.

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 highly susceptible to extirpation and eventually extinction (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). The 2016 Forest Plan FEIS (USDA Forest Service 2016b) provides a detailed discussion on endemism and its implications on the Tongass.

There are 24 known endemic wildlife species (mammals and birds) on the Tongass (see USDA Forest Service 2016b, *Wildlife* section; Table 3.10-7 in Appendix C of this EIS; ISLES 2013). The Alaska Natural Heritage Program (AKNHP) has established a working web-based interactive range map and list of endemic species for Alaska. Two of the more well-studied species, the Prince of Wales flying squirrel and Prince of Wales spruce grouse, are endemic to portions of the Tongass where much of the past timber harvest has been concentrated and are described in more detail below. Other species include the Coronation Island long-tailed vole, Admiralty Island ermine and vole, and the Warren Island red-backed vole, which occur where little to no past harvest has occurred. The Alexander Archipelago wolf and Alexander Archipelago black bear are also thought to be endemic taxa and are described above.

Old-growth timber harvest has the potential to remove habitat used by some endemic species, such as snags and hollow trees used by the Keen's myotis and the Prince of Wales flying squirrel, but may also create habitat for some species e.g., regenerating forest stands for spruce grouse. Fragmentation of habitat patches could limit the ability of some species, e.g., flying squirrels, to disperse between areas of suitable habitat. In addition, for those species that are hunted, roads have the potential to increase hunter access and thus may increase harvest rates along the road system and the areas that these roads access (note that there are no known road thresholds relative to road density for these species).

Prince of Wales Flying Squirrel

The Prince of Wales flying squirrel is endemic to the Prince of Wales Island complex (Demboski et al. 1998; Smith 2005). Due to its close association with old-growth forest structure and processes and because of its specific habitat requirements for efficient movement, some authors have expressed concern about the long-term viability of this species because much of its range overlaps areas that have been affected by old-growth timber harvest (Carey 2000; Scheibe et al. 2006; Pyare et al. 2010).

Prince of Wales flying squirrels are associated with POG forest and den sites are typically located in areas with lower levels of fragmentation than elsewhere on the landscape (Pyare et al. 2010). Thus, successful dispersal of the species depends on the functional connectivity of the landscape (Smith et al. 2005).

Under the Old-growth Habitat Conservation Strategy, the system of small OGRs was designed to provide for the distribution of flying squirrels in every major watershed and facilitate functional connectivity between larger reserves (USDA Forest Service 1997a). However, some biologists suggest that many reserves on Prince of Wales Island may be too small or spaced too far apart to support populations of Prince of Wales flying squirrels over the long term or maintain functional connectivity to support a back-and-forth exchange between flying squirrel populations (Pyare and Smith 2005; Smith et al. 2011). In addition to the system of OGRs, connectivity between reserves for flying squirrels is also provided by the legacy forest structure, stream, lake, and beach and estuary buffer standards and guidelines. These features represent significant structural elements providing functional connectivity among landscape elements.

Prince of Wales Spruce Grouse

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

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 managed as a game species by ADF&G.

Timber harvest and associated fragmentation may lead to population declines if open areas are too large or forested patches are spread too far apart to enable spruce grouse to move between them (greater than 1 mile). Clearcuts may also present a dispersal barrier to this species due to the thick logging debris often present which could inhibit walking, this species' preferred method of movement (Russell 1999).

Spruce grouse are a small game species that 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). Existing total road densities are provided in Table 3.3b-3. The current season for grouse is August 1 through May 15 with a bag limit of five per day in GMU 2 (ADF&G 2018). The Old-growth Habitat Conservation Strategy maintains connectivity within matrix lands that will help facilitate dispersal and interchange between spruce grouse populations.

Environmental Consequences

This section describes effects on wildlife resources in the analysis area.

The Tongass Forest Plan Old-growth Habitat Conservation Strategy provides the platform to manage wildlife habitat across the planning area to maintain viable and well distributed populations. For this analysis, the evaluation of viability includes considerations of the island archipelago environment as well as the best available science related to each species.

This section begins with an analysis of effects on the overall Old-growth Habitat Conservation Strategy, which is addressed in detail in the 2016 Forest Plan FEIS Appendix D and discussed in the *Biological Diversity* section of this DEIS. The use of the word "wildlife" occurs frequently in this discussion without referencing a particular species because the intent is to consider each of the contributing elements of the conservation strategy and their ability to function as intended with respect to old-growth associated species under the alternatives. Modifications to various Forest Plan standards and guidelines occurred through interagency technical workgroups, workshops, and advisory groups during revisions to the 1997, 2008, and 2016 Forest Plans. Monitoring on the Tongass has helped inform that the management actions taken under the standards and guidelines have protected wildlife resources in the Tongass. The current Forest Plan considered the past actions related to timber harvest and other activities that have affected wildlife and their habitat. This Alaska Roadless Rule EIS evaluates how the alternatives would affect wildlife and their habitat under the current 2016 Forest Plan.

Following this discussion, impacts to individual species are addressed.

Indirect Effects

Old-growth Habitat Conservation Strategy

The Tongass Old-growth Habitat Conservation Strategy was designed to maintain well-distributed, viable wildlife populations across the Forest in the context of past and anticipated old-growth timber harvest. Since 1997, timber harvest rates have been far below those assumed in the 1997 Forest Plan Final EIS, the 2008 Forest Plan EIS, and the 2016 Forest Plan FEIS (USDA Forest Service 1997a, 2008a, 2016b). Under all of the alternatives, long-term protection of POG would continue to occur under the Conservation Strategy. The system of OGRs and other non-development LUDs is intended to maintain the ecological integrity of the old-growth ecosystem; all non-development LUDs would remain intact across all alternatives. Within the matrix, old-growth between reserves is maintained through Forest-wide standards and guidelines for stream buffers, the beach and estuary fringe, legacy forest structure, and others that preclude or limit POG timber harvest for other resources under all alternatives (USDA Forest Service 2016a). Collectively, these measures would facilitate and maintain connectivity and functionality of the old-growth ecosystem (USDA Forest Service 2016a).

Common to all alternatives, young-growth harvest within the reserve system, beach and estuary fringe, or RMAs has the potential to affect the integrity of the Old-growth Habitat Conservation Strategy under the Forest Plan. Effects can include reduced functionality of these areas, reduced or fragmented buffers, and increased edge effects. However, the Forest Plan only allows RMA harvest outside of TTRA buffers, and beach fringe harvest is only allowed outside of a 200-foot buffer along the shoreline. Additional Forest

Plan restrictions on harvest of young growth apply within these areas (created openings must be less than 10 acres and less than 35 percent of stand can be removed) and harvest is limited to a one-time entry within the first 15 years of Forest Plan implementation. Because of these strong limitations on harvest, modeling results for the Forest Plan presented in the 2016 Forest Plan EIS (USDA Forest Service 2016b) estimated that only approximately 3,900 acres of young-growth within the beach and estuary fringe, 1,100 acres in riparian management areas, and 1,800 acres in Old-growth Habitat LUD would be harvested over 100 years. The analysis assumed application of the 2001 Roadless Rule and is represented by Alternative 1 in this EIS. For the action alternatives, the acres of suitable young growth in these special areas would not increase that much because most young growth occurs outside of roadless areas and is already captured under Alternative 1. The maximum increase in suitable young growth in these special areas under the action alternatives would occur under Alternative 6 and is 6 percent for RMA suitable, 5 percent for beach fringe suitable, and 12 percent for Old-growth Habitat LUD suitable. It is likely that any increase in harvest in these areas under the action alternatives, if any, would be a lower percentage than the percent increase in suitable. In addition, the effects of harvest in these areas would be localized. Ultimately, the substantial reduction in old-growth harvest through the transition to young-growth harvest under the Forest Plan would enhance biological diversity and the functioning of the Conservation Strategy over the long-term and would not change under any of the alternatives.

General Effects – POG and Roads

Relative to old-growth habitat conservation, all of the alternatives would allow old-growth harvest at levels similar to the level predicted in the Forest Plan FEIS (USDA Forest Service 2016b) though more areas would be available to choose from. The 2016 Forest Plan FEIS assumed under maximum timber harvest over the planning horizon (100 years), approximately 91 percent of the original total POG, 85 percent of the original high-volume POG, and 79 percent of the original large-tree POG will be maintained (USDA Forest Service 2016b; dee also Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this DEIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high-volume, and 33 to 100 percent of the original large-tree POG would be maintained. Overall, under the action alternatives, effects on wildlife resulting from these POG reductions are not expected to be substantially different from Alternative 1 (implementation of the Forest Plan under the 2001 Roadless Rule) (USDA Forest Service 2016b; see also Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C of this DEIS). By biogeographic province, 72 to 100 percent of the original total, 62 to 100 percent of the original high- volume, and 33 to 100 percent of the original large-tree POG would be maintained.

Timber harvest in newly opened areas and associated road construction or reconstruction has the potential to decrease the value of these roadless areas to wildlife through increased habitat fragmentation and reduced landscape connectivity. Additionally, species that are vulnerable to overharvest (e.g., wolf, marten, and spruce grouse) would be affected by potential increased hunter and trapper access along new or reconstructed roads, whether for young-growth or old-growth harvest or renewable energy projects. As with all alternatives, the specific magnitude of effects and where these would occur would be evaluated at the project level through a separate NEPA process. Total road miles to be constructed under each alternative are expected to be similar because the harvest levels are the same. However, Alternatives 4, 5, and 6 are expected to result in more roads being built because these alternatives result in suitable timber in more remote areas than under Alternatives 1, 2, and 3.

Comparison of Action Alternatives

Although IRAs were not part of the original 1997 Old-growth Habitat Conservation Strategy, they add value by providing larger expanses of roadless refugia, which are important to wide-ranging wildlife species such as wolves, brown bears, marten, and less mobile species such as flying squirrels and amphibians. Alternative 2, would remove roadless designation from areas identified as roaded roadless (e.g., roaded or altered before the 2001 Roadless Rule or during the 2001 Roadless Rule exemption period) which would allow slightly more access to harvest forest stands than under the current Forest Plan (Alternative 1), but would be limited to areas that already have a road system. Young-growth harvest within the Old-growth Habitat LUD, Beach Fringe, and RMAs would remain restricted to the first 15 years and under the additional harvest restrictions addressed earlier. There would be no difference in the amount of harvest under this alternative relative to Alternative 1.

Similar to Alternative 2, Alternative 3 would open up areas identified as roaded-roadless but would also include areas identified as logical extensions of existing roads. Alternative 3 would be less protective because it would result in a net reduction of approximately 1.1 million total acres of roadless designations; however, 0.8 million of these acres are LUD II areas, which already have statutorily protection. Alternative 3 would still rank relatively high overall because it would maintain substantial roadless designations within development LUDs and 4.7 million total acres would be managed under a Roadless Priority designation, 3.2 million acres would be managed under a Watershed Priority ARA, and 0.2 million acres would be managed under a Community Priority ARA. Although suitable acres would increase for old growth and young growth, there would be no difference in the overall amount of harvest under this alternative relative to Alternative 1. An additional benefit of Alternative 3 is that T77 and TNC/Audubon Conservation Priority Areas outside of roadless would be given permanent protection from old-growth harvest; this would be designated in the Alaska Roadless Rule.

Alternative 4 would remove the roadless designation on areas identified as roaded roadless and on areas identified as logical extensions of existing roads. Alternative 4 would be less protective than Alternative 3 but would still include a high number of roadless acres within development LUDs. However, 749,000 roadless acres are designated as Timber Priority, which provides little or no protection of roadless characteristics and essentially eliminates the roadless protections provided in these development LUDs. Although suitable acres would increase for old growth and young growth, there would be no difference in the overall amount of harvest under this alternative relative to Alternative 1.

Whereas the roadless rule language under Alternatives 2, 3, 4, and 5 would be modified, all regulatory roadless designations would be removed from on the Tongass under Alternative 6 and, therefore, it would rank the lowest in terms of roadless designations. However, it would still be moderate in terms of overall protection due to the degree of protections provided by the underlying Forest Plan LUDs and Forest Plan standards and guidelines, which would not change. Because overall harvest levels would not change relative to Alternative 1 and because the broader Old-growth Habitat Conservation Strategy for the Tongass was developed prior to the roadless rule and would be maintained under the Forest Plan, the general effects of Alternative 6 on wildlife and the Conservation Strategy are expected to be relatively low but greater than projected under Alternative 1 (existing Forest Plan).

Under Alternative 5, approximately 6.9 million acres would be maintained and managed as Roadless Priority or LUD II Priority. Roadless designations would be removed on all development LUDs and mineral overlay areas and, as a result, it would rank the second lowest in terms of roadless designations. However, it would still be moderate in terms of overall protection due to the degree of protections provided by the underlying Forest Plan LUDs and Forest Plan standards and guidelines, which would not change. Because overall harvest levels would not change relative to Alternative 1 and because the broader Old-growth Habitat Conservation Strategy for the Tongass was developed prior to the roadless rule and would be maintained under the Forest Plan, the general effects of Alternative 5 on wildlife and the Conservation Strategy are expected to be relatively low but slightly greater than projected under Alternative 1 (existing Forest Plan).

Species-specific Effects

The following sections describe impacts to threatened and endangered species, MIS, Alaska Region sensitive species, migratory birds, and endemic species that could occur by implementing the Forest Plan under the Alaska Roadless Area alternatives.

Threatened, Endangered, and Candidate Species

Impacts on Threatened and Endangered species potentially occurring within the boundary of the Tongass are expected to be the same or similar to those addressed in the 2016 Forest Plan BA and 2016 Forest Plan BE for Wildlife and Fish. All of the alternatives considered in this Roadless Rule EIS maintain the current 2016 Forest Plan LUDs, standards and guidelines, and predicted harvest amounts.

Humpback Whale, Fin Whale, Sperm Whale, and Steller Sea Lion (Western DPS)

Adherence to the ESA, MMPA, and NMFS guidelines for approaching sea lions and other marine mammals, as currently required under the Forest Plan, would continue under any alternative. The amount

of human activity in the marine environment associated with Forest management activities is only a fraction of the total amount of human activity occurring in the marine environment. Some of the other activities include commercial fishing, sport fishing, hunting, subsistence, tourism, and mariculture. Many of these activities are not regulated by the Forest Service. The effect of such activities on listed marine species would depend on many factors such as size of the bay, depth of the waters in the bay, number of boats, individual behavior responses to disturbance. Currently, there is not a quantifiable way to estimate these possible effects. Land use designations and forest-wide standards and guidelines that have been developed for application on all Forest Service permitted or approved activities minimize or eliminate adverse impacts on marine species. Any Alaska Roadless Rule decision would not result in on-the-ground effects. Any future Forest Service actions or authorizations will be subject to additional Section 7 consultation under the ESA, as well as consultation required at the project level.

Common to all alternatives, these species could be exposed to disturbance and noise associated with LTF activity, young-growth timber harvest in the beach fringe, energy development, mining activities, potential collisions with vessels, and fuel or oil spills associated with vessel traffic particularly if these activities occur in the vicinity of nearshore areas used by whales and major haul-outs or rookeries used by sea lions. Harassment or displacement of whales and Steller sea lions from preferred habitats by human activities such as boating, recreation, aircraft, log transfer facilities, and log raft towing, were identified as a concern with regard to long-term conservation in the BA conducted for the 2016 Forest Plan FEIS (USDA Forest Service 2016d). Exposure of whales and Steller sea lions to these impacts would be essentially unchanged under all of the alternatives because predicted harvest volumes would be the same under each alternative and the potential for other developments would be similar. The locations of timber harvest and associated nearshore activities may change under the various alternatives, but these are not known at this programmatic level of evaluation. When specific timber or other projects are proposed, site-specific NEPA analysis would be conducted at that time. For these reasons, the Roadless Rule (all alternatives considered) would not result in affects above what was analyzed in the BA prepared for the 2016 Forest Plan FEIS for whales and Steller sea lions.

Short-tailed Albatross

Short-tailed albatross occur in nearshore areas along the outer coast. Short-tailed albatross could be affected by reduced marine water quality due to activities in the nearshore environment, including LTF use, log raft towing, vessel traffic, and timber harvest within the beach fringe. However, vessel traffic, log raft towing, and LTF use are expected to remain comparable to that anticipated under the current Forest Plan with use occurring periodically over the planning horizon. Effects would be minor and effects would likely be limited to nearshore areas. The proposed Roadless Rule (all alternatives considered) would not result in effects above the level that was analyzed in the BA prepared for the 2016 Forest Plan revision for the short-tailed albatross (USDA Forest Service 2016e).

Alaska Region Sensitive Species

Queen Charlotte Goshawk

Timber harvest in both old-growth and mature young-growth forest may locally limit the availability of nest sites through removal of suitable nest trees, or through removal of forest surrounding these trees. Nest trees optimally should be surrounded by patches of mature or old-growth forest large enough to include several alternate nests and provide post-fledging habitat. Timber harvest may also decrease foraging habitat quality through reductions in prey abundance and availability. Dense young-growth stands are difficult for goshawks to hunt, reducing availability of prey, even where prey populations may otherwise be adequate. The availability of adequate prey resources has been linked to goshawk territory occupancy and breeding success (Doyle and Smith 1994; Salafsky et al. 2005; Keane et al. 2006; Salafsky et al. 2007).

Forest Plan Standards and Guidelines for this species include project-level survey requirements for nesting goshawks, retention of confirmed or probable nest stands, designing and maintaining a buffer area of not less than 100 acres of POG forest if it exists centered on or adjacent to the nest tree or nest site, timing restrictions during active nesting, and retention of legacy old-growth forest structure in old-growth harvest units larger than 20 acres, where logging has been most intensive (USDA Forest Service 2016a). The system of OGRs and other non-development LUDs also maintains habitat for this species,

although a recent study suggests that some uncertainty remains with respect to the ability of Forest Plan conservation measures to contribute sufficient habitat to sustain well-distributed, viable populations of northern goshawks throughout Southeast Alaska (Smith 2013). Continued inventories and monitoring of established nest protection buffers will help to inform future decisions.

Impacts to goshawks are assessed in terms of the reduction in total and high-volume POG, which provides potential high-quality nesting and foraging habitat. High-volume POG represents optimal nesting habitat due to the presence of large trees and snags. Reductions in forest cover, and the subsequent progression of forest succession in young-growth stands, also have the potential to affect the abundance and availability of prey. At a landscape level, reductions in the amount of POG and mature young-growth forest may result in portions of the landscape becoming marginal or unsuitable for goshawks. Under all alternatives, the projected harvest level would be about 42,500 acres of old growth and 284,000 acres of young growth over 100 years. Approximately 84 percent of the original high-volume POG existing in 1954, the time at which industrial scale logging began on the Tongass, remains (see Table 3.9-6 in Appendix C of this DEIS). None of the action alternatives would increase harvest rates of POG above what was analyzed in the 2016 Forest Plan FEIS (refer to the *Biological Diversity* section for a discussion of effects on POG by biogeographic province and the *Wildlife* section for additional detail).

Young-growth forest provides marginal goshawk habitat, but over the long term, if unharvested or thinned with an objective of accelerating old-growth conditions, would return to old-growth conditions. Young-growth stands ready for commercial harvest may be reaching an age to provide some benefits to goshawk (foraging, occasional nesting, post-fledging areas) if adequate structure is developed (typically 50 to 100 years following harvest, depending on site productivity).

Under all alternatives, impacts to goshawks would still be greatest in the North Central Prince of Wales, Kupreanof/Mitkof Island, East Chichagof Island, and Revilla Island/Cleveland Peninsula biogeographic provinces where the most suitable young-growth forest is located. The beach and estuary fringe and RMAs provide connectivity for goshawks between reserve areas, and old-growth forest near beach, estuary, and riparian habitats generally support greater prey diversity and net prey productivity for goshawk foraging. Thus, young-growth stands in these areas have the potential to develop into productive habitats for goshawks. Pre-commercial and commercial thinning of young-growth stands, which would occur under all of the alternatives, would promote the development of stand conditions that provide foraging habitat for goshawks. However, even-aged harvest or group-selection of young-growth in these areas, as well as in the Old-growth Habitat LUD, would set back the stand development process (returning harvest units to the stand initiation stage). The creation of gaps several acres in size or more could result in localized reductions in goshawk foraging habitat quality and would delay the development of old-growth habitat capable of providing higher quality foraging, nesting, and post-fledging habitat. Effects to connectivity for goshawks are lessened through implementation of Forest Plan standards and guidelines (Beach and Estuary Fringe, RMAs, Legacy tree, goshawk habitat, and protection measures).

Despite these localized effects, the transition to young growth guided by the 2016 Forest Plan, unchanged by the Alaska Roadless Rule alternatives, is likely to benefit goshawks by reducing the amount of POG harvest that would occur over the planning horizon, thereby maintaining more old-growth forest that provides potential foraging, nesting, and post-fledging habitat.

Individual projects would be required to conduct goshawk surveys and implement the goshawk standards and guidelines which would minimize impacts to this species at the project level. For the reasons articulated in this section, all the alternatives considered would not result in a loss of viability of this species or trend toward federal listing.

Kittlitz's Murrelet

The Kittlitz's murrelet is associated with glacial habitat and occupies areas outside of where timber harvest and associated activities and other development have occurred or are likely to occur. Consequently, implementation of any of the alternatives, guided by the 2016 Forest Plan restrictions would not affect the Kittlitz's murrelet. The 2016 Forest Plan standard and guideline to "provide for the protection and maintenance of known Kittlitz's murrelet nesting habitats" would be unchanged. Project-level analysis would occur should any future development be proposed near tidewater glaciers.

Black Oystercatcher
The black oystercatcher is associated with rocky shorelines and tidal mudflats along the coast. They could be affected by oil or fuel spills associated with vessels in the vicinity of the LTFs and the transport of logs from harvested areas under all of the alternatives. They could also be affected by disturbance associated with management activities within the beach fringe.

However, black oystercatchers occur at low densities across the Tongass and the habitats it uses (intertidal areas) do not typically coincide with management activities, although there is the potential for ongoing effects associated with recreation and tourism activities on the Tongass, disturbance associated with young-growth harvest in the beach fringe, and energy development or other activities under all alternatives. The Forest Plan requires a minimum 330-foot buffer from human activities around concentration or nesting areas that would apply to future projects regardless of roadless status. For these reasons, all the alternatives considered would not result in a loss of viability of this species or trend toward federal listing.

Aleutian Tern
Threats to this species include human disturbance at nest sites, marine oil spills, and change in forage fish populations (USFWS 2012d). Common to all alternatives, timber harvest associated activities (i.e., log transport, use of LTFs, and helicopter activity) could have the potential to affect this species through disturbance to nesting colonies or through water quality impacts to prey species. Although most known colonies are in remote sites in areas surrounded by non-development LUDs, some do exist in areas where Forest Service permitting may have the potential to cause disturbance. There is no specific Forest Plan direction for this species but the standards and guidelines for Seabird Colonies apply (USDA Forest Service 2016a).

None of the alternatives would increase the potential of any young-growth or old-growth harvest or other management activities in the vicinity of Black Sand Spit, in the Yakutat Ranger District, where the largest known breeding colony occurs. Only Alternatives 5 and 6 would remove this area from roadless designation; however, harvest would not occur because it is in a non-development LUD as well as areas conservation priority areas identified by The Nature Conservancy (TNC) and Audubon Alaska (Audubon Alaska and The Nature Conservancy 2007). Therefore, all the alternatives considered would not result in a loss of viability of this species or trend toward federal listing.

Steller Sea Lion (Eastern DPS)
Steller sea lions may occur in the nearshore and pelagic waters throughout the Tongass. Common to all alternatives, Steller sea lions have the potential to be exposed to disturbance and noise associated with LTF activity, potential collisions with vessels, and fuel or oil spills associated with vessel traffic particularly if these activities occur in the vicinity of major haul-outs or rookeries. All identified rookery sites occur in the outside waters of the Tongass far from expected activities. One site, Forrester Island, is a designated National Wildlife Refuge and is under the jurisdiction of the USFWS. Most of the known haulouts (Biali Rock, Cape Cross, Biorka Island, Cape Ommaney, Coronation Island, Timbered Island, and Cape Addington) occur in the outside waters of the Tongass and would not likely be impacted by any future activities permissible under any of the alternatives. Of the known haulout sites, only Gran Point, Benjamin Island, Sunset Island, and Lull Point occur in the inside waters of the Tongass. Gran Point is an area in Chilkoot Inlet near Haines; Benjamin Island is a small island in Lynn Canal north of Juneau; Sunset Island is a small island located in Stephens Passage between Hobart and Windham Bay; and Lull Point located on the south end of Catherine Island on the east side of Baranof Island. It is unlikely that any of the areas identified as critical habitat would be impacted by activities that would be newly permissible under the alternatives; if impacts do occur that create noise and disturbance (e.g., boating), the potential resulting disturbance would likely be minor and temporary and would be addressed at the project level.

The amount of human activity in the marine environment associated with Forest management activities is only a fraction of the total amount of human activity occurring in the marine environment. Some of the other activities include commercial fishing, sport fishing, hunting, subsistence, tourism, and mariculture. Most of these activities are not regulated by the Forest Service. Adherence to the MMPA, ESA, and NMFS guidelines for approaching sea lions, as currently required under the Forest Plan, would continue under all alternatives. Young-growth timber harvest within the beach fringe or other developments in

these areas have the potential to result in very localized, minor, temporary reductions in water quality to which Steller sea lions could be exposed. Therefore, all the alternatives considered would not result in a loss of viability of this species or trend toward federal listing.

Sitka Black-Tailed Deer

Extensive analysis on deer was done for the 1997 Forest Plan and subsequent 2008 and 2016 Forest Plan FEIS. Analyses conducted during the 2016 Forest Plan FEIS also included information on summer and winter forage and effects of roadbuilding, noting that the expected ecological response of deer to old-growth and mature young-growth timber harvest, road building, and vegetation succession would be similar to those predicted previously, but the extent of future impacts would be expected to be reduced from earlier analyses because lower levels of old-growth harvest were proposed in all action alternatives in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

As part of the 2016 Forest Plan FEIS, the interagency deer habitat capability model was used to assess existing habitat capability within the planning area, and describes model limitations, and results (see USDA Forest Service 2016b, *Wildlife* section). Table 3.3b-2 summarizes the modeled deer habitat capability by biogeographic provinces. Forest-wide, approximately 89 percent of the original (1954) habitat capability remains, ranging from 72 to 100 percent depending on the biogeographic province. The greatest reductions in deer habitat capability have occurred, and will continue to occur, in provinces where timber harvest has been concentrated (the North Central Prince of Wales, East Baranof, and Etolin Island biogeographic provinces). The analysis conducted for the 2016 Forest Plan EIS, including the results of that analysis, is detailed in the 2016 Forest Plan EIS (see the *Wildlife* section), and summarized below as it relates to potential impacts from the alternatives.

The 2016 Forest Plan FEIS recognized that there would be a reduction in deer habitat capability (based on Interagency Deer Habitat Capability model output) from then existing conditions due to the harvest of mature young-growth and POG forest. Immediately following young-growth and old-growth timber harvest, there is an increase in the amount of forage available to deer during the summer and mild winter months in response to increased understory growth responding to sunlight associated with opening the forest canopy, although it may be of lesser quality compared to the same species of plants grown in the shade (Person and Brinkman 2013; Happe et al. 1990). Therefore, reductions in deer habitat capability in summer and mild winters were not expected to be realized immediately after timber harvest due to the short-term increase in forage but were expected to be greatest in heavy snow winters during years immediately following harvest and after about 25 years, as forest succession progresses and harvested stands reach the stem exclusion stage. Over the long term, reductions in habitat capability are expected to reduce carrying capacity, or the numbers of deer an area is capable of supporting given the available resources. This could lead to a decline in the deer population, particularly following severe winters, if the demand for resources (e.g., food or habitat) exceeds that which is available. Potential declines in the deer population resulting from reduced habitat capability may decrease the availability of deer to wolves (Person 2001; Farmer et al. 2007; Brinkman 2009). Likewise, reductions in deer habitat capability over the long term may reduce the access to and availability of deer to wolves and subsistence hunters.

At the forest scale, the current Forest Plan maintains 89 percent of the existing deer habitat capability over the long term and this would not vary between Alaska Roadless Rule alternatives. Stand treatments (pre-commercial and commercial thinning) in young-growth forest are not reflected in the deer habitat capability, but would result in increased understory growth which improve forage resources for deer over the first 15-25 years following harvest.

Other developments, such as energy projects and transmission lines, and transportation projects, can affect deer during construction through disturbance and through habitat removal or alteration. Operational impacts due to disturbance would expected to be minimal. Forest Plan standards and guidelines, which are unchanged by any Alaska Roadless Rule alternative, include consideration of the most current science, guidance, and methodologies related to avoiding and minimizing wildlife impacts and minimize impacts to deer and/or areas of important deer habitat during construction and operation.

Mountain Goat

Mountain goats inhabit alpine and subalpine areas and adjacent POG forests on the mainland portions of the Tongass and have been introduced to several islands. Mountain goats are susceptible to over-hunting if road access is increased or improved, though most roads are located a long distance (both vertically and horizontally) from mountain goat habitat.

The amount of road access quantified in terms of the amount of road construction and reconstruction, common to all alternatives, is representative of the potential for over-hunting. Existing road conditions in 2016 included about 5,100 miles of existing road on NFS lands (see USDA Forest Service 2016b, Table 3.4-6). The projection over the next hundred years was modeled to include an additional 1,000 miles of new roads, totaling about 6,100 miles of new roads over 100 years. This would be an increase of nearly 20 percent over existing conditions in 2016. Additionally, there would be about 500 miles of road constructed over decommissioned roads and another 1,100 miles of reconstructed roads. While there would be more acres potentially available for harvest with each of the action alternatives, there would be no change in the projected harvest amount. Therefore, new or reconstructed road miles would remain about the same for all alternatives. Alternatives 1 and 2 would have the same amount of road miles as indicated in the 2016 Forest Plan FEIS; Alternative 3 is expected to result in slightly more roads than Alternatives 1 and 2; and Alternatives 4, 5 and 6 would have slightly more road miles than Alternative 3. However, most of the roads, particularly those accessing young-growth units, would be below 1,500 feet in elevation and outside of mountain goat habitat. Additionally, note that many new or reconstructed roads would be closed or decommissioned after use, further reducing effects on mountain goats. Risk of over-harvest due to human access along roads is mitigated to some extent by Transportation Forest-wide standards and guidelines that require travel access road objectives to be developed for all roads, and mountain goat standards and guidelines would not be affected by any Alaska Roadless Rule alternative.

Energy, transportation, or other projects that may become permissible in new areas could affect mountain goats through direct disturbance or through removal or modification of habitats. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to mountain goats and their habitat during project construction and operation.

Black Bear

Preferred habitats for black bears, which include coastal, estuarine, and riparian areas, are protected by the Old-growth Habitat Conservation Strategy. None of the alternatives would remove these measures. Common to all alternatives, harvest of mature young-growth and old-growth timber (both even aged as well as thinning) would increase forage availability (berries) for black bears over the short term in the resulting early-successional plant communities. However, this food source typically lasts only about 25 years post-logging and decreases over time in association with canopy closure. Over the long term, old-growth harvest would decrease habitat suitability for black bears, due to the reduced understory forage in young-growth stands and loss of denning habitat in upland areas (e.g., large woody structures such as hollow logs and hollow living trees; Davis et al. 2012). The transition to young-growth harvest under the current Forest Plan, which is not changed by any of the alternatives, is expected to increase forage availability over the long term by reverting young-growth stand in the stem exclusion stage back to the stand initiation stage but, development of old-growth stand characteristics used by bears for denning would be delayed in those stands. Effects to the contributing elements of the Old-growth Habitat Conservation Strategy would be localized and common to all alternatives, with the maximum expected young-growth harvest affecting 0.4 percent of forest land in the beach and estuary fringe, 0.3 percent of the forest land within RMAs, and approximately 0.2 percent of the forest land (young-growth, POG, and unproductive forest) within the Old-growth Habitat LUD. (See USDA Forest Service 2016b, Appendix D for additional discussion of the Old-growth Habitat Conservation Strategy). Therefore, these areas would continue to function as habitat for black bears.

Timber harvest may also indirectly increase the susceptibility of black bears to over-harvest if road access is increased or improved. An increase in open roads, particularly in open habitats such as clearcuts and muskegs, where bears forage and are easier to see, can increase the potential for human-bear interactions. The amount of road access, quantified in terms of the amount of road construction and reconstruction anticipated under the current Forest Plan, is representative of the potential for over-hunting (see discussion above under *Mountain Goat* for a comparison of the alternatives). Average total road

density on NFS lands (across all WAAs) in 100 years under Alternative 1 would be approximately 0.23 mile per square mile and is not expected to increase significantly above this road density under any of the action alternatives.

Therefore, any potential increase in hunter access and risk of over harvest would be localized, and no measurable increase would be expected at the forest scale under any of the alternatives.

Energy, transportation, or other projects that may become permissible in new areas could affect black bears through direct disturbance or through removal or modification of habitats. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to black bears and their habitats during project construction and operation.

River Otter

River otters prefer habitats, especially POG forest, immediately adjacent to coastal and fresh water aquatic environments, with most use occurring within 500 feet of these areas. These old-growth habitats are protected by Forest Plan standards and guidelines for the beach and estuary fringe, riparian areas, and lakes which would be implemented under all alternatives.

Energy, transportation, or other projects that may become permissible in new areas could affect river otters through direct disturbance or through removal or modification of habitats, particularly if activities affect waterbodies. These effects would be evaluated at the project level. Forest-wide standards and guidelines would minimize impacts to river otters and their habitats during project construction and operation.

American Marten

Through the removal of forest cover and old-growth ecosystem features such as decadent live trees and snags, timber harvest (POG harvest and young-growth harvest) under that could occur under all alternatives would reduce the vertical and horizontal structural complexity important to marten in relation to prey access, denning and resting sites, escape from predation, and thermoregulation (Buskirk and Zielinski 1997; Hargis et al. 1999; Flynn and Schumacher 2001). Forest fragmentation resulting from timber harvest may also alter patterns of occupancy by marten (Bissonette et al. 1997; Chapin et al. 1998). Although more recent research indicates that marten use all forested stands relative to their ability, including young-growth stands mixed conifer and deciduous stands less than 40 years of age (Goldstein et al. 2013), harvests that result in the greatest reduction in deep snow marten habitat (high-volume POG at or below 800 feet elevation) are expected to have the greatest adverse effects to marten.

Reductions in deep snow marten habitat may result in localized reductions in the capability of the remaining habitat to support marten. The 2016 Forest Plan FEIS estimated that about 9,800 acres of deep snow marten habitat would be harvested in the next 100 years (see Table 3.10-13 in Appendix C of this DEIS).

Increased human access associated with new roads may result in increased marten vulnerability to harvest, particularly along open roads (Flynn et al. 2004). Harvest under the Forest Plan, under all alternatives, would result in minor increased average total road densities; however, the proportion of WAAs within various road density categories would not likely change under any of the alternatives (see the discussion under Black Bear). Increased road densities have the potential to indirectly increase hunter access and associated trapping pressure; however, these effects would be minor and would not significantly differ among alternatives as no increased harvest and only slight increases in roading (Alternatives 3, 4, 5, and 6) are anticipated.

Under the current Forest Plan, marten populations are supported by the Old-growth Habitat Conservation Strategy which works to maintain old-growth forest cover and coarse woody debris to provide structure important to marten for resting, denning, escape from predators, trapping refugia, and facilitate marten dispersal. The beach and estuary fringe and RMAs provide travel corridors for marten, and old-growth reserves and other non-development LUDs provide refugia from trapping. Pre-commercial and commercial thinning of young-growth stands in these areas, which would occur under all of the alternatives, would promote the development of stand conditions that provide habitat structure for marten.

However, even-aged harvest or group-selection of young-growth in the beach and estuary fringe, RMAs, and non-development LUDs would setback the stand development process (returning harvest units to the stand initiation stage). The creation of gaps several acres in size or more could result in localized reductions in marten movement, local reductions in prey availability, and would delay the development of old-growth habitat conditions in harvested stands. However, overall connectivity for marten would be provided through application of the Forest Plan requirement of maintaining the 1,000-foot buffer immediately inland of young-growth harvest units in the beach and estuary fringe and a 200-foot buffer along the shoreline.

Energy, transportation, or other projects that may become permissible in new areas could affect marten through direct disturbance or through removal or modification of habitats. These effects would be evaluated at the project level. Forest-wide standards and guidelines would minimize impacts to marten and their habitats during project construction and operation.

Brown Bear

Brown bears are associated with low-elevation POG forests, particularly along Class I salmon streams. These habitats are protected to some extent by Forest-wide standards and guidelines for beach and estuary fringe and RMAs. However, young-growth harvest under the Forest Plan would occur in these areas under all alternatives. Young-growth harvest within beach and estuary fringe and RMAs are discussed above under Black Bear.

Road densities are another measure of the potential impact on brown bears. Primary concerns include increased hunting or poaching, and disturbance during critical life stages (e.g., late-summer feeding periods for bear). Habitat fragmentation, as well as habitat loss secondary to activities that are facilitated by vehicular access (e.g., timber harvest, mining, residential development, and renewable energy development) are other potential impacts. Open roads, which receive the highest and most consistent use, are likely to have the greatest effect on brown bears, although closed roads still facilitate access (e.g., off-highway vehicle, pedestrian) to roadless areas. There is no road density guideline for brown bears; however, it can be assumed that increased road density elevates the potential for human-bear interactions. Implementation of the Forest Plan under all alternatives would result in minor changes in total road density (see the discussion under Black Bear). Increased road densities have the potential to indirectly increase human-bear interactions; however, these effects would be minor. Alternatives 1 and 2 would be similar in their effects, Alternative 3 would be slightly greater, and Alternatives 4, 5, and 6 would be slightly greater than Alternative 3. Overall, there is little difference between the alternatives because predicted harvests levels are not changed.

Energy, transportation, or other projects that may become permissible in new areas could affect brown bears through direct disturbance or through removal or modification of habitat, particularly if developments affect Class I salmon streams. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to brown bears and their habitats during project construction and operation.

Alexander Archipelago Wolf

The 1997, 2008, and 2016 Forest Plan analyses contain extensive information on wolf ecology, building on the wolf assessment (Person et al. 1996). As outlined in the above Forest Plans and associated documents, scheduled harvest of POG forest has the potential to result in a small reduction of the wolf prey base (deer through decreased deer habitat capability) and increased human access along project roads, which could reduce the wolf population through increased legal and illegal hunting and trapping. It is assumed that a decline in the deer population would likely result in a decline in the wolf population (USDA Forest Service 2008b). Resonating effects could include reductions in opportunities to hunt or trap wolves (see USDA Forest Service 2016b, *Subsistence* section).

These effects are of particular concern on Prince of Wales Island where the population has apparently undergone substantial declines over the last several decades; however, this population represents a small portion (approximately 4 percent) of the overall Alexander Archipelago wolf population and this decline is not anticipated to affect the status of the population at large (USFWS 2015).

Evaluation employing the Interagency Deer Carrying Capacity Model suggests that harvest of POG forest will decrease carrying capacity for deer over the long term because of reductions in the amount of available winter habitat due to the ultimate development of forest in stem-exclusion (see Table 3.10-11 in Appendix C of this DEIS; see also discussion of effects to deer). However, this long-term decline in carrying capacity is lessened now due to the current Tongass Forest Plan's transition to young growth, which would not change under any alternative. Current deer habitat capability based on the interagency habitat capability model is below the Forest Plan guideline of 18 deer per square mile in many WAAs.

This results from several factors and varies among landscapes. Contributing factors include lower inherent capability of some landscapes and habitats, reduced habitat capability from past timber harvest and associated succession, and the static nature of how the model expresses habitat capability during succession (e.g., one value for young growth from 25 to 150 years of age). Model results suggested that continued harvest of POG forest in some areas would result in higher risk that there will be insufficient deer to sustain predation by wolves and human deer harvest over the long term (see existing modeled deer densities in Table 3.10-2 in Appendix C). That concern exists despite the availability of alternative prey and current abundance of deer in some parts of the forest.

Projections based on the 2016 Forest Plan indicate a reduction in the existing percentage of WAAs with deer habitat capability of at least 18 deer per square mile by 11 percent after approximately 25 years (at stem exclusion) (see Table 3.10-14 in Appendix C). After 100 years of Forest Plan implementation the reduction in the percentage of WAAs with at least 18 deer per square mile would be 14 percent. WAAs with the greatest potential impacts are located in South Prince of Wales, North Central Prince of Wales, Kupreanof/Mitkof Islands, Revillagigedo Island, and Chichagof Island biogeographic provinces (see Table 3.10-14 in Appendix C). Reductions in habitat capability are due to both timber harvest as well as natural succession of stands harvested in the past. None of the alternatives would be expected to change the model results as there would be no increase in the overall harvest relative to the 2016 Forest Plan.

The transition to young-growth harvest under the current Forest Plan is not fully reflected in the interagency deer model results because the model does not assign different values to stands that have been pre-commercially or commercially thinned (i.e., it still treats them as stands in the stem exclusion phase with limited value for deer), or young-growth stands beyond the stem exclusion phase which become more suitable for deer. Harvest of young-growth stands would increase summer and low-snow winter forage availability for deer over the short term, providing temporary increases in habitat capability during most years, but reduced winter habitat capability in high-snow years. Over the long term as young-growth stands re-enter the stem exclusion phase, habitat capability for deer (and thus potential prey availability for wolves) would be expected to decrease (due to reduced forage availability) until the next stand treatment. Ultimately, the continued harvest of old-growth and young-growth forest that would be permissible under all the alternatives has the potential to result in localized reductions in deer habitat capability which may reduce prey availability for wolves in portions of the Tongass where deer are their primary prey (e.g., Prince of Wales Island and surrounding islands [GMU 2]). ADF&G recently updated its wolf management by game management area. All updated management reports and plans were reviewed but the discussion below focuses on GMU 2 (Porter 2018). The harvest data through 2014 was used for the 2016 Forest Plan. ADF&G plans for the next period (2015-2020) include the development of a more formal management plan for Unit 2 wolves (Porter 2018). Other recently updated management reports and plans for various GMUs note that changes to seasons and bag limits for wolves are currently not needed at this time.

All action alternatives would allow the construction or reconstruction of roads in some areas previously prohibited by the 2001 Roadless Rule, but the amount of roads would be similar. Roads associated with timber harvest may also increase the risk of both legal and illegal hunting and trapping related wolf mortality by increasing human access. Estimated total road densities and open road densities below 1,200 feet (representative of low elevation habitats used by wolves and deer) would increase by 0.07 and 0.01 miles per square mile (NFS lands only), for all roads and for NFS roads only for the current Forest Plan (see Table 3.10-15 in Appendix C). Therefore, at most, localized increases in hunter access would be expected under the action alternatives with no substantial increase across the Tongass. Alternative 2 would be the same as Alternative 1, Alternative 3 would result in slightly more roads than Alternative 2, and Alternatives 4, 5, and 6 would result in slightly more roads than Alternative 3. These effects would be

lessened through road closures after use, through storage or decommissioning. The effectiveness of closure and storage, or decommissioning and ultimately the extent of mitigation will depend on both enforcement and the approach to closure. These decisions are made at the island, district, and project level through Access Travel Management Plans based on an evaluation of all resources.

Energy, transportation, or other projects that may become permissible in new areas could affect wolves directly during construction through disturbance at den and rendezvous sites and indirectly through effects to deer habitat and increased vulnerability to harvest. These effects would be evaluated at the project level.

The Forest-wide standards and guidelines would minimize impacts to wolves, their habitats, and their prey base during project construction and operation, and through cooperation and coordination with ADF&G and the Wolf Technical Committee to meet the management intent to secure and support sustainable wolf population levels, particularly in GMU 2.

Bald Eagle

Common to all alternatives, timber harvest and associated activities, which create noise and disturbance (e.g., blasting and helicopter logging), have the potential to result in minor, temporary disturbance to individual bald eagles. As required by the Forest Plan, all activities would be conducted in accordance with the Bald and Golden Eagle Protection Act, including maintaining appropriate distances from active bald eagle nests. Riparian and beach and estuary standards and guidelines, as well as OGRs and other non-development LUDs, protect bald eagle habitat on the Tongass. Management activities in these areas could disturb eagles and reduce the protection afforded to suitable bald eagle habitat. Under all alternatives, commercial management of young growth (up to 10-acre openings) in the beach and estuary fringe and RMAs for the first 15 years after plan approval would continue. Harvest of young-growth in these areas would delay development of future trees/snags suitable for eagle nesting, perching, and roosting; however, it includes a minimum 200-foot forested buffer along the shore (beach) that would continue to protect some eagle perching or roosting trees during that time.

Many young growth trees harvested would be of insufficient size to be suitable for nesting or preferable for roosting. Harvest of young growth has potential to disturb eagles, especially if helicopter harvest methods are used. Timing restrictions would apply near active eagle nests in the vicinity of harvest activities to minimize disturbance to eagles or the abandonment of nests.

Energy, transportation, or other projects that may become permissible in new areas could affect bald eagles directly during construction through disturbance and through habitat removal or alteration. During operation, electrocution with powerlines and/or collisions with project structures are a potential risk. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to bald eagles, their habitats, and their prey base during project construction and operation. They would include adherence to the MBTA, Bald and Golden Eagle Protection Act, and guidelines such as APLIC standards for transmission lines (APLIC 2006).

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

These species are associated with old-growth forest and extensive quality habitat is protected through the conservation system, particularly old-growth reserves and non-development LUDs. In the matrix, these species rely on legacy components (e.g., large diameter trees, snags) of the old-growth forest ecosystem for nesting and foraging. Harvests that could occur under all alternatives would result in the removal of nesting and foraging habitat (POG forest; see Tables 3.9-12, 3.9-13, and 3.9-14 in Appendix C). Red-breasted sapsuckers are most closely associated with low-volume old growth, whereas hairy woodpeckers and brown creepers are associated with high-volume and large-tree stands, respectively. Red squirrels are more versatile and will use young-growth stands as young as 40 years of age. Indirect effects to these species would be associated with fragmentation and the reduction in POG patch sizes. Fragmentation reduces the amount and effectiveness of interior old-growth forest habitat by creating habitat edges along which may increase rates of nest predation by avian predators (Kissling and Garton 2008). Harvest of young-growth stands would have minimal fragmentation-related effects to these species because old-growth interior forest conditions preferred by these species would not be affected.

However, connectivity for red squirrels could be locally reduced because this species may use mature young-growth stands that are suitable for commercial harvest.

Legacy Forest Structure standards and guidelines which are intended to maintain old-growth structure in areas that are already highly developed, as well as areas that will experience increased harvest levels over the life of the Forest Plan would continue to be implemented under all alternatives. These components (large trees and snags) may provide nesting and foraging habitat for the red squirrels, red-breasted sapsuckers, hairy woodpeckers, and brown creepers.

Energy, transportation, or other projects that may become permissible in new areas could affect red squirrels, red-breasted sapsuckers, hairy woodpeckers, and brown creepers during construction through direct disturbance or through removal or modification of habitats. During operation, the potential for collision with project structures is a risk. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to these species and their habitats during project construction and operation.

Vancouver Canada Goose

Vancouver Canada geese use wetlands (forested and non-forested) in the estuary, riparian, and uplands areas of the forest. Habitat needs for this subspecies are specifically provided for under the waterfowl standards and guidelines, which apply to specific sites, and a 100-foot buffer around lakes and streams. The beach, estuary, and riparian Forest-wide standards and guidelines provide additional protection to habitats used by Vancouver Canada geese.

Harvest of young-growth within the beach and estuary fringe and RMAs under the Forest Plan could affect this species. However, because of Forest Plan measures, effects on the Vancouver Canada goose should be minimal and would be similar under all alternatives.

Energy, transportation, or other projects that may become permissible in new areas could affect the Vancouver Canada goose during construction through direct disturbance or through removal or modification of habitats. During operation, collision with project structures is a risk. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to Vancouver Canada geese and their habitats during project construction and operation.

Other Species

Migratory Birds

Under all alternatives, harvest implemented under the Forest Plan would result in a reduction of perching, foraging, and potential nesting habitat and the increase in fragmentation associated with timber harvest and road building. After timber harvest, there would be a short-term increase in the habitat for species associated with early successional habitats and forest edges, which may result in short-term population growth for these species. However, extended local reductions in available habitat would be expected as forest succession progresses. Habitat removal would reduce the effectiveness of interior forest habitat, and increase the potential for nest predation and nest parasitism for some species, which can ultimately reduce reproductive success (Robinson et al. 1995). Migratory birds would be most susceptible to impacts from harvest activities occurring in suitable nesting habitat during the nesting/fledging period, which generally begins in mid-April and ends about mid-July, when young birds have fledged.

The migratory bird species most likely to be adversely affected by the harvest of POG forest under all of the alternatives are those that primarily nest in POG forests, including the Western screech-owl, rufous hummingbird, red-breasted sapsucker, Pacific-slope flycatcher, Steller's jay, northwestern crow, chestnut-backed chickadee, golden-crowned kinglet, varied thrush, Townsend's warbler, blackpoll warbler, northern goshawk, and marbled murrelet. However, species associated with early successional or scrub habitats such as the MacGillivray's warbler, golden-crowned sparrow, and golden-crowned kinglet would benefit through increases in suitable habitat over the short- to mid-term from timber harvest. All migratory bird species would benefit from the transition to young-growth harvest continued under all alternatives due to the reduced long-term scheduling of POG harvest. Differences among alternatives would be very slight because of the fact that harvest levels would remain the same.

Under all alternatives, the Old-growth Habitat Conservation Strategy would continue to provide for extensive areas in reserves of migratory bird habitat and distributed across the Forest. Legacy Forest Structure standards and guidelines that protect habitat features important for migratory birds on a stand level would be applied, as appropriate, under all alternatives.

Energy, transportation, or other projects that may become permissible in new areas could affect migratory during construction through direct disturbance or through removal or modification of nesting habitats. During operation, collision with project structures is a risk. These effects would be evaluated at the project level. The Forest-wide standards and guidelines would minimize impacts to migratory birds and their habitats during project construction and operation.

Bats

All bat species known to occur in southeast Alaska are associated with mature forested habitats which provide roosting, breeding, and foraging sites, and bat activity appears rare in young-growth forest. Old-growth timber harvest would remove POG, thereby reducing the number of potential day-roosts available to tree-roosting bats and foraging habitat. Indirectly, timber harvest may also reduce the suitability of remaining roosting habitat through increased fragmentation (and decreased patch sizes) as day-roosts are more likely to be selected by some species (e.g., Keen's myotis and silver-haired bat) if they are located in stands with a higher number of trees in early to late decay stages (Boland et al. 2009).

Under all alternatives, harvest of POG that could occur under the Forest Plan would be expected to have some level of impact, but differences among alternatives would be very limited due to the uniform harvest level. It should be noted tree-roosting species may choose a large-diameter tree for roosting regardless of whether or not it is located in an area with past timber harvest (Boland et al. 2009). Habitat and landscape connectivity would be provided for these species by the Forest Plan conservation strategy.

Marbled Murrelets

Marbled murrelets nest in structurally complex old-growth forest stands (Piatt et al. 2007). As a result, timber harvesting and road construction within POG forest stands (especially high-volume POG) can remove nest trees or disturb nesting birds. Indirectly, timber harvest and road building increase fragmentation, reducing the effectiveness of interior forest habitat and creating habitat edges, which may result in increased rates of nest predation by avian predators. Under all alternatives, marbled murrelet nesting habitat would be protected by the Forest Plan conservation strategy.

The ongoing transition to young-growth harvest would benefit this species through the retention of a greater amount of POG forest on the landscape over the planning horizon. Moreover, many of young-growth trees harvested would be of insufficient size to be suitable for nesting. Additionally, harvest of young-growth stands that could occur under all alternatives would have minimal fragmentation-related effects to this species because old-growth interior forest conditions preferred by this species for nesting would not be affected.

Legacy Forest Structure standards and guidelines are intended to maintain old-growth structure in areas that are already highly developed, as well as areas that will experience increased harvest levels over the life of the Forest Plan. These components (large trees and snags) may provide nesting habitat for marbled murrelets. Differences in effects among the alternatives would be very slight because of the lack of differences in harvest volumes.

Energy, transportation, or other projects that may become permissible in new areas could affect marbled murrelets during construction through direct disturbance or through removal or modification of habitat. During operation, the potential for collision with project structures is a risk. The Forest-wide standards and guidelines would minimize impacts to marbled murrelets and their habitats during project construction and operation. Forest Plan standards and guidelines pertaining to marbled murrelets include maintaining a 600-foot radius no-cut buffer zone around identified murrelet nests; however, habitat protection is also provided through beach and estuary fringe and riparian standards and guidelines (USDA Forest Service 2016a), as well as the overall system of OGRs and other non-development LUDs.

Amphibians

Amphibians require both aquatic and terrestrial habitats in order to complete their life-cycle. Ponds, streams, and wetlands used by amphibians for breeding are protected by Forest Plan Riparian and Wetland standards and guidelines.

However, increased sedimentation and the entry of contaminated run-off from roads resulting from timber harvest can reduce the quality of these habitats. Under all alternatives, standard best management practices (BMPs) for water quality would be implemented to minimize these effects (see the Fisheries section for additional discussion).

Timber harvest has the potential to result in the loss and/or degradation of terrestrial habitats through changes in microclimates, soil compaction, and leaf litter disturbance. Tree canopy removal increases solar radiation to the forest floor, resulting in changes in moisture and soil temperatures which can make terrestrial habitats unsuitable for amphibians. Thinning or uneven-aged harvest techniques may reduce these effects.

The effects of specific harvest treatments on amphibians is complex. Some amphibians in the aquatic stage may be affected positively by even-aged harvest techniques (clearcutting), whereas effects of these treatments on juvenile and adult terrestrial stages are mostly negative (Semlitsch et al. 2009). In addition, renewable energy, mining, and transportation projects could affect amphibians through direct disturbance or through removal or modification of habitats, particularly if activities affect water bodies. The Forest-wide standards and guidelines would minimize impacts to amphibians and their habitats during project construction and operation.

Endemism

By definition, endemic species occur in isolated populations and many have limited mobility or specific habitat requirements. Thus, they are vulnerable to the effects of habitat loss and fragmentation, introduced non-natives, pathogens and disease, natural events (i.e., climate change), and overharvesting (Dawson et al. 2007). Therefore, the ability to disperse and recolonize is an important factor in how endemic species are able to respond to environmental changes.

Under all alternatives, harvest and road construction/reconstruction implemented under the Forest Plan would affect endemic species through habitat loss (POG) and fragmentation (reduced patch size), and by altering the distribution of habitats across the landscape. This may inhibit the ability of individuals to move between patches of suitable habitat, and therefore may further limit the distribution of a population or reduce genetic interchange between subpopulations. These effects would occur to a less extent in association with young-growth harvest as these stands provide lower quality habitat to most endemic species. Although timber harvest levels are the same among all alternatives, Alternatives 4, 5, and 6 would have the greatest potential for effects on endemics because of the degree of fragmentation is likely to be higher under these alternatives (landscape connectivity and fragmentation are discussed in detail in the *Biological Diversity* section). Most endemic species would benefit from the transition to young-growth harvest continued under all alternatives due to the reduced amount of scheduled POG harvest over the long term.

Prince of Wales Flying Squirrel

A thorough analysis of this species occurred during the 1997, 2008 and 2016 Forest Plan efforts and results documented that the conservation strategy was functioning adequately to maintain the viability of this species in the planning area (USDA Forest Service 1997b, Appendix N; 2008b, Appendix D; 2016b). Prince of Wales flying squirrels are closely associated with old-growth structural characteristics and are limited by their dispersal capabilities. This subspecies has a limited gliding range (approximately 250 feet), a distance substantially less than the average clearcut width (Flaherty et al. 2008). Fragmentation resulting from old-growth timber harvest has the potential to reduce the value of residual patches of old growth in the matrix if they become isolated from adjacent patches either by distance or habitat type (young growth). Under all alternatives, old-growth timber harvest implemented under the Forest Plan could reduce the quality and quantity of flying squirrel nesting, foraging, and denning habitat.

However, the Old-growth Habitat Conservation Strategy would continue to maintain suitable old-growth habitat and provide landscape connectivity for flying squirrels.

Young-growth management (particularly commercial thinning) could benefit flying squirrels over the short term by increasing canopy height and creating more open space in the midstory conditions that facilitate efficient gliding (Scheibe et al. 2006). Over the long term, commercial thinning would promote stand development toward conditions capable of supporting breeding flying squirrels and improve the functional connectivity between old-growth reserves (Smith et al. 2011).

Prince of Wales Spruce Grouse

Prince of Wales spruce grouse are associated with muskegs, high-volume POG, and mixed conifer (scrub) habitats but will also use young-growth forest (15-30 years following timber harvest) with a well-developed middle story. Because they are associated with microhabitats within POG forests, old-growth timber harvest would alter habitat availability for this species, though effects would change over time. Harvest of old-growth timber under all alternatives would have a short-term benefit to grouse due to increased forage availability, followed by an extended period in which habitat conditions in harvested units would not be suitable. Young-growth harvest would provide similar short-term benefits to this species in the years following stand treatments. However, even-aged harvest of both old-growth and young-growth forest would initially (i.e., within the first 5 years after harvest) result in habitat patches unsuitable for spruce grouse, which may result in local impediments to movement. Due to their generally sedentary nature and preference for walking rather than flying, fragmentation due to even-aged timber harvest can result in the isolation of local spruce grouse populations (i.e., if open areas are too large or forested patches are spread too far apart to enable spruce grouse to move between them). However, thinning and group selection treatments can promote the development of structural and horizontal diversity beneficial to grouse (Russell 1999).

Cumulative Effects

Increased road densities associated with timber harvest could also adversely affect spruce grouse by increasing hunter access (USFWS 2010). None of the alternatives would result in significant increases in average WAA road densities and therefore would not be expected to result in significantly increased harvest risk at the forest level. Localized increases in road densities would be managed through road closures and storage or decommissioning which would likely minimize the potential for increased harvest risk for spruce grouse over the long term.

Overall effects of the alternatives would be very similar due to the constant level of harvest among them. The Old-growth Habitat Conservation Strategy would continue to provide suitable habitat and landscape connectivity for spruce grouse.

Activities that occur on other land ownerships within and adjacent to the Tongass have the potential to affect the overall context within which effects to wildlife are considered. Appendix B provides a full list of all the activities considered in the cumulative effects analysis. Such reasonably foreseeable activities include, but are not limited to, timber harvest, community development, mining, recreation and tourism, and road construction. Typically, these activities have the potential to adversely impact wildlife populations through habitat conversion, fragmentation, and disturbance associated with road building, though some activities can have short-term or long-term beneficial impacts, depending on the species. Prediction of the future extent and intensity of such activities has a high degree of uncertainty associated with it on a Forest-wide basis over a broad time scale. The 2016 Forest Plan FEIS also summarizes a review of the overall wildlife viability analysis (see USDA Forest Service 2016b, cumulative effects discussion in the *Wildlife* section).

Many private lands in Southeast Alaska are already highly developed in terms of roading and timber harvest and are likely to experience a continuing decline in old-growth forest in the future. Therefore, the cumulative long-term trend within the Forest boundary under all alternatives is likely to be a decline in optimum habitat for most old-growth associated species, with non-NFS land contributing to this trend. Additionally, land exchanges and conveyances (e.g., Mental Health Trust) have the potential to remove some lands from protection under the Old-growth Habitat Conservation Strategy. The Forest Service

would continue to evaluate opportunities to compensate for these losses by evaluating additional OGR modifications when land adjustments are implemented.

The transition to young-growth harvest on the Tongass would benefit wildlife species by reducing the overall amount of POG forest harvested over the planning horizon. Activities such as pre-commercial and commercial thinning would have both short-term (increased forage availability) and long-term (promotion of the development of old-growth forest stand characteristics) benefits to wildlife species that use POG forests on the Tongass.

When combined with other management activities occurring on non-NFS lands, implementation of the Forest Plan under any Alaska Roadless Rule alternative would produce additional impacts (noted above) associated with continued old-growth harvest to species for which this forest type is optimal habitat, such as goshawks, marten, mountain goats, red squirrel, red-breasted sapsucker, hairy woodpecker, brown creeper, marbled murrelets, and bat species. However, these declines in habitat (and associated effects such as fragmentation) would be lessened to some extent through the transition to young-growth harvest on NFS lands.

Approximately 875,700 acres of POG have been harvested across the Tongass, including both NFS lands and non-NFS lands, resulting in a reduction to 86, 79, and 68 percent of the original total, high-volume, and large-tree POG in Southeast Alaska, respectively (see Tables 3.9-16, 3.9-17, and 3.9-18 in Appendix C). Approximately 83 percent of the original POG would remain on the Tongass after full implementation of the 2016 Forest Plan (Alternative 1) and future non-NFS harvest in 100+ years. Future representation of high-volume POG and large-tree POG would be expected to be approximately 76 and 63 percent of the original amount, respectively, after 100+ years under the 2016 Forest Plan. The action alternatives would result in the same long-term estimates because harvest levels would be the same as Alternative 1.

Harvest associated with all alternatives would contribute to the cumulative reduction in POG and associated increase in fragmentation and loss of connectivity, which has the potential to reduce biological diversity. Timber harvest on NFS lands, as well as on non-NFS lands would result in similar effects; however, would not contribute above what was analyzed in the current Forest Plan.

Collectively, the implementation of the Forest Plan under all of the alternatives in combination with ongoing and foreseeable projects would increase the number of smaller patches on the landscape, reducing the amount of interior forest and increasing the occurrence of forest edge habitat. Edge effects such as shifts in species composition may reduce natural biological diversity over time by favoring some species over others; however, effects would be lessened by the transition to predominantly young-growth harvest, which would reduce the long-term cumulative effects to old-growth biological diversity by reducing the total amount of POG harvest and associated fragmentation. Note that the actual amount of harvest that has occurred to date on the Tongass is far less than that projected under all previous Forest Plan EISs and would likely continue to be less under all of the alternatives (see *Timber* section of this EIS for additional discussion).

Cumulative effects to modeled deer habitat capability would maintain 78 percent of the original level in 25 years and at 100 years. WAAs with the greatest impacts under the alternatives are located in GMU 2 (Prince of Wales and surrounding island) where concentrated past timber harvest has occurred. The USFWS Alexander Archipelago wolf species status assessment concluded that assuming continuation of current land use trends, the GMU 2 wolf population is anticipated to decline by another roughly 8 to 14 percent of current levels over the next 30 years (USFWS 2015). Although this could result in gaps in wolf distribution within GMU 2, given that it comprises just 6 percent of the population range wide, impacts to the overall distribution in Southeast Alaska or to species viability are not expected (USFWS 2015). The Forest Service will continue to coordinate with ADF&G and the Wolf Technical Committee to address future issues, especially within GMU 2.

Overall, biological diversity on the Tongass and in Southeast Alaska remains in good condition and the landscape continues to be dominated by old-growth forest ecosystems. As development continues through timber harvest and associated activities such as road building, and community expansion, particularly in areas where extensive development has already occurred (e.g., Prince of Wales Island),

maintaining connectivity and roadless refugia will become increasingly important, particularly for wide-ranging species whose distribution depends on some level of connectivity across the landscape. In addition, the management of human resources will continue to play a role in maintaining biological diversity across the Tongass. Within the Tongass boundary, the Old-growth Habitat Conservation Strategy was designed to address the more extensive harvest on non-NFS lands through the old-growth reserve system and Forest-wide standards and guidelines, both of which were intended to maintain ecological components needed to maintain the ecological integrity important to a variety of organisms and maintain connectivity across the landscape, with or without much contribution from non-NFS lands. Note that the system of OGRs and overall Old-growth Habitat Conservation Strategy approach was developed prior to roadless and would be maintained regardless of the alternative selected.

There are portions of the Tongass where cumulative effects become more important due to the level of past harvest that has occurred. Specifically, the North Central Prince of Wales and Kupreanof/Mitkof Islands biogeographic provinces have experienced some of the highest reductions in original (1954) POG forest on the Tongass and are also where much of the young-growth suitable for commercial timber production is located. Additional timber harvest, particularly when located adjacent to previously harvested areas, has a greater potential to result in localized reductions in landscape connectivity and gaps in species distributions in these more heavily harvested areas compared to portions of the Tongass that have less cumulative past timber harvest. These cumulative effects would be most likely to occur for species with very limited ranges (endemic species limited to individual islands or island groups, e.g., Prince of Wales flying squirrel, Prince of Wales spruce grouse) or with limited dispersal capabilities or capabilities that are dependent on certain mature forest structural characteristics (e.g., goshawks, amphibians, flying squirrels, spruce grouse).

Species with limited dispersal capabilities (i.e., flying squirrels and spruce grouse, which are also endemic species) are likely to be more sensitive to habitat loss and fragmentation than species with greater dispersal capabilities (i.e., goshawks, wolves, and brown bears; D'eon et al. 2002). Natural fragmentation of habitats can also affect the level of additional fragmentation that can be supported. The Old-growth Habitat Conservation Strategy would continue to provide for extensive areas in reserves distributed across the Forest. The Legacy Forest Structure and other standards and guidelines that retain POG forest in harvested areas (e.g., beach and estuary fringe, RMAs, and Scenic Integrity Objectives) would also ensure the maintenance of a functional and interconnected old-growth ecosystem on the Tongass. These features are important for species associated with shoreline and riparian habitats such as river otters, black bears, brown bears, bald eagles, and Vancouver Canada geese. These measures, particularly when implemented in areas that have experienced concentrated past harvest increase the likelihood that the landscapes will continue to provide the full range of matrix functions that support viable and well-distributed populations of wildlife species.

Under all alternatives, activities implemented under the Forest Plan would result in vessel traffic and marine activity associated with LTF use and log transport, which would occur irregularly over the life of the Forest Plan (in association with individual old-growth and young-growth timber harvest projects as they are proposed). Therefore, all of the alternatives would make a minor contribution to the existing potential for oil or fuel spills associated with existing vessel activity and bark accumulations near the LTFs to which marine and shoreline-associated species such as black oystercatchers, Aleutian terns, short-tailed albatrosses, humpback whales, and Steller's sea lions would be exposed. However, levels of marine activity are expected to remain within levels anticipated for the current Forest Plan (Alternative 1) under all of the action alternatives. Furthermore, all activities at the project level would be conducted in accordance with Alaska Water Quality Standards under Section 401 of the Clean Water Act for LTFs.

These standards place restrictions on the types, quantities, and extent of discharges (including bark) to the marine environment and would limit the effects of the project on water quality. Therefore, very minor contributions to cumulative effects in the marine environment are anticipated under all of the alternatives and these would be the same among the alternatives.

Climate change may also contribute to cumulative effects. Warmer temperatures and increased precipitation are anticipated to result in changes to vegetation and thus, the suitability of wildlife habitat, among other impacts (Haufler et al. 2010, Shanley et al. 2015; see the *Climate and Carbon* section).

Although many species may benefit (e.g., greater overwinter survival of deer, and thus a greater prey base for wolves, resulting from warmer winter temperatures during normal years), habitat changes resulting from a longer growing season, wind, fires, insect infestations, and disease would have variable effects on others. The greatest concerns for wildlife populations in relation to climate change, however, are the weather extremes that can be expected to occur periodically (Haufler et al. 2010).

Periodic severe winter snowfalls, which may seem counterintuitive given the general warming trend, are anticipated (SNAP 2013). These stochastic events would be of greatest concern for populations that are limited in number or distribution. The Forest Plan Old-growth Habitat Conservation Strategy was designed to maintain a resilient old-growth forest ecosystem in the face of this uncertainty. The potential for contributions to climate change from continued old-growth timber harvest on the Tongass, which could indirectly affect wildlife species such as the Kittlitz's murrelet, is described in detail in the *Climate and Carbon* section.

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Fish

Affected Environment

The important fish and aquatic habitat details of the Tongass were provided in the recently developed 2016 Forest Plan FEIS (USDA Forest Service 2016b). This section relies extensively on that information to characterize the current affected environment and refers the reader to that document for further details. The abundant aquatic systems of the Tongass provide spawning and rearing habitats for most fish produced in Southeast Alaska. Maintenance of this habitat and associated high-quality water is a focal point of public, state, and federal natural resource agencies, as well as user groups, Native organizations, and individuals.

Several watersheds and VCUs in the Tongass have been evaluated for relative importance for several metrics relating to fish and wildlife. Included among these are conservation priority areas identified by The Nature Conservancy (TNC) and Audubon Alaska (Audubon Alaska and The Nature Conservancy 2007), and the "Tongass 77" (T77)[18] watersheds identified by Trout Unlimited. Audubon Alaska and TNC identified conservation priority watersheds that include high-value intact watersheds in primarily intact conditions and generally encompass the highest current ecological values within each province; these areas were recommended to be managed for intact ecological values and habitat productivity.

About 46,000 stream miles and 213,000 acres of lakes and ponds are present on Tongass lands. Of these, approximately 14,900 stream miles and 3,300 lakes and ponds are mapped as anadromous or high-value resident fish habitat. Another 9,500 stream miles and 1,000 lakes and ponds are mapped as resident fish habitat. Many estuarine and marine, fish and shellfish resources are affected by actions on the Tongass that affect marine shorelines and stream runoff (USDA Forest Service 2016b).

Subsistence, commercial, and sport fisheries are all important to the way of life for Southeast Alaskan residents and some forms occur in both marine and freshwater systems (USDA Forest Service 2016b). Major species include all five salmon species [pink salmon (*Oncorhynchus gorbuscha*), chum salmon *(O. keta*), coho salmon *(O. kisutch*), Chinook salmon *(O. tshawytscha*), and sockeye salmon *(O. nerka*)] for all activities, while various primarily trout species [e.g., rainbow trout/steelhead (O. *mykiss)* and cutthroat trout *(O. clarki*), Dolly Varden char *(Salvelinus malma*)] are important for sport, commercial, and subsistence fishing, while a variety of other marine species are also of importance. Hatcheries, and the enhancement of wild fish, among other aquaculture projects, contribute to resource availability and abundance.

Details of quantity and changes in harvest of salmon species in Southeast Alaska are provided in the 2016 Forest Plan FEIS (USDA Forest Service 2016b) and are summarized here. Commercial fish harvest in the waters of Southeast Alaska (includes Yakutat area harvest) can fluctuate widely from year to year but has remained typically in the tens of millions of fish for all five species. The annual average has ranged from a low of about 6 million in 1975 to a high of 112 million in 2013. Pink salmon make up the bulk of the harvest, averaging 76 percent since 1962.

Fish production from the Tongass is a primary source of fish for commercial, sport, and subsistence harvest. Based on the estimated portions of each species originating from the Tongass, about 80 percent of the total harvested fish began their life in streams and lakes within the Forest boundaries. The estimated annual average commercial salmon harvest (1984 to 2013) produced from streams originating in the Tongass was over 176 million pounds, with a wholesale value (ex-vessel value) over $93 million (adjusted to 2013 dollars). Approximately 85 percent of Southeast Alaska's sport fishing occurs in the vicinity of the Tongass. Sport fishing for salmon has been substantial over the last two decades (averaging over 400,000 fish per year (USDA Forest Service 2016b). Hatchery production has also

[18] The Tongass 77 (T77) refers to VCUs, which approximate major watersheds located on National Forest System lands that Trout Unlimited, Alaska Program, identified as priority salmon watersheds. Four watersheds were removed from the T77 in 2014 as a result of the Sealaska Land Entitlement Finalization in the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law 113-291).

contributed substantially in overall fish production regionally. Hatchery production statewide has greatly increased since 1977 with releases of more than 1 billion fish occurring annually since 1988, peaking in 2012 with about 1.7 billion juvenile fish released statewide (Vercessi 2014). State subsistence and personal use salmon fisheries averaged 50,000 fish from 2004 to 2013 for Southeast Alaska and Yakutat, down from an average of 61,000 fish in the 10 years prior (1994–2003).

Fish Habitat

Important Components of Fish Habitat

With more than 46,600 miles of streams and 212,000 acres of ponds and lakes, the Forest provides abundant fish habitat. Generally, salmon and trout require cool stream temperature to thrive in streams with stream temperature affecting fish rearing, migration and spawning success (Bjornn and Reiser 1991). The relative composition of stream substrate and sediment affects many factors in stream production, including spawning areas and spawning success for salmon and trout, and benthic organism composition and abundance, an important food resource for fish.

The amount of coarse sediment affects available spawning habitat and influences pool filling and bank stability (Spence et al. 1996). High levels of fines affect pool filling and survival of eggs and fry in spawning nests of salmon and (Chapman and McLeod 1987; Chapman 1988; Iwamoto et al. 1978; Gregory and Bisson 1997; McNeil 1964). Increased fines in streams also reduce interstitial spaces in large substrate that are important habitat for many common cool water mountain stream aquatic insects.

Large woody debris (LWD) is an important component of good trout and salmon habitat, especially in heavily wooded regions (Swanson et al. 1976; Bisson et al. 1987; Naiman et al. 1992; Beechie and Sibley 1997; Spence et al. 1996; Murphy et al. 1986), that provides channel complexity and cover, and is especially important in the formation of pools (Bisson et al. 1987; Sullivan et al. 1987; Benda et al. 2003). The primary timber-related actions that may affect LWD supply to streams include buffer width along streams, stream class and channel characteristics that buffers are placed on, size of trees remaining in the buffer area, and effects on windthrow from adjacent harvest. Additional information on LWD in Tongass streams and timber harvest practices of the past is presented in the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

Fish passage and access to suitable habitat in streams and lakes is critical to fish stocks. Natural falls and barriers in systems have been found in some areas to prevent the use of suitable fish habitat, especially for anadromous stocks in some natural systems. Man-made barriers in the form of dams, diversion, and road-crossing structures have been common partial or complete barriers to fish movement in much of the developed areas where fish are present. Road crossings (e.g., culverts) over much of the range of salmonids in the Pacific Northwest have often reduced or eliminated access to substantial portions of habitat to migratory fish use.

Effects of Past Forest Management Practices

Effects of past timber harvest practices on fish populations and habitat in the Tongass were addressed in the 2016 Forest Plan FEIS (USDA Forest Service 2016b). Older forest practices (mostly prior to 1980) in the Tongass have had adverse effects to anadromous fish habitat conditions, including spawning and rearing habitat, and migration conditions (Murphy and Milner 1997). Timber harvest during this timeframe accounts for about 60 percent of all timber harvest on the Forest. Generally, studies found that older harvested watersheds (mostly prior to 1980), which generally included clearcutting of riparian trees, had mostly lower fish production (Stillwater Sciences 2012).

Modern forest practices under the Forest Plan are intended to prevent the habitat degradation in riparian areas and headwater streams that have contributed to adverse effects on fish and habitat. Monitoring of stream habitat, fish, and riparian conditions has not found marked problems with water quality, fish resources, or habitat with the implementation of current forest practices (USDA Forest Service 2004, 2007, 2014, 2015c). The results of the latest monitoring report, while indicating that some issues need further monitoring and analysis to fully assess effects, have not resulted in any recommendations to change the current standards and guidelines of the Forest Plan (USDA Forest Service 2015c).

Fish Habitat Enhancement and Restoration

Recent enhancements have included varied activities such as fishways, falls improvements, and lake and stream stocking, while restorations have been primarily culvert removal or repair and LWD management. Other watershed improvement activities include riparian and upland vegetation improvement, road storage and decommissioning, and improved road drainage structures to reduce sediment entry to streams and improve fish passage.

Special Status Species

Fish Management Indicator Species

The 1982 Planning Rule directed the use of MIS in forest planning to help display the effects of forest management. For the 1997 Forest Plan, pink salmon, coho salmon, Dolly Varden char, and cutthroat trout were selected as MIS. Pink salmon were selected to represent anadromous fish that are limited in their freshwater life period by spawning gravel quality and quantity; coho salmon to represent anadromous fish that are generally limited in their freshwater life period by stream and lake rearing area; Dolly Varden char because of their ubiquitous distribution in freshwater habitats; and cutthroat trout because of their dependency on small freshwater stream systems, which are most susceptible to effects from management activities. These MIS, and their habitats, are described in the 1997 Forest Plan Revision FEIS (USDA Forest Service 1997a) where carried through to the 2008 Forest Plan Amendment. Because the 2016 Forest Plan EIS analyzed an amendment to the 2008 Forest Plan done under the 1982 Planning Rule, these species were carried forward and analyzed even though the 2012 Planning Rule does not use MIS for evaluating effects.

Sensitive Fish Species

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern on NFS lands within the region. The goal of the Forest Service Sensitive Species Program (Forest Service Manual 2670) is to ensure that species numbers and population distribution are adequate so that no federal listing will be required, and no extirpation will occur on NFS lands.

The Alaska Region Sensitive Species List was updated in 2009 (USDA Forest Service 2009a). There currently are no fish species designated as sensitive species in the Alaska Region.

Threatened and Endangered Fish Species

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS), under authority of the Endangered Species Act of 1973 (ESA), as amended. An endangered species is defined as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

No federally listed fish species or stocks originate from Alaska streams. However, some federally listed fish stocks may occur in marine waters within the boundary of the Tongass National Forest (NMFS 2015a). These fish include the following:

Endangered species:

- Snake River sockeye salmon
- Upper Columbia River spring-run Chinook salmon

Threatened species:

- Upper Columbia River steelhead
- Snake River spring/summer Chinook salmon

- Snake River fall Chinook salmon
- Puget Sound Chinook salmon
- Lower Columbia River Chinook salmon
- Upper Willamette River Chinook salmon
- Hood Canal summer chum salmon
- Lower Columbia River coho salmon
- Snake River Basin steelhead
- Lower Columbia River steelhead
- Upper Willamette River steelhead
- Middle Columbia River steelhead
- Green Sturgeon (*Acipenser medirostris*) – Southern distinct population segment (DPS)

These listed stocks of salmon and steelhead do not spawn in Alaska but are known to seasonally inhabit marine waters on the outside coast to the west and occasionally in inside waters of the Tongass (McNeil and Himsworth 1980; Trudel et al. 2004; Trudel et al. 2009; Burgner 1991; Haggerty 2009; Groot and Margolis 1991; Tucker et al. 2011). They may feed on fish that are dependent on coastal marine waters of the Tongass at some stages of their lives. The southern DPS of the green sturgeon is an anadromous species that spawns in the Sacramento River in California (NMFS 2015b). Green sturgeon also do not rear or spawn in fresh waters of Southeast Alaska but have been rarely found to be present in marine waters of Southeast Alaska and may feed on benthic organisms found in these waters, likely in waters less than 100 meters deep (Lindley et al. 2008; Huff 2012; Colway and Stevenson 2007).

Green sturgeon could be present in the inside waters of Southeast Alaska, particularly during the winter.

Environmental Consequences

Indirect Effects

The current standards and guidelines in the 2016 Forest Plan were developed substantially through work that was done initially by the Anadromous Fisheries Habitat Assessment (AFHA) (USDA Forest Service 1995). Follow-up work in the Tongass after 1995 and other studies have contributed to modifications of these standards and guidelines in the 1997, 2008, and 2016 Forest Plans. Monitoring in the Tongass has helped confirm that the actions taken under the standards and guidelines have protected fisheries resources in the Tongass. The Alaska Roadless Rule alternatives will be evaluated on how these alternative associated actions would affect fish resources relative to implementation of the 2016 Forest Plan under the 2001 Roadless Rule (Alternative 1).

Fish Habitat

Roads pose the greatest risk to fish resources on the Tongass (Dunlap 1996), partly because they pose the largest risk of management-caused sediment input to streams (Reid and Dunne 1984; Furniss et al. 1991; Gomi et al. 2005; Hassan et al. 2005). Road construction, road drainage, level of road use, number of road stream crossings, watershed road density, and related actions in forested areas may all influence the amount of sediment to streams (Gomi et al. 2005; Furniss et al. 1991; Swanson et al. 1987; Chamberlin et al. 1991; Reid and Dunne 1984). Road effects to aquatic systems and fish are likely to vary little among the alternatives.

Roads

Roads have been found to contribute more sediment to streams than any other land management activity (Gucinski et al. 2001). Roads can contribute towards increases in peak flow to streams (Grant et al. 2008) that can result in stream channel erosion and bed scour (Tonina et al. 2008), affecting stream bed and bank stability, and adverse effects on fisheries resources. Roads can also potentially create areas of hillslope instability resulting in landslide generation, contribute fine sediment from surface erosion, and

alter surface and subsurface water flow patterns. Long-term sediment introduction from roads is influenced by the type of structure at the road–stream crossing, proximity of the drainage structures to streams, road slope, age, maintenance condition, time since last graded, seasonal timing of maintenance activities, amount of traffic, rock quality, weather, hillslope length, soil depth, and cutbank depth (Croke and Hairsine 2006; Wemple and Jones 2003; Kahklen and Hartsog 1999; Reid and Dunne 1984). Although standards and guidelines are in place to help moderate these effects, some adverse effects, or increase in risk of adverse effects, would occur with these road parameters.

New road construction would be similar under all alternatives because roads on the Tongass are largely developed in support of timber harvesting, and the PTSQ under the 2016 Forest Plan does not vary between the alternatives. Existing conditions in 2016 included about 5,100 miles of road on NFS lands (from the 2016 Forest Plan FEIS, see Table 3.4-6 in Appendix C of this EIS). The projection over the next hundred years was modeled to include an additional 1,000 miles of new roads, totaling about 6,100 miles of new roads over 100 years. This would be an increase of nearly 20 percent over existing conditions in 2016. In addition to new roads, roads would be constructed over decommissioned roadbeds or reconstructed. Reconstruction involves the rehabilitation of the original roadbed, and can include cleaning ditches, replacing drainage structures, re-installing bridges, and grading and shaping. By the same rationale, the estimated 500 miles of roads constructed over decommissioned roadbeds and 1,100 miles of road reconstruction over 100 years for the No Action alternative would be similar among all alternatives (from the 2016 Forest Plan FEIS, see Appendix C, Table 3.4-6).

Alternatives 1 and 2 would have the about the same amount of road miles as indicated in the current Forest Plan evaluation, with Alternative 3 a slight increase over 1 and 2, and Alternatives 4, 5 and 6 similar with slightly more road miles than Alternative 3 (see *Transportation* section). Overall, the potential effects to fish from road construction, reconstruction, and maintenance under projects that could be approved in the future would be similar among all alternatives and would be evaluated at the project-scale.

Fish Passage

Roads may also increase risk to fish movement due to improper construction affecting fish passage (Gibson et al. 2005) and blocked culverts. Stream-rearing fish, particularly cutthroat trout and Dolly Varden, which occupy the smaller headwater streams during some parts of their lives, are at the greatest risk. Fish passage guidelines (Forest Service Handbook 2090.21 Aquatic Habitat Management Handbook [USDA Forest Service 2001]) for culvert design greatly reduces the risk of new culvert installation impeding fish passage, but some risks remain.

As discussed above, road construction would be similar under all alternatives; thus, the number road crossings that could impede fish passage would also be similar. While the alternatives with the most potentially harvestable acreage (Alternatives 4 through 6) would appear to have the largest potential for increase in stream crossings, the lack of increase in actual predicted harvest would greatly limit additional construction of new roads, and respective increase in stream crossings, relative to implementation of the current Forest Plan under the 2001 Roadless Rule. Therefore, the total change in stream crossings, including fish streams, with their associated impacts to fish and their habitat, is unlikely to vary substantially among the alternatives.

Timber Harvest

Timber harvest activities can increase risk to fish resources. Protection of riparian areas, including floodplains, areas of riparian vegetation, and certain wetlands associated with riparian systems, is of concern. Riparian vegetation serves many important functions for stream fish habitat, including supplying LWD, food input, and stream shade to name a few. The 2016 Forest Plan standards and guidelines associated with riparian areas, wetlands, and beach and estuary fringe are expected to protect fish resources from significant impacts associated with timber harvest, but there is still some level of risk.

All alternatives would have the same PTSQ as the current Forest Plan. Timber harvest activities projected under the current plan could potentially affect over 320,000 acres after full implementation of the Forest Plan over 100 years. The acres of harvest would not be substantially different from the current plan or

among the alternatives. Therefore, effects on fish and fish habitat would be similar among the alternatives.

The Tongass 77 Watersheds and TNC/Audubon Conservation Priority Areas

The 2016 Forest Plan prohibits old-growth timber harvest in T77 Watersheds and TNC/Audubon Conservation Priority Areas, and this carries through for all the alternatives in this EIS. Within ARAs, harvests would generally be prohibited in Watershed Priority, LUD II Priority, and Roadless Priority ARAs, with exceptions. The exceptions for timber harvest and road building are presented in Chapter 2 (Table 2-1). However, there would be no prohibition on young-growth harvests within the Timber Priority ARA (Alternative 4). Under Alternative 4, young-growth harvest could occur within Timber Priority ARAs if other suitability requirements were met (such as occurring within a development LUD). Community Priority ARAs (Alternative 3) do not include T77 Watersheds and TNC/Audubon Conservation Priority Areas.

While the size and location of future harvests are unknown, Table 3.3c-1 presents the acres of suitable young growth and estimated harvest over 100 years within T77 Watersheds and TNC/Audubon Conservation Priority Areas. Suitable acres within these areas, as well as estimated harvest, would occur outside of roadless areas.

Table 3.3c-1
Acres of Suitable Young Growth and Estimated Harvest within Tongass 77 Watersheds and TNC/Audubon Conservation Priority Areas

	Alternative					
Harvest Type	**1**	**2**	**3**	**4[2]**	**5**	**6**
Suitable YG	55,600	58,000	58,300	58,800	60,000	61,300
Increase in Suitable YG Relative to Alt. 1	0	2,400	2,700	3,300	4,400	5,700
Estimated YG Harvest over 100 years[1]	47,300	47,900	47,600	48,000	48,600	49,200
Increase in YG Harvest over 100 years	0	600	300	700	1,300	1,900

[1] Estimated harvest acres are derived by taking the total 100-yr harvest for young growth (YG), derived from Forest Plan modeling in 2016, and distributing it evenly across all suitable young growth for each alternative.
[2] Includes Timber Priority areas within Alternative 4 ARAs.

Suitable young growth in T77 watersheds and TNC/Audubon Conservation Priority Areas would not increase much between the alternatives, with increases ranging from about 2,400 acres (4 percent) under Alternative 2 and about 5,700 acres (10 percent), as shown in Table 3.3-1c. Increases in estimated harvest over 100 years ranges between 300 to 700 acres (less than 1.5 percent) under Alternatives 2 through 4 and about 1,300 acres (3 percent) under Alternative 5. Alternative 6 increases estimated harvest of 1,900 acres (4 percent) over 100 years.

All action alternatives would allow young-growth harvest in T77 watersheds and TNC/Audubon Conservation Priority Areas outside of designated roadless areas. Relative changes from current plans for all alternatives are slight and spread over a 100-year period resulting in no substantial change or differences among alternatives to fish resources. Further, the Record of Decision on the 2016 Forest Plan calls for a 5-year internal scientific review in collaboration with stakeholders to assess impacts resulting from young-growth harvest in these high-value areas.

Alternative Summary

While more suitable harvest acres would be open among the action alternatives than are currently available, none of the alternatives propose to increase harvest over the existing Forest Plan. While some of the metrics that have potential to cause adverse effect to fish and their habitat (e.g. road miles, road crossing of streams, total harvest acres) may slightly increase, their quantity is not expected to change substantially among any of the alternatives. Additionally, while there are minor differences among the alternatives, the overall risk to fish resources and watersheds is unlikely to be large or differ from current

Forest Plan projected conditions. None of the alternatives would change Forest Plan standards and guidelines developed to protect fish and their habitat. Any potential site-specific effects will be addressed under separate site specific NEPA analysis, as this assessment will not authorize any site-specific actions.

Alternative 1: This alternative would have the lowest potential harvestable acres, the lowest number of new and rebuilt roads constructed, and likely the lowest number of new and reconstructed stream crossings of any alternative. However, these numbers are not substantially different than the other alternatives. All stream crossings increase risks to fish passage, and new crossings have a greater risk of sediment effects. Given that the expected number of new and reconstructed stream crossings under this alternative would be similar to other alternatives, there would be an overall similar risk of sediment addition and passage issues to other alternatives.

Alternative 2: The opening of roaded roadless areas would allow access to more acres of second-growth forest areas than under current conditions in areas that already have roaded systems. However, there would not be a substantial difference in harvest volume, road building or road reconstruction compared to Alternative 1. While young-growth harvest could potentially increase in key TNC/Audubon Conservation Priority Areas and T77 watersheds in formerly roaded roadless areas, the amount of overall potential harvest area added would not be substantial. Overall, the risk of adverse effects to fish or their habitat relative through future actions would be similar to that under the current Forest Plan (Alternative 1). Compared to the Alternatives 4 through 6, Alternative 2 would be more protective to fish resources within T77 watersheds and TNC/Audubon Conservation Priority Areas because it is the most restrictive on timber harvest and road building by designating nearly all of these lands within ARAs as Watershed Priority (about 3.25 million acres) with the remaining areas designated LUD II Priority (about 856,000 acres) or Roadless Priority (8,700 acres).

Alternative 3: This alternative would open more areas to harvest and slightly increase road miles compared to Alternatives 1 and 2. The number of new road miles and road crossings would increase slightly (see *Transportation* section) relative to Alternatives 1 and 2 but overall harvest would not. While different areas may have harvest occurring and some additional roads may be constructed compared to the current Forest Plan, the change would be minor, and effects would be similar for fish, fish habitat, and watershed conditions as under Alternative 1. Like Alternative 2, Alternative 3 would be protective to fish resources within T77 watersheds and TNC/Audubon Conservation Priority Areas because it is the most restrictive on timber harvest and road building by designating nearly all of these lands within ARAs as Watershed Priority (3.21 million acres) with the remaining acres designated as Roadless Priority (24,000 acres).

In addition to designating T77 watersheds and TNC/Audubon Conservation Priority Areas within ARAs as Watershed Priority, Alternative 3 would also add protection to these areas outside of ARAs through the roadless regulation. Specifically, old-growth timber harvest would be prohibited, subject to exceptions (Table 2-1) within T77 watersheds and TNC/Audubon Conservation Priority Areas outside of ARAs (about 370,000 acres). Thus, the old-growth harvest prohibition would be extended beyond the designated roadless area boundaries in order to maintain the balance and integrity of the watershed protection system. A prohibition on old-growth harvesting already exists through the Forest Plan, but Alternative 3 would include this prohibition in regulation. Young-growth timber harvest outside of ARAs within these areas would be allowable, as it is currently. This would apply to about 377,000 acres outside of roadless areas.

Alternative 4: This alternative has the potential to add more roads in roadless areas beyond roaded roadless logical extensions into old-growth areas and has a slight increase in overall new road miles constructed than Alternative 3 but similar to Alternatives 5 and 6. While a potential slight increase in roads and potential harvest areas with associated effects to streams could occur, with the current project harvest remaining unchanged, harvest and road building in these areas would only occur, with minor exceptions, with an associated reduction in roads and harvest in other areas. Thus, there would be similar effects to fish and their habitat, though possibly in different areas, as under Alternative 1.

Alternative 4 would be slightly less protective to fish resources within T77 watersheds and TNC/Audubon Conservation Priority Areas than Alternatives 2 and 3, designating most roadless areas within these lands Roadless Priority (about 3.1 million acres) or LUD II Priority (about 139,000 acres) ARAs. Forest Plan

requirements would still apply, including the prohibition on old-growth harvests within these areas. However, there would still only be a slight potential increase in roads and essentially no change in harvest amount, so effects to fish and their habitat would be similar to current plan conditions over the Tongass.

Alternative 5: This alternative removed all regulatory roadless designation, and related restrictions, in development LUDs. This alternative has the potential to add more roads in currently roadless areas beyond the roaded roadless and logical extensions into old-growth areas accessible and has a slight increase in overall new road miles compared to Alternative 3 but similar to Alternatives 4 and 6. While a potential slight increase in roads and potential harvest areas with associated effects to streams could occur, with the current project harvest remaining unchanged, harvest and road building in these areas would only occur, with minor exceptions, with an associated reduction in roads and harvest in other areas. Thus, there would be similar effects to fish and their habitat, though possibly in different areas, as under Alternative 1.

Alternative 5 would be less protective to fish resources within T77 Watersheds and TNC/Audubon Conservation Priority Areas than Alternatives 2 and 3 because it is moderately restrictive on timber harvest and road building in these areas, designating these lands as LUD II Priority (about 132,000 acres) and Roadless Priority (about 2.1 million acres) ARAs.

Alternative 6: This alternative removes all designations of roadless areas on the Tongass. This alternative has the potential to add more roads in currently roadless areas beyond the roaded roadless and logical extensions into old-growth areas accessible and has a slight increase in overall new road miles compared to Alternative 3 but similar to Alternatives 4 and 5. While a potential slight increase in roads and potential harvest areas with associated effects to streams could occur, with the current project harvest remaining unchanged, harvest and road building in these areas would only occur, with minor exceptions, with an associated reduction in roads and harvest in other areas. Thus, there would be similar effects to fish and their habitat, though possibly in different areas, as under Alternative 1.

Alternative 6 would be less protective to fish resources within T77 watersheds and TNC/Audubon Conservation Priority Areas than Alternatives 2, 3, and 4 because it is not restrictive on timber harvest and road building in these areas, removing all regulatory roadless designations. Forest Plan requirements would still apply, including the prohibition on old-growth harvests within these areas. However, there would still only be a slight potential increase in roads and essentially no change in harvest amount, so effects to fish and their habitat would be nearly identical to current plan conditions over the Tongass.

Special Status Species Assessments

Threatened and Endangered Species

As stated in the *Affected Environment* section, there are six Chinook salmon, one sockeye salmon, one coho salmon, one chum, five steelhead, and one green sturgeon evolutionarily significant units/DPSs that are federally ESA listed that may be present in waters potentially affected by project alternatives. These are the same listed fish that were addressed during the 2016 Forest Plan FEIS and associated BA.

No ESA-listed stocks of salmon or steelhead originate (spawn) in Alaska streams. Listed species and stocks originate in freshwater habitats in Washington, Idaho, and Oregon. Some of these listed species migrate into marine waters off the coast of Alaska. While distribution of these stocks is primarily in outer coastal waters, some are occasionally present in the inner waters of Southeast Alaska and they may feed on prey resources originating within marine and estuarine waters of the Tongass.

The southern DPS of the green sturgeon is rarely present in Southeast Alaska waters. Most are believed to stay south, but some could be present in the inside waters of Southeast Alaska, particularly during the fall and winter. They migrate south again in spring (Lindley et al. 2008). The adults live in nearshore waters typically less than 100 meters deep (Lindley et al. 2008). Based on their regional and seasonal distribution, they would be uncommon in nearshore areas where potential project actions may have some effect.

The potential project actions of concern for these ESA fish species would be those that directly or indirectly affect the nearshore marine and marine environments. Beach and estuarine fringe timber

harvests under the 2016 Forest Plan have a chance of affecting nearshore habitat that may supply prey resources to listed salmon, steelhead, or green sturgeon. Currently, there are about 17,000 miles of shoreline in the Tongass lands, and about 500 miles have past harvest. A small subset of these areas would be harvested over a 100+-year period under all alternatives. The Roadless Rule alternatives would not substantially or measurably change the quantity of these areas potentially affected. Nearshore marine bottom disturbance to intertidal and subtidal habitats could be caused by nearshore log yarding, vehicle travel on beaches, log rafting, and log loading and yarding vessel anchorage and associated activities. Sediment runoff to streams from land-based activities could have some effects to nearshore marine habitat where these species may be present. Site-specific nearshore marine habitat-disturbing actions, or any other ground-disturbing action, are not, however, directly authorized under the considered alternatives of the Roadless Rule alternatives. Thus, the considered actions of the Roadless Rule alternatives would not have any direct adverse effects to any of the listed species addressed in this section from potential nearshore marine disturbance or upslope activity.

These actions' effects to listed fish were considered in the 2016 Forest Plan FEIS which included informal consultation and NMFS concurrence with effects determination. The Roadless Rule alternatives will follow the 2016 Forest Plan standards and guidelines and total harvest amount. Therefore, the potential effects to ESA fish species from implementing any of the Roadless Rule alternatives would be "not likely to adversely affect" threatened and endangered species occurring on or adjacent to the Tongass National Forest. Therefore, a BA will be prepared and appropriate consultation with NFMS will occur prior to a ROD.

Any proposed actions indirectly resulting from the considered alternatives will be evaluated on a case-specific basis as to their effects to listed species. This may include formal or informal consultation with NMFS at the time of project-specific evaluations.

Sensitive Species
There are no aquatic sensitive species on the Tongass.

Cumulative Effects

General

The effects of the alternatives on fish resources may be influenced by other actions occurring in the project area. Appendix B provides a list of past, present, and reasonably foreseeable actions considered for cumulative effects and indicates which of these interact with aquatic resources affected by the Forest Plan alternatives.

The main factors affecting fish are related to land development actions that occur regionally. This primarily includes other timber harvest-related actions on non-NFS lands, especially associated roads. The total lands within the Tongass boundary, which includes all NFS lands and other non-NFS lands, is about 17.8 million acres. Of this, only about 6 percent (1.1 million acres) are non-NFS lands. However, development actions on these non-NFS lands, which include most cities and towns in Southeast Alaska, are moderately intense.

Cumulative effects to fish resources include those actions that affect water and watershed resources, such as the development of roads. Generally, overall average road density, which is an indicator of potential adverse sediment effects to streams, is expected to increase markedly on non-NFS lands, but across the region would only increase slightly over 100 years (see USDA Forest Service 2016b, *Water* section Table 3.4-12) under the current Forest Plan and would not change from this estimate among the alternatives.

Effects on fish resources are less directly tied to the amount of timber harvest than to roads, but harvest may affect fish through effects to water quality, riparian condition, and where the harvest occurs, as discussed under *Effects*. Existing conditions include retention of 86 percent of the original productive old-growth forest inside the Forest boundary and 95 percent of the land area remaining undisturbed from direct timber harvest (USDA Forest Service 2016b, *Water* section Table 3.4-10). Overall, the cumulative effects to fish relating directly to quantity of timber harvest would be about 82 percent of the original

productive old growth on all lands within the Forest boundary under the current Forest Plan in the future and would be unchanged by any Alaska Roadless Rule alternative.

While some local regions may have fish resources affected where watershed harvest levels and road density are high under the current Forest Plan, additional affects from any Roadless Rule alternative would not occur. Protections on non-NFS lands for stream buffers would be less but roadless alternative actions would not likely change cumulative effects to fish resources in these. There would be no difference in cumulative effects among the Alaska Roadless Rule alternatives and these cumulative effects would be unchanged from those disclosed in the 2016 Forest Plan FEIS. Again, effects of harvest activities on fish resources would ultimately be considered at the project-specific levels, ensuring minimal adverse cumulative effects.

Climate Change

Climate change is one factor that has some unquantifiable potential to affect fishery resources on the Tongass. In general, climate changes could affect stream temperature, snow accumulation and precipitation, stream flow and peak stream flow, and ocean water levels. The effects to fish resources in the Tongass from these changes would be both positive and negative and would vary by species, life stage, and location. Higher temperatures are expected in the winter months, with greater precipitation increases expected in winter and fall (EcoAdapt 2014). With warmer temperatures, much of the precipitation that currently is snow would fall as rain. The result would be higher peak flows in the winter and fall in most streams, and, even with increased precipitation, lower summer flows primarily in snowmelt- and rain-fed dominated basins, which would include most major fish-producing systems in Southeast Alaska (Shanley and Albert 2014; Shanley et al. 2015).

Higher stream temperatures would result in faster egg development and emergence of fry. This may affect when fish out-migrate to the ocean, which may have negative consequences (Heard 1991; Salo 1991). Elevated temperatures, however, may result in faster fish growth in these typical cool water streams of Southeast Alaska, which could be positive. If temperatures increase too much, fish may suffer indirect effect such as insufficient food supply to maintain growth even for temperatures well below physiological stress. Elevated temperatures may also increase the rate of predation on juvenile fish by other fish species (e.g., cutthroat trout and Dolly Varden char). Elevated temperatures in late summer or fall could also affect adult salmon survival and reproductive success (Bryant 2009). Changes in temperature could also affect life stage development possibly affecting whether fish out migrate or remain as resident fish (Kendall et al. 2015; Pearce et al. 2009).

Changes in flow could also have positive and negative effects. Higher flows in the winter may increase overwintering habitat for fish such as juvenile coho salmon, while high flows at this time could also scour streams beds affecting fish redds and habitat (Shanley and Albert 2014; Bryant 2009). Increasing precipitation in the winter likely increases the risk of landslides and debris flows that may enter streams (Bryant 2009). Areas that historically received precipitation as snow may get more as rain as estimated for climate change. Many species of Pacific salmon have adapted to high flows by selecting coarser spawning substrate (depending on species size) and locations away from the channel center (May et al. 2009). Sloat et al. (2016) modeled the likely effects of future flow changes from climate change on spawning conditions in Southeast Alaska. They noted that median annual average flood flows would increase by 28 percent by 2080. The estimated effects on habitat varied by watershed and stream morphology–specific conditions.

Climate change could also result in sea-level change. This sea-level rise could inundate estuarine rearing areas for fish. Stream mouth areas of some low-gradient small streams, which are used by some rearing fish including coho salmon, could also be inundated with salt water if sea-level rises were substantial. Pink and chum salmon in some areas spawn in intertidal regions, which could be affected with sea-level rise. Current predictions are for a sea-level rise of 1.3 to 2.1 feet by 2081-2100 (Shanley et al. 2014). However, the Southeast Alaska land mass is rising in many areas; due to isostatic rebound from past glaciers, sea level in Southeast Alaska is decreasing by as much as about 3 centimeters/year (1.2 inches/year) (Larsen et al. 2005). Some areas, particularly in northern Southeast Alaska, may rise 1 to 4 feet over the next century (Kelly et al. 2007). This rate of land rebound increase would likely offset sea-

level rises over most of the Tongass shorelines. Thus, overall effects on estuarine areas, coastal stream mouths, and fish stocks would vary considerably, and changes are difficult to predict and may even be difficult to detect.

In summary, there is general agreement that the climate is warming, precipitation will increase, and flows will increase in the fall and winter but decrease in summer in snow- and rain-dominated watersheds. However, there is uncertainty surrounding specific predictions and even more uncertainty regarding the effect of these changes on resources including fish. The cumulative effects of climate change are not clear but some of the changes could be detrimental to fish resources.

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Other Important Issues

Climate and Carbon

Affected Environment

Climate

The Tongass National Forest occupies an archipelago and a narrow strip of the mainland between the Pacific Ocean and the crest of the coastal mountains. The configuration of the coastline, the warm Japanese ocean current, and the high coastal mountains combine to produce a cool, wet environment. Precipitation at sea level in Southeast Alaska ranges from 30 inches per year at Skagway to 220 inches per year at Little Port Walter, with precipitation rates increasing with elevation. Average annual precipitation can be as high as 400 inches on the mountains of southern Baranof Island and about 260 inches over the Juneau Icefield. Southeast Alaska has complete cloud cover approximately 85 percent of the year. Snowfall varies according to elevation and distance inland from the coast. October is generally the wettest month. May through July are on average the drier months. The Pacific maritime influence holds the daily and seasonal temperatures within a narrow range. Temperatures average 28 degrees Fahrenheit (°F) in the winter and 52°F in the summer. During the warmer months, temperatures are highest inland and lowest along the coasts, while in the colder months, the reverse is true. Storms and moderate to heavy precipitation occur year-round, but occurs most commonly in early fall. The abundant moisture supports an extensive temperate rain forest and feeds numerous streams, rivers, and lakes, which in turn provide valuable fish habitat.

Climate Change

Southeast Alaska experiences considerable year-to-year and decade-to-decade variability in its weather, associated with large-scale shifts in ocean temperatures, salinity levels, and ice conditions (as described in the 2016 Forest Plan FEIS [USDA Forest Service 2016a]). However, Southeast Alaska's climate has shown a strong warming trend since the middle of the 19th century (i.e., the end of the Little Ice Age), as has much of the Northern Hemisphere (Parson et al. 2001; Sullivan et al. 2015; Markon et al. 2018). A portion of this change in Southeast Alaska's average temperature is likely the result of the natural changes in the earth's climate, which are caused in part by "wobbles" in the earth's rotation around the sun resulting in changes to earth's position within its elliptical path (i.e., the precession of equinoxes) as well as the Pacific Decadal Oscillation (as described in the 2016 Forest Plan FEIS [USDA Forest Service 2016a]). However, recently (in geological terms) humans have contributed to the acceleration of natural climate change on a global level through multiple activities such as the burning of fossil fuels, which have released greenhouse gases (GHGs) into the environment, as well as reducing natural carbon sinks (Intergovernmental Panel on Climate Change [IPCC] 2014; USDA Forest Service 2015d; Markon et al. 2018). The potential impacts of accelerated global climate change on the ecosystems of Southeast Alaska may include acidification of ocean waters; increasing the temperatures of ocean and streams; altering water input sources; changing precipitation rates and patterns; increasing the rate of glacier retreat; increasing storm intensities; altering ecosystem composition and structure; altering species distributions; and altering fire regimes (Wolken et al. 2011; EcoAdapt 2014; Shanley et al. 2015; Markon et al. 2018).

The impacts of climate change have been, and will likely continue to be, more pronounced in the most northern and southern regions of the globe. Alaska, which is located farther north than any other U.S. territory or state, has experienced an increase in annual temperatures at twice the rate of the rest of U.S. (Haufler et al. 2010; Chapin et al. 2014; Markon et al. 2018). Alaska's annual average temperatures have increased by 3.4°F over the last 50 years, with an increase of 6.3°F in average winter temperatures (Haufler et al. 2010; Chapin et al 2014; U.S. Environmental Protection Agency [EPA] 2014a). The average number of snow-free days has also increased in Alaska by about 10 days (Chapin et al. 2014). The observed changes to the climate in Southeast Alaska have resulted in modifications to ecosystem processes and ecosystem services on the Tongass. For example, the warmer summers have led to

longer growing seasons for trees and other vegetation, while warmer winters have resulted in more insect outbreaks, plant diseases, and population declines for some plant species.[19] The warming trend has also reduced snowpack in low-elevation areas, which may be contributing to ongoing yellow-cedar decline.[20] Drier summers may have also contributed to the number and duration of low stream-flow episodes, which can have adverse effects on salmon while warming of some watersheds may increase productivity for some fish populations (EcoAdapt 2014). The increase in the amount of precipitation falling as rain instead of snow since the 1970s has reduced the frequency of low- and moderate-elevation avalanches, which has allowed mountain hemlock to colonize some alpine areas (EcoAdapt 2014; Shanley and Albert 2014). Furthermore, although Alaska has not yet experienced the same extensive rate of establishment by invasive plant species that has historically occurred in the rest of the U.S., the current and predicted milder winter temperatures and the longer growing season in Southeast Alaska have created opportunities for the spread and establishment of invasive plant species within this region (Bauder and Heys 2004; McKee 2006; Wolken et al. 2011).

The ongoing changes to Alaska's climate, as well as to the temperate forests in this region, can have global consequences. For example, recent data show that the melting of glaciers and ice sheets in Alaska has contributed more to the global increase in sea levels over the past 50 years than any other glaciated region that has been measured, with the exception of the Greenland and Antarctic ice sheets (Wolken et al. 2011; Chapin et al. 2014). The coastal-temperate forests in Southeast Alaska comprise approximately 10 percent of Alaska's total forests and 19 percent of the world's coastal-temperate forests (Wolken et al. 2011). Although these coastal forest types are confined to a relatively small footprint globally (covering less than 0.5 percent of the earth's total forested area), they play a critical role in the delivery of dissolved organic carbon to coastal oceans (Wolken et al. 2011). In addition, these forests currently take up and store large quantities of carbon (DellaSala 2014; DellaSala 2016; Law 2014). As a result, Southeast Alaska plays an important role in the global climate and carbon cycle; however, the recorded and projected increases in temperature and precipitation in the region can have both positive and negative effects on these forests ability to sequester carbon (Parks 2013; Markon et al. 2018; see further discussion in the "Carbon Sequestration" subsection below).

Climate Models

There are several models that examine the potential future climate conditions and/or trends in Alaska's climate. Most models suggest warmer, wetter conditions for Alaska. They generally project that rainfall may increase and snowfall may decrease at lower elevations in Southeast Alaska over the next 50 to 100 years (Bonsal and Prowse 2006; SNAP 2013; Markon et al. 2018). The Scenarios Network for Alaska & Arctic Planning (SNAP) developed a model for climate projections in Southeast Alaska (SNAP 2013 as cited in EcoAdapt 2014). SNAP's projections suggest that mean winter temperatures in Southeast Alaska may increase by an additional 1.8 to 6.3°F (or 1 to 3.5 degrees Celsius) by the year 2050 (SNAP 2013 as cited in EcoAdapt 2014). Their model also suggests that precipitation levels may increase in all seasons, with winter precipitation potentially increasing by 5 to 15 percent by 2050. The most recent synthesis for the National Climate Assessment (by the NCA4 Alaska Chapter team), presented annual average temperature increases for southeast Alaska for the end of the 21st century ranging from 4 to 6°F under a lower GHG emission scenario to 6 to 10°F under a higher scenario (Markon et al. 2018).

The effects that these changes in temperature and precipitation levels would have on local conditions would vary, with the increased precipitation potentially resulting in increased snow occurring at higher elevations where temperatures remain below freezing. Lower elevations could experience a shift from snow to rain and a decrease in snowpack as the lower elevations warm and the number of days with below freezing temperatures decrease (SNAP 2013 as cited in EcoAdapt 2014; Markon et al. 2018).

[19] In 2014, Alaska Region Forest Health Protection surveyed 4.5 million acres of the Tongass National Forest and mapped 51,000 acres of insect and disease damage. The most widespread damage type was recorded for yellow-cedar (which had a decline of about 19,600 acres), followed by 12,000 acres of spruce defoliation. Seventeen other infestation/damages were mapped, most notably cottonwood defoliation, hemlock sawfly, and general conifer defoliation (Heutte, pers. comm. 2015).

[20] Almost 585,000 acres of yellow-cedar decline have been mapped in Alaska through aerial detection surveys since the surveys began in the late 1980s, with extensive mortality occurring in a wide band from the Ketchikan area to western Chichagof and Baranof Islands (USDA Forest Service 2015d).

Carbon Sequestration

Forests both take up carbon dioxide and release it into the atmosphere. Forests are dynamic systems that naturally undergo ebbs and flows in carbon storage and emissions as trees establish and grow, die with age or disturbances, and re-establish and regrow. Management activities, such as timber harvests and prescribed fire, tend to approximate and promote natural processes that would also release carbon to the atmosphere. Many management activities initially remove carbon from the forest ecosystem, but they can also result in long-term maintenance or increases in forest carbon uptake and storage by improving forest health and resilience to various types of stressors. Carbon can also be transferred and stored outside of the forest system in the form of wood products, further influencing the amount of carbon entering the atmosphere. Wood fiber can substitute for products that generate more GHG emissions to produce, such as concrete and steel, and it may be used as a renewable energy source ("substitution effect"). Substitution of wood for fossil fuel–intensive materials and energy can lower net carbon emissions.

Carbon, primarily in the form of carbon dioxide, is one of the major GHGs released into the atmosphere through both natural and anthropogenic (i.e., human-driven) influences (McPherson and Simpson 1999; IPCC 2014). Recent changes to the global carbon cycle, driven in large part by human activities, have been cited as the leading cause of global climate change and the general global warming trend that has been detected (IPCC 2014, 2018). Forests worldwide contribute greatly to the global carbon cycle by taking up and storing about 1.4 billion metric tonnes of carbon every year (McKinley et al. 2011), and forests already store over one trillion metric tonnes of carbon[21] in plants and soil (Domke 2018). Forest management can play an important role in moderating the amount of carbon dioxide that enters and leaves the atmosphere (Ryan et al. 2010; McKinley et al. 2011; Skog et al. 2014).

The Tongass contains almost 10 million acres of forest land. About 5.5 million of these acres are considered to be productive forest land. The Tongass stores more forest carbon than any other national forest in the United States (Barrett 2014), due to its very large size and high density of carbon. As such, an important ecosystem service sustained by this forest is carbon uptake and storage (i.e., the removal of carbon dioxide from the atmosphere and storage of it in live or dead biomass as well as organic soil matter). This makes the Tongass, along with forests worldwide, an important component in the global carbon cycle (DellaSala 2014; Law 2014).

Carbon Storage in Soils

Generally, the capacity of a forest system to take up and store carbon depends on the location (climate, disturbance), stand age, and species composition of the forest (Birdsey et al. 1993; McKinley et al. 2011). In some forests found in warmer climates, the accumulation of carbon can decrease overtime as the carbon stored in soils and dead vegetative materials are released through the process of organic decay, which includes biomass breakdown/decay and carbon release. A portion of the dead or decaying plant matter is eventually incorporated into the soil's organic and mineral layers within the Tongass where it accumulates and has varying degrees of recalcitrance (i.e., resistance to breaking down), decaying quickly or over centuries. The cool conditions on the Tongass produce a slower rate of decomposition compared with forests in warmer climates. Mature forests within the Tongass generally store considerable amounts of carbon in the soils. Although the soils of the Tongass currently store considerable amounts of carbon, D'Amore and Lynn (2002) note that numerous studies have shown that carbon stored in soils may be released to the atmosphere in the form of carbon dioxide or methane as the climate warms, and climate warming is expected to be relatively high in southeast Alaska (see above). Harvest activities can modify this effect by increasing the amount of solar energy that is allowed to reach the ground while the forest regenerates following a harvest. In contrast, forest clearing can have a slight cooling effect due to surface albedo (replacing the darker forest with more reflective open land, especially in winter when the ground is covered by snow). Davidson and Janssens (2006) noted that many factors can affect the sensitivity of soil decomposition rates to increased temperatures (e.g., the relative mix of organic to mineral substrates, soil moisture levels, as well as other biotic and abiotic conditions) and that not all soil

[21] Carbon mass is used here, not carbon dioxide mass, because carbon is a standard unit and can easily be converted to any other unit. To convert carbon mass to carbon dioxide mass, multiply by 3.67 to account for the mass of the oxygen.

types would be equally sensitive to increased temperature; however, D'Amore has indicated that the organic layers in the soil profile on the Tongass may experience increased decomposition rates if average temperatures were to increase (D'Amore et al. 2015; D'Amore 2016). Based on a synthesis of information from a wide range of recent studies, Conant et al. (2011) state that the impacts of climate warming on decomposition dynamics have not been resolved due to apparently contradictory results from field and lab experiments, most of which has focused on labile carbon with short turnover times. But the majority of total soil carbon stocks are composed of organic carbon with turnover times of decades to centuries. They conclude that important advances in understanding the temperature response of the processes that control substrate availability, depolymerization, microbial efficiency, and enzyme production will be needed to predict the fate of soil carbon stocks in a warmer world.

Carbon Storage Aboveground

Previous studies have been conducted to determine how much carbon is stored on the Tongass. Barrett (2014) examined the storage and flux of carbon in live trees, snags, and logs in the Tongass.[22] On the Tongass, growth and recruitment of live trees removed an estimated 760 pounds of carbon per acre per year on average from the atmosphere, but net change in live (aboveground) carbon mass was not significantly different from zero, with mortality and harvest estimated at 670 pounds of carbon per acre per year on average (Barrett 2014). Estimates were based on plot data measured in 1999-2003 compared with plots measured in 2004-2010. Including wilderness areas, aboveground live and snag carbon on the Tongass is estimated to be 601 (± 21) million U.S. tons[23] on an estimated 9.7 million acres of forest.[24] Some 233 million U.S. tons of this carbon are on lands that are legally excluded from timber harvesting, such as formally designated wilderness areas (Barrett 2014). Total carbon densities on unmanaged forests were estimated as 72 U.S. tons per acre, which comprised 7 percent logs, 13 percent snags, and 80 percent live trees. Carbon densities on managed forests were estimated as 45 U.S. tons per acre, which comprised 38 percent logs, 8 percent snags, and 54 percent live trees (Barrett 2014). On a per-acre basis, the Western hemlock and Sitka spruce forest types were found to have the highest amount of carbon (Barrett 2014). Using the per-acre values by forest types, and extrapolating to include wilderness areas, provides a rough estimate of about 650 million U.S. tons in aboveground tree carbon on the Tongass, equivalent to 2.4 billion U.S. tons of carbon dioxide (Barrett 2014). To put this in perspective, an estimated 83,500,000 billion metric tons of carbon are stored worldwide, primarily in the oceans and marine sediment, based on United Nations estimates. In 2005, Heath et al. (2011) estimated that the carbon stored in the Tongass makes up about 11 percent of the carbon currently stored in the national forests of the United States. Leighty et al. (2006) estimate that between 6.4 and 17.2 million metric tons (0.2 to 0.6 percent) of stored carbon in aboveground carbon pools, net of subsequent regrowth, has been lost on the Tongass since timber harvest began in the early part of the 20th century. For comparison, approximately 2,039 million metric tons of carbon dioxide (converts to approximately 556 million metric tons of carbon) were released to produce electric power in the United States in 2012 (U.S. Energy Information Administration [EIA] 2013). The total U.S. carbon dioxide emissions in 2017 (which includes the electric sector discussed above, as well as other sections such as industry, transportation, agriculture, and commercial/residential) were approximately 5,280 million metric tons of carbon dioxide (converts to approximately 1,439 million metric tons of carbon) (EPA 2019).

Mature forests on the Tongass National Forest likely store considerably more carbon compared to younger forests (within the individual trees themselves as well as within the organic soil layer found in mature forests). At the stand level, the rate of carbon uptake may decline and level off as forests reach older ages due to increases in mortality and subsequent respiration, although total carbon storage may continue to increase over time (Ryan et al. 1997; Pregitzer and Euskirchen 2004). However, this decline in the rate of carbon uptake may be slower and less pronounced than in other regions, given that decomposition rates in the Tongass are relatively lower. Furthermore, some studies have indicated that

[22] A number of carbon pools and fluxes were not included in Barrett's report, including (1) carbon in non-forested lands, which includes alpine environments, wetlands, grasslands, and shrublands; (2) below-ground carbon, including roots, soils, and organic materials; (3) carbon in non-tree vegetation and litter within forest; (4) carbon in a few pools currently not measured by FIA, which includes stumps below 4.5 feet and dead saplings; and (5) carbon in forest lands in inaccessible wilderness.

[23] Conversions: 1 U.S. ton = 0.907 metric ton, 1 metric ton = 1.102 U.S. tons

[24] Note that this does not represent a complete accounting of stored carbon, as it does not take into consideration carbon stored in the soil, nor does it take into consideration the stored carbon present in the final products of the harvested timber.

individual live trees can continue to accumulate carbon at increasing rates as they mature, thereby resulting in large amounts of carbon stored annually within mature trees (Stephenson et al. 2014).

Land Conversion

Important to the maintenance of this ecosystem service performed by the Tongass is the maintenance of its land base in forest. The largest source of GHG emissions in the forestry sector globally and within the United States is deforestation, defined as the removal of all trees on forested land to convert it to other land uses. Converting forest land to a non-forest use removes a very large amount of carbon from the forest and inhibits future carbon storage, because regrowth is inhibited. Since the mid-1950s, changes in land use have been minor in the Tongass. Development pressure for land use conversion in southeast Alaska has been slight. This is true for the non-NFS lands as well.

Timber Harvesting

Timber harvesting and active forest management can affect a forest's ability to take up and store carbon. After a forest is harvested, it will eventually regrow and recover the carbon removed from the ecosystem in the harvest. In some cases, removing carbon from forests for human use can result in lower net contributions of GHGs to the atmosphere than if the forest was not managed, when accounting for the carbon stored in wood products, substitution effects, and forest regrowth (Skog et al. 2014; Bergman et al. 2014; McKinley et al. 2011), Skog et al. (2014) noted that harvesting forests with high biomass and replanting with new forests would reduce carbon stocks more in the near term than if the high biomass forest were retained. They also note that increasing harvest intervals for forests harvested prior to peak growth rates begin to decline (culmination of mean annual increment [CMAI]) would maintain higher carbon stocks over time. Several authors (DellaSala 2016; Janish and Harmon 2002) suggest that the amount of carbon lost initially due to harvesting might take 50 to 200 years to fully recover in the ecosystem. However, these estimates do not include consideration of harvested wood products and substitution effects, which would effectively reduce the initial impacts more quickly. The net effect of a timber harvest and active forest management action (i.e., amount of carbon released versus the amount stored) would depend on how the harvested timber was used (e.g., if it was used for durable timber products, paper, pulp, or biomass fuels), what substitute materials are available for construction purposes (i.e., non-wood materials), the amount of carbon emitted during harvesting activities, the amount of carbon emitted via decomposition of on-site wood and organic soil matter losses, and the influence of the harvested wood on timber markets elsewhere (McKinley et al. 2011; Jonsson et al. 2012).

Timber harvesting in southeast Alaska peaked in the 1970s and 1980s, and harvest on the Tongass declined after that, especially after closure of two large pulp mills in the 1990s. Beginning in the 1980s logging increased on Alaska Native corporation and state lands. Approximately 474,000 acres of productive old growth have been harvested on the Tongass, almost entirely from the 1950s and more recent. This represents about 9 percent of the original amount of productive old growth and about 5 percent of all forest land on the Tongass. About 76 percent of these acres were harvested prior to 1990. Current harvest rates (since about 2006) were around 1,200 acres or less each year. The USDA Forest Service (In Review) estimated that the 2011 carbon storage on the Tongass was reduced by less than 0.3 percent by all disturbances (including harvest, insects, wind, and fire) during the period from 1990 to 2011. During this period, the harvest rate was approximately 5,100 acres of old growth per year. This result includes all non-soil ecosystem pools.

Forest carbon stocks on the forest appear to be steady or increasing, even after the impacts of disturbances. In the Alaska Region's baseline forest carbon assessment, the USDA Forest Service (2015d) concluded that, based on forest inventory data, total forest ecosystem carbon (in all seven ecosystem carbon pools) stored on the Tongass steadily increased from 2005 to 2013, although only slightly.

Other Disturbance Factors

Aside from timber harvesting, the only other disturbance factors of major importance on the Tongass have been windthrow and, to a lesser extent, insects; large windthrow events have occurred sporadically, but small windthrow disturbances are a common occurrence in southeast Alaska forests. Land exchanges

could be considered a disturbance factor as well. However, the lands involved are generally maintained as forests, possibly undergoing forest management.

Environmental Consequences

Indirect Effects

Climate Change / Carbon Sequestration

Implementation of any of the alternatives would be similar to how the Forest is managed today and would not convert additional forest land to non-forest uses. The largest source of GHG emissions in the forestry sector globally and within the United States is deforestation, defined as the removal of all trees on forested land to convert it other land uses. Maintaining forest land is necessary to ensure carbon storage over time and to realize potential carbon benefits from management activities through regrowth. Forests would not be converted to other land uses but rather would be retained and managed to maintain a vigorous and healthy condition with a decreasing reliance on old-growth harvest and increased harvest of regenerated forest (young growth) over the next 15 years. Consequently, the alternatives would not result in major sources of GHG emissions relative to local, national and global emissions and can be important in maintaining forest carbon uptake and storage and other ecosystem services in the region.

The effects of implementing the Forest Plan under the nationwide Roadless Rule (i.e., the No Action Alternative) and the action alternatives on GHG emissions and climate change would likely be small though there is considerable uncertainty regarding these effects. For instance, there is uncertainty regarding long-term carbon release particularly because of the importance of how the wood is used (durable or nondurable products), the regrowth of young forests, and market dynamics related to substitution. Considering the alternatives in a global atmospheric carbon dioxide context, treatment levels would have a small contribution to GHG emissions and therefore would have a negligible effect on GHG emissions and climate change. Because local GHG emissions mix readily into the global pool of GHGs, it is difficult and highly uncertain to ascertain the indirect effects of emissions resulting from these alternatives on global climate. There would be only negligible differences among the alternatives because the harvest levels and the mix of old growth and young growth to be harvested are expected to be very similar, and thus unaffected by implementation of the Alaska Roadless Rule. As a result, the alternatives would not differ in regard to their contributions to GHG emissions, changes in forest carbon stocks, carbon sequestration, or global climate change. Given the level of uncertainty in parameters related to the net contribution of GHGs, an attempt to quantify the evaluation would not provide a clearer understanding of potential effects.

This scope and degree of harvest effects would be similar and minor for all the alternatives, affecting an estimated 3.5 percent of the 9.7 million acres of forested land, 6 percent of all productive forest land, and less than 1 percent of productive old growth forests on the Tongass over 100 years (based on the assumption that harvest occurs at the Projected Timber Sale Quantity rate over the next 100 years). The average harvest rate over the next 100 years would be about 425 acres per year for old growth and 2,842 acres per year for young growth (with more old growth and less young growth in the early years and the opposite in later years), which is substantially lower than the harvest rate analyzed in the USDA Forest Service (2018) disturbance report (discussed previously). In addition, timber harvests mostly affect aboveground carbon stocks (live woody vegetation), while additional carbon stored in the soils represents a relatively stable and long-lived carbon pool (McKinley et al. 2011; Domke et al. 2017), However, there is growing evidence that carbon stored in soil is sensitive to global change effects, particularly land use histories, resource management, and climate (Domke et al. 2017).

Based on the fact that all of the alternatives would result in the same harvest volumes, effects are expected to be similar. Given the fact that the average harvest rate expected over the next 100 years is low by historical standards it is logical to assume that the rate of carbon storage reduction due to disturbances would also be lower. Further, given the maintenance of live tree carbon estimated on the Tongass by Barrett (2014) and the growth of total ecosystem carbon on the Tongass estimated by the USDA Forest Service (2015d) (both discussed previously) under the more intensive historical harvests, it

is logical to assume that ecosystem carbon will continue to accumulate at the forest level with the harvests expected under all alternatives.

Some assessments suggest that the effects of climate change in some U.S. forests may cause shifts in forest composition and productivity or prevent forests from fully recovering after severe disturbance (Anderson-Teixeira et al. 2013), thus impeding their ability to take up and store carbon and retain other ecosystem functions and services. An evaluation of the relative stability of biomes and the climate niche of dominant tree species on neighboring Chugach National Forest suggests that the Chugach Kenai Peninsula of Alaska are exceptionally resilient to expected changes in climate over the next 30 to 50 years (Hayward et al. 2017). However, there are considerable differences between the Tongass and the Chugach/Kenai assessment area and a comparable assessment has not yet been completed for the Tongass.

On the Tongass, yellow-cedar is one species that is already demonstrating effects of climate change on its distribution (Hennon et al. 2016). Based on plot data, Parks and Barrett (2013) noted that live-tree biomass in higher elevation ecoregions of the Alaska temperate rain forest increased by 7 to 8 percent between 1995 and 2008, western redcedar showed a 4.2 percent increase in live-tree biomass, and shore pine showed a 4.6 percent decrease. They concluded that continued warming in Alaska's temperate rain forest could lead to further biomass increases at higher elevations via faster growth, more trees, and uphill migration of tree species. However, there is considerable uncertainty in the long-term response of Tongass forests in terms of forest composition, especially because the forest trees of southeast Alaska are so long-lived. Despite long-term changes in climate, there is no direct evidence to suggest that that regenerating rainforest on the Tongass will have a reduced capacity for carbon storage under future climate conditions.

Cumulative Effects

Climate Change / Carbon Sequestration

This section will address two issues: 1) the cumulative effects of the alternatives and other past, present, and reasonably foreseeable actions on climate change and carbon sequestration; and 2) the cumulative effects of climate change on the Forest Service's future management of the Tongass.

The extent and scope of cumulative effects on climate change and carbon sequestration depends on the amount and condition of total forest land harvested (worldwide, as well as locally within Southeast Alaska); the use to which harvested wood is put; the use of the land post-harvest; how the non-NFS lands are managed (including private and state-managed lands within the U.S., as well as forests in other countries); on the amount of carbon released during harvest, processing, and transporting wood products; decomposition rates of organic materials; factors such as the amount of new hydroelectric or other renewable energy power projects that are built (e.g., those that might replace diesel-generated power); future community expansion and development; as well as emissions from ongoing and future activities in the region. It is likely that most of the state and private commercial forest land in Southeast Alaska, except for state parks and some other state lands, would be managed for the production of forest products under any of the alternatives considered in this analysis. A noteworthy exception to this is the recent decision by Sealaska to set aside 165,000 acres of forested land in Southeast Alaska for 110 years to store, or bank, carbon (Sealaska 2018).

Potential negative effects on the Tongass may be ameliorated and may be completely reversed with time, reducing or eliminating potential negative cumulative effects on carbon and climate. Carbon emitted during the initial implementation of the management actions (e.g., harvest) would have a temporary influence on atmospheric carbon concentrations, because carbon would be removed from the atmosphere over time following management as the forest regrows. Over the longer term, the lower anticipated harvest levels associated with the Forest Plan are likely to result in increased carbon storage and reduced emissions at the forest level, independent of which alternative is selected. These net outcomes would be the cumulative result of forest regrowth, enhanced productivity of young stands, growth of older stands, growth releases from light thinning, carbon storage off-site in products (Tongass produces mainly saw logs for long-lived products), and substitution benefits of wood products and wood-based energy (IPCC 2007; McKinley et al. 2011; Keyser and Zarnoch 2012; Bergman et al. 2014; Skog et

al. 2014). The management mechanisms applied in all alternatives are consistent with internationally recognized climate change adaptation and mitigation practices identified by the IPCC (IPCC 2000, 2007).

Climate change could impact the resources currently managed by the Forest Service as well as how the Forest Service manages the Tongass in the future. While there is general agreement among scientists that the climate of Southeast Alaska is warming, there is considerable uncertainty concerning the exact scope of the effects of climate change on the forests of Southeast Alaska and how best to deal with possible changes to the many resources managed on the Tongass. A summary of the effects of climate change on Tongass resources is presented in the Climate and Air section of the 2016 Forest Plan FEIS (USDA Forest Service 2016b). Because the effects of the alternatives on climate change are the same, this discussion is not repeated here.

The Forest Service will continue to work with local stakeholders and scientists to develop measures to alert the Forest Service to trends that may affect the health of the Forest and the species that depend on it, as well as measures that could be implemented to minimize or adapt to the effects of climate change on managed resources.

Karst Lands

Affected Environment

The geology and climate of Southeast Alaska are particularly favorable for karst development. Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and landforms that develop by the action of water on soluble rock in Southeast Alaska). The dissolution of the rock results in the development of internal drainage, producing sinking streams (streams that sink into the stream bed or karst features), closed depressions, sinkholes, collapsed channels, and caves.

Karst lands add a vertical, underground dimension to land use planning. Karst subsurface drainage networks generally operate independently of, and with more complexity than, the surface drainage systems above. On karst lands, the many solution-widened fissures at the surface become entry points into the subsurface drainage system, where water and sediment from surface sources move vertically downward into the underground lateral systems. Sediment and water from disturbed lands or roads may enter this system at a single point and emerge unexpectedly at one or more distant springs, sometimes crossing surface watershed boundaries.

Karst resources must be evaluated according to their vulnerability to land uses. Vulnerability mapping recognizes that some parts of the karst landscape are more sensitive than others to surface activities and groundwater contamination. These differences in vulnerability may be a function of the extent of karst development, the openness of the karst systems, and the sensitivity of other resources that benefit from karst groundwater systems. The vulnerability categories and their criteria are defined in the 2016 Forest Plan, Appendix H (USDA Forest Service 2016a). For projects that could affect karst, a four-step Karst Vulnerability Assessment is conducted that includes identifying potential karst lands, inventorying and characterizing karst resources in the project area, delineating karst hydrologic systems and recharge areas, and assessing the vulnerability of the karst terrain to management activities.

Applicable federal, state, and municipal laws, regulations, and policies that govern the management of karst include the Federal Cave Resources Protection Act (FCRPA) of 1988 (16 United States Code 4301-4309; 102 Stat. 4546), 36 CFR Part 290, 36 CFR part 261, Forest Service Manuals 2356 and 2880, and the Forest Plan (Karst and Cave Resources, Forest-wide Standards and Guidelines pp. 4-23 to 4-25, Plan Components for young-growth harvests on karsts pp. 5-5 to 5-6, and Appendix H).

Approximately 431,000 acres of karst underlies NFS lands inside the Tongass. Of these acres of NFS karst lands, approximately 278,000 acres were originally POG. Based on geographic information system (GIS) queries conducted for the 2016 Forest Plan FEIS, about 82,000 of these POG acres (29 percent) have been harvested. Much of the karst land within development LUDs has been designated as high vulnerability karst land and is protected by standards and guidelines or included within geologic Special Interest Areas.

On the low to moderate vulnerability karst lands, where mineral or glacially derived soils fully or partially cover the epikarst, forest regeneration is exceptional. In these areas, even the complete loss of soil and litter from the surface of the limestone will not prohibit the re-establishment of a forest because the displaced surface materials are retained within the epikarst channels (Harding and Ford 1993).

Recent monitoring has shown that the karst and cave standards and guidelines outlined in Forest Plan were implemented to the fullest extent practicable, and through effectiveness monitoring have shown that they ensure a high level of protection for significant caves and karst resources overall (USDA Forest Service 2015a).

For additional information on the importance and sensitivity of karst, and the effects of past and current forest management practices on karst, see the 2016 Forest Plan FEIS (USDA Forest Service 2016b, pp. 3-28 to 3-36).

Environmental Consequences

Indirect Effects

Potential effects from harvest that could occur under any of the alternatives could initially increase flow through karst systems after initial harvest in low and moderate vulnerability karst areas and subsequently (approximately 15 years post-harvest) decrease flow through these karst systems due to dense forest regeneration (Aley et al. 1993). Increase to turbidity and changes in water chemistry through the karst system could also occur due to these changes in flow (Aley et al. 1993). However, with implementation of the Forest Plan standards and guidelines, and site-specific mitigation measures (designed and implemented at the project level), the Forest Service expects to mitigate the effects of these activities.

None of the alternatives predict a PTSQ greater than the amount disclosed in the 2016 Forest Plan EIS (46 MMBF per year) nor would they result in a considerable difference in suitable acres on mapped low or medium vulnerability karst lands (estimated to range from 64,000 acres for Alternatives 1, 2, 3, and 4 to 65,000 acres for Alternative 5 and 6). Impacts to karst and cave resources would be based on site-specific proposals, which are currently unknown, and would be addressed in subsequent project environmental analyses. From a broad programmatic standpoint, the impacts to karst and cave resources from the proposed alternatives would be the same as disclosed in the 2016 Forest Plan EIS due to implementation of the Forest Plan standards and guidelines. Karst inventories and vulnerability assessments would continue to be required before timber harvest could occur on suitable lands under all alternatives.

No additional harvest is anticipated in any areas mapped as high vulnerability karst under any alternative because they are included in the existing Special Interest Areas and are not suitable for harvest. However, where commercial thinning is determined to be an appropriate treatment on high vulnerability karst lands, effects to karst will be addressed through project-specific prescriptions and analysis to ensure karst management objectives can be met.

Cumulative Effects

There are approximately 549,522 acres (859 square miles) of karst lands within the boundaries of the Tongass. Some 431,000 acres (674 square miles) are on NFS lands. Past timber harvest has affected the epikarst landscape on the Tongass. In some portions of the Tongass, 70 to 80 percent of the commercial forest land within specific karst blocks has been harvested. It is estimated that about 29 percent (82,239 acres) of the karst lands on NFS lands have been harvested (based on the GIS database). In addition, several hundred miles of authorized and unauthorized roads have been constructed on karst lands. All alternatives would allow additional future harvests and associated road building and reconstruction on karst lands to varying degrees.

Baichtal and Swanston (1996) observed sediment deposits and waterline marks in underground systems that suggested that past timber harvesting had increased sediment and debris transport and flooding of underground passages, many of which had not previously flooded for centuries. These timber harvests were conducted prior to the Karst and Cave Resources Standards and Guidelines implemented in the 1997 Forest Plan. As a result, they had more significant effects on karst lands than current and future harvest activities. At that time, many cave entrances were filled or blocked by logging slash, sediment, and debris. Additional runoff generated from road surfaces commonly had been diverted into karst features. They also noted strong evidence of greatly increased surface runoff on karst landscapes and adjacent surfaces after timber harvest, which increased sediment, nutrient, and debris transport capability of associated drainage networks.

Most easily accessible, low-elevation karst areas on Prince of Wales Island have been harvested. After the initial timber harvests, harvest activities concentrated on steeper, higher elevation karst landscapes characterized by shallower, excessively well-drained soils. Baichtal and Swanston (1996) suggested that trees were smaller and regeneration problems were greater on these steep, upper elevation sites. This condition possibly resulted from shallow soils with low nutrient availability, excessive drainage of surface and soil waters into subsurface karst systems, removal of much of the shallow soil because of inadequate

log suspension, and continued desiccation of the soil once the protective forest canopy was removed. After timber removal, high rainfall rapidly transported fragile soils into the well-developed epikarst.

More recent monitoring of karst lands near harvested areas (USDA Forest Service 2015a) have confirmed that current timber harvest practices have adjusted substantially to accommodate Karst and Cave Standards and Guidelines. For example, karst resource input was provided for timber sales projects throughout the Tongass.

Extensive landscape changes and ground disturbance have occurred and are likely to continue to occur on non-federal lands in Southeast Alaska. These include timber harvest and road construction, mining, recreation and tourism, growth of human settlements, transportation projects, and energy and transmission projects. Forest Service regulations requiring protection of karst resources do not apply to non-federal lands.

Transfers of karst lands from NFS lands to other land managers or private owners could also occur under any of the alternatives through land adjustments (such as the Alaska Mental Health Trust Land Exchange). This type of future action could increase the amount of karst lands in Southeast Alaska that are not in a protected LUD.

The Forest Service has identified a need to amend the 2016 Forest Plan. The amendment will focus on Standard S-YG-KC-02 related to commercial timber harvest on lands identified as moderate vulnerability karst to provide greater flexibility in managing harvests to protect the karst resource based on site-specific conditions.

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Sensitive and Invasive Plants

Affected Environment

Threatened, Endangered, Sensitive, and Rare Plants

Threatened and Endangered Plants

There are no federally listed or proposed threatened or endangered plants under the Endangered Species Act known to occur on the Tongass. The only federally listed or proposed plant in Alaska is the endangered Aleutian hollyfern (*Polystichum aleuticum)*, which is only known to occur on Adak Island and is not expected to occur on the Tongass. A petition to list yellow-cedar (*Callitropsis nootkatensis*) was filed with the U.S. Fish and Wildlife Service (USFWS) on June 24, 2014. The 90-day finding of this petition, published on April 10, 2015 (80 FR 19263), determined that the petition to list yellow-cedar presented "substantial scientific or commercial information indicating that the petitioned action [to list the species under the Endangered Species Act] may be warranted". This petition is still under review.

Alaska Region Sensitive Plants

Sensitive plants are those plants identified by the Regional Forester for which population viability is a concern on NFS lands within the region. The objective of the Forest Service Sensitive Species Program (Forest Service Manual 2600 [USDA Forest Service 1991]) is to ensure that species numbers and population distributions are adequate so that no federal listing will be required and no extirpation will occur on NFS lands. The Alaska Region Sensitive Species list, updated in 2009 (Goldstein et al. 2009), includes 18 plants designated as sensitive, 14 of which are known to occur on the Tongass and an additional 2 that are not known but are suspected to occur. The 16 sensitive plants known or suspected to occur in the Tongass are listed in Table 3.6-1 along with habitat and occurrence information. Our understanding of sensitive and rare plant distribution across the Tongass is limited because of the enormous size of the Tongass coupled with the fact that most botanical surveys are focused within planning areas for specific projects.

Rare Plants

The 2016 Tongass Land and Resource Management Plan (Forest Plan) defines rare plants as:

> "…those with potential conservation concerns on the Tongass National Forest. They may be common elsewhere; however, the edge of their range is known or suspected to be on the Tongass National Forest, or disjunct populations of the plant species occur on the Tongass National Forest."

The Alaska Natural Heritage Program (AKNHP) maintains a list of plants that are rare in Alaska. The AKNHP Rare Vascular Plant List was most recently updated in 2013. This list contains 126 vascular plants documented to occur on the Tongass.

Under the 2016 Forest Plan, rare plants have similar protection in the Forest-wide standards and guidelines as sensitive plants. The AKNHP Rare Vascular Plant List is used as guidance for determining which rare plants may be evaluated in the project-level analysis. Generally, plants with a state ranking of S1 (critically imperiled in state) or S2 (imperiled in state) are given consideration during project analysis. Plants with a state ranking of S3-5 are sometimes given consideration if they are known to be rare in a specific location on the Forest.

Table 3.6-1
Alaska Region Sensitive Plants Known or Suspected to Occur on the Tongass National Forest

Common Name (Scientific Name)	Habitat and Occurrences on the Tongass National Forest[2]
Eschscholtz's little nightmare (*Aphragmus eschscholtzianus*)	Grows in moist mossy areas, seeps, heaths, and scree slopes in subalpine and alpine areas. Suspected to occur in mountainous areas on the northern mainland of the Tongass, but has not been documented on the Tongass.
Spatulate moonwort (*Botrychium spathulatum*)	Habitat includes coastal forests, stabilized coastal dunes, upper beach meadows, well-drained open areas, alpine habitats, and riparian forests. In southeastern Alaska, populations are known from Kruzof Island (on lands managed by the State of Alaska) and one on Chicaghof Island on the Tongass.
Moosewort (*Botrychium tunux*)	Grows on upper beach meadows, coastal dunes, stream, terraces, river bars, and subalpine and alpine slopes. Ten known occurrences on the Tongass; 8 on the Yakutat Ranger District, 1 on the Wrangell Ranger District, and 1 in the Admiralty National Monument.
Giant moonwort (*Botrychium yaaxudakeit*)	Grows on upper beach meadows, beach dunes, coastal outwash plains, abandoned fields, and roadsides. Six known occurrences on the Tongass, one on the Hoonah Ranger District, and five on beach meadows on the Yakutat Ranger District.
Macoun's thistle (*Cirsium edule* var. *macounii*)	Grows in moist to dry open meadows, open forests in the upper montane to lower alpine zone, on scree slopes and talus slopes, and along glacial streams and lakeshores. Two known occurrences on the Tongass, both on the Ketchikan-Misty Fjords Ranger District.
Mountain lady's slipper (*Cypripedium montanum*)	Habitat includes upper beach meadows, areas along the beach-forest ecotone, open forests, muskegs, and wet meadows. Known from one population on the Tongass, on the Wrangell Ranger District.
Large yellow lady's slipper (*Cypripedium parviflorum* var. *pubescens*)	On the Tongass, grows in peatlands on calcareous substrates. Two known occurrences on the Tongass, both on northern Prince of Wales Island.
Calder's lovage (*Ligusticum calderi*)	Habitat includes alpine and subalpine meadows, boggy slopes, open mixed conifer forests, and rocky areas. There are 24 known occurrences on the Tongass: 23 on the Craig Ranger District and one on the Thorne Bay Ranger District.
Pale poppy (*Papaver alboroseum*)	Grows in open, well-drained areas, in rocky tundra of ridges and mountain summits, ash and cinder slopes, and sand and gravel of glacial outwash and river floodplains. Occasional disturbance can create or maintain habitat, including by humans (e.g., stabilized road sides, railroad trackbeds) can create habitat. Not known from, but suspected to occur on, the Tongass.
Lesser round-leaved orchid (*Platanthera orbiculata*)	Occurs in a variety of habitats including temperate, boreal, deciduous, and wetland forests. In Alaska, grows in low-elevation forested wetlands, medium to high volume old-growth hemlock forests with high bryophyte cover and red cedar, forest edges or near gaps in shady forests, near muskegs, open water, or boggy areas. This species is known from 285 occurrences on the Tongass, comprising 61 distinct populations.
Alaska rein orchid (*Platanthera unalascensis*)[3]	Habitat includes dry open sites, riparian areas, mesic meadows, drier areas in coniferous and mixed evergreen forests, and bogs and heath habitat from low to subalpine elevations. On the Tongass, generally grows in low-productivity forests at lower elevations in poorly drained soils. Known from 27 occurrences on the Tongass: 2 on the Ketchikan-Misty Ranger District, 6 on the Sitka Ranger District, and 19 on the Thorne Bay Ranger District.
Kruckeberg's swordfern (*Polystichum kruckebergii*)	Habitat includes ultramafic rock outcrops. Known from nine occurrences: five on the Ketchikan-Misty Fjords Ranger District and four on the Sitka Ranger District.
Lichen, no common name (*Ricasolia amplissima* (Scop.) De Not. subsp. sheiyi Derr & Dillman)[4]	Grows on trunks and main branches of Sitka spruce, Pacific crab apple (Malus fusca), and western hemlock in old-growth beach fringe forest. There are 30 known occurrences on the Tongass: 6 on the Petersburg Ranger District, 9 on the Sitka Ranger District, 13 on the Thorne Bay Ranger District, and 2 on the Wrangell Ranger District.
Unalaska mist-maid (*Romanzoffia unalaschcensis*)	Grows on ledges and crevices in rock outcrops and in gravelly areas along stream banks, often along coasts. Two known occurrences on the Tongass, both on the Thorne Bay Ranger District.

Table 3.6-1 (continued)
Alaska Region Sensitive Plants Known or Suspected to Occur on the Tongass National Forest[1]

Common Name (Scientific Name)	Range and Habitat2
Henderson's checkermallow (*Sidalcea hendersonii*)	Habitat includes wet meadows, estuaries, and tidal flats. On the Tongass, the one known population grows at the upper edge of an upper beach meadow near the edge of a hemlock and spruce forest. This population was located on the Juneau Ranger District; however, during surveys conducted in 2013 and 2017, the occurrence was not located.
Dune tansy *Tanacetum camphoratum* Less. (syn. = T*anacetum bipinnatum* (L.) Sch. Bip. Pro parte)[5]	Habitat includes upper beaches, sand dunes, and well-drained and calcareous soils. Known from seven occurrences on the Tongass, all on the Sitka Ranger District.

[1] Sensitive Plant list updated February 2009.
[2] Habitat and occurrence information based on: AKNHP 2018; Dillman 2004, 2008, 2011; Douglas et al. 1999; eFloras 2018; Goldstein et al. 2009; Nawrocki et al. 2013; USDA Forest Service 2012b, 2015e, 2019.
[3] New taxonomy: Nawrocki et al. 2017.
[4] New taxonomy: Dillman et al. 2017; Cornejo et al. 2017
[5] New taxonomy: Carlson and Fulkerson 2018.

Invasive Plants

Executive Order 13112 (1999) defines an "invasive species" as a species that is 1) non-native (or alien) to the habitat under consideration, and 2) whose purposeful or accidental introduction causes or is likely to cause economic or environmental harm or harm to human health. This Executive Order directs all federal agencies to address invasive species concerns and refrain from actions likely to increase invasive species problems.

Invasive plants can negatively affect habitat by competing with native plants for resources such as water and light, establishing and changing the community composition, eliminating or reducing native plants, or changing the vegetation structure. The changes in community composition or vegetation structure can reduce native plant populations as well as negatively affect habitat for wildlife and fish. Compared to other states, Alaska has a low level of invasive plant infestations; however, invasive plant infestations within the state are increasing (Carlson and Shephard 2007; Nawrocki et al. 2011; Schrader and Hennon 2005).

Policy and guidance for managing invasive plants are provided by the Forest Service Manuals and Handbooks and Forest Service policy, including the Invasive Species Management Policy (Forest Service Manual [FSM] 2900), the *National Strategic Framework for Invasive Species Management* (USDA Forest Service 2013a), the Alaska Region Invasive Species Strategy (USDA Forest Service 2006), and the Tongass National Forest Invasive Plant Management Plan (Lerum and Krosse 2005). Additionally, the Tongass established an integrated weed management plan that includes manual and mechanical, as well as herbicidal, treatments of target invasive species on the Wrangell and Petersburg Ranger Districts (USDA Forest Service 2013b). FSM 2900 and Forest-wide standards and guidelines include direction to review proposed projects to determine the risk of introduction or spread of invasive plants and implement appropriate mitigation measures. They also include direction to control existing invasions and rehabilitate habitats impacted by invasive species.

Occurrences of invasive plants throughout Alaska are tracked by the Alaska Exotic Plants Information Clearinghouse (AKEPIC), a cooperative project between the Forest Service, State and Private Forestry, the National Park Service, U.S. Geological Survey, University of Alaska, and other federal, state, and local agencies. The AKEPIC database maintains a georeferenced inventory of Alaska's invasive plants (AKEPIC 2018). Additionally, all invasive plant surveys, invasive plant finds, and treatments are entered into the Forest Service's Natural Resource Information System (NRIS) georeferenced invasive species database (USDA Forest Service 2018j). As of January 2019, 125 species of invasive plants have been documented on the Tongass. The Forest Service database (NRIS-INVP) and associated map provides an estimate of the extent of infestations, as well as the locations of invasive species observed. Table 3.7-3 of the 2016 Forest Plan FEIS (USDA Forest Service 2016b) lists the invasive plants known on the Tongass, the number of observations of each species, and their invasiveness ranking. At the time of publication of

the 2016 Forest Plan FEIS, there were 23,386 documented observations of 124 different invasive plant species on the Tongass. Currently, there are 24,257 known occurrences of 125 invasive plant species known on the Tongass.

Environmental Consequences

This section compares effects of the six alternatives on sensitive, rare, and invasive plants. There would be no effects to threatened or endangered plants under any of the alternatives because none are known on the Tongass.

The alternatives described in Chapter 2 differ in the locations and extent of land designated as roadless and the management categories designated for lands within roadless areas. None of the alternatives authorize any site-specific projects or other ground-disturbing activities; rather the alternatives describe exceptions under which certain activities might be allowed within roadless areas. Specific projects that include ground disturbance or timber harvest must undergo site-specific environmental analysis when they are proposed as required by the NEPA. Additionally, the activities must still comply with applicable standards and guidelines identified in Forest land management plans.

Activities allowed under the action alternatives would primarily affect productive old-growth and young-growth forest habitats. Although there would be effects on unproductive forest, non-forest or other vegetation types, as roads are constructed through many types of habitat, these effects would be more limited since these vegetation types would not be the focus of any future timber harvest and associated road construction.

Indirect Effects

Sensitive and Rare Plants

Effects Common to All Alternatives
Effects of future timber harvest and road construction on sensitive or rare plants could include physical damage by cutting, trampling, or crushing them with vehicles, other machinery, foot traffic, or felled trees. Severe impacts may cause mortality or inhibit the vigor and reproductive capability of the plants.

Indirect effects to sensitive or rare plants from timber harvest or road construction and reconstruction involves alteration of habitat, such as changes in sunlight or hydrology, herbivore or pollinator behavior, soil structure and fertility, vegetation structure, fragmentation of habitat, and competition from other native plants as well as invasive plants. Some indirect effects, such as changes in sunlight or hydrology, can be beneficial or harmful depending on the effect and the species' life history. Other activities likely to cause indirect effects to sensitive and rare plants include increased off-road vehicle use, increased access, and increased use and associated trampling by recreationists.

A BE is conducted as part of the site-specific environmental analysis for individual project proposals. This type of sensitive plant review is required to include sufficient detail to determine how any proposed action may affect each sensitive species. In addition, existing Forest-wide standards and guidelines would be applied to avoid or minimize impacts to those sensitive plants and their habitat.

As a part of a NEPA analysis, an effects analysis may also be conducted for rare plants; however, a formal BE is not required. All alternatives would continue to follow the current Forest-wide standards and guidelines for rare plants.

Effects Specific to Each Alternative
In general, alternatives that are less permissive of road construction would have less risk of adverse effects to sensitive and rare plants and alternatives more permissive of road construction would have more risk of adverse effects. New road construction would be similar under all alternatives because roads on the Tongass are largely developed in support of timber harvesting and the PTSQ under the 2016 Forest Plan does not vary between the alternatives. Thus, the predicted 1,000 new road miles on NFS lands over 100 years for the No Action alternative (from the 2016 Forest Plan EIS; see Table 3.4-6 in Appendix C of this DEIS) would be similar for all alternatives, with minor variations. Under Alternatives 1

and 2, approximately 1,000 miles of new roads are estimated to be built on the Tongass over the next 100 years. Slightly more roads would likely be constructed under Alternative 3; however, the difference would likely be negligible. Alternatives 4, 5, and 6 are likely to result in the most road miles because they add the most remote suitable timber acres. However, the overall differences among alternatives in total new road miles are expected to be low because total harvest levels would remain the same among all alternatives.

Species-Specific Impacts to Sensitive and Rare Plants

Approximately 126 plants listed on the AKNHP Rare Vascular Plant List have been documented on the Tongass; because of the large number of rare plants, species-specific impacts to rare plants are not discussed in this document, but if, during project planning, they are known or suspected within the project area, they would be evaluated. Potential effects to the 16 sensitive plant species known or suspected to occur on the Tongass under each of the alternatives are discussed below.

As discussed above, 16 sensitive plant species are known or suspected to occur on the Tongass. Two of these 16 sensitive plant species, Escholtz's little nightmare (*Aphragmus eschoscholtzianus*) and pale poppy (*Papaver alboroseum*), are suspected, but not known to occur on the Tongass. Therefore, there is a very low risk that any of the alternatives would adversely impact these two sensitive species.

Potential impacts to the 14 sensitive plant species that have been documented on the Tongass can be estimated by looking at the proportion of known occurrences of each sensitive plant species in areas suitable for young-growth and old-growth timber harvest, and the percentage of harvest expected in each of these suitable areas under each alternative. Only four sensitive plant species have known occurrences expected to be within suitable young-growth or old-growth harvest areas over 100 years (Table 3.6-2).

As shown in Table 3.6-2, no known occurrences of Macoun's thistle (*Cirsium edule* var. *macounii*) or large yellow lady's-slipper (*Cypripedium parviflorum* var. *pubescens*) are expected within old-growth harvest areas under any of the alternatives. The proportion of known occurrences of Alaska rein-orchid (*Platanthera unalascensis*) expected within old-growth harvest areas over 100 years includes 0.3 to 0.6 occurrences under all alternatives. For lesser round-leaved orchid (*Platanthera orbiculata*), the proportion of known occurrences expected within old-growth harvest units is 7.4 to 11.3 over 100 years under all alternatives. However, differences may be explained by the variable level of effort expended searching for sensitive plants.

Within young-growth harvest areas, the proportion of known occurrences of Macoun's thistle expected within harvest areas is 0.8 to 0.9 for all alternatives over 100 years. The proportion of known occurrences of large yellow lady's-slipper and Alaska rein-orchid expected within young-growth harvest areas is 1.6 to 1.7 under alternatives over 100 years. The proportion of known occurrences of lesser round-leaved orchid expected within young-growth harvest units is 27.0 to 28.9 under all alternatives over 100 years. Therefore, the differences among alternatives appear to be insignificant, and may be related to the variable effort expended in sensitive plant surveys in one area versus another.

Under all alternatives, if previously undocumented populations of any sensitive plant species are located during project surveys, Forest-wide standards and guidelines under all alternatives would consider protection to minimize impacts to these species on the Tongass. For additional discussion of potential impacts to sensitive plant species from future timber harvest, road construction, and other development projects on the Tongass, see the 2016 Forest Plan FEIS (USDA Forest Service 2016b). Additional details on the assessment of impacts to lesser round-leaved orchid are provided in the Plants BE (Krosse 2016).

Table 3.6-2
Known Occurrences of Sensitive Plant Species within Estimated Old-Growth and Young-Growth Harvest Areas over 100 Years by Alternative

		Species			
Alternative	Harvest Type	Macoun's thistle (*Cirsium edule* var. *macounii*)	Large yellow lady's slipper (*Cypripedium parviflorum* var. *pubescens*)	Lesser round-leaved orchid (*Platanthera orbiculata*)	Alaska rein-orchid (*Platanthera unalascensis*)
1	Known Occurrences in Est. YG Harvest Areas	0.9	1.7	28.9	1.7
	Known Occurrences in Est. OG Harvest Areas	0	0	11.3	0.6
2	Known Occurrences in Est. YG Harvest Areas	0.8	1.7	27.2	1.7
	Known Occurrences in Est. OG Harvest Areas	0	0	11.2	0.5
3	Known Occurrences in Est. YG Harvest Areas	0.8	1.6	27.0	1.6
	Known Occurrences in Est. OG Harvest Areas	0	0	9.6	0.4
4	Known Occurrences in Est. YG Harvest Areas	0.8	1.6	27.7	1.6
	Known Occurrences in Est. OG Harvest Areas	0	0	7.6	0.3
5	Known Occurrences in Est. YG Harvest Areas	0.8	1.6	27.6	1.6
	Known Occurrences in Est. OG Harvest Areas	0	0	7.4	0.3
6	Known Occurrences in Est. YG Harvest Areas	0.8	1.6	27.3	1.6
	Known Occurrences in Est. OG Harvest Areas	0	0	7.4	0.3

OG = old growth; YG = young growth

Invasive Plants

Effects Common to All Alternatives

Ground disturbance associated with timber harvest, road construction, and other development or management activity on the Forest provides an opportunity for invasive plant introduction or expansion. Introduction and spread of invasive plants can occur because these activities disturb soil and/or remove existing vegetation, providing openings for invasive plants to establish or spread. Additionally, movement of equipment and personnel can also provide opportunities for transport of invasive plant seeds or propagules into new areas. Indirect effects can include the establishment or spread of invasive plants through the use of roads after harvest for recreation or during road maintenance. Similarly, construction and maintenance of energy and transmission line projects and associated road construction, maintenance, and use increases the risk of invasive species spread and colonization. The impacts of invasive plant spread and colonization can often spread beyond the area of disturbance.

Effects Specific to Each Alternative

The potential for the introduction and spread of invasive plant species due to ground disturbance associated with timber harvest, road construction, and other development or management activity exists under all alternatives. Increased disturbance increases the risk of establishment or spread of invasive plants. As discussed above, the volume of timber anticipated to be harvested and the miles of new roads anticipated to be constructed are not expected to be significantly different under the six alternatives. As a result, the alternatives are not expected to differ significantly in regard to their contributions to the introduction and spread of invasive species on the Tongass. Timber harvest and road construction in

inventoried roadless areas, however, could potentially lead to the introduction and spread of invasive species where these species do not currently exist. Thus, Alternatives 1 and 2 would have little effect on the spread of invasive species, and Alternative 3 would only have a slightly larger effect. Alternatives 4, 5, and 6 would have the largest potential to result in the spread of invasives into currently roadless areas because they include the most suitable forest land in remote areas and would likely result in more road construction.

The number of documented occurrences of invasive plant species within suitable young-growth and old-growth stands is similar under all the alternatives. Additionally, none of the alternatives authorize any site-specific projects or other ground-disturbing activities. Specific projects that include ground disturbance or timber harvest must undergo site-specific environmental analysis when they are proposed as required by NEPA, and the activities must still comply with applicable standards and guidelines identified in forest land management plans, including management of invasive species.

Cumulative Effects

Sensitive and Rare Plants

There are no federally listed or proposed threatened or endangered plants that are known to occur or are likely to occur on the Tongass; therefore, there would be no contribution to cumulative effects to threatened or endangered plants under any of the alternatives.

When considering effects to sensitive and rare plants, it is important to look at the cumulative effects of past, present, and reasonably foreseeable future activities on all land ownerships within the geographic area. The significance of any direct or indirect effect in contributing to the cumulative effects on sensitive and rare plants from management activities depend on the amount and type of disturbance in the cumulative effects analysis area and how that disturbance may affect known locations of sensitive and rare plants.

Past plus expected timber harvest, road construction, and implementation of other development projects on all land ownerships within the Forest boundary on all lands in Southeast Alaska can be used to compare the risk that each alternative would add to cumulative effects on both sensitive and rare plants. Therefore, all lands in Southeast Alaska constitute the cumulative effects analysis area for sensitive and rare plants. Appendix B provides a full list of all the projects considered in the cumulative effects analysis.

As stated above, overall timber harvest levels are not expected to vary significantly among the proposed alternatives. Therefore, the contribution of cumulative effects to sensitive or rare plants due to timber harvest and road construction would be similar for all alternatives. Other activities that have occurred in the past and are reasonably foreseeable to occur in the future that have the potential to add to cumulative effects to rare and sensitive plants include mineral extraction, energy and transmission line projects, hydroelectric projects, transportation developments, and urban and recreational site development (Appendix B). Each of the activities could include clearing vegetation and disturbing habitat for construction and maintenance; therefore, they have the potential to affect sensitive and rare plants and their habitat. These impacts would be considered in project analysis and an assessment of cumulative effects to sensitive and rare plants would also be done for individual projects as part of the NEPA process for the relevant analysis area. Timber harvesting on state, municipal, and private land is governed by the Alaska Forest Resources and Practices Act (AS 41.17). Alaska Forest Resources and Practices Regulations (ADNR 2013) do not address threatened, endangered, or rare plants; however, they do recommend minimizing road construction and limiting disturbance in marshes and muskegs, which would provide some protection for some of the sensitive and rare plants.

Changes in Alaska's climate (discussed in the *Climate and Carbon* section of this chapter) could affect the hydrology and other habitat conditions where sensitive and rare plants occur. While the models do not fully agree on the climate change predictions for Southeast Alaska, they generally predict warmer weather with increased rainfall, and a decrease of snowfall. Recent research by Shanley et al. (2015) predicted an increase in mean annual temperature of approximately 3 to 10 degrees Fahrenheit, a 3 to 18 percent increase in mean annual precipitation, and a 22 to 58 percent decrease in snowfall by the 2080s (Shanley et al. 2015). These changes would likely result in lower soil moisture due to increased

evaporation during warmer summer months. Also, a precipitation shift from snow to rain could lead to more water running off the landscape rather than being stored as snow and feeding streams and wetlands in the late spring and summer, thus increasing evaporation and reducing water storage. These factors could lead to drier streams, meadows, and wetlands.

Changes in temperature and hydrologic conditions would likely favor some plants and stress others. There has been little research into the effects of changes in environmental conditions for each of the sensitive and rare species; consequently, there is uncertainty as to the effect of changes in the climate on sensitive and rare plant species known or suspected to occur on the Tongass.

Invasive Plants

Invasive plants on any land ownership in Southeast Alaska can affect establishment or spread of invasive plants on NFS lands and vice versa. As mentioned in the direct and indirect effects, activities can have wider effects on invasive plant spread than the specific area of land disturbance due to the interconnectedness of land. The cumulative effects of invasive plants from management activities would depend on factors such as the following:

- Amount and location of ground disturbance;
- Existence and extent of invasive plants at the time of project implementation;
- Overall habitat alteration due to invasive plants expected as a result of past, present, and foreseeable projects; and
- Anticipated response of invasive plants to the proposed actions and any management considerations or mitigation and monitoring that will be applied to each project.

Past, present, and future timber harvest, road construction, and other development activities on both private and public lands can be used to compare the risk of cumulative effects of the six alternatives on invasive plant introduction or spread. As stated above, overall timber harvest levels are not expected to vary significantly among the alternatives. Therefore, the contribution of cumulative effects to invasive plants due to timber harvest and road construction would be similar for all alternatives.

As discussed under cumulative effects for sensitive and rare plants, there are fewer restrictions on timber activities on non-NFS lands than on NFS lands. Timber activities on non-NFS lands that can contribute to the introduction or spread of invasive plants are not specifically regulated by the State of Alaska. Other activities that have occurred and are reasonably foreseeable to occur in the future that have the potential to add to cumulative effects of invasive plants include mineral activities, renewable energy and transmission line projects, hydroelectric projects, transportation developments, and urban and recreational site development (Appendix B). Each of these activities can include clearing vegetation, construction, transportation for construction and ongoing activities, and maintenance. Therefore, they have the potential to introduce or spread invasive plants in an area and would need to be considered in the project analysis.

Changes in Southeast Alaska's climate (discussed in the *Climate and Carbon* section of this chapter) could also create the conditions that encourage the spread of invasive plants by altering opportunities for invasive plants to colonize new areas, where could be compounded by climate change. Changing climate may also result in range extensions for some species that are native at more southerly latitudes, and they may become established or become more widespread on the Tongass, as a result. Changes in growing conditions would likely favor some plant species and stress others. There is uncertainty about the effect of changes in climate on invasive plants on the Tongass.

With any of the action alternatives, applying mitigation measures in the form of Forest-wide standards and guidelines as well as ongoing invasive plant control and management programs will contribute to lessening the cumulative effects of invasive plants across Southeast Alaska. For additional discussion of Forest-wide standards and guidelines and mitigation measures used by the Forest Service for prevention and control of invasive plants during implementation of management actions, see the 2016 Forest Plan FEIS (USDA Forest Service 2016b).

Transportation, Energy, Communications, and Infrastructure

Affected Environment

Transportation

Residents of the region are dependent on air and water transportation for travel between most communities, rather than roads or rail. A roaded transportation system has developed on NFS lands, largely in support of timber harvesting, but for the most part does not connect communities except on Prince of Wales Island. This section focuses on the road transportation system.

Regional Transportation System

The Alaska Department of Transportation & Public Facilities (ADOT&PF) issued the comprehensive Southeast Alaska Transportation Plan (SATP) in 2004 (ADOT&PF 2004). The 2004 SATP called for transitioning away from the long-distance ferry runs to a system that connects the communities of Southeast Alaska with roads and relies on shuttle ferries to fill the gaps in the road network. The 2004 SATP identified 34 essential highway and utility corridors and requested they be reserved and incorporated into the Forest Plan. A Draft SATP was published in June 2014 (ADOT&PF 2014) that includes the same 34 essential corridors.

In recent years, ADOT&PF completed about 30 miles of highway construction in furtherance of the SATP goals. An additional 140 miles of highways are funded for design and construction in the SATP corridors, with a portion of those projects moving to construction phase in the 2019 and 2020 construction seasons. There are also 16 miles of highway funded for environmental permitting and design in the SATP corridors, without current appropriations for construction activities. The multiple highway projects will deliver improved transportation of goods and services through Southeast Alaska and will ease the development of connecting utilities in the region.

Because the ADOT&PF's Southcoast Region lies largely within the Tongass National Forest's boundaries, many of the proposed road projects cross NFS lands and require Forest Service authorization. The proposed linkages for the East Lynn Canal Highway (Juneau Access Improvement Project), the Kake to Petersburg road, and the Sitka to Warm Spring Bay road would each cross NFS land.

In August 2005, Congress enacted Section 4407 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU; Public Law 109-59), which states: "Notwithstanding any other provision of law, the reciprocal rights-of-way and easements identified on the map numbered 92337 and dated June 15, 2005, are hereby enacted into law." In 2015, the President signed into law Public Law 114-94, Fixing America's Surface Transportation Act. This law amended Section 4407 of SAFETEA-LU by striking "hereby enacted into law" and inserting "granted."

National Forest System Roads

NFS roads are constructed to provide access to NFS lands and are included in the Forest Development Transportation Plan (see Transportation Standards and Guidelines in Chapter 4 of the 2016 Forest Plan FEIS [USDA Forest Service 2016a]). Most NFS roads are unpaved, single-lane roads.

On the Tongass, the demand for roads has primarily been for access to timber resources. The maintenance and reconstruction requirements of the existing system depend mainly on the volume of timber hauled and, to a lesser extent, on recreational use. The need for future road development is largely determined by the need to access timber resources. There are approximately 5,100 miles of roads on Tongass NFS lands, including both system roads (3,700 miles) and non-system or decommissioned roads (1,400 miles). Of the 3,700 miles of classified Tongass NFS roads, over 80 percent are not open to use or not maintained for highway vehicles. There are another 4,300 miles of roads that are on non-NFS lands.

All timber harvest requires some road construction and maintenance and repair. If the planned harvest area is roaded, often the case for timber harvest which comprises solely regenerated timber stands, then most of the activity expected is road maintenance and repair. Otherwise, road construction is the primary activity.

Log Transfer Facilities

The transport of harvested timber from Southeast Alaska requires both land and water routes to reach processing facilities. Log transfer facilities (LTFs) are used to transfer logs to barges or rafts for towing. Over 100 LTFs exist on the Tongass. A Memorandum of Understanding (MOU) provided a framework for the State to grant the Forest Service tideland easements to use the 126 LTFs on state lands listed on Map 92337. As of 2016, there were 55 LTFs with active permits.

Transportation Systems in the Forest Plan

The 2016 Forest Plan applies the Transportation Systems Corridors Direction to existing and future transportation system corridors such as the those considered under the SATP and applicable laws (i.e., Section 4407 of Public Law 109-59; Alaska National Interest Lands Conservation Act of 1980 [ANILCA] Title XI, Public Law 96-487).

Within IRAs, the Roadless Rule generally prohibits construction or reconstruction of roads with some exceptions. The Forest Service may authorize a road in an IRA if they determine it meets certain criteria (see Chapter 2).

Energy

Twenty-two operating hydroelectric projects are located either on NFS lands or on adjacent state or private land. These projects have a total installed capacity of 216.9 megawatts (MW) and range in size from less than 1 MW to 78 MW in size.

The existing transmission system in Southeast Alaska is limited. The electric systems in a few communities are currently interconnected. These may be summarized by region, as follows:

- Southeast Alaska Power Agency (SEAPA) Region—The SEAPA system connects Ketchikan, Petersburg, and Wrangell.
- Juneau Area—The Alaska Electric Light & Power system connects Juneau, Douglas Island, Auke Bay, and Greens Creek.
- Prince of Wales Island—The Alaska Power & Telephone (AP&T) system connects Coffman Cove, Craig, Hollis, Hydaburg, Kasaan, Klawock, and Thorne Bay.
- Upper Lynn Canal Region—A separate AP&T system connects Haines and Skagway in the Upper Lynn Canal Region and is connected via an intertie to the existing Inside Passage Electrical Cooperative) system that serves Klukwan and Chilkat Valley.
- Kake to Petersburg Intertie (approved but not constructed) — In 2016, the Forest Service issued a Record of Decision approving the construction of a transmission line connecting Kake and Petersburg.

Inventoried Roadless Areas

Currently, there are five proposed or unconstructed renewable energy projects in IRAs (see Table 3.7-1). In addition, proposed transmission lines serving as power interties among Southeast Alaska communities, including the line between Kake and Petersburg, would also cross IRAs.

Table 3.7-1
Proposed or Unconstructed Renewable Energy Projects in IRAs

Name	Ranger District	Power Destination	IRA
Sweetheart Lake	Juneau	Juneau	302
Crooked Creek/Jim's Lake	Hoonah	Elfin Cove	311
Little Port Walter	Sitka	Little Port Walter Marine Station	334
Bell Island Geothermal[1]	KMF	Swan-Tyee Intertie	529
Mahoney Lake[2]	KMF	Swan-Tyee Intertie	524

[1] See *Minerals* section for geothermal discussion.
[2] Federal Energy Regulatory Commission licensed in 1998, unconstructed.

Hydroelectric projects are not prohibited in IRAs[25] on the Tongass. The Federal Power Act (FPA) grants the Federal Energy Regulatory Commission (FERC) the authority to issue and administer licenses for hydropower projects. For projects located on NFS lands, Section 4(e) of the FPA requires FERC to determine whether the project is consistent with purposes and the land management plan. Section 4(e) also gives the Forest Service authority to impose mandatory conditions in the FERC license to ensure the adequate protection and use of NFS land and resources.

The Roadless Rule does not prohibit the construction or maintenance of transmission lines that do not require road construction or reconstruction. Temporary or permanent roads are not permitted in IRAs, with exceptions, though temporary linear construction zones can be authorized. As of January 2018, 10 hydropower or intertie projects have been approved in IRAs in the Alaska Region, including the 2016 approval of the Kake to Petersburg intertie.

Communication Sites

Appendix E of the 2016 Forest Plan (USDA Forest Service 2016a) lists approved communication sites on the Tongass (Table E-1). Sites approved for telecommunication facilities are characterized by antennas, electronic transmitters, equipment shelters, and a wide variety of electronic communication support equipment such as those listed in Forest Service Handbook 2709.11, Chapter 90.

Proposals for new communications uses on the Tongass will be encouraged to co-locate on an approved communications site, unless the proponent demonstrates that communication sites approved in the Forest Plan are not technically feasible due to geographic location or are incompatible with the requested use.

Communication and infrastructure are not prohibited in IRAs.

Environmental Consequences

The 2016 Forest Plan provides Forest-wide management direction for Renewable Energy and for Transportation Systems Corridors and other activities, which allows greater flexibility in development including renewable energy development to help Southeast Alaska communities reduce fossil fuel energy dependence. Energy project development and regional transportation development are possible under all alternatives with limitations that vary by alternative. Although these projects can be permitted under Alternative 1, there is likely to be a slight improvement in the potential for project development under each of the action alternatives because of the broadening of the rule language regarding access for the construction, expansion, or maintenance of facilities.

The following discussions address the indirect and cumulative effects of the alternatives on the transportation and other infrastructure of Southeast Alaska. Direct effects would result from on-the-ground

[25] In reinstating the Roadless Rule on the Tongass, the Alaska District Court's judgement in Organized Village of Kake, et al., v. USDA, et al. clarified that "nothing in this judgement shall be construed to prohibit any person or entity from seeking, or the USDA from approving, otherwise lawful road construction, road reconstruction, or the cutting or removal of timber for hydroelectric development pursuant to the standards and procedures set forth in the Federal Power Act."

activities that could occur in or outside of roadless areas under the Forest Plan and would be evaluated when they are proposed.

Transportation Effects

National Forest System Roads

The amount of new road construction would be similar under all alternatives because roads on the Tongass are largely developed in support of timber harvesting and the PTSQ under the 2016 Forest Plan does not vary between the alternatives. Thus, the predicted 1,000 new road miles on NFS lands over 100 years for the No Action (from the 2016 Forest Plan EIS, see Table 3.4-6 in Appendix C of this DEIS) alternative would be similar for all alternatives, with minor variations. Because the locations of future harvests and associated roadbuilding are unknown, a qualitative discussion of the predicted difference is used here.

Existing conditions in 2016 included about 5,100 miles of system and non-system roads on NFS lands (from the 2016 Forest Plan EIS; see Table 3.4-6 in Appendix C of this DEIS). The projection over the next hundred years was modeled to include an additional 1,000 miles of new roads, totaling about 6,100 miles of new roads over 100 years. This would be an increase of nearly 20 percent over existing conditions in 2016. In addition to new construction, some roads would be constructed or reconstructed over decommissioned roadbeds. Reconstruction involves the rehabilitation of the original roadbed, and can include cleaning ditches, replacing drainage structures, re-installing bridges, and grading and shaping. By the same rationale, the estimated 500 miles of roads constructed over decommissioned roadbeds and 1,100 miles of road reconstruction over 100 years for the No Action alternative would be similar among all alternatives (from the 2016 Forest Plan EIS; see Table 3.4-6 in Appendix C of this DEIS).

Alternatives 1 and 2 would have roughly the same amount of road miles as indicated in the current Forest Plan evaluation because additional timber harvest opportunities would be provided through the removal of roadless area designation within roadless areas that generally have roads (known as roaded roadless). In roaded areas, most of the activity expected is road maintenance and repair.

Alternative 3 is expected to result in more new road miles than Alternatives 1 and 2 because additional timber harvest opportunities may be provided through extending areas removed from roadless designation to forest lands adjacent to existing road systems in addition to the roaded roadless areas. Thus, some new roads may be constructed to access these adjacent areas, and road maintenance and repair would occur within previously roaded areas.

Alternatives 4, 5 and 6 would be similar and have the potential for slightly more road miles than Alternative 3 because they would allow harvests and roadbuilding in areas farther from existing road systems. However, the economics of building roads to access forest land farther from the forest transportation system would be a limiting factor for new road construction.

Most roads developed for timber harvest would be closed to motorized traffic once their initial use is over. These roads are built for silvicultural purposes under exemptions granted under Section 404(f)(1) of the Clean Water Act. Roads constructed and maintained specifically for recreation or other uses do not qualify under this exemption (USACE 2004).

The effects of operations at LTFs are likely to be same under all alternatives because the PTSQ does not vary between the alternatives. Guidelines for LTF siting, construction and operation, and monitoring are provided in Appendix G of the 2016 Forest Plan.

Regardless, the decision on this Alaska Roadless Rulemaking would not result in any direct on-the-ground effects. Future Forest Service activities that would result in road building, maintenance, or removal would be subject to additional project-level NEPA analysis.

Effects on Regional Transportation Opportunities

Alternative 1
Transportation Systems Corridor plan components under the Forest Plan would apply to major road systems such as state and federal highways, railroads, and those identified by the State of Alaska in the current version of the SATP and applicable laws (for example, Section 4407 of Public Law 109-59, as amended, Title XI of ANILCA, Public Law 96-487).

The 2001 Roadless Rule provides an exception to allow construction, reconstruction, or realignment of a Federal Aid Highway to occur in IRAs and pursuant to reserved or outstanding rights, or as provided by statute or treaty.

Action Alternatives
Each of the action alternatives would add or remove areas or roadless designations to varying degrees (Table 2-11) that would affect where and for what purpose roads could be developed. Generally, roads would be prohibited in ARAs unless they met the one of the exceptions listed in Table 2-1. The exceptions vary by ARAs. Watershed Priority ARAs (Alternatives 2 and 3) are the most restrictive to road building. Timber Priority ARAs (Alternative 4) place no prohibition on permanent or temporary roads, and Community Priority ARAs allow more exceptions than Alternative 1. LUD II and Roadless Priority ARAs fall in the middle.

The effect to the potential for development of regional transportation systems within each ARA is discussed below.

Watershed Priority (Alternatives 2 and 3)
Watershed Priority ARAs would be more restrictive on regional transportation routes than the current roadless rule because the exception for construction, reconstruction, or realignment of a Federal Aid Highway in IRAs would be removed. Roads needed pursuant to reserved or outstanding rights, or as provided for by statute or treaty, would still be allowable in Watershed Priority ARAs. There is no exception for State highways.

LUD II Priority (Alternatives 2, 4, and 5)
Within LUD II Priority ARAs, regional transportation routes would be permissible when a road is needed for Federal Aid Highway projects (same as the 2001 Roadless Rule), a transportation need is identified by the State of Alaska, other vital linkage and no other feasible routes exist, or it can be demonstrated that routing through the LUD II area is clearly environmentally preferable. Site-specific measures would be designed to minimize effects on the primitive characteristics of the area or on recreational resources and scenery.

Roadless Priority (Alternatives 2, 3, 4, and 5)
Within Roadless Priority ARAs, regional transportation routes would be permissible when a road is needed for Federal Aid Highway projects, for the connection of communities and development of the regional transportation system as identified in the State of Alaska's SATP and roads identified in the easements Congress granted in Section 4407 of Public Law 109-59, as amended, and no other feasible routes exist or it can be demonstrated that routing through the ARA is the least environmentally damaging practicable alternative.

Timber Priority (Alternative 4 only)
Timber Priority ARAs would not prohibit road building and would make the process to develop regional transportation systems less restrictive.

Community Priority (Alternative 3 only)
Within Community Priority ARAs, regional transportation routes would be permissible when a road is needed for Federal Aid Highway projects (same as the 2001 Roadless Rule) or when needed for the construction, expansion, or maintenance of essential public facilities such as airports and marine access points. Like Watershed Priority ARAs, there is no exception for State highways.

Alternative 2
Alternative 2 includes Watershed, LUD II, and Roadless Priority ARAs. With 3.25 million acres (1.1 million acres of development LUDs) of Watershed Priority ARAs, Alternative 2 would be more restrictive on regional transportation opportunities than Alternative 1 within Watershed Priority ARAs. However, the exceptions for regional road systems would be increased in LUD II (856,000 acres) and Roadless Priority ARAs (5.1 million acres) compared to the 2011 Roadless Rule.

The 2004 SATP (ADOT&PF 2004) identified 34 essential highway and utility corridors distributed throughout the Southeast Alaska and the Forest. Roadless areas exist along many of these routes and, under Alternative 2, several of the crossed roadless areas would be designated as Watershed Priority ARAs, which do not include the exception for State roads included in the LUD II and Roadless Priority ARA. However, most of these routes were granted by Congress in 2005 (Public Law 109-59). Routes identified in the 2004 SATP that were not granted by Public Law 109-59 that could be prohibited in Watershed Priority ARAs include:

- A route on the east side of Eastern Passage (SATP Map 13); Portions of the Kuiu Island Corridor (SATP Map 19);
- A route on the Cleveland Peninsula north of Ketchikan (SATP Map 23);
- A portion of the route on Chichagof Island between Pelican and Tenakee Inlet (SATP Map 17); and
- A beachfront segment along Clarence Strait southeast of Coffman Cove (SATP Map 14).

Alternative 3
Alternative 3 includes 8.1 million acres of Watershed Priority, Community Priority, and Roadless Priority ARAs. Like Alternative 2, Alternative 3 would include 3.2 million acres (1.1 million acres of development LUDs) of Watershed Priority ARAs and would be more restrictive than Alternative 1 on regional transportation opportunities in these areas. However, the exceptions for regional road systems would be increased in Roadless Priority ARAs (5.2 million acres) compared to the 2011 Roadless Rule. By decreasing roadless areas by 1.1 million acres, Alternative 3 would be more permissive to road building than Alternatives 1 and 2 (although 857,000 acres of this would be in LUD II areas).

Like Alternative 2, opportunities for development of regional transportation systems that were not granted by Congress (Public Law 109-59) could be prohibited within Watershed Priority ARAs. Additionally, while Community Priority ARAs provide more exceptions for road building, including Federal Aid Highway projects, there is no exception for State highways.

Alternative 4
Alternative 4 includes about 9 million acres of LUD II, Roadless, and Timber Priority ARAs. Alternative 4 would be more permissive to road building than Alternatives 1 and 2 because it decreases roadless area acres by about 343,000 million acres and designates about 749,000 acres as Timber Priority ARAs. Together, the area removed from roadless designation and the area of Timber Priority ARAs would be about 1.1 million acres, similar to Alternative 3. Road-building restrictions imposed by the Roadless Rule within development LUDs would be removed from these 1.1 million acres. Of the remaining 8.1 million acres of ARAs in Alternative 4, 7.3 million acres would be designated as Roadless Priority, and the remaining 856,000 acres would be designated as LUD II Priority.

Alternative 5
Alternative 5 includes 6.9 million acres of ARAs and would be more permissive to road building than Alternatives 1 through 4 because it decreases roadless area acres by about 2.3 million acres. All remaining ARAs would be Roadless Priority, which provide more exceptions for regional road systems compared to the 2001 Roadless Rule, or LUD II Priority. A total of 6.1 million acres would be Roadless Priority ARAs and 0.8 million acres would be LUD II Priority. The remaining Roadless and LUD II Priority ARAs would have more exceptions for road systems compared to the 2001 Roadless Rule.

Alternative 6
Alternative 6 would be the most permissive to road systems because it would remove all 9.2 million acres of roadless areas.

Energy and Infrastructure Effects

Five proposed hydropower projects are located in IRAs. Other hydropower projects and other types of energy projects could be developed in the future. Potential impacts to roadless areas would be addressed during the permitting and licensing of these projects, with most requiring NEPA analysis. Potential impacts would be mitigated, but some impacts, like the presence of a road or facilities in a roadless area, would be unavoidable.

No significant consequences related to energy projects and related infrastructure are anticipated for any of the alternatives. Removing roadless designations in areas under Alternatives 2 through 6 would simplify the process for projects but would not necessarily result in an increase in the number of projects developed. If new roadless areas are added or expanded, the permitting process could be more burdensome, but projects would not be prohibited. An exemption for utility systems in Roadless Priority ARAs under Alternatives 2, 3, 4, and 5, would allow for timber harvest and road construction. Under Alternative 4, lands within the Timber Priority ARA would not prohibit timber harvest or road construction at all. If roadless areas are removed, or exemptions added the greatest effect may be in making the permitting process for developers less burdensome, resulting in a quicker permitting process rather than an increase in the number of projects developed.

Under all alternatives, energy projects would need to be consistent with the 2016 Forest Plan components for Renewable Energy (Forest Plan Chapter 5). Existing and proposed renewable energy projects are widely distributed across the Forest, with five proposed renewable energy projects in roadless areas (Table 3.7-2). This would reduce the cumulative effects of these activities on any specific roadless area. Overall, none of the alternatives would likely have additional adverse effects to roadless areas relative to current conditions.

Management and administration would remain the same in all the action alternatives. For projects located on NFS lands, Section 4(e) of the FPA requires FERC to determine whether the project is consistent with National Forest purposes. The Forest Service will continue to use Section 4(e) to impose mandatory conditions in the FERC license to ensure the adequate protection and use of NFS land and resources. Non-FERC projects would continue to be administered through issuance of a special use authorization, with specified conditions and in accordance with other federal and state permits and/or permissions, to allow construction and operation of projects.

Table 3.7-2
Alaska Roadless Area Priorities at Proposed or Unconstructed Renewable Energy Projects in IRAs[1]

Name	Roadless Area	Action Alternatives				
		2	3	4	5	6
Sweetheart Lake	302	W	W	R	R	Rv
Crooked Creek/Jim's Lake	311	R	R	R	R	Rv
Little Port Walter	334	R	R	R	R	Rv
Bell Island Geothermal[2]	529	W	W	R	R	Rv
Mahoney Lake	524	R	R	R	R	Rv

[1] R = Roadless Priority; W = Watershed Priority; Rv = Removed
[2] See *Minerals* section for geothermal discussion.

Communications and infrastructure projects that do not require tree cutting or road construction / reconstruction are not prohibited in IRAs, nor would they be in ARAs. Added exceptions for energy infrastructure in Roadless Priority and Timber Priority ARAs, and to a lesser extent LUD II Priority ARAs would facilitate development of projects such as transmission lines.

Cumulative Effects

The road construction projected for non-NFS lands primarily includes roads needed for timber harvest, but also includes roads that may be built to serve or connect communities. Road corridors covered by Public Law 109-59 would, if developed, connect additional areas in Southeast Alaska to the continental highway system, and improve transportation between communities.

There is considerable uncertainty concerning the future development of Southeast Alaska's road system. As stated above, the ADOT&PF has prepared a Draft SATP. As stated above, the ADOT&PF has prepared a Draft SATP and is delivering transportation projects under that plan. However, new roads linking communities and linking Southeast Alaska to the continental highway system are expensive to build and maintain.

If new wood-processing facilities and markets are not developed, especially for young-growth products, the levels of harvest predicted in the 2016 Forest Plan EIS (USDA Forest Service 2016b) are unlikely to occur, and new road construction would be less than anticipated. There is also uncertainty concerning the funds to maintain the existing NFS road network, to place existing roads into storage status, and to decommission roads that are no longer needed. Risks associated with inadequate funding include adverse effects to fish, water quality, and wildlife and increased safety hazards as older roads and stream crossings deteriorate.

Timber Resources

Affected Environment

Introduction

The forests of Southeast Alaska are primarily the western hemlock-Sitka spruce forest type. This forest type is part of the temperate rain forest that occupies a coastal strip 2,000 miles long from northern California to Southcentral Alaska. While western hemlock and Sitka spruce comprise the majority of the stocking in this forest type, associated species include, depending on location, yellow-cedar, western redcedar, mountain hemlock, and silver fir (Harris and Johnson 1983). Other forest lands support relatively small stands dominated by yellow-cedar, lodgepole pine (shore pine), red alder, or black cottonwood. Western hemlock is used for pilings, poles, railway ties, windowsills, doors, and construction lumber, and has been an important fiber source for pulp. Sitka spruce is used for lumber and commodity products, as well as specialty products, such as piano sounding boards, guitar faces, oars, planking, masts, and spars for custom-made or traditional boats, and ladders. For centuries Alaska Natives have used cedar species for canoes and paddles, housing (along with Sitka spruce), and totem poles. Today, redcedar is primarily used as a roofing material and yellow-cedar has many uses, including boats, utility poles, heavy flooring, framing, and marine decking and piling.

The forests of Southeast Alaska are the major source of raw materials for the region's wood products industry. Generally, timber harvested on NFS lands is available for processing by the local wood products industry but most timber harvested on non-NFS lands is exported. Due to economic conditions in recent years, the exporting of timber from NFS lands has been allowed under certain circumstances. The wood products industry and associated regional employment is discussed in more detail in the *Key Issue 2* section of this document.

Current Condition of the Forest Land Base

Approximately 56 percent of the forest land on the Tongass (approximately 5.5 million acres) is classified as productive forest land; these lands are considered biologically capable of producing industrial wood products. Approximately 0.5 million acres of the productive forest lands on the Tongass have been converted to young-growth forest due to harvest or other disturbances such as fire or wind. This is approximately 5 percent of the total forest land base and 10 percent of the productive forest lands and represents approximately 15 billion board feet of harvested timber.

In addition to productive forest lands, the Tongass includes approximately 4.4 million acres of unproductive forest. These are lands that are not capable of producing industrial forest products, but are important for watershed protection, wildlife habitat, recreation, and other uses. Unproductive forest is land incapable of yielding crops of industrial wood, usually because of adverse site conditions. These conditions may include sterile or poorly drained soil, subalpine conditions, and steep rocky areas where landslides or avalanches curtail timber development.

Currently, the forest land suitable for timber production covers approximately 564,000 mapped acres (230,000 old growth and 334,000 young growth). Following field verification, the suitable acreage is expected to amount to approximately 474,000 acres. This is based on the level of falldown assumed in the 2016 Forest Plan. Falldown is the reduction in suitable acreage that occurs when a project is implemented and taken from the paper plan stage to an actual field-based plan. It is mostly due to finding new streams, over steepened slopes, difficult to log areas, muskegs, etc., within areas that were mapped as suitable.

Current Condition of the Timber Resource

Age Class Distribution. The Tongass is a mix of old-growth stands and naturally regenerated young-growth forest, which consists of both wind-created and harvest-created young growth. Harvest-created young growth amounts to approximately 5 percent of the total forest land area. Suitable forest lands are classified into five stand conditions: 1) old-growth sawtimber, 2) young-growth sawtimber, 3) pole timber,

4) seedling and sapling, and 5) non-stocked. For timber inventory purposes, stands of trees 150 years old or older are designated as old growth. Over 85 percent of productive forest lands meet the criteria for old-growth sawtimber (USDA Forest Service 2016b). Forests less than 150 years (harvest and natural) cover approximately 0.5 million acres; forests that are 150 years of age or older cover over 5 million acres.

Approximately 46 percent of the area harvested over the past century is no longer suitable, due to Congressional designations such as Wilderness, State and Native land selections, or Forest Plan LUD allocations. For example, areas designated as Wilderness or LUD II by Congress are no longer suitable.

Approximately 80 percent of harvested young growth stands on the Tongass are less than 55 years of age and about 10 percent of young-growth stands are 56 to 65 years of age. Because stands on the Tongass need to be about 65 years old or older to have a chance of being economic to harvest, less than 10 percent of the Tongass harvested young-growth stands are currently in this category.

Volume Strata

The Forest currently uses three volume strata to categorize commercial timber: high, medium, and low volume. Average volumes for each category vary with geographic area on the Tongass. In terms of net sawlog volume, the high-volume stratum averages about 25 to 33 thousand board feet (MBF) per acre, medium volume averages about 18 to 28 MBF per acre, and low volume averages about 5 to 15 MBF per acre, depending on geographic area (USDA Forest Service 2016b, Table 3.13-4).

While the three-strata approach is useful for estimating timber volume for forest planning purposes, it is not a good tool for identifying other important forest elements, including forest structure, biological diversity, and wildlife habitat. For example, two stands may have the same volume, but one may be a dense stand of medium-sized trees with a single canopy layer, while the other stand may be a combination of widely-spaced large overstory trees and two or three lower canopy layers containing small- and medium-sized trees. To help account for these differences, the Size Density Model (SDM), which is based on a combination of tree sizes and tree densities (Caouette et al. 2001), has proven to be a better tool for representing these other forest elements. Using tree sizes and densities provides a more comprehensive forest measuring system for describing habitat than timber volume (Spies and Franklin 1991). The SDM (Caouette and DeGayner 2005) is described and used in the *Biological Diversity* and other sections.

Non-National Forest System Lands

The State of Alaska, Native village corporations, Sealaska (the Native regional corporation), and individuals own over 1,186,000 acres of land in Southeast Alaska, inside the Forest boundary. Approximately 364,000 acres of this land currently consists of productive old-growth forest and 422,000 acres consists of young growth. This means that approximately 54 percent of the original productive old growth on non-NFS lands has been harvested (based on geographic information system analysis and information provided by the landowners; USDA Forest Service 2016b). Most timber harvested from Department of Natural Resources state lands in recent years has been processed locally, while timber harvested from University Trust and Mental Health Trust lands has been exported.

Current Practices

Young-Growth Management

Managing young-growth forests in Southeast Alaska will become an increasingly important component of forest management on the Tongass in the next decade. Young-growth stands can be treated through thinning and other intermediate treatments to concentrate growth in fewer, larger trees, improve lumber quality, and/or to enhance habitat conditions for wildlife. Zaborske et al. (2000) concluded that the types of treatments applied to young stands will have a profound effect on the types of materials available in the future, including log diameter, knot size, and wood strength.

Public Law 113-291 specifies that the Tongass may harvest trees prior to 95 percent of culmination of mean annual increment (CMAI) to facilitate the transition away from commercial timber harvest of old-growth stands, given certain acreage and time limitations.

Over 200,000 acres have been precommercially thinned on the Tongass since 1979. In recent years, precommercial thinning has averaged approximately 5,600 acres per year. The Forest has less experience with other young-growth management techniques, such as pruning and commercial thinning.

There has been increased interest in commercial thinning in recent years, not only to improve timber values, but as a tool to improve wildlife habitat. Studies in other forest types in the Pacific Northwest indicate that stand structures that are similar to old-growth forest conditions can be developed through thinning (Thysell and Carey 2000). However, there are many unanswered questions as to how to implement thinning treatments that provide a sustainable source of high-value wood products while maintaining biological diversity (Zaborske et al. 2000). In a study comparing the lumber harvested from thinned and unthinned, 90-year-old stands on the Tongass, Christensen et al. (2002) found that there was no difference in volume recovery or lumber grade in thinned and unthinned Sitka spruce. For western hemlock, the unthinned stands produced more wood volume, but the thinned stands produced more high-grade lumber. The Prince of Wales Commercial Thinning Study was awarded as an Integrated Resource Service Contract at the end of fiscal year 2008. This study looks at five different commercial thinning prescriptions that offer a range of potential treatments that could be used on the Tongass. The five different prescriptions were implemented at three replicates: near Harris River, in the Maybeso Experimental Forest, and near Naukati. The objectives of the study are to assess how mechanized equipment operates, how the different prescriptions hold up to Southeast Alaska's weather, and what the understory response is after treatment. A 5-year re-measurement of the sites was completed in 2014.

There is also increased interest in managing young-growth stands to increase and maintain understory vegetation, especially as forage for deer and other wildlife. Hanley et al. (2005) noted that much research is needed on new approaches involving thinning of older stands, including red alder in the secondary successional sequence. Zaborske et al. (2002) found that thinning greatly increased forage production, though the amount of useful forage produced varied by the type of thinning implemented.

In addition to their continuing research on managing young forests, scientists at the Pacific Northwest Research Station joined with the Tongass in 2001 to establish an operational-scale adaptive management study of young-growth management options. This program, called the Tongass-wide Young-Growth Studies (TWYGS), is designed to evaluate the potential benefits of treating young-growth stands to increase wildlife habitat and wood production. Currently, TWYGS includes experiments that test the effectiveness of alder interplanting, precommercial thinning, slash treatments, girdling and pruning.

Regeneration Methods and Reforestation

Regeneration methods are the harvest methods used to create a new age class within a stand. The methods used on the Forest are not expected to differ when applied to old-growth or young-growth stands. A description of the primary methods is provided in the *Timber* section of the 2016 Forest Plan FEIS (USDA Forest Service 2016b). They cover even-aged, two-aged, and uneven-aged systems.

The National Forest Management Act (NFMA) requires assurance that all areas receiving final removal harvest can be adequately restocked with trees within 5 years of that harvest. On the Tongass, natural restocking is usually adequate to meet this objective because both western hemlock and Sitka spruce are prolific seed producers (USDA Forest Service 1983). The new stand originates from advance regeneration and from seeds that come from residual trees or from trees adjacent to the harvest unit.

Species Composition

Of the four major commercial tree species on the Tongass, western hemlock is the most shade tolerant, followed by western redcedar, yellow-cedar, and Sitka spruce, in that order (USDA Forest Service 1990). Western hemlock is by far the most prevalent species, making up 83 percent of the old-growth forests (Farr and McClellan 1994). Western hemlock has the lowest economic value of these four species.

Having a diverse species mix contributes to wildlife habitat quality, economic value, and minimizes losses due to insects and diseases that are species-specific.

Regeneration harvest methods that create open conditions and expose bare mineral soil, such as clearcutting, would encourage germination and growth of Sitka spruce and the cedars. Group selection with openings of at least 2 acres could also encourage germination and growth of Sitka spruce and the cedars, but to a lesser degree than clearcutting due to side shading. The amount of sun reaching the surface would vary depending on the size, shape, and aspect of the opening. Regeneration methods that create less ground disturbance and smaller openings in the canopy such as single tree selection, smaller sized groups in group selection, overstory removals, and treatments with many reserve trees would encourage growth of western hemlock at the expense of the other species. However, limited retrospective studies indicate that Sitka spruce can be maintained in mixed hemlock-Sitka spruce stands over a wide range of cutting intensities if enough Sitka spruce trees are present in the stand after harvest (McClellan 2005). Two-aged harvest would be similar to even-aged harvest if leave trees are concentrated near the unit boundaries but may be more favorable for western hemlock regeneration if reserve trees are scattered through the unit, due to shading from the residual overstory.

Forest Health

Insects, diseases, related decay processes, and windthrow are an integral and natural part of forest ecosystems. Many of these appear to play key roles in gap-level disturbance (see discussion of old-growth forests in the *Biological Diversity* section of this chapter) and in providing wildlife habitat. The majority of the forests on the Tongass are old-growth forests. Losses to the timber resource caused by heart rot in live trees are considerable in old-growth forests. Approximately one-third of the volume of the old-growth hemlock-spruce forests in Southeast Alaska is decayed by heart rot fungi (USDA Forest Service and ADNR 2014).

In addition to heart rot, some of the more common destructive insects, diseases, and conditions within Southeast Alaska are the black-headed budworm (*Acleris gloverana*), hemlock sawfly (*Neodiprion tsugae),* hemlock dwarf mistletoe, (*Arceuthobium tsugense*) and other decays, Alaska yellow-cedar decline*,* and windthrow.

Decline and mortality of yellow-cedar continues to be one of the most widespread and important forest problems in Southeast Alaska. This decline is associated with wet, poorly drained sites, and recent research has demonstrated that no organism is the primary cause of the decline (Hennon and Shaw 1997). As the climate continues to warm, cedar decline is likely to continue to spread, especially in the south and east. Conversely, yellow-cedar appears to be spreading northward as climate warms, into areas that retain snow longer into the spring.

Windthrow is the dominant disturbance agent in Southeast Alaska. Two forms occur: small-scale events (gap disturbance) and large-scale events (catastrophic disturbance). Most of the Forest is subject to small-scale windthrow events. Individual trees or small groups of trees blow over during storm events, opening gaps in the canopy that allow young trees to grow to fill the openings. This results in complex, mixed-aged stands. Disease and decay agents also play a role in this process. Small-scale events occur on a regular basis and result in openings from 6 to 13 percent on the canopy (Nowacki and Kramer 1998). Areas not protected by topographic barriers from the severe effects of infrequent, major storms are subject to large-scale windthrow events that cause catastrophic damage. Entire stands have been blown down in the past, resulting in the regeneration of more even-aged stands with more uniform canopies (Nowacki and Kramer 1998). Both forms of windthrow are a part of the natural forest generation, growth, and development. Juday et al. (1998) rated many potential impacts on the coastal forests of Southeast Alaska due to climate change. They concluded that there was a high risk of increased large-scale blowdown across Southeast Alaska as well as increased windthrow around harvest units.

Environmental Consequences

The analysis of the potential effects of the alternatives addresses the following questions:

- How much land would be allocated to timber production?

- What would be the future condition of the Forest in 100 years?

The analysis of timber supply and demand for timber products, as well as how existing sales under contract and timber volume in preparation may be affected by the alternatives is discussed in the *Key Issue 2* section of this EIS. The effects on the timber industry infrastructure and employment levels are also discussed in that section.

Suitable Timber Lands

Most importantly, the Tongass has initiated a formal transition from predominantly old-growth harvest to predominantly young-growth harvest. The 2016 Forest Plan prescribes an average of 46 MMBF per year while transitioning to predominantly young growth harvest after about 16 years. See a more complete discussion of the market demand, the young-growth transition strategy, and the export policy in the *Key Issue 2* section of this EIS.

There are approximately 5.5 million acres of productive forest land on the Tongass. Approximately 1,000,000 acres were mapped as suitable for timber production under the 2008 Forest Plan (which included roadless areas). Under the 2016 Forest Plan (which excluded roadless), approximately 564,000 acres (230,000 acres of old growth and 334,000 acres of young growth) were mapped as suitable for timber production. In this EIS, the amount of suitable land would vary by alternative for both young growth and old growth (Table 3.8-1) (see Maps 7-12 on the thumb drive and website, which show suitable by alternative).

Table 3.8-1
Mapped Suitable Acreage of Old-Growth and Young-Growth under Each Alternative (thousands of acres)[1]

	Alternative					
Classification	**1**	**2**	**3**	**4**	**5**	**6**
Suitable Forest Land						
Mapped Suitable Old Growth	230	247	305	388	395	395
Mapped Suitable Young Growth	334	344	348	349	351	354
Total Estimated Suitable Old Growth	**564**	**592**	**653**	**736**	**746**	**749**

[1] Sums and differences may not appear exact due to rounding.

Mapped suitable old-growth acreage would range from 230,000 acres under Alternative 1 to 395,000 acres under Alternatives 5 and 6, which is a 72 percent increase relative to Alternative 1. Mapped suitable young-growth acreage is relatively consistent among alternatives, however, ranging from 334,000 to 354,000 acres, only a 5 percent increase. The vast majority of suitable young growth is already suitable in Alternative 1. An exception is the roaded roadless areas, which are designated as roadless but include 10,000 acres of suitable young growth along with their access roads. These roaded roadless areas are incorporated into Alternative 2 and the other action alternatives.

Projected Timber Harvest

The PTSQ of each of the alternatives is an indicator of possible future timber supply level that each alternative would produce. PTSQ is the estimated quantity of timber meeting applicable utilization standards that is expected to be sold during the plan period.

The PTSQ for the Tongass under the 2016 Forest Plan, based on an annual average, is 46 MMBF in the initial years (about 15 or more years). The projection is 34.5 MMBF from old growth and 11.5 from young growth for the first decade. Full transition is expected about Year 16 with 41 MMBF of young growth and 5 MMBF of old growth. After that, young growth harvest is permitted to grow, but old growth harvest must remain at 5 MMBF per year.

All alternatives would have the same PTSQ. There would be no change in young-growth or old-growth harvest. Aside from the changes in suitable timber land acres, none of the alternatives include any changes to the 2016 Forest Plan, so the only changes are the removal of the roadless designation overlay.

The main effect of the alternatives on timber would be the ability to develop economic sales. Although no additional harvest would take place, the expansion of suitable areas means that greater area is available for the development of sales, allowing more choices for the development of economic ones. Therefore, the resultant effect would be the same harvest spread out over a larger area. Alternative 2 would add suitable acres from the roaded roadless areas, which, because of their existing infrastructure and connection to the existing road systems should include some of the most economic areas. Alternative 3 would result in even more added suitable acres in areas where roads already exist, in areas where roads could be logically extended within the same watershed, and in Community Priority ARAs and, therefore, are also generally considered relatively economic to harvest. Alternatives 4, 5, and 6 would result in a greater increase in harvest in remote areas; however, a number of factors would limit this increase. First, remote areas almost entirely consist of old growth, so once transition starts resulting in a greater proportion of young growth in the harvest in 10 to 15 years, there is little reason to move away from existing roads. Second, current economic conditions suggest that economic sale requirements may limit the level of entry into remote areas, at least for the next 5 or 10 years. This suggests that while Alternatives 2 and 3 may result in improvements in sale economics because they open up areas that appear likely to be more economic due to accessibility, the additional expansion produced by Alternatives 4, 5, and 6 may not produce further improvements in economic sales.

Cumulative Effects

In 1954, there were approximately 6.3 million acres of productive forest land on all ownerships inside the Tongass Forest boundary (including Annette Island). The amount of forest land in Southeast Alaska that is available for timber management has declined over the past century, largely due to Wilderness and LUD II designation by Congress, land selections by the State and ANSCA, land restricted by roadless designations, and land allocated to non-development LUDs in the current Forest Plan. This, along with mill closures and changes in timber markets, has contributed to a decline in timber harvest. Harvest on all lands in Southeast Alaska peaked from the late 1960s through the early 1990s and has been in decline since then. Total harvest on federal, state, and private lands declined from just under 1,000 MMBF in 1989 to less than 80 MMBF in 2017. Approximately 722,000 acres of productive forest land have been harvested since 1954 in this portion of Southeast Alaska; approximately 64 percent of this is NFS land and 36 percent is on Alaska Native corporation, state, and other lands (USDA Forest Service 2016b).

Currently, there are between 0.56 and 0.75 million acres of NFS lands considered suitable for timber management on the Tongass, depending on the alternative. In addition, approximately 0.5 million acres of state, Alaska Native corporation, and other private lands are available for harvest. Potential annual harvest on state and private land is estimated to be approximately 90 MMBF (Daniels et al. 2016). Based on past experience, most of the harvest on private land would be exported and would not contribute to meeting local demand. Using this estimate, cumulative harvest in Southeast Alaska would be about 136 MMBF for the next decade, increasing slowly in succeeding decades, and would be the same for all alternatives. Table 3.8-2 displays the cumulative harvest under the alternatives.

Table 3.8-2
Maximum Estimated Average Annual Timber Harvest in Southeast Alaska during the Next Decade (MMBF)

Alternative	National Forest[1]	State and Private[2]	Total
1	46	90	136
2	46	90	136
3	46	90	136
4	46	90	136
5	46	90	136
6	46	90	136

[1] PTSQ in the current Forest Plan
[2] 70 MMBF/year from Native corporation lands and 20 MMBF/year from state land (Daniels 2015). Most harvest on private land is exported.
MMBF = million board feet; PTSQ = projected timber sale quantity

Minerals

Affected Environment

Mineral deposit types and mineral resource occurrences were described thoroughly in the 2016 and 2008 Forest Plan Amendment Environmental Impact Statements (EIS; USDA Forest Service 2016b, 2008b) and the 1997 Forest Plan EIS (USDA Forest Service 1997a).

With respect to National Forest management, mineral resources are divided into three groups: locatable minerals, leasable minerals, and salable minerals. The Forest Service manages mineral resource programs that are specific to each group of minerals.

The Tongass Forest Plan, as amended, allocates about 249,570 acres of the Forest to the Minerals LUD. The intent of the Minerals LUD is to encourage exploration and development of locatable minerals in areas of high mineral potential, while taking other resource values into account.

Locatable Minerals

A locatable mineral is any mineral that is "valuable" in the usual economic sense or has a property that gives it distinct and special value. Examples of some locatable minerals on the Tongass are gold, silver, copper, molybdenum, iron, nickel, lead, and zinc. The General Mining Law of 1872, as amended, grants every United States citizen the right to prospect and explore public domain lands open to mineral entry. The right of access is guaranteed and is not at the discretion of the Forest Service.

The Forest Service works with mining claimants and operators to provide reasonable access to their claims, minimize adverse environmental impacts on surface resources, and ensure reasonable reclamation of disturbed lands affected by mining operations. Protection of surface resources is accomplished by reviewing the mining plan of operations submitted by the claimant, disclosing impacts of the proposed mining operations in a project-specific environmental analysis, approving only those activities that are reasonably incident to the proposed operation, monitoring operations to ensure environmental standards are met, and ensuring prompt and reasonable reclamation of disturbed areas.

By law, designated Wilderness, National Monuments, Research Natural Areas, Enacted Municipal Watersheds, and Wild Rivers (when designated by Congress) are withdrawn from mining claim location, subject to existing rights.

On the Tongass, Modified Landscape, Scenic Viewshed, Recreational Rivers, Timber Production, and Minerals LUDs are open to mineral entry. The Primitive Recreation, Semi-Remote Recreation, Old-growth Habitat, Experimental Forest, Special Interest Areas, Scenic Rivers, and LUD II LUDs remain open to mining activities; however, special stipulations and more stringent mitigation measures may be required for mining activities in these LUDs. Similarly, roadless areas within any of these LUDs are open to mineral entry.

Leasable Minerals

Certain types of minerals, primarily energy resources (e.g., oil, gas, coal, and geothermal resources), are not subject to mining claim location but are available for exploration and development under provisions of the Mineral Leasing Act of 1920. Access to these types of minerals is provided through leases, permits, or licenses that include fee and/or royalty payment conditions. The authority to manage these minerals is presently administered by the U.S. Department of Interior, Bureau of Land Management (BLM) in cooperation with the Forest Service. National Monuments, Wilderness Areas, and Wild Rivers are withdrawn from mineral leasing.

No leasable minerals are presently being produced on the Tongass, nor have they been since at least the 1997 Forest Plan, and the anticipated demand is expected to remain low. There are three existing geothermal leases on Bell Island. Previous assessments have indicated a potential for oil and gas occurrence in the Yakutat region (BLM 2006; URS Corporation 2006); however, the resource development potential is considered low. Outside of the Yakutat area, oil and gas occurrence potential

elsewhere in the Tongass is considered low to none. Coal is found at several locations in Southeast Alaska; however, the development of these resources is considered uneconomic, other than possibly for local use, and exploration or development activity is unlikely.

Geothermal resources occur in 19 known locations in Southeast Alaska. Thermal springs in several locations have been developed for small-scale commercial uses such as tourism, aquaculture, community bathhouses, and district heating of buildings (URS Corporation 2006). There has been some recent interest in geothermal resources in the Bell Island area, but no projects are currently under consideration by the Forest Service. In 2012, the Forest Service issued a consent determination on the Bell Island lease application areas being made available for leasing and the adjacent mainland (USDA Forest Service 2012c). Of note, the consent determination included restrictions on new road construction or reconstruction (Roadless Area Stipulation) on any leases within NFS Inventoried Roadless Areas (IRAs).

While the occurrence potential for geothermal resources is considered high in several locations and some exploration could occur, geothermal development activity is not anticipated in the near future.

Salable Minerals

Salable, or "common variety," minerals are sold rather than located or leased. These minerals include petrified wood and common varieties of sand, rock, building stone, gravel, pumice, clay, and other similar materials. Crushed rock is the most common saleable mineral extracted on the Tongass and is often used to construct roads. The supply of quality rock sources is largely dependent upon the locations of active logging operations.

Mineral Resource Inventory and Development Potential

The 2008 Forest Plan Amendment provides a summary of Mineral Resource Inventory and Development potential on the Tongass including identified mineral resources and undiscovered resources. There has been no update to mineral inventories since that time.

Mineral Resource Demand

The extent to which identified and undiscovered mineral resources on the Tongass will be developed in the future depends largely upon the level of demand for those resources. Demand for mineral resources can be inferred based on the amount of money spent by the mining industry to prospect and explore for mineral resources in Southeast Alaska. Between 1982 and 1987, the mineral industry spent an average of $2.92 million per year on mineral exploration in Southeast Alaska, with a high of $5.85 million in 1987 (USDA Forest Service 1997a). Exploration expenditures increased drastically for the 1988 to 1991 period, when the industry spent more than $20 million each year. Expenditures generally declined for the next 10 years, reaching $1.6 million in 2001, before increasing again to a level of $9.9 million in 2006 (Alaska Department of Natural Resources [ADNR], Alaska's Mineral Industry annual reports and summaries for 1997 to 2005). Annual exploration expenditures remained high between 2007 and 2013, averaging $20 million with a high of $34.3 million in 2011. Recently, statewide exploration spending increased significantly to $120.8 million in 2017, doubling 2016 exploration spending (Athey and Werdon 2018), but exploration spending for Southeast Alaska alone was not provided.

Environmental Consequences

Indirect Effects

None of the alternatives propose any changes to the Forest Plan relating to minerals management. Operators will continue to submit plans of operation to the Forest Service for approval, and regulations under which those operating plans are processed will not change by alternative. Identified and undiscovered mineral resource tracts, characteristics and location of mineral deposits, and Southeast Alaska geology will not vary as a result of implementing any of the alternatives.

Locatable Minerals

Under any alternative, future exploration and development (except for valid, currently existing rights) would be precluded in areas withdrawn from mineral entry, such as Wilderness.

Future exploration, mining, and mineral processing activities would continue to occur in ARAs) where valuable deposits exist. When necessary, construction or reconstruction of roads for locatable mineral exploration or development is part of the reasonable right of access provided under the General Mining Law. Therefore, none of the alternatives would affect rights of reasonable access to prospect and explore lands open to mineral entry and to develop valid claims.

All proposals for locatable mineral exploration or development are subject to the planning and design requirements governing locatable minerals in 36 CFR 228, subpart A, and the appropriate level of environmental analysis. The plan of operations would be approved subject to modifications identified in the environmental analysis and would be binding on the operator.

Under Alternative 5, roadless areas would be removed from areas with the highest potential for locatable mineral development (areas within the Forest Plan Minerals LUD). The minerals overlay LUD aims to encourage the prospecting, exploration, development, mining, and processing of locatable minerals in these areas. These areas would also be removed from roadless under Alternative 6, the full exemption alternative.

Leasable Minerals

The effects of any mineral leasing activity would be analyzed at the appropriate future time if the Forest Service receives specific requests for access to leasable minerals.

Alternative 1
The Tongass has three active geothermal leases but the anticipated demand for leasable minerals is generally expected to remain low. The Forest Service is aware of some level of interest in leasable minerals in specific areas of the Tongass; however, there are no active leasable activities nor have there been since at least the 1997 Forest Plan. Consistent with the current Forest Plan, any mineral leasing activity would need to be consistent with the standards and guidelines for the respective LUDs affected by the leasable mineral activity. The Forest Service currently prohibits roadbuilding for any new leasable projects, including geothermal projects, within IRAs. Although the road building is prohibited, these projects may include the incidental cutting, sale, and/or removal of trees.

Alternatives 2, 3, 4, and 5
Roadless areas would be added and removed under Alternatives 2, 3, 4, and 5 (see Chapter 2, Table 2-11). The Forest Service currently prohibits roadbuilding for any new leasable projects, including geothermal, within IRAs. This prohibition would continue in newly designated Watershed Priority (Alternative 2), Community Priority (Alternative 3), and LUD II Priority ARAs. Following project-specific analyses, roads could be approved for leasable projects within Timber Priority (Alternative 4) and Roadless Priority ARAs.

Regarding the Bell Island geothermal site, the island would retain its roadless designation under each of these alternatives. It would be designated a Roadless Priority ARA under Alternatives 4, and 5, which allows road building associated with leasable projects. Under Alternatives 2 and 3, Bell Island would be designated a Watershed Priority ARA, which does not allow for road building associated with leasable projects.

The effects of any geothermal or other leasable project would be analyzed at the appropriate future time if the Forest Service receives specific requests for such projects.

Alternative 6
Under Alternative 6, there would be no areas under a roadless designation. Consistent with the current Forest Plan, any mineral leasing activity would need to be consistent with the standards and guidelines for the respective LUDs affected by the leasable mineral activity.

Salable Minerals

The predominant use of salable minerals is to construct roads in support of the Tongass transportation system. Since road construction is not expected to vary much between alternatives, there would be little difference in salable mineral development between the alternatives.

Cumulative Effects

Under all alternatives, the right to prospect and explore public domain lands open to locatable mineral entry are preserved. Existing mineral projects are expected to continue and new projects are expected to be explored and developed. The effects of any mineral activity operating under the standards and guidelines of the Forest Plan would be evaluated at the time appropriate future time if the Forest Service receives specific requests for such projects.

In September 2018, the Forest Service published two separate Advance Notices of Proposed Rulemaking in the FR as first steps to update the agency's regulations that address surface activities associated with exploration and development of locatable minerals, and to update regulations that address leasing and subsequent development of oil and gas resources. Revision of the regulations governing both locatable minerals and oil and gas resources should help achieve more efficient permitting processes, which in turn reduces regulatory burdens.

Recreation and Tourism

Affected Environment

Southeast Alaska possesses a remarkable and unique combination of features including inland waterways with over 11,000 miles of shoreline, mountains, fjords, glaciers, and large fish and wildlife populations that provide opportunities for a wide range of outdoor recreation experiences. Many Alaska residents purposefully live in proximity to such settings as a part of their lifestyle. Most visitors who travel to see Alaska expect to find it in a wild and "unspoiled" state, but also expect comfort and convenience, reliable transportation, and other features requiring some level of infrastructure and development. The challenge for recreation managers is to identify and understand the relationship between the settings and the variety of groups seeking to recreate on or near the Tongass. Commercial providers of recreation activities base much of their marketing strategy on particular environmental settings and identified recreation places within those settings.

The Tongass includes approximately 16.7 million acres of land available for recreation. This land contributes to the feeling of vastness and solitude that dominates the region; however, much of the land is not heavily used for outdoor recreation. Difficult and steep terrain, wetlands, icefields, glaciers, and heavy vegetation confine most recreation activities to accessible shorelines, river and stream bottoms, and around the many lakes within the Forest. Extensive use is made of some of the icefields and alpine areas (above tree line), but access to these areas is usually by aircraft. Both residents and visitors use developed campground and picnic areas, beaches, trails, cabins, shelters, and visitor centers that are located near communities. An inventory of developed recreation sites on the Tongass is presented in Table 3.10-1.

Table 3.10-1
Tongass Recreation Facilities, 2015

Type of Facility	Number
Anchor Buoys	42
Boating Sites	7
Campgrounds	15
- Number of Sites	220
Camping Areas	7
Day Use Areas	10
Picnic Sites	33
Group Picnic Sites	2
Hotel, Lodge, Resort	2
Interpretive Site	3
Interpretive Visitor Centers	3
Lookout/Cabin	147
Shelters	39
Observation Site	2
Recreation Residence	3
Swimming Site	2
Trailheads	120
Trails (number of miles):	
– Nonwilderness	900
– Wilderness	93
– Total Trail Miles	993
Wildlife Viewing Sites	10

The National Park Service (NPS) and the State of Alaska also provide recreation opportunities in Southeast Alaska. The NPS manages 3.3 million acres in three park units, with the majority of this land located within the Glacier Bay National Park and Preserve. Alaska State Parks manages about 80,000 acres and 34 park units, including 16 marine parks, in Southeast Alaska. In addition, the Alaska Department of Fish and Game (ADF&G) manages two state wildlife refuges, two critical habitat areas, and one wildlife sanctuary, and the Alaska Division of Forestry manages the 247,000-acre Haines State Forest.

Community road systems are limited and used for access to recreation sites and attractions near local communities. Existing road systems are primarily located near the communities of Juneau, Sitka, Ketchikan, Petersburg, and Wrangell. There is also an extensive road system connecting the small communities on Prince of Wales Island, as well as road systems near the communities of Hoonah and Kake. There is no interconnecting highway system between islands or between communities on the mainland.

Roads exist in other locations where timber harvest has taken place. Residents, as well as independent visitors from elsewhere, often use road systems that are accessible from the Alaska Marine Highway System ferries or from local communities for recreational purposes. Roads in locations where there are no communities or interconnecting ferry access receive relatively low levels of recreation use. However, recreation-related vehicle use has been growing on certain remote islands, including Kruzof, Zarembo, and Etolin Islands, and isolated systems on Kuiu and Kupreanof Islands. While the total amount of recreation use on these islands is low, it can be heavy at times, such as during hunting season.

Supply of Recreation Opportunities

Recreation Opportunity Spectrum

The 2016 Forest Plan (USDA Forest Service 2016a) uses the ROS to help identify, quantify, and describe the range of recreation settings provided by the Forest. The ROS system portrays the combination of activities, settings, and experience expectations along a continuum that ranges from highly modified to primitive environments. The following seven classifications are identified along this continuum from most to least developed:

- Urban (U)
- Rural (R)
- Roaded Modified (RM)
- Roaded Natural (RN)
- Semi-Primitive Motorized (SPM)
- Semi-Primitive Non-Motorized (SPNM)
- Primitive (P)

The setting indicators and applicable standards and guidelines for the seven ROS classes are described in Appendix I to the 2016 Forest Plan (USDA Forest Service 2016a). These classes and associated indicators may be used in recreation planning and project analysis to describe the current condition across the landscape (ROS inventory) and assess the potential effects of the alternatives on recreation settings. Viewed in terms of acres, the Primitive ROS setting is the largest on the Tongass, with approximately 62 percent of the forest (10.4 million acres) allocated to this setting (Table 3.10-2). SPNM accounts for a further 18 percent (3.1 million acres), followed by RM (10 percent) and SPM (9 percent) (Table 3.10-2).

Table 3.10-2
Forest-wide Recreation Opportunity Spectrum Acres

ROS Class	Acres	Percent of ROS Total
Primitive (P)	10,357,832	62
Semi-Primitive Non-Motorized (SPNM)	3,052,410	18
Semi-Primitive Motorized (SPM)	1,458,528	9
Roaded Natural (RN)	157,386	1
Roaded Modified (RM)	1,662,825	10
Rural and Urban (R and U)	5,618	<0

Note:
The total acres by Recreation Opportunity Spectrum (ROS) class shown in this table are slightly lower than the Forest-wide total because the ROS inventory does not include the entire Forest. Source: USDA Forest Service 2016b, Table 3.15-3

Recreation Places

The pattern of use associated with known protected boat anchorages, boat landings, aircraft landing sites, and the limited road systems makes it possible to identify specific "recreation places" on the Tongass. A total of 1,436 recreation places, encompassing approximately 3.6 million acres, were identified as part of the planning process for 1997 Forest Plan Revision (USDA Forest Service 1997a). Recreation places are classified in two basic ways. First, recognizing that access plays a key role in recreation in Southeast Alaska, "home ranges" were defined for each community. Inventoried recreation places were classified into two categories: those located within a radius of approximately 20 miles from communities ("home range") and those farther than 20 miles from a community. Almost half (48 percent) of the identified recreation place acres are within a community home range. Second, recreation places were identified as either important or ordinary/common based on five categories: facilities, marine, hunting, fishing, and tourism. Recreation places may be important for one, several, or none of the identified categories. Important recreation places by category are summarized in Table 3.10-3 and discussed further in the *Recreation and Tourism* section of the 1997 Forest Plan Revision FEIS (USDA Forest Service 1997b, pp. 3-109, 3-111).

Table 3.10-3
Important Recreation Places by Category[1]

	Number of Places	Percent of Total[2]	Acres (1,000s)	Percent of Total[2]
Facilities[3]	402	28	1,053	29
Marine[4]	617	43	1,089	30
Hunting[5]	373	26	1,452	40
Fishing[6]	187	13	472	13
Tourism	876	61	1,924	53
Total	**1,436**	**NA**	**3,630**	**na**

na = not applicable
[1] Recreation places are rated as either important or common/ordinary.
[2] The Percent of Total columns sum to more than 100 because a recreation place can be rated important in more than one category.
[3] All recreation places with facilities were rated as being important. In addition, other recreation places with some type of facility, such as a viewing platform, and facilities authorized by a special use permit for recreation purposes, were identified as important.
[4] The marine category identified here is different to the marine type identified in Table 3.15-6 (USDA Forest Service 2016b). The marine category in this table only includes those recreation places that are truly unique or typify the Southeast Alaska marine experience.
[5] Important hunting areas were distinguished from ordinary hunting areas based on a number of factors, including heavy recurring use, hunter success, ease of access, opportunities for several species, and prized species, such as mountain goats and moose.
[6] Important fishing recreation places were identified using ADF&G ratings for recreational fishing. Source: USDA Forest Service 2016b, Table 3.15-7

Recreation Use

Many residents of Southeast Alaska place a high value on the quality and availability of outdoor recreation opportunities in the region, with the proportion of Alaskan residents who participate in outdoor activities generally much higher than elsewhere in the United States (Bowker 2001). Many local residents engage in dispersed recreation activities on National Forest System (NFS) land and adjacent saltwater. Most recreation activities take place in and depend upon settings that are primarily undeveloped and widely dispersed. Much of the recreation on the Forest occurs as day trips originating from a nearby community. Although there are some locations on the Tongass where fees are collected and locations where people can be easily counted, accurate data on dispersed recreation use is difficult to obtain. As a result, while there is a general consensus that outdoor recreation opportunities provided by the Tongass are highly important to residents, there is limited data that accurately quantifies resident recreation use.

Resident recreation demand is influenced by a number of factors, including regional population levels, per capita participation rates, and recreation travel behavior. Over time, the supply of certain recreation opportunities in Southeast Alaska has increased. Road systems have expanded into previously inaccessible areas and visitor services and in some cases resulted in supply-induced increases in participation. Supply-induced participation changes have also been accompanied by additional demand for specific recreation places or facilities for a related activity. Increased opportunities for roaded access and activities are typically accompanied by a need for parking, dispersed campsites, picnic sites, trails to scenic attractions, and additional short access routes to cabin sites and previously inaccessible beaches.

Based on the results of the National Visitor Use Monitoring (NVUM) program for 2010 to 2014 and coefficients developed by White and Stynes (2010), the Forest Service (2017f) calculated a visitation estimate of 2,874,000 annual visits to the Tongass. The results of earlier surveys indicated that half of Alaska residents surveyed who live in Southeast Alaska reported using a boat or plane to access the national forest (White and Stynes 2010). Almost half (49.7 percent) of non-resident visits to the Tongass involved the use of a guide or outfitter at some point, with local cruises, wildlife viewing, and flightseeing reported most frequently. Alaska residents in contrast were found to very rarely use outfitters or guides (White and Stynes 2010).

The Tongass is home to a vibrant and growing tourism industry. Cruise ship and other package visitors are a very large group that uses the Tongass. These visitors spend less time in the area than independent visitors and generally follow preplanned and regimented itineraries. Shore excursions have, however, become an important part of the cruise ship experience, with much of this activity centered around ports of call that accommodate large or mid-sized cruise ships. Trends in visitation in areas near communities that serve as large cruise ship ports (such as Juneau, Ketchikan, Sitka, and Hoonah) include a desire for shorter, “softer” adventure excursions that do not require “hard” skills to experience wild Alaska (Zegre et al. 2012). Half-day and day excursions into the Forest have increased in popularity, providing increased revenues for ship operators and opportunities for local entrepreneurs.

Independent visitors, who constitute a much smaller group, tend to arrive by air, ferry, and highway and engage in a variety of activities.[26] Independent visitors spend more time in the communities and on the Forest, and may secure the services of outfitters and guides, restaurants, motels, and transportation services such as floatplanes, boats, and gas stations. Independent travelers tend to plan their own itineraries, but often secure the services of mini-packages, such as day excursions or fishing charters. These types of visitors compete more directly with residents for recreation opportunities on the Forest.

Lodges have grown in popularity in recent years, with fishing lodges playing an important role in the tourism industry in some areas. This is, for example, the case with Elfin Cove, an unincorporated town located west of Hoonah, where nine recreational fishing lodges are located in the vicinity of the town (Dugan et al. 2009). Fishing lodges accounted for 79 percent of the non-cruise, multi-day packages identified in Summer 2016, with wilderness lodges and adventure tours accounting for a further 6 percent of the total each. Rail packages (1 percent), motor coach tours (1 percent), rental car/recreational vehicle

[26] Three Southeast Alaska communities – Haines, Hyder, and Skagway – can be accessed from outside the region via highway. As noted above, there is no interconnecting highway system between islands or between communities on the mainland.

package (2 percent), and hunting (less than 1 percent) accounted for the remaining share of multi-day packages (McDowell Group 2017).

The marketing of recreation opportunities by suppliers has important similarities to resident recreation concerns. For example, many businesses that provide boat or aircraft access for wildlife viewing and other activities have a low tolerance for the presence of other groups in the same area. The presence of more than two or three other parties in a bay or area may cause such operators to seek other locations. Similarly, resident recreationists who traditionally use an area may be discouraged by businesses operating in the same area. Outfitter/guide businesses are discussed in the next section.

Commercial Outfitter/Guide Use

The Forest Service authorizes outfitter and guiding services to provide for public health and safety and foster successful small businesses. Outfitters and guides are typically skilled and experienced individuals who conduct activities in a manner that protects environmental resources and ensures that national forest visitors receive high-quality services. Due to its remote and rugged nature, recreation use on much of the Tongass requires good outdoor skills and/or specialized equipment. Commercial outfitters and guides provide access and equipment to assist people who might not otherwise be able to pursue certain recreation activities on the Forest. Outfitter/guides on the Tongass range from small family-run operations to larger corporations and non-profit organizations, with activities ranging from fishing and hunting to helicopter flights and photography. Both residents and nonresidents use the services of outfitter/guides, but nonresidents tend to use outfitter/guides more often because they do not have the local knowledge or necessary equipment. Outfitter/guides are authorized to operate on the Tongass through special use permits and are required to report annual use as part of their permit.

While people often participate in several different activities in one or more settings on any given trip, different activities result in different numbers of people in a group and different amounts of time spent on the Forest. At one end of the spectrum, guided bear hunting consists of many small groups of one or two people. (State regulations require non-resident hunters to use guides for hunting brown bear and mountain goats which are present in Southeast Alaska). Hunters are dispersed across a large area and are on the Forest for long periods of time, typically 5 to 10 days, during spring and fall. At the other end of the use spectrum are mid-sized nature-viewing tour boats with relatively large group sizes (from 12 to 70 people). These groups are typically concentrated in a few areas of the Forest. Their use is short-term and typically concentrated in the summer season.

Using information provided by outfitter/guides as part of their permit requirements, the Forest Service compiles data for 143 separate outfitter/guide use areas, which are used to identify and manage recreation use. These use areas are subdivisions of the Guide Use Areas that ADF&G uses to manage commercial big game guiding. Use areas are distinct geographic areas that range in size from about 500 acres to more than 1.3 million acres. Outfitter/guide use areas consist of a mix of IRAs, Wilderness, and LUD II areas, as well as other areas managed for a range of non-development and development use under the 2016 Forest Plan. Thirteen outfitter/guide use areas have no IRA acres and 11 more include less than 100 acres. IRAs make up more than half the total acres of 96 of the 143 use areas (66 percent), with the roadless area share ranging from 51 percent to 100 percent.

A total of 3.1 million outfitter/guide service days were reported on the Tongass from 2013 to 2017, for an annual average of 632,100 service days. Reported use in 2017 was 641,149 service days, higher than the five-year average. Reported use is presented for 2013 to 2017 for the 143 outfitter/guide use areas in Table D-1 in Appendix D. The following sections provide an overview of existing outfitter/guide use by ranger district. More detailed information on outfitter/guide use and management is available in the Outfitter and Guide Management Plan documents that address outfitter/guide use on the Forest (USDA Forest Service 2009b, 2009c, 2012d, 2012e, 2017e).

Admiralty National Monument

Admiralty National Monument is composed of 11 outfitter/guide use areas, 8 of which do not include any IRAs. The roadless share of the other three areas ranges from 14 percent to 31 percent. A total of 14,221 outfitter/guide service days were reported on Admiralty National Monument from 2013 to 2017, for an annual

average of 2,844 service days (Table 3.10-4). Viewed in terms of service days, wildlife viewing at Pack Creek Zoological Area was the most popular activity, accounting for 23 percent of total outfitter/guide use on Admiralty National Monument. Pack Creek Zoological Area is located in the Pack Creek use area, which does not include any roadless areas and would not be affected under any of the alternatives. Freshwater fishing was the next most popular activity making up 21 percent of service days. The Greens Creek use area accounted for almost half (47 percent) of total freshwater fishing service days.

Craig Ranger District

Outfitter/guide data are compiled for the Craig Ranger District as a whole. Approximately 77 percent of the 0.93 million acres that comprise this area are roadless. A total of 9,343 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 1,869 service days. Wildlife viewing was the most popular outfitter/guide activity in this area, accounting for 84 percent of total service days (Table 3.10-4).

Table 3.10-4
Outfitter/Guide Average Annual Use 2013 to 2017 by Ranger District and Activity

	Ranger District									
Reported Activity[1]	Admiralty	Craig	Hoonah	Juneau	Ketchikan-Misty Fjords	Petersburg	Sitka	Thorne Bay	Wrangell	Yakutat
Total Service Days	2,844	1,869	6,079	575,802	17,399	8,266	13,431	1,239	2,346	2,831
Percent of Total by Ranger District										
Camping	1	1	5	0	0	18	5	26	42	1
Fishing	21	2	4	0	3	2	10	23	2	90
Flightseeing	0	0	0	0	36	0	0	0	0	0
Helicopter ski/tours	0	0	0	15	0	0	0	0	0	0
Hiking/Mountaineering	17	0	52	7	31	63	43	28	8	0
Hunting	14	9	1	0	0	6	5	4	1	3
Nature Viewing	1	0	0	0	0	0	2	0	0	0
Non-Motorized Boating	1	0	1	3	3	0	0	0	0	0
Other	0	1	0	2	0	0	5	0	0	0
Remote-Setting Nature Tours	15	2	10	0	12	6	14	3	12	0
Road-Based Activities	0	1	26	0	2	1	15	0	0	0
Sightseeing	7	1	1	0	0	3	1	16	4	2
Visitor Center	0	0	0	71	1	0	0	0	0	0
Wildlife Viewing	23	84	0	0	12	0	0	0	29	0

Note:
[1] Reported activities and service days are from the Forest Service's outfitter/guide database.

Hoonah Ranger District

The Hoonah Ranger District includes 10 outfitter/guide use areas and parts of two others, Tenakee Inlet and West Yakobi Island, which are also partially in the Sitka Ranger District. Four of the 12 areas do not include any roadless areas. The roadless share of the other eight areas ranges from 61 percent to 100 percent. A total of 30,394 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 6,079 service days. Hiking/mountaineering accounted for 52 percent of average annual use. Road-based activities were the second most popular activity (26 percent), followed by remote-setting nature tours (10 percent) (Table 3.10-4). Viewed by use area, hiking/mountaineering service days were concentrated in two use areas, Port Althorp and Idaho Inlet, which together accounted for 81 percent of total service days. Port Althorp also accounted for more than one-third (39 percent) of the remote-setting nature tour visitor days. Road-based activities were concentrated in the Port Frederick and Freshwater Bay areas, which together accounted for 99 percent of total road-based service days.

Juneau Ranger District

The Juneau Ranger District includes 28 outfitter/guide use areas. Three of the 28 areas do not include any roadless areas. The roadless share of the remaining 25 areas ranged from 67 percent to 100 percent. A total of 2,879,009 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 575,802 service days (Table 3.10-4). Visits to the Juneau Ranger District accounted for 91 percent of Forest-wide outfitter/guide service days over this period. Put another way, outfitter/guides using the Juneau Ranger District reported 10 times as many service days as the other nine districts (including Admiralty National Monument) combined. Visits to one use area, Juneau Icefield 4 – Mendenhall Glacier, accounted for 90 percent of reported service days, with the majority of these service days (79 percent) consisting of trips to the Forest Service's Mendenhall Glacier Visitor Center. Helicopter ski/tours accounted for 15 percent of total service days on the Juneau Ranger District and were mainly reported for the seven Juneau Icefield and three Skagway Icefield use areas, with Juneau Icefield 4 – Mendenhall Glacier accounting for almost half (48 percent) of the reported total.

Ketchikan-Misty Fjords Ranger District

The Ketchikan-Misty Fjords Ranger District includes 28 outfitter/guide use areas. Four of the 28 areas do not include any roadless areas, and two more had less than 50 roadless acres each. The roadless share of the remaining 22 areas ranged from 6 percent to 98 percent. A total of 86,997 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 17,339 service days. Flightseeing accounted for 36 percent of service days, followed by hiking/mountaineering (31 percent) (Table 3.10-4). More than 99 percent of flightseeing service days were reported in the Misty Core Lakes use area. This area does not include any roadless areas and would not be affected under any of the alternatives.

Hiking/mountaineering service days on the Ketchikan-Misty Fjords Ranger District were reported for a number of areas, with the largest use occurring in the Betton Island use area, which accounted for about 72 percent of service days in this category. Other important types of use included remote-setting nature tours (12 percent of service days) and wildlife viewing-developed sites (12 percent of service days) (Table 3.10-4). Almost all (98 percent) of the remote setting nature tour service days were reported in the Betton Island use area. Wildlife viewing-developed site service days were all reported for the Margaret Creek Wildlife Viewing Area, which is part of the Margaret Bay outfitter/guide use area.

Petersburg Ranger District

The Petersburg Ranger District includes 20 outfitter/guide use areas, one of which does not include any roadless acres. The roadless share of the remaining 19 areas ranges from 2 percent to 99 percent. A total of 41,328 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 8,266 service days.

Hiking/mountaineering was the most popular outfitter/guide activity (63 percent of service days), followed by camping (18 percent) (Table 3.10-4). Hiking/mountaineering service days were reported for a number of use areas, with relatively large numbers reported for the Thomas Bay/Point Vandeput (30 percent) and Petersburg Creek/Duncan Salt Chuck (25 percent) use areas. Camping service days were reported in almost all of the outfitter/guide use areas on the Petersburg Ranger District.

Sitka Ranger District

The Sitka Ranger District includes 13 outfitter/guide use areas and parts of two others, Tenakee Inlet and West Yakobi Island, which are also partially in the Hoonah Ranger District. Two of the 15 areas include less than 10 roadless acres, with the roadless share of the other 13 areas ranging from 70 percent to 99 percent. A total of 67,156 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 13,431 service days.

Hiking/mountaineering accounted for 43 percent of reported service days, followed by road-based activities (15 percent), and remote-setting nature tours (14 percent) (Table 3.10-4). Two outfitter/guide use areas, the Sitka Area and Kelp Bay use areas, together accounted for more than three-quarters of reported visitor days. Hiking/mountaineering and remote-setting nature tour service days were

concentrated in these use areas, with the Sitka Area also accounting for most of the road-based activity service days. Use in these two areas is discussed in more detail in the *Environmental Consequences* section below.

Thorne Bay Ranger District

Outfitter/guide data are compiled for the Thorne Bay Ranger District as a whole. Approximately 40 percent of the 0.9 million acres that comprise this area are roadless. A total of 6,196 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 1,239 service days.

Hiking/mountaineering, camping, and fishing were the most popular outfitter/guide activities in this area, accounting for 28 percent, 26 percent, and 23 percent of total service days, respectively (Table 3.10-4).

Wrangell Ranger District

The Wrangell Ranger District includes 13 outfitter/guide use areas. Two of the 13 areas had no roadless acres, with the roadless share of the other 11 areas ranging from 40 percent to 99 percent. A total of 11,730 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 2,346 service days. Camping was the most popular outfitter/guide activity, accounting for 42 percent of total service days, followed by wildlife viewing-developed sites (29 percent) and remote-setting nature tours (12 percent) (Table 3.10-4).

Camping service days were reported for most of the use areas. Wildlife viewing-developed site service days were all reported for the Anan Creek wildlife viewing area, which is part of the Anan Creek outfitter/guide use area. Remote-setting nature tour service days were reported for a number of use areas, with the Stikine-LeConte Wilderness use area accounting for 71 percent of the total.

Yakutat Ranger District

The Yakutat Ranger District includes 16 outfitter/guide use areas, with roadless shares ranging from 1 percent to 99 percent. A total of 14,157 outfitter/guide service days were reported from 2013 to 2017, for an annual average of 2,831 service days. Fishing was the most popular outfitter/guide activity accounting for 90 percent of service days (Table 3.10-4). Fishing visitor days were reported for a number of use areas, with the Situk River use area accounting for 71 percent of the total.

Environmental Consequences

Supply of Recreation Opportunities

Recreation Opportunity Spectrum

This EIS is programmatic, meaning that it examines potential effects arising from direction and allowable activities for broad land areas, rather than schedule specific activities in specific locations. The action alternatives would increase the acres available for timber harvest, but harvest levels are expected to remain the same across all alternatives. In addition, while there may be some variation by alternative, the amount of new or reconstructed road miles is expected to be broadly similar across all alternatives.

Alternatives 2 to 6 would result in changes in to the number of suitable old-growth and young-growth acres available for harvest[27] in development LUDs (Timber Production, Modified Landscape, and Scenic Viewshed) presently managed as roadless. Total suitable acres are, therefore, used here as a relative measure of timber opportunity by ROS setting to differentiate between alternatives. They do not represent estimates of how much harvest would occur under each alternative, which, as noted above, is expected to be the same across all alternatives. In addition, harvest projections that assume an even Forest-wide distribution of harvest across suitable acres are used to provide another perspective on potential

[27] Changes in roadless management, areas in development LUDs managed as roadless, and suitable timber are discussed in more detail in the Commercial Outfitter/Guide Use section below.

programmatic changes in ROS settings. Actual harvest locations would depend on the timber sales that are carried out during plan implementation.

As discussed in the preceding affected environment section, the ROS system is designed to help identify and quantify different types of recreation setting on the Tongass and portrays the appropriate combination of activities, settings, and experience expectations along a continuum that ranges from highly modified to primitive environments (Table 3.10-2). Recreational visitors with an expectation of a remote experience would be most affected by timber production in Primitive, SPNM, and SPM settings.

Figure 3.10-1 shows total old-growth suitable acres by ROS setting and alternative. Total old-growth suitable acres would increase relative to Alternative 1 under all five action alternatives, with increases ranging from about 18,000 acres (8 percent) (Alternative 2) to 165,000 acres (72 percent) (Alternatives 5 and 6). The total number of suitable acres would increase for all ROS settings. The largest increase for Alternatives 4 to 6 would occur in the SPNM setting. Large absolute increases would also occur in RM, but RM as a share of total acres decreases as total acres increase, decreasing from almost 90 percent under Alternative 1 to 67 to 68 percent under Alternatives 4 to 6 (Figure 3.10-1).

Young-growth acres suitable for harvest would remain relatively constant across all alternatives. Suitable young-growth acres would range from 334,000 acres for Alternative 1 to 354,000 acres for Alternative 6. More than 90 percent of young-growth suitable for harvest is in the RM setting under all six alternatives.

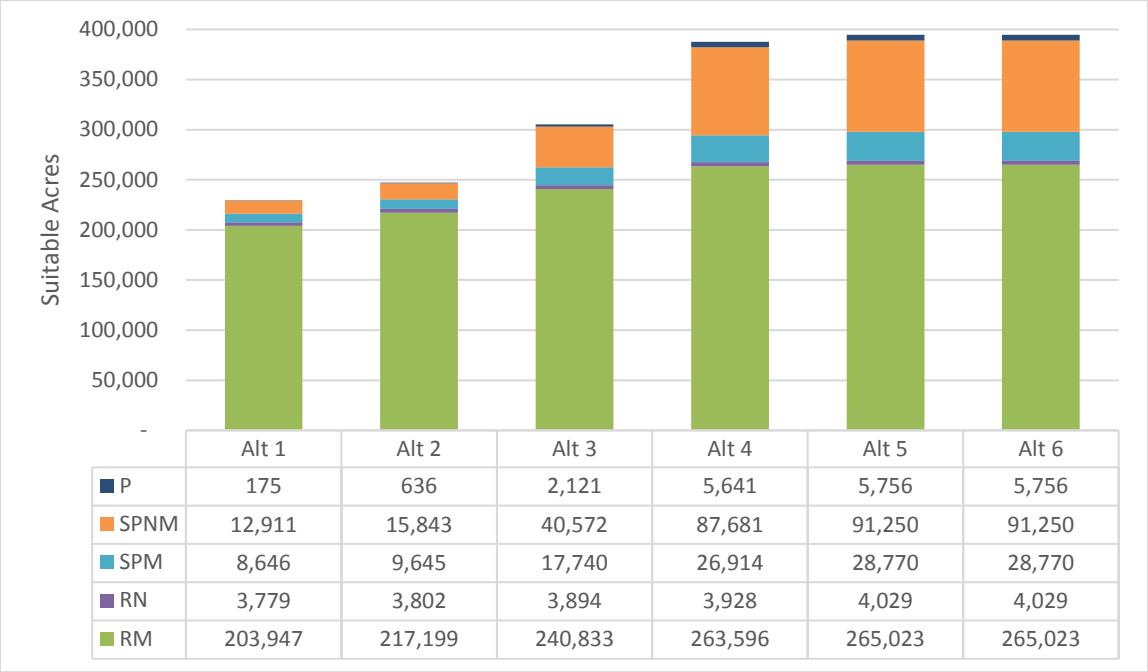
Although the alternatives would vary in terms of the amount and location of acres suitable for timber harvest, the total volumes expected to be harvested would be the same under each alternative. An estimated 42,500 acres of old growth would be harvested over 100 years.[28] As described above, the following analysis assumes that the estimated total number of acres harvested would be the same for each alternative and that harvest would be evenly distributed across the available suitable acres. Using this assumption, RM as a share of the estimated total would decrease relative to Alternative 1 under all alternatives, decreasing from almost 90 percent under Alternative 1 to 67 to 68 percent under Alternatives 4 to 6 (Figure 3.10-2). RM decreases as a relative share under the action alternatives because the share of suitable acres in other ROS settings increases (see Figure 3.10-1). Much of this relative decrease in RM would be made up by an increase in SPNM acres. SPNM as a share of the estimated total would range from about 6 percent under Alternatives 1 and 2 to 23 percent under Alternatives 4 to 6 (Figure 3.10-2).

Using the same assumptions for young growth, an estimated 284,000 acres of young growth would be harvested over 100 years under all alternatives.[29] Harvest would largely be concentrated in RM settings under all six alternatives, with RM accounting for 93 to 96 percent of total harvest acres by alternative.

[28] These estimates of total old growth (42,500 acres) and young growth (284,000 acres) that would be harvested over 100 years were developed as part of the 2016 Forest Plan EIS modeling for the Forest Plan (Alternative 1 in this EIS).

[29] See previous footnote.

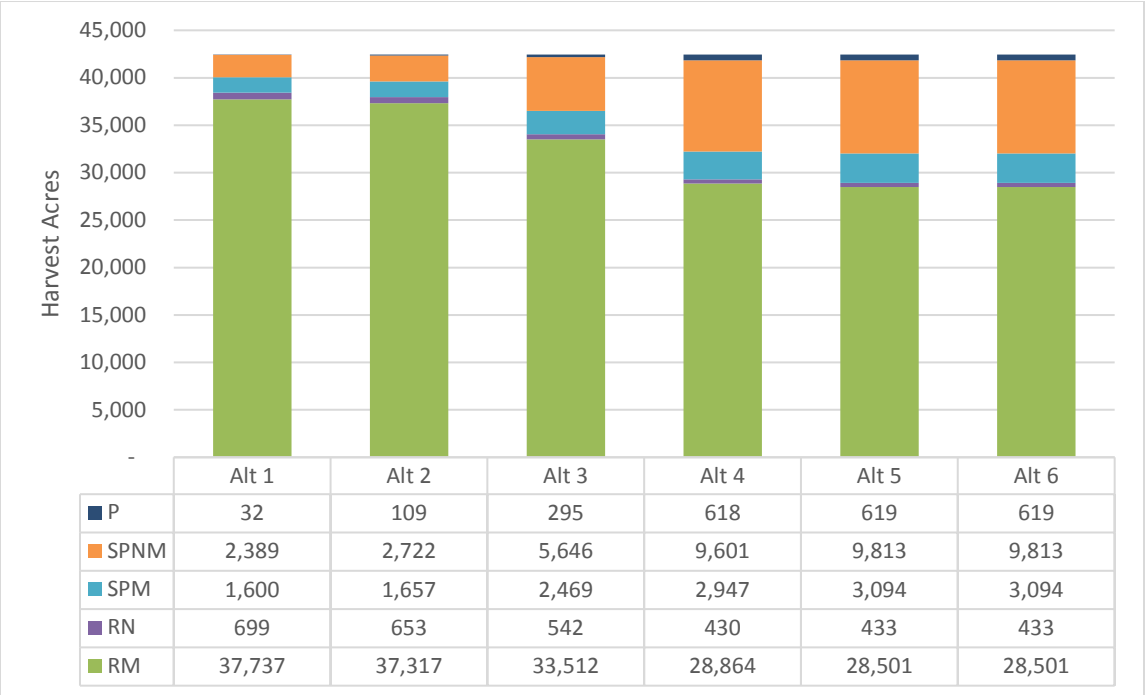
Figure 3.10-1
Old-Growth Suitable Acres by ROS Setting and Alternative



	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
P	175	636	2,121	5,641	5,756	5,756
SPNM	12,911	15,843	40,572	87,681	91,250	91,250
SPM	8,646	9,645	17,740	26,914	28,770	28,770
RN	3,779	3,802	3,894	3,928	4,029	4,029
RM	203,947	217,199	240,833	263,596	265,023	265,023

Note:
[1] Urban (U) and Rural (R) ROS settings are not shown because they each make up a very small share of suitable acres under all six alternatives, less than 10 acres and between 100 and 200 acres, respectively.

Figure 3.10-2
Old-Growth Acres Expected to be Harvested After 100 Years by ROS Setting and Alternative



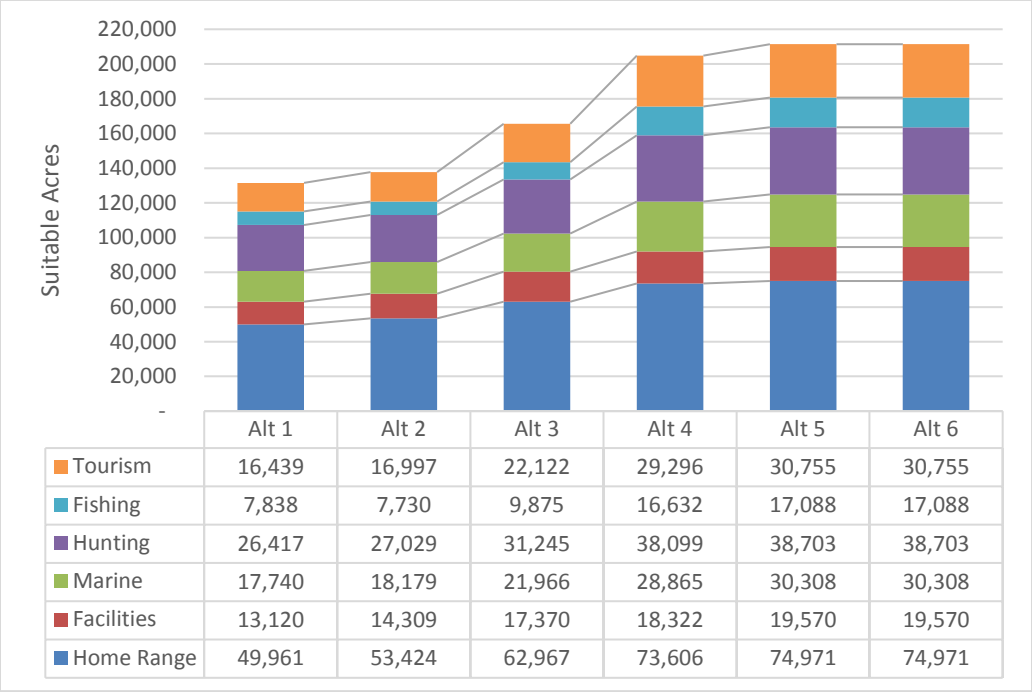
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
P	32	109	295	618	619	619
SPNM	2,389	2,722	5,646	9,601	9,813	9,813
SPM	1,600	1,657	2,469	2,947	3,094	3,094
RN	699	653	542	430	433	433
RM	37,737	37,317	33,512	28,864	28,501	28,501

Recreation Places

As with the preceding ROS assessment, total suitable acres available for harvest are used here as a relative measure of timber opportunity by recreation place to differentiate between alternatives. They do not represent estimates of how much harvest would occur under each alternative, which is expected to be the same across all alternatives. Figure 3.10-3 shows total old-growth suitable acres by important recreation place and alternative. Total old-growth suitable acres in recreation places would increase relative to Alternative 1 under all five action alternatives. The total number of suitable old-growth acres would increase for all recreation place categories. The largest absolute increases would occur in home range recreation places, with net increases of approximately 25,000 suitable old-growth acres under Alternatives 5 and 6. Home range recreation places are those inventoried recreation places within an approximate 20-mile radius of one or more communities. Large increases would also occur under Alternatives 5 and 6 in recreation places important for marine use, hunting, and tourism, with net gains of about 12,000 to 14,000 suitable old-growth acres (Figure 3.10-3).

Total young-growth acres suitable for harvest would remain relatively constant across all alternatives, with the largest increase anticipated for home range recreation places under Alternative 6, a net gain of almost 4,000 acres.

Figure 3.10-3
Old-Growth Suitable Acres by Recreation Place Category and Alternative



	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Tourism	16,439	16,997	22,122	29,296	30,755	30,755
Fishing	7,838	7,730	9,875	16,632	17,088	17,088
Hunting	26,417	27,029	31,245	38,099	38,703	38,703
Marine	17,740	18,179	21,966	28,865	30,308	30,308
Facilities	13,120	14,309	17,370	18,322	19,570	19,570
Home Range	49,961	53,424	62,967	73,606	74,971	74,971

Note:
[1] Recreation place categories are not mutually exclusive. A recreation place can be rated as important in more than one category.

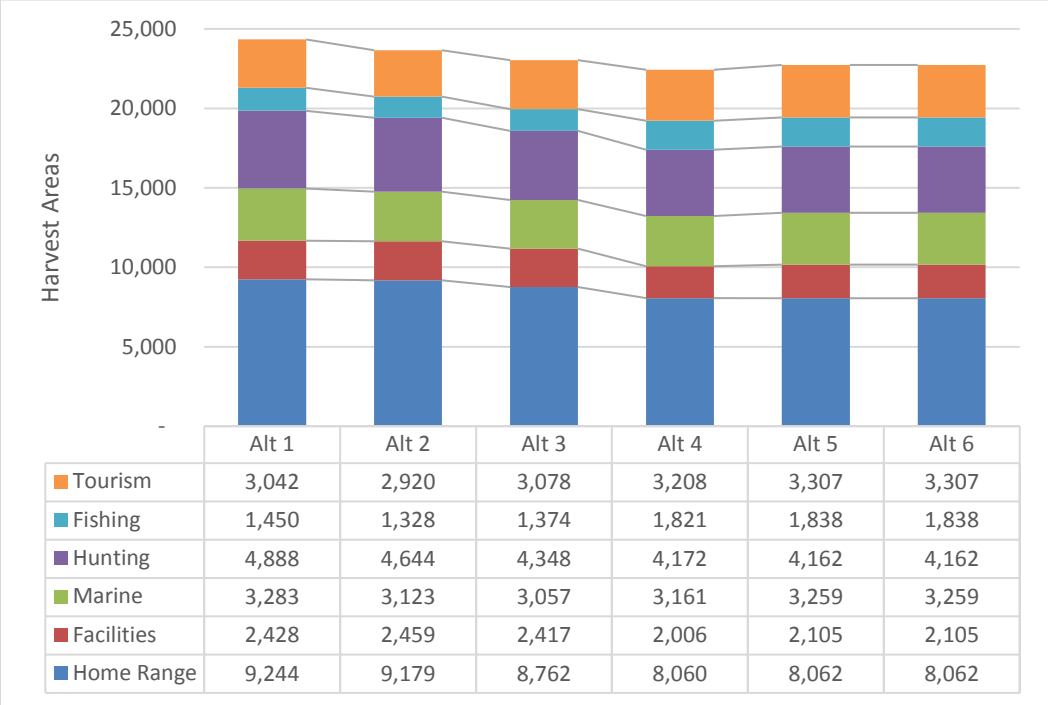
As discussed with respect to ROS settings, although the alternatives would vary in terms of the amount and location of acres suitable for timber harvest, the total volumes expected to be harvested would be the same under each alternative. The following analysis assumes that the estimated total number of acres harvested over 100 years would be the same for each alternative and that harvest would be evenly distributed across available suitable acres, including those that coincide with important recreation places. Based on these assumptions, the acres of old-growth acres harvested within four of the recreation place categories (home range, facilities, marine, and hunting) would mostly decrease relative to Alternative 1 (Figure 3.10-4). This relative decrease would occur because old-growth acres in these recreation places would make up a smaller share of total Forest-wide suitable old-growth acres (as shown in Figure 3.10-3).

Old-growth acres harvested in recreation places important for fishing and tourism would be expected to increase relative to Alternative 1.

Using the same assumptions for young-growth, total acres harvested in important recreation place over 100 years would be similar across all alternatives, decreasing by 1 to 3 percent relative to Alternative 1.

Overall, the total share of recreation place acres that would be harvested over 100 years would be small under all alternatives. Viewed as a share of total recreation place acres in each category, estimated old-growth and young growth harvest would range from about 2 percent (facilities and tourism) to 4 percent (home range and fishing) of total acres, with harvest in the other two categories (marine and hunting) equivalent to about 3 percent of total acres. Total acres by category are shown in Table 3.10-3. Actual harvest locations would depend on the timber sales that are carried out during plan implementation.

Figure 3.10-4
Old-Growth Acres Expected to be Harvested After 100 Years by Recreation Place Category and Alternative



	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Tourism	3,042	2,920	3,078	3,208	3,307	3,307
Fishing	1,450	1,328	1,374	1,821	1,838	1,838
Hunting	4,888	4,644	4,348	4,172	4,162	4,162
Marine	3,283	3,123	3,057	3,161	3,259	3,259
Facilities	2,428	2,459	2,417	2,006	2,105	2,105
Home Range	9,244	9,179	8,762	8,060	8,062	8,062

Note:
[1] Recreation place categories are not mutually exclusive. A recreation place can be rated as important in more than one category.

Recreation Use

As noted above, this EIS evaluates direction and allowable activities for broad land areas, rather than authorizing specific activities in specific locations. Actual timber harvest locations and associated road development activities would depend on the timber sales that are carried out during plan implementation. Further, timber harvest levels are expected to be similar under all alternatives. This makes it difficult to evaluate the effects of the alternatives on particular groups of recreation users or resources. The following discussion addresses potential impacts at the programmatic or Forest-scale and assesses relative potential impacts in terms of suitable acres available for harvest as a measure of potential timber opportunity. Forest-wide suitable acres are shown by alternative in Maps 7 to 12 (on thumb drive or website).

Changes in roadless area designations have the potential to affect the spatial distribution of future development activities, especially timber harvest. Figure 3.10-1 indicates that Alternatives 4 to 6 would result in

relatively large increases in suitable old-growth acres available for harvest in SPNM ROS settings, as well as RM settings. If projected harvest over the next 100 years for each alternative were distributed evenly across forest-wide suitable acres available for harvest, the share of harvest in Primitive, SPM, and especially SPNM settings would increase relative to Alternative 1 under all the action alternatives with the largest increases occurring under Alternatives 4 to 6 (Figure 3.10-2). Similarly, the number of suitable acres available for harvest in important recreation places would increase relative to Alternative 1 under all action alternatives with the largest increases under Alternatives 4 to 6 (Figure 3.10-3).

Timber harvest and associated road construction in Primitive and Semi-Primitive (SPNM and SPM) ROS settings has the potential to affect recreation activities and users dependent on remote, natural settings with low to no evidence of human use. Harvest in these settings could affect the quality of the recreation experience and displace visitors to other parts of the Forest. These types of impacts are likely to occur in Primitive, SPNM, and SPM ROS settings in recreation places, especially in "home range" recreation places (i.e., those within approximately 20 miles of communities). Impacts are likely to be most acute in Primitive and Semi-Primitive areas where recreation use is already at or near capacity, including areas where competition already exists between resident recreationists, independent visitors, and commercial outfitter/guide operations. Commercial outfitter/guide use is discussed in more detail below.

Changes in roadless area designations could also indirectly affect nearby Primitive and Semi-Primitive ROS settings, as displaced recreationists seek other locations with similar qualities. In addition to long-term impacts in Primitive and Semi-Primitive settings, in the short term, resident and other recreationists could be displaced by logging operators in the nearby vicinity, with the presence of logging equipment potentially affecting access and the overall quality of the recreation experience. This type of short-term impact would potentially affect recreationists across all ROS settings.

The alternatives evaluated here could also result in different supply-induced changes in participation. In the past, supply-induced changes in participation on the Tongass have been mainly related to changes in road systems and road access. This type of change in participation appears to have occurred on Prince of Wales, Wrangell, and Mitkof Islands, for example. In these locations, road systems developed for timber harvesting created an opportunity for road-related access to previously inaccessible recreation settings and, therefore, an opportunity for recreation activities involving wheeled vehicles. In addition, new roads that provide easier access to a wider area may create new semi-primitive opportunities that increase the capacity of a recreation place or create a new recreation place. Over time, continuation of such new opportunities would be dependent on the availability of funds for road maintenance and other system management needs.

There would be some new road access in the long term under all alternatives. In addition, the Community Priority ARA (Alternative 3) would allow road construction and reconstruction in conjunction with the construction, expansion, or maintenance of a developed recreation site. Nearly all new roads constructed under the alternatives would be closed following harvest. These roads would, therefore, not be available for use by highway vehicles or high-clearance vehicles. They may, however, be available for access by other methods and would, as a result, have the potential to affect existing recreation patterns. Any potential increase in recreational access may be limited by the extent to which road closures include restoring the road bed to a more natural condition, possibly blocking or discouraging non-vehicle access as well. The action alternatives would increase the acres available for timber harvest, but harvest levels are expected to remain the same across all alternatives. As a result, the amount of new or reconstructed road miles would be similar across the alternatives, but would be lowest under Alternatives 1 and 2 and highest under Alternatives 4, 5, and 6. Alternative 3 would likely result in more roads than Alternatives 1 and 2, and fewer than Alternatives 4 to 6. In addition, based on the distribution of suitable acres, Alternatives 4 to 6 would be more likely to result in new road construction in Primitive or Semi-Primitive ROS settings.

Commercial Outfitter/Guide Use

Land management activities that affect the natural appearance of the landscape have the potential to affect outfitter/guide operations that provide commercial recreation opportunities on the Forest. Impacts to existing outfitter/guide use are likely to be greatest where changes in roadless designations allow

development in remote areas that are used for outfitter/guide activities dependent on high scenic integrity and undisturbed landscapes.

Changes in roadless area designations could also affect outfitter/guide use in other adjacent or nearby areas as outfitter/guides displaced from one location seek other places to take clients. Some use areas are currently at capacity, which could serve to exacerbate potential displacement effects. Long-term changes in roadless area management could affect the Forest's ability to meet future outfitter/guide demand, especially for operators seeking more remote areas. In the short term, commercial recreation operators could be displaced by logging operations in the nearby vicinity, with the presence of logging equipment and related noise affecting the quality of the recreation experience.

The following analysis assesses potential impacts to the 143 outfitter/guide use areas that the Forest Service uses to manage outfitter/guide use using three primary measures by alternative: 1) change in acres managed as roadless; 2) change in acres in development LUDs managed as roadless; and 3) change in suitable old-growth acres available for harvest. As described below, a screening review based on existing outfitter/guide use and changes in suitable old-growth acres is used to help focus on a smaller group of outfitter/guide use areas for more detailed review.

Changes in Roadless Area Acres

The change in acres managed as roadless provides a broad overview of the changes in the current management situation by outfitter/guide use area. Changes in roadless acres are presented by outfitter/guide use area and alternative in Table D-2 in Appendix D.

Under Alternative 3, roadless designation would be removed from "roaded roadless" and "logical extension" areas, as discussed in Chapter 2. Alternative 3 would also remove protection from the 826,000 LUD II acres that are currently within an IRA. LUD II acres removed from roadless designation would still retain their congressionally-designated protections, which require that these areas be managed in a roadless state to retain their wildland character. Therefore, decreases shown for Alternative 3 tend to overstate the amount of acres that would no longer be protected.

Two sets of estimates are provided for Alternative 4. Three ARAs would be designated under this alternative: LUD II Priority, Roadless Priority, and Timber Priority. The Timber Priority ARA would exempt timber harvest and road construction. The first set of estimates (4a) shows the net change in acres classified as roadless; the second set (4b) also subtracts the acres that would be managed as Timber Priority ARA because road construction would be allowed in these areas.

Changes in Acres in Development LUDs Managed as Roadless

Not all acres removed from roadless management would be available for development. LUD II acres removed from roadless designation under Alternative 3, for example, would, as noted above, still retain their congressionally-designated protections, which require that these areas be managed in a roadless state to retain their wildland character. Other areas removed from roadless designation occur in non-development LUDs, such as Old-growth Habitat and Remote and Semi-remote Recreation, which do not allow old-growth timber harvest. The change in acres in development LUDs managed as roadless serves as a measure of development potential.

Development LUDs for the purposes of this analysis are Timber Production, Modified Landscape, and Scenic Viewshed. These three LUDs all allow timber production, with Timber Production generally considered an intensive development LUD and Modified Landscape and Scenic Viewshed considered moderate development LUDs. Approximately 6.7 percent (1,176,000 acres) of the Forest is presently managed in development LUDs without roadless designation. This total does not include development LUD acres that are presently in IRAs. Total development LUD acres without roadless designation would increase under all action alternatives, with net gains ranging from about 34,600 acres (Alternative 2) to 2.1 million acres (Alternatives 5 and 6), as areas are removed from roadless designation.

Changes in development LUDs are presented by outfitter/guide use area and alternative in Table D-3 in Appendix D.

Changes in Suitable Timber

Not all lands allocated to development LUDs are available for timber management. As described in Appendix A to the 2016 Forest Plan (USDA Forest Service 2016a), old-growth forest located within Phases 2 and 3 of the Tongass Timber Sale Program Adaptive Management Strategy or within the Tongass 77 (T77) Watersheds and The Nature Conservancy (TNC)/Audubon Conservation Priority Areas is identified as not suitable for timber production. As a result, not all increases in development LUD acres would provide additional opportunities for timber harvest. Changes in suitable old-growth and young-growth acres available for harvest are, therefore, used as a relative measure of timber opportunity to differentiate between alternatives (see Tables D-3 and D-4 in Appendix D, respectively). Forest-wide, approximately 229,600 acres are presently considered suitable old-growth available for harvest. This total would increase under all the action alternatives, with gains ranging from about 17,700 acres (Alternative 2) to 158,400-165,400 acres (Alternatives 4 to 6). Approximately 334,000 acres are considered suitable for young-growth harvest, with estimated increases ranging from about 10,300 acres (Alternative 2) to 20,000 acres (Alternative 6).

When viewing changes in suitable timber available for harvest, it is important to note that suitable acres in this context serve as a relative measure of timber resources that would be potentially available under the current Forest Plan by alternative. They do not represent estimates of how much harvest would occur under each alternative. Actual harvest locations would depend on the timber sales that are carried out during plan implementation. Elsewhere in this EIS, including the preceding ROS and recreation place analyses, harvest projections that assume an even Forest-wide distribution of harvest across suitable acres are used to assess potential impacts. The assessment presented here differs in that it is concerned with identifying change in potential timber opportunity, rather than the potential Forest-wide distribution of harvest, and, therefore, focuses on changes in suitable acres.

Effects on Selected Outfitter/Guide Use Areas

The following analysis uses changes in suitable old-growth acres in conjunction with information on existing outfitter/guide use to help focus on potentially affected areas. Changes in suitable old-growth acres are presented by outfitter/guide use area and alternative in Table D-4 in Appendix D. Reported service days for 2013 to 2017 are presented for each outfitter/guide use area in Table D-1 in Appendix D. Not all of the outfitter/guide use areas were used over the past 5 years; a number do not include any roadless acres; others include roadless acres, but none are suitable for old-growth harvest; and others would see little change in suitable old-growth acres by alternative. A screening review based on these factors identified 15 outfitter/guide use areas where potential conflicts between existing outfitter/guide use and future management could occur based on recent patterns of existing use. These are outfitter/guide use areas with recent outfitter/guide use where there would be increases in suitable old-growth acres under one or more of the action alternatives. Areas with no or limited existing use and no or small estimated changes in suitable old-growth acres relative to Alternative 1 were removed from further review. A majority of the areas removed had no or minimal change in suitable old-growth acres under all five action alternatives (see Table D-4 in Appendix D).

This screening was undertaken to help focus on potentially affected areas as part of this programmatic review and is not meant to imply that potential conflict between changes in roadless management and outfitter/guide use would be limited to the 15 identified areas only. Outfitter/guide use could also be affected in site-specific locations in other areas. Further, changes in roadless area designations in one or more of the 15 identified outfitter/guide use areas could indirectly affect use in adjacent or nearby areas as displaced outfitter/guides seek other places to take clients. It is also important to note that the screening review looked at recent outfitter/guide use only, and did not consider future patterns of outfitter/guide use or Forest Service outfitter/guide management actions.

The 15 areas identified for further discussion are identified in Table 3.10-5, which also identifies the total number of acres in each area and the share presently in IRAs and provides a summary of reported service days for 2013 to 2017. Eight of the 15 identified outfitter/guide use areas are located on the north part of the Forest, in the Juneau, Sitka, and Hoonah Ranger Districts. The remaining seven areas include the entire Craig and Thorne Bay Ranger Districts, and outfitter/guide use areas on the Petersburg (four areas) and Ketchikan-Misty Fjords (one area) Ranger Districts. These areas are identified in Figure 3.10-

5, which shows these areas along with the areas presently in development LUDs not managed as roadless. These 15 areas and the other 128 outfitter/guide use areas are shown on Map 13, which also shows existing roadless areas and suitable old-growth and young-growth acres presently available for harvest.

Table 3.10-5
Total Area, Percent Roadless, and Reported Service Days for Selected Outfitter/Guide Use Area

			Reported Service Days						
Outfitter/Guide Use Area	Total Acres	Percent in IRA	2013	2014	2015	2016	2017	Grand Total	Annual Average
01-03 East Chilkats	361,545	67%	446	454	179	146	246	1,471	294
04-03 Sitka Area	345,862	85%	5,213	4,733	6,005	5,614	6,597	28,162	5,632
04-04A Rodman Bay	75,427	60%	250	428	385	347	508	1,918	384
04-04B Kelp Bay	144,680	89%	4,048	4,427	5,316	5,343	5,494	24,628	4,926
04-11A Port Frederick	112,512	77%	10	15	78	1,358	3,021	4,482	896
04-11B Freshwater Bay	160,078	61%	178	228	1,838	2,235	2,468	6,947	1,389
04-12 Tenakee Inlet	312,370	79%	95	89	108	230	407	929	186
04-13 Peril Strait	232,130	72%	744	1,057	1,473	1,254	1,368	5,896	1,179
CRD 00 Craig Ranger District	925,876	77%	2,574	1,920	2,125	1,798	926	9,343	1,869
K19 North Revilla	70,401	83%	217	269	101	286	193	1,066	213
P01 Mitkof Island	109,302	32%	1,179	1,106	1,105	681	568	4,639	928
P08 North Lindenberg Peninsula	75,605	78%	200	227	482	224	255	1,388	278
P12B Kuiu Island Road System	134,852	31%	167	91	174	156	108	696	139
P21 Muddy River Area	63,357	68%	474	330	411	263	257	1,735	347
TBRD 00 Thorne Bay Ranger District	901,507	40%	1,872	1,495	953	1,006	870	6,196	1,239

The following sections assess potential impacts by alternative to existing outfitter/guide use in each of the 15 identified areas. This assessment is a programmatic review based on the distribution of suitable old-growth and young-growth acres available for harvest by alternative, and locations where outfitter/guides have reported use as part of their permit requirements. Reported outfitter/guide use information includes number of groups and service days, primary activity, and usually a named location (e.g., Teardrop Creek, Mirror Creek, Mosquito Cove Trail). This location information is useful at the programmatic level, but does identify actual patterns of outfitter/guide use, which may extend over relatively large areas, depending on the activity. It is also important to note that the 15 outfitter/guide use areas identified are large areas ranging from about 63,000 acres to more than 900,000 acres in size. All 15 areas are larger than the District of Columbia and the two largest areas (Craig Ranger District and Thorne Bay Ranger District) are each larger than the state of Rhode Island. Use in some of these areas involves multiple outfitter/guides, activities, and locations. Potential conflict could occur in multiple locations in each area. The following assessment is not a site-specific review, rather it uses available information to illustrate broad patterns of use and differentiate between alternatives. More detailed information on outfitter/guide use and management is available in the Outfitter and Guide Management Plan documents that address outfitter/guide use on the Forest (USDA Forest Service 2009b, 2009c, 2012d, 2012e, 2017e).

With these caveats in mind, the following review found that in almost all of these areas existing outfitter/guide use occurs on or near shorelines and along Forest road systems where development has occurred in the past. Viewed in terms of increases in acres suitable for harvest, impacts under Alternatives 2 and 3 would be minimal in all areas, with increases in roadless acres and reductions in suitable acres occurring in some areas under these alternatives. Alternatives 4 to 6 would add similar numbers of suitable acres in all areas. In most cases, additions under Alternatives 4 to 6 would expand areas of existing suitable acres around an existing road system, for example, rather than open-up new

areas for potential harvest. For old-growth this is at least partially due to the definition of suitable, which allows harvest only in Phase 1 of the Tongass Timber Sale Program Adaptive Management Strategy and excludes the T77 Watersheds and TNC/Audubon Conservation Priority Areas, as noted above. These exclusions result in roadless restrictions being removed in development LUDs, with no corresponding increase in suitable acres.

In most of the following outfitter/guide use areas, harvest that could already occur in these areas (under Alternative 1) has the potential to conflict with existing outfitter/guide use. By expanding the acres available for harvest, Alternatives 4 to 6 could directly add to these potential impacts by increasing the number and geographic extent of the acres affected. The addition of acres could also improve the economics of a potential timber sale, increasing the potential for a sale to be proposed in that area.

Areas in development LUDs without roadless designations are shown for the six alternatives in Figures 3.10-5 to 3.10-10, which also highlight the 15 outfitter/guide use areas discussed below. More detailed maps showing suitable old-growth and young-growth acres available for harvest for each alternative and outfitter/guide use area are provided as Maps 13 to 18 (on thumb drive or website).

Figure 3.10-5
Alternative 1 with 15 Selected Outfitter/Guide Use Areas

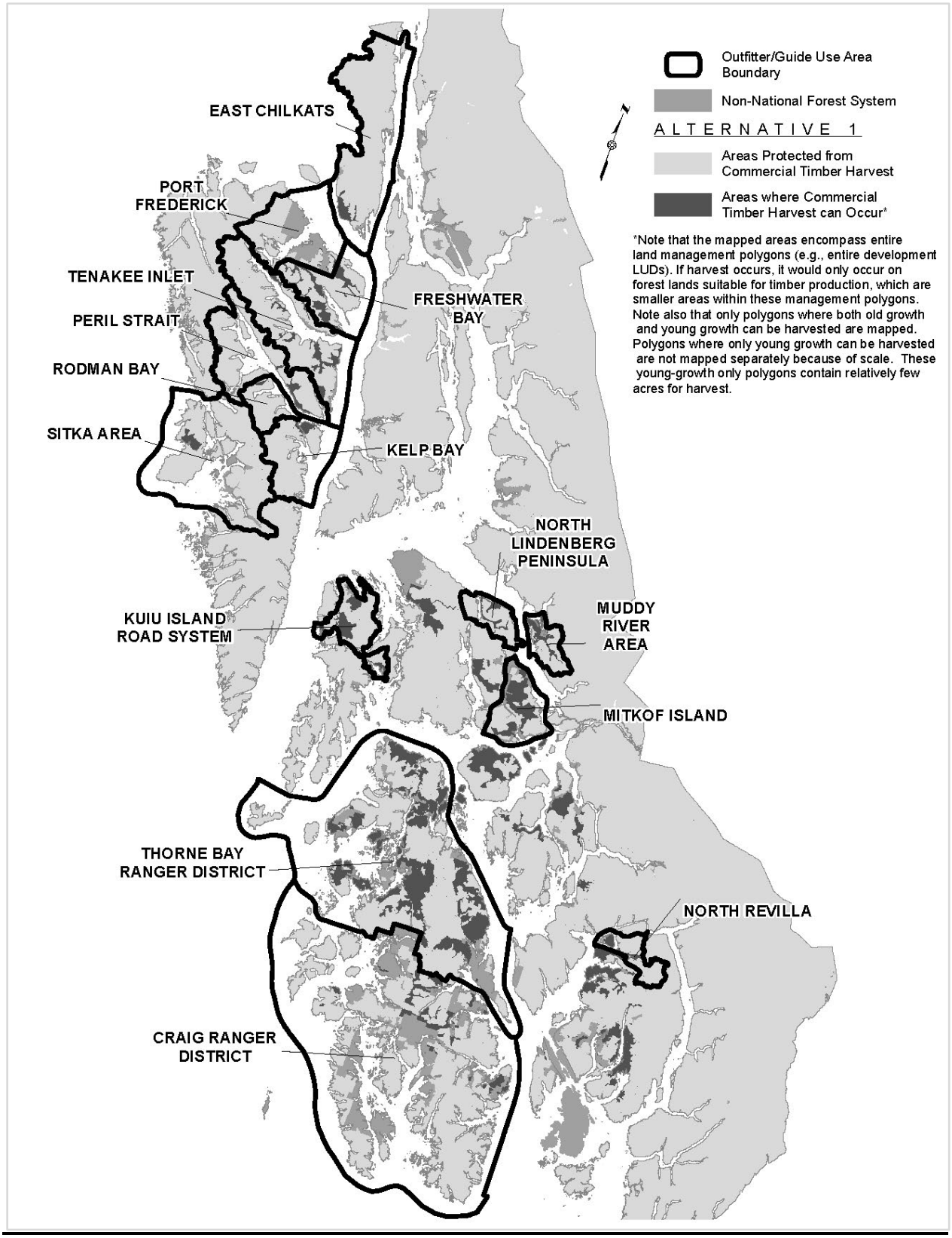


Figure 3.10-6
Alternative 2 with 15 Selected Outfitter/Guide Use Areas

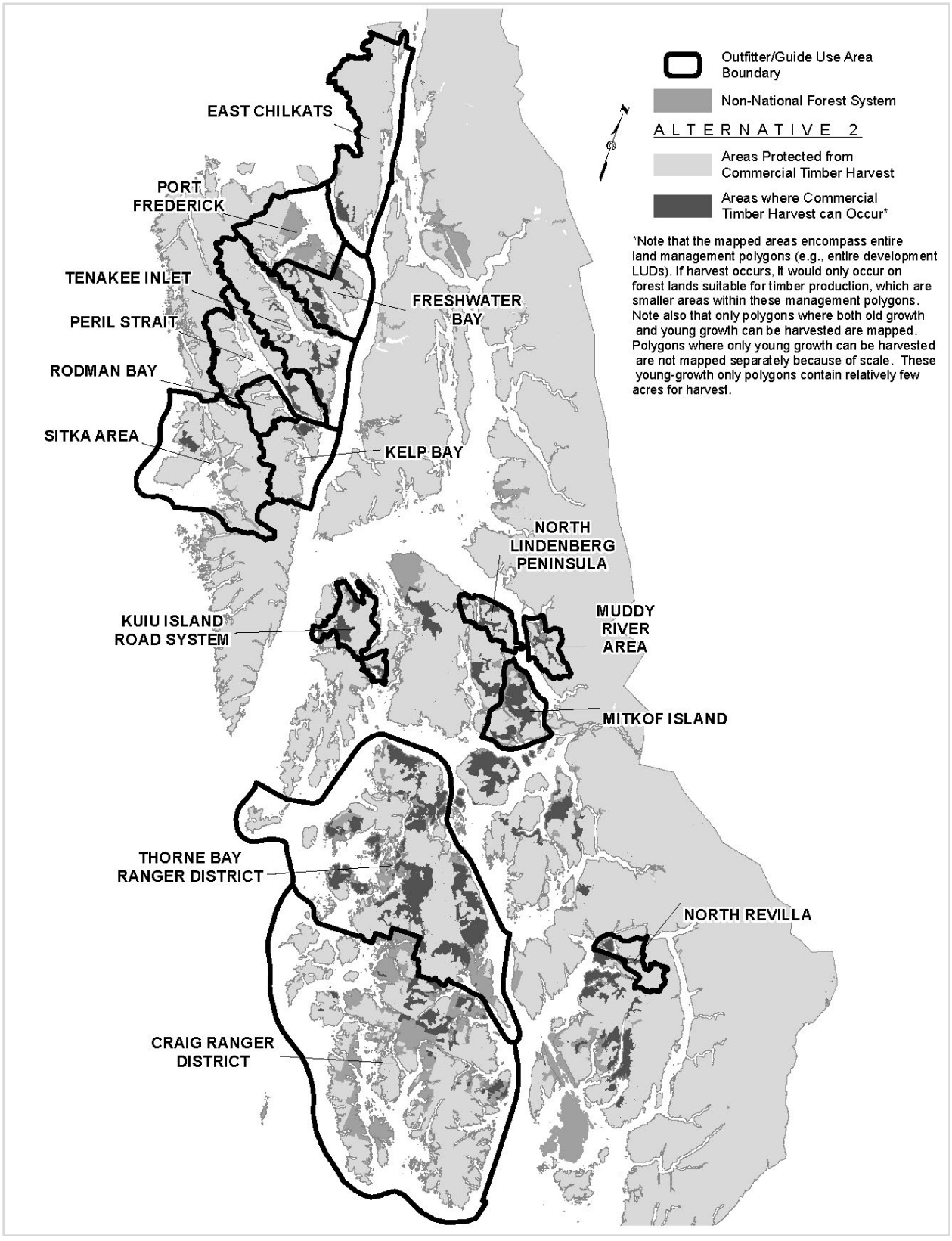


Figure 3.10-7
Alternative 3 with 15 Selected Outfitter/Guide Use Areas

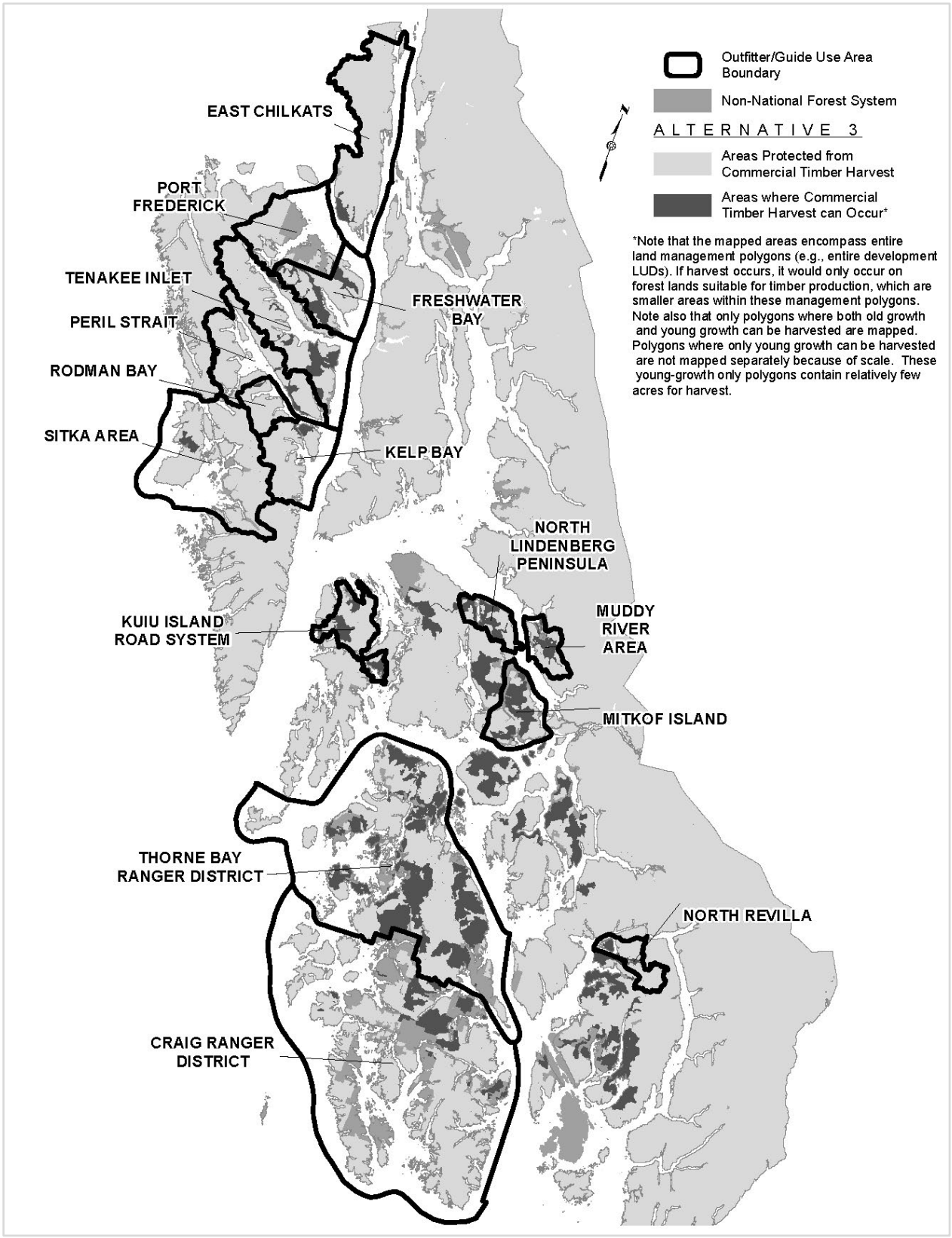


Figure 3.10-8
Alternative 4 with 15 Selected Outfitter/Guide Use Areas

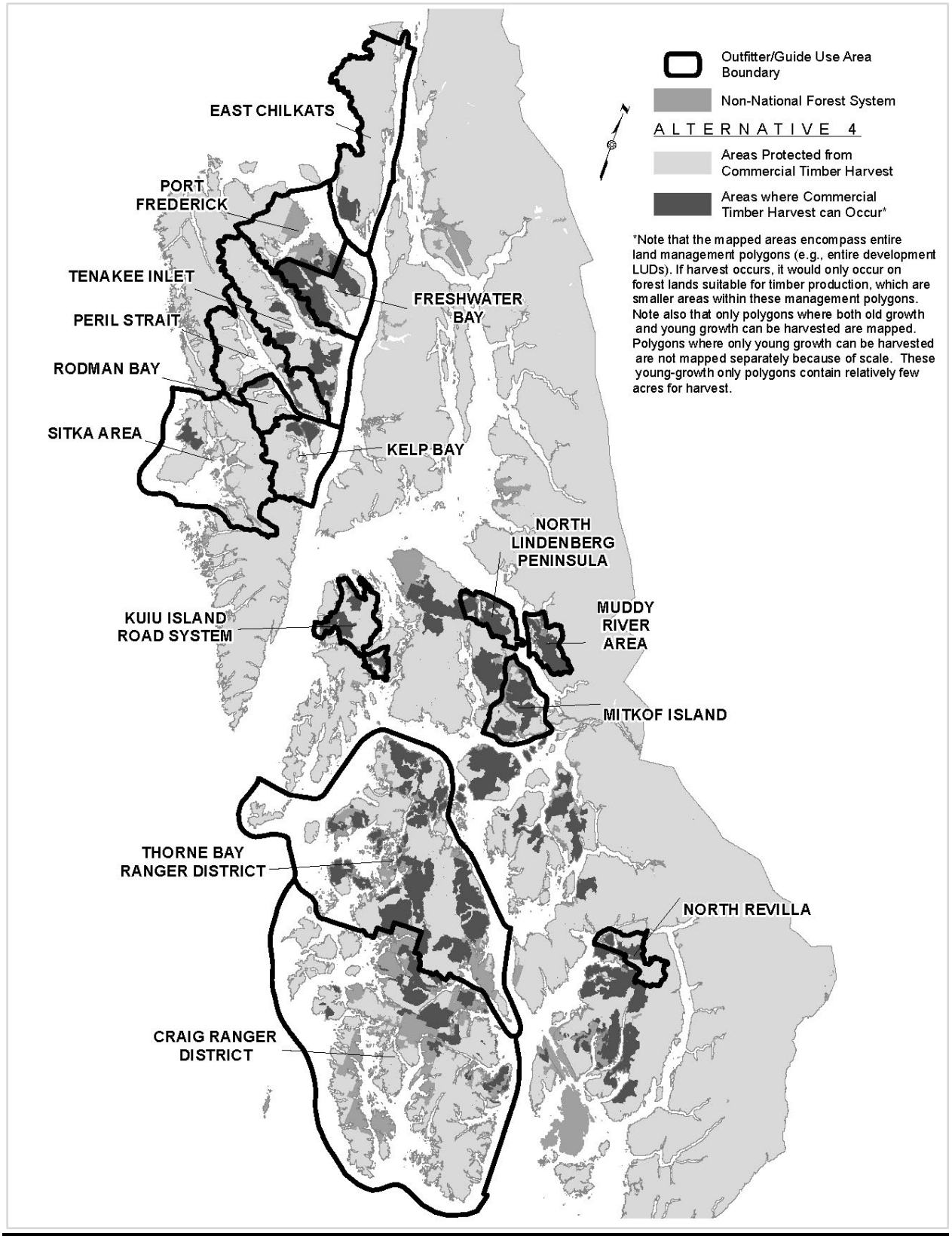


Figure 3.10-9
Alternative 5 with 15 Selected Outfitter/Guide Use Areas

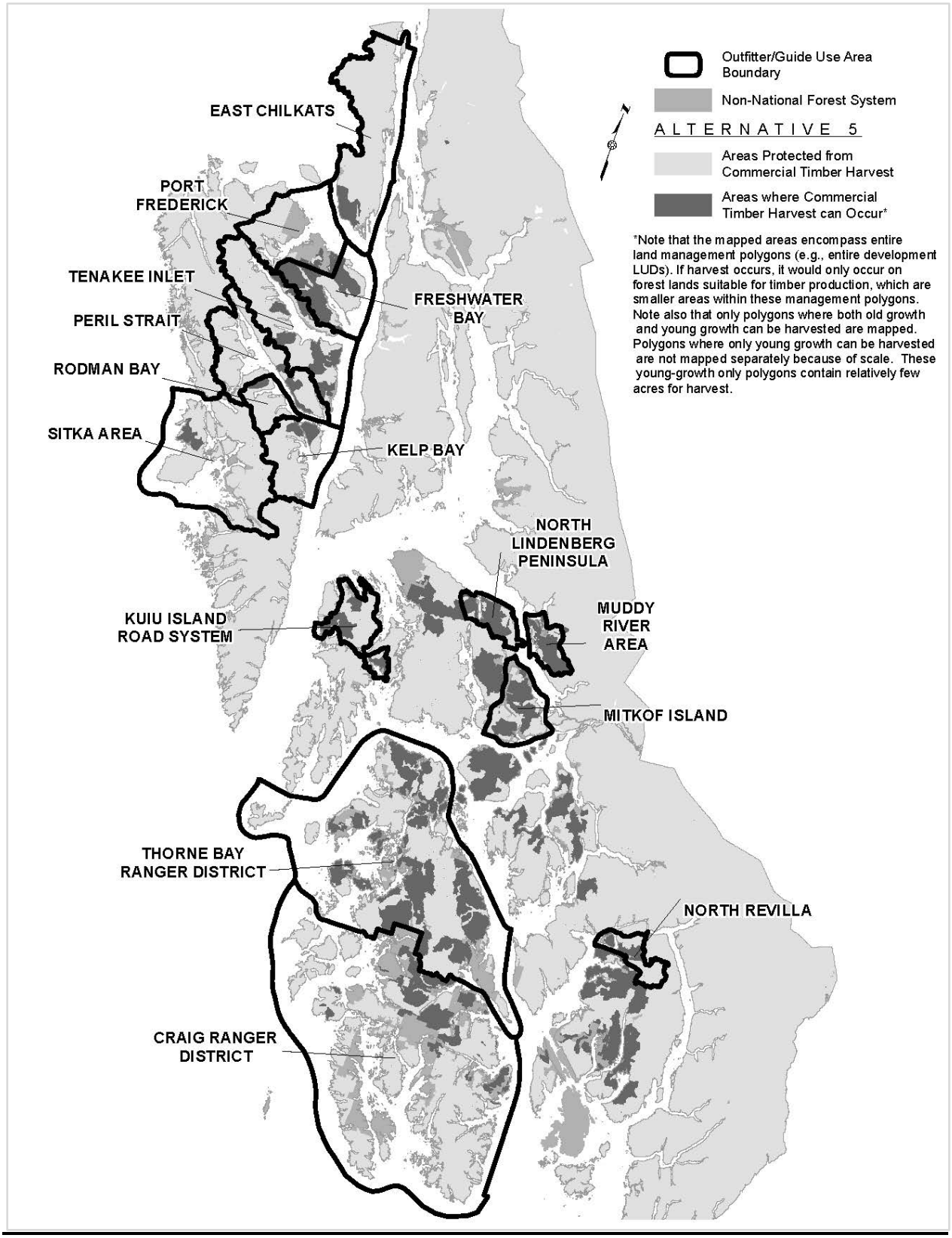
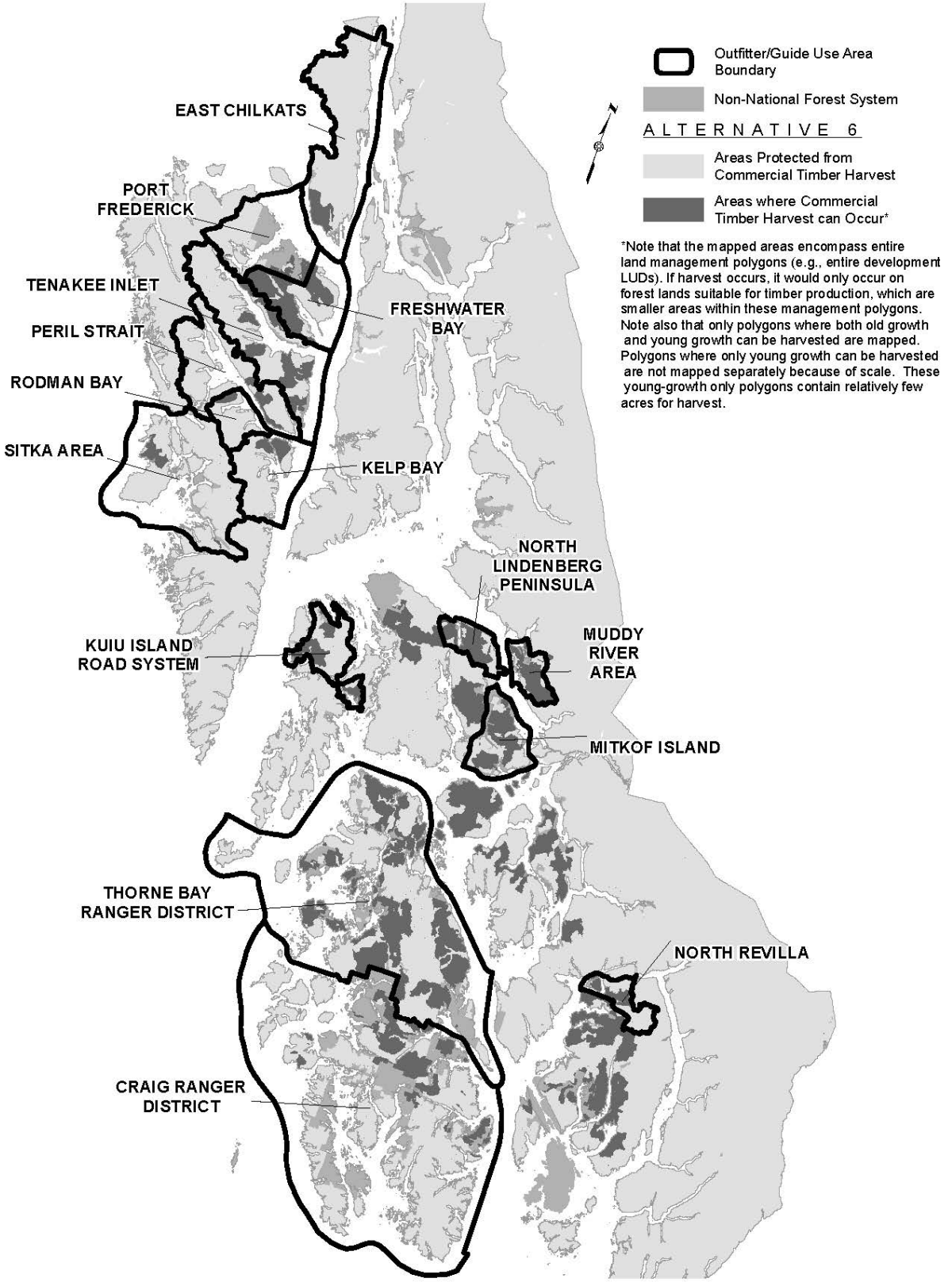


Figure 3.10-10
Alternative 6 with 15 Selected Outfitter/Guide Use Areas



01-03 East Chilkats

The East Chilkats outfitter/guide use area is located on the Juneau Ranger District and consists of 361,545 acres, almost two-thirds of which (67 percent) are located in IRAs (Table 3.10-6). Located on the south end of the Chilkat Peninsula, this use area is bordered to the west by Glacier Bay National Park and Lynn Canal to the east, with the Endicott River Wilderness located alongside the north part of the area. An existing logging road system is located at the southern end of the area.

Seven outfitter/guides reported use in this area from 2013 to 2017, two of which used the area regularly (4 out of 5 years). An annual average of 294 service days were reported over this period (Table 3.10-6). The majority of the use involved one operator conducting guided freshwater fishing trips. Fishing accounted for the majority (86 percent) of reported service days, followed by hiking/mountaineering (11 percent). Use was reported at 12 locations, with Teardrop Creek accounting for 36 percent of reported service days, followed by Couverden Creek (31 percent) and Mirror Creek (19 percent).

The East Chilkats use area includes about 16,700 acres of lands in development LUDs outside of roadless, with about 6,350 acres of suitable old-growth available for harvest and 3,800 acres of suitable young-growth. Existing suitable old-growth acres are concentrated around the existing logging road system at Point Couverden on the south end of the peninsula. Suitable young-growth is also located along this road system and along the shorelines near Excursion Inlet on the west side, and near St James Bay and Sullivan Island to the east.

Table 3.10-6
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the East Chilkats Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	242,377	-1,975	-1,975	-1,975	-49,984	-242,377
Development LUDs – Not Roadless[2]	16,662	1,880	1,880	1,880	49,885	49,885
Suitable Old Growth	6,355	256	256	3,420	4,341	4,341
Suitable Young Growth	3,791	688	688	688	1,055	1,091

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the East Chilkats use area would decrease under the action alternatives, with decreases ranging from about 2,000 acres (Alternatives 2, 3, and 4) to about 242,400 acres under Alternative 6, which would remove roadless designation from all lands. Alternative 5 would remove roadless designation for about 50,000 acres (Table 3.10-6). Increases in the number of acres in development LUDs without roadless designation would range from 1,880 acres (Alternatives 2 to 4) to 49,885 acres (Alternatives 5 and 6). Increases in suitable old-growth would range from less than 300 acres (Alternatives 2 and 3) to about 4,300 acres (Alternatives 5 and 6). Suitable young-growth acres would increase from about 700 acres (Alternatives 2 to 4) to 1,100 acres (Alternatives 5 and 6) (Table 3.10-6).

Suitable old-growth and young-growth acres would be added in and around the existing road system under all alternatives. Alternatives 5 and 6 would add more suitable old growth along the Excursion Inlet shoreline north of the past harvest area. Young-growth acres would also be added along the shoreline, north of William Henry Bay (all action alternatives) and south of Lynn Sisters (Alternatives 5 and 6). Harvest near Lynn Sisters under Alternatives 5 and 6 could conflict with existing outfitter/guide use in that area. Fishing at Lynn Sisters accounted for about 10 percent of reported service days from 2013 to 2017.

04-03 Sitka Area

The Sitka Area outfitter/guide use area is located on the Sitka Ranger District and consists of 345,562 acres, 85 percent of which are located in IRAs (Table 3.10-5). This use area includes Sitka and northwest

Baranof Island from north of Fish Bay to south of Three Entrance Bay, as well as Kruzof, Partofshikof, Halleck, Krestof, and Siginaka Islands. Much of the shoreline is protected and provides easy access to the bays, sounds, and straits located throughout the area.

Thirty-two outfitter/guides reported use in this area from 2013 to 2017, 11 of which used the area regularly (4 out of 5 years). An annual average of 5,632 service days were reported over this period, more than 40 percent of the total reported for all areas on the Sitka Ranger District. Hiking accounted for 39 percent of reported use, followed by road-based nature tours (32 percent) and remote-setting nature tours (12 percent). Use was reported in multiple locations, with relatively high use identified for the Mud Bay road system and Iris Meadows, which together accounted for 31 percent of reported service days, followed by the Mosquito Cove Trail, with 20 percent of service days.

The Mud Bay road system and Iris Meadows are mainly used for road-based nature tours. The Mosquito Cove Trail is mainly used for hiking, with some road-based nature tour use also reported.

The Sitka Area includes 24,600 acres of lands in development LUDs outside of roadless, with 2,335 acres identified as suitable for old-growth harvest and 9,857 acres suitable for young-growth harvest (Table 3.10-7). Existing suitable old-growth acres are almost entirely located on Kruzof Island, primarily along the existing Mud Bay road system. Suitable young-growth acres are also located in this area, as well as along FR 7595 on the north part of Kruzof Island.

Suitable young-growth acres are also available along existing Forest road systems near Fish Bay, St. John Baptist Bay, and along Nakwasina Sound.

Table 3.10-7
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Sitka Area Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	293,354	1,004	1,004	-617	-59,090	-293,354
Development LUDs – Not Roadless[2]	24,617	204	204	247	58,721	58,721
Suitable Old Growth	2,335	-16	-16	2,517	2,517	2,517
Suitable Young Growth	9,857	1	1	1	1	28

Note:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

Changes in roadless area acres in the Sitka Area would be minimal under Alternatives 2 to 4, with Alternatives 2 and 3 adding about 1,000 acres to roadless designation. Alternative 4 would remove about 600 acres from roadless, with this total increasing to 25,900 acres (9 percent of the roadless area), if acres designated as Timber Priority ARA are included with those removed. Alternative 5 would remove roadless designations from about 59,000 acres (Table 3.10-7). Alternative 6 would remove regulatory roadless prohibitions from all lands in existing IRAs, approximately 293,000 acres.

Alternatives 2 to 4 would have very little effect on development potential, as measured by acres in development LUDs without roadless designation, with each alternative adding from 200 to 250 acres, about 1 percent of the existing total. Alternatives 5 and 6, on the other hand, would increase existing development LUD acres without roadless designation more than three-fold, with a net increase of 58,700 acres under each alternative. There would be essentially no change in suitable young-growth acres under any alternative, and a negligible decrease in suitable old-growth acres under Alternatives 2 and 3. Alternatives 4 to 6 would each add 2,500 suitable old-growth acres, mainly along the north side of the Mud Bay road system on Kruzof Island.

The Mud Bay road system is heavily used by outfitter/guides, mainly offering road-based nature tours. The existing old-growth suitable acres in this area are along this road system. The addition of 2,500

suitable old-growth acres under Alternatives 4 to 6 would extend the area available for harvest. Harvest of existing suitable old-growth and young-growth acres under all alternatives would conflict with outfitter/guide use in the area. The old-growth acres that would be added under Alternatives 4 to 6 could make harvest in this area more likely by expanding available volumes and improving economics; potentially exacerbating the level of impact if harvest were to occur in these areas.

04-04A Rodman Bay

The Rodman Bay outfitter/guide use area is located on the Sitka Ranger District and consists of 75,427 acres, 60 percent of which are located in IRAs (Table 3.10-5). This use area is located on the north end of Baranof Island extending from just west of Peschani Point to Point Moses, just east of the Lake Eva Trail. Shorelines are easily accessed in the area's bays: Rodman Bay, Appleton Cove, and Saook Bay.

Twenty outfitter/guides reported use in this area from 2013 to 2017, five of which used the area regularly (4 out of 5 years), with one outfitter/guide accounting for more than half (57 percent) of total reported use. An annual average of 384 service days were reported over this period (Table 3.10-5). Hiking accounted for almost half (46 percent) of reported use, followed by freshwater fishing (37 percent), and remote-setting nature tours (13 percent). Use was reported at eight locations around the area's three bays. Almost three-quarters (74 percent) of reported service days were for Saook Bay or Saook Bay Creek.

The Rodman Bay use area includes 24,400 acres of lands in development LUDs outside of roadless, with about 750 acres identified as suitable for old-growth harvest and 7,500 acres suitable for young-growth harvest (Table 3.10-8). Existing suitable young-growth acres are located along the existing road systems around Rodman Bay, Appleton Creek, and Saook Bay, along Rodman Creek, and extending northeast along the Duffield Peninsula toward Peschani Point. Existing suitable old-growth acres are located either side of the suitable young-growth along Forest Road 7587 on the Duffield Peninsula.

The number of roadless acres in the Rodman Bay use area would increase under Alternatives 2 and 3, with net gains of approximately 7,800 aces, about 10 percent of the total use area. The number of acres with roadless designation would decrease under Alternatives 4, 5, and 6. Alternative 5 would remove roadless designation for about 34,300 acres, and Alternative 6 would remove regulatory roadless prohibitions from all lands, approximately 45,300 acres (Table 3.10-8).

Table 3.10-8
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Rodman Bay Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	45,273	7,777	7,777	-159	-34,269	-45,273
Development LUDs – Not Roadless[2]	24,411	-6,317	-6,317	153	34,263	34,263
Suitable Old Growth	749	19	19	2,661	2,662	2,662
Suitable Young Growth	7,508	-30	-30	0	0	0

Note:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

Changes in the total number of acres in development LUDs without roadless designation would range from a decrease of about 6,300 acres under Alternatives 2 and 3 to an increase of about 34,300 acres for Alternatives 5 and 6. Increases in suitable old-growth acres available for harvest would range from a negligible increase under Alternatives 2 and 3 (about 20 acres) to about 2,700 acres (Alternatives 4 to 6) (Table 3.10-8). Suitable old-growth acres would be entirely added to the Duffield Peninsula, extending the existing narrow bands of suitable old-growth to the north and south. None of the action alternatives would add suitable young-growth acres.

Harvest of existing suitable young-growth acres under all alternatives would conflict with outfitter/guide use in the area. The suitable old-growth acres added on Duffield Peninsular under Alternatives 4 to 6 are located farther away from areas that receive relatively high levels of existing outfitter/guide use.

04-04B Kelp Bay

The Kelp Bay outfitter/guide use area is located on the Sitka Ranger District and consists of 144,680 acres, 89 percent of which are located in IRAs (Table 3.10-5). Located on the northern end of Baranof Island, this use area extends from Hanus Bay to south of Takatz Bay and includes Catherine Island and surrounding islands, as well as the islands in Kelp Bay. Easily accessible shorelines include Hanus Bay, Cosmos Cove, Kasnyku Bay, Takatz Bay, and Kelp Bay.

Almost 40 outfitter/guides reported use in this area from 2013 to 2017, 20 of which used the area regularly (4 out of 5 years). An annual average of 4,926 service days were reported over this period (Table 3.10-5). Hiking accounted for more than half (54 percent) of reported use, followed by remote-setting nature tours (17 percent) and hatchery tours (13 percent). Use was reported at 31 locations, with the Lake Eva Trail accounting for almost half (46 percent) of reported service days. Other popular locations were Hidden Falls Hatchery (21 percent of total service days) and various locations around Kelp Bay (10 percent of service days).

Conflicts between guided groups (hunting, remote-setting nature tour, and freshwater fishing) have been reported during spring and fall hunting seasons at Hanus Bay and Kelp Bay. Concerns have also been expressed about small cruise ship activity in Kelp Bay and the impact of larger groups on the remote experience being sought by other operators in the area (USDA Forest Service 2017e).

The Kelp Bay use area includes 10,500 acres of lands in development LUDs outside of roadless, with about 2,500 acres identified as suitable for old-growth harvest and 3,500 acres suitable for young-growth harvest (Table 3.10-9).

Existing suitable old-growth and young-growth acres are located on the north end of Catherine Island, around Hanus Bay, and either side of Portage Arm. Suitable young-growth acres are also along existing roads near Kelp Bay.

Table 3.10-9
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Kelp Bay Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	129,335	92	92	-83	-22,229	-129,335
Development LUDs - Not Roadless[2/]	10,500	129	129	142	22,288	22,288
Suitable Old Growth	2,530	26	26	3,875	3,875	3,875
Suitable Young Growth	3,535	0	0	1	1	6

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the Kelp Bay use area would increase slightly under Alternatives 2 and 3 and decrease under the other action alternatives. Alternative 5 would remove roadless designation for about 22,200 acres Alternative 6 would remove regulatory roadless prohibitions from all lands, approximately 129,300 acres, and (Table 3.10-9).

The total number of acres in development LUDs without roadless designation would range from very slight increases under Alternatives 2 and 3 (less than 150 acres) to about 22,300 acres (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from a negligible increase under Alternatives 2 and 3 (about 25 acres) to 3,875 acres (Alternatives 4 to 6). Suitable old-growth acres would be added next to the areas of existing suitable old-growth, extending further south on

Catherine Island and northwest on Baranof Island toward Lake Eva. None of the action alternatives would add suitable young-growth. Harvest of existing suitable old-growth and young-growth acres under all alternatives would conflict with outfitter/guide use in the area. The old-growth acres that would be added under Alternatives 4 to 6 could potentially exacerbate these impacts if harvest were to occur in these areas.

04-11A Port Frederick

The Port Frederick outfitter/guide use area is located on the Hoonah Ranger District and consists of 112,500 acres, 77 percent of which are located in IRAs (Table 3.10-5). This use area encompasses the north and northeast portions of Chichagof Island from Chicken Creek east to Port Frederick. The area also includes the city of Hoonah, Alaska Native corporation lands, State properties, and several private inholdings. Access is via boat or float plane.

Fourteen outfitter/guides reported use in this area from 2013 to 2017, two of which used the area regularly (4 out of 5 years). An annual average of 896 service days were reported over this period. Use has, however, increased substantially over recent years, with reported service days increasing from 10 (2013) to 1,358 and 3,021 in 2016 and 2017, respectively (Table 3.10-5).

Road-based nature tours accounted for almost two-thirds (62 percent) of reported use, followed by hiking (34 percent). Use was reported at 12 locations, with Burnt Point and the Neka Bay North Bight Large Group Area each accounting for more than one-third of reported service days, followed by Game Creek (20 percent).

The Port Frederick use area includes about 15,850 acres of lands in development LUDs outside of roadless, with about 2,000 acres of old-growth identified as suitable for harvest and 3,800 acres of young-growth suitable for harvest (Table 3.10-10). Existing suitable old-growth acres are mainly located east of Hoonah. Suitable young-growth acres are located south of Port Frederick and along the existing road system that follows the Neka River.

Table 3.10-10
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Port Frederick Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	86,804	2,491	2,333	-141	-47,650	-86,804
Development LUDs – Not Roadless[2]	15,851	-2,171	-2,076	131	47,641	47,641
Suitable Old Growth	1,999	15	69	3,269	3,369	3,369
Suitable Young Growth	3,800	-2	-2	0	5	115

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the Port Frederick use area would increase by more than 2,000 acres under Alternatives 2 and 3 and decrease under the other action alternatives. Alternative 5 would remove roadless designation for about 47,650 acres, and Alternative 6 would regulatory roadless prohibitions from all lands, approximately 86,800 acres (Table 3.10-10).

The total number of acres in development LUDs without roadless designation would decrease by more than 2,000 acres under Alternatives 2 and 3 and increase by about 47,650 acres under Alternatives 5 and 6. Increases in suitable old-growth acres available for harvest would range from a negligible increase under Alternatives 2 and 3 (less than 70 acres) to about 3,300 acres (Alternative 4) and 3,400 acres (Alternatives 5 and 6). Suitable old-growth acres would be added south and east of Hoonah in areas that do not presently receive high outfitter/guide use. Changes in suitable young-growth acres available for harvest range from a negligible decrease to an increase of 115 acres (Table 3.10-10).

04-11B Freshwater Bay

The Freshwater Bay outfitter/guide use area is located on the Hoonah Ranger District and consists of about 160,000 acres, 61 percent of which are located in IRAs (Table 3.10-5). This use area encompasses the north and northeast portion of Chichagof Island from Whitestone Harbor east to Freshwater Bay. Access is via float plane, boat, or the Hoonah forest road system.

Fifteen outfitter/guides reported use in this area from 2013 to 2017, three of which used the area regularly (4 out of 5 years). An annual average of about 1,389 service days were reported over this period. Use has, however, increased over recent years, with reported service days increasing from 178 (2013) to 2,235 and 2,468 in 2016 and 2017, respectively (Table 3.10-5).

Road-based nature tours accounted for more than three-quarters (78 percent) of reported use, followed by hiking (9 percent) and freshwater fishing (8 percent). Use was reported at 14 locations, with Upper Game Creek accounting for almost half (45 percent) of reported service days, followed by Kennel Creek (23 percent) and Freshwater Bay (13 percent).

The Freshwater Bay use area includes about 47,200 acres of lands in development LUDs not currently classified as roadless, with about 16,600 acres of suitable old-growth available for harvest and 12,400 acres of suitable young growth (Table 3.10-11). Existing suitable old-growth and young-growth acres are located along the existing road systems in the area with almost half (46 percent) of the non-roadless portion of the area considered suitable and available for harvest.

The number of roadless acres in the Freshwater Bay use area would decrease under all of the action alternatives with decreases ranging from about 1,200 acres (Alternative 2) to 97,253 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation for about 49,151 acres, with a similar reduction under Alternative 4 (49,100 acres), if acres designated as Timber Priority ARA are included with those removed.

Table 3.10-11
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Freshwater Bay Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	97,253	-1,170	-10,968	-11,129	-49,151	-97,253
Development LUDs – Not Roadless[2]	47,178	1,298	10,401	10,401	49,118	49,118
Suitable Old Growth	16,587	341	3,480	12,073	12,236	12,236
Suitable Young Growth	12,374	178	203	303	350	1,204

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The total number of acres in development LUDs outside of roadless would increase under all alternatives with gains ranging from about 1,300 acres (Alternative 2) to 49,200 (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from about 350 acres (Alternative 2) to more than 12,000 acres (Alternatives 4 to 6). Suitable young-growth acres available for harvest would increase under all alternatives, with the largest increase (about 1,200 acres) under Alternative 6 (Table 3.10-11). Suitable old-growth acres would be added throughout the area under Alternatives 4 to 6. Harvest of existing suitable old-growth and young-growth acres under all of the alternatives would conflict with outfitter/guide use in the area. The old-growth acres that would be added under Alternatives 4 to 6 could potentially exacerbate these impacts if harvest were to occur in these areas.

04-12 Tenakee Inlet

The Tenakee Inlet outfitter/guide use area is located on the Sitka and Hoonah Ranger Districts and consists of 312,370 acres, 79 percent of which are located in IRAs (Table 3.10-5). This use area

encompasses the central and eastern portions of Chichagof Island that surround Tenakee Inlet, as well as the lands adjacent to Chatham Strait from the mouth of Tenakee Inlet south to Florence Bay.

Sixteen outfitter/guides reported use in this area from 2013 to 2017, with none using the area more than 3 out of 5 years. Reported use has increased in recent years, jumping from 95 service days in 2013 to 407 in 2017, for a 5-year annual average of 186 service days (Table 3.10-5). Hiking accounted for almost half (47 percent) of reported use, followed by brown bear hunting (33 percent) and remote-setting nature tours (10 percent). Use was reported at more than 20 locations, with much of the use reported at the bays on the south side of Tenakee Inlet. Seal Bay received the most use (29 percent of total service days), followed by Corner Bay (20 percent) and Basket Bay (10 percent).

The Tenakee Inlet use area includes almost 48,000 acres of lands in development LUDs outside of roadless, with about 13,400 acres identified as suitable for old-growth harvest and 10,100 acres suitable for young-growth harvest (Table 3.10-12). Existing suitable old-growth and young-growth acres are located along the existing road systems that are excluded from the Chichagof IRA (IRA 311).

The number of roadless designated acres in Tenakee Inlet would increase under Alternative 2, with a net gain of approximately 7,200 acres, about 2 percent of the total use area. The number of acres with roadless designation would decrease under the other action alternatives. Alternative 5 would remove roadless designation from about 104,000 acres, and Alternative 6 would remove regulatory roadless prohibitions from all lands, approximately 246,500 acres.

Table 3.10-12
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Tenakee Inlet Outfitter/Guide Use Area

	Total Acres		Change from Alternative 1 (acres)			
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	246,547	7,224	-50,608	-13,983	-103,908	-246,547
Development LUDs – Not Roadless[2]	47,757	-4,632	6,152	11,714	103,837	103,837
Suitable Old Growth	13,380	359	3,538	11,656	11,656	11,656
Suitable Young Growth	10,145	89	89	89	140	143

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The total number of acres in development LUDs without roadless designation would decrease by about 4,600 acres under Alternative 2. Increases in development LUDs outside of roadless for the other alternatives would range from about 6,300 acres (Alternative 3) to almost 104,000 acres (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from less than 400 acres (Alternative 2) to about 11,700 acres (Alternatives 4 to 6). Suitable old-growth acres would mainly be added to areas in and around existing roads, extending the areas of existing suitable old-growth available for harvesting. The action alternatives would each add less than 150 acres of suitable young-growth.

Suitable old-growth acres would be added in the vicinity of Basket Bay and Corner Bay, both of which receive relatively high levels of reported outfitter/guide use. Suitable old-growth acres would also be added south of Crab Bay, another area with reported outfitter/guide use, under Alternatives 4 to 6. These additions would extend existing areas of suitable acres that are presently available for harvest. Harvest of these areas under all of the alternatives, including Alternative 1, would have the potential to conflict with existing outfitter/guide use, but particularly under Alternatives 4 to 6, which would increase suitable old-growth acres by 87 percent.

04-13 Peril Strait
The Peril Strait outfitter/guide use area is located on the Sitka Ranger District and consists of 232,130 acres, 72 percent of which are located in IRAs (Table 3.10-5). This use area encompasses the southern end of Chichagof Island surrounding Hoonah Sound and Peril Strait, from near Sergius Point to Point

Hayes. Access to the shoreline along Hoonah Sound and Peril Strait is dictated by weather conditions and tidal flow.

Twenty-one outfitter/guides reported use in this area from 2013 to 2017, eight of which used the area regularly (4 out of 5 years). An annual average of 1,179 service days were reported over this period (Table 3.10-5). Hiking accounted for more than half (58 percent) of reported use, followed by freshwater fishing (15 percent), brown bear hunting (9 percent), and road-based nature tours (9 percent). Use was reported at more than 30 locations, with about one-third of service days reported at Sitkoh Bay, Sitkoh Creek, and Sitkoh Lake on the south end of Chichagof Island. Relatively high use was also reported for Eammon Island (18 percent of total service days), Deep Bay, Sergius Narrows (11 percent), and the False Island Road System (10 percent).

The Peril Strait use area includes 49,700 acres of lands in development LUDs outside of roadless, with about 3,000 acres identified as suitable for old-growth harvest and 9,000 acres suitable for young-growth harvest (Table 3.10-13). Existing suitable old-growth and young-growth acres are mainly located along the existing road systems at the south end of Chichagof Island, and further northwest around two existing roads on the north shore of Peril Strait.

Table 3.10-13
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Peril Strait Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	167,544	25,959	-63,632	5,162	-52,108	-167,544
Development LUDs – Not Roadless[2]	49,702	-17,629	-17,616	458	52,108	52,108
Suitable Old Growth	2,998	-35	-35	1,534	2,536	2,536
Suitable Young Growth	9,063	85	85	112	129	188

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of designated roadless acres in the Peril Strait use area would increase under Alternatives 2 and 4. Alternative 2 would have a net gain of approximately 26,000 aces, about 11 percent of the total use area. The number of acres with roadless designation would decrease under the other action alternatives. Alternative 5 would remove roadless designation from about 52,100 acres, and Alternative 6 would remove regulatory roadless prohibitions from all lands, approximately 167,500 acres (Table 3.10-13).

The total number of acres in development LUDs without roadless designations would decrease by almost 17,600 acres under Alternatives 2 and 3. Increases in development LUDs outside of roadless for the other alternatives would range from less than 500 acres (Alternative 4) to about 52,000 acres (Alternatives 5 and 6). Changes in suitable old-growth acres available for harvest would range from a very small drop (Alternatives 2 and 3) to increases of about 2,500 acres (Alternatives 5 and 6). Suitable old-growth acres would mainly be added in areas in and around existing roads, extending the areas of existing suitable old-growth available for harvesting. The action alternatives would each add less than 200 acres of suitable young-growth.

Suitable old-growth acres would be added south of Sitkoh Lake, on the north side of the False Island road system, and around the existing roads further northwest on the north shore of Peril Strait under Alternatives 4 to 6. These additions would extend existing areas of suitable acres that are presently available for harvest. Harvest of these areas under Alternatives 4 to 6 would have the potential to conflict with existing outfitter/guide use.

CRD 00 Craig Ranger District

The CRD 00 outfitter/guide use area, which consists of the entire Craig Ranger District, encompasses about 926,000 acres, 77 percent of which are located in IRAs (Table 3.10-5). The Craig Ranger District is located on the southern half of Prince of Wales Island, the largest island in Southeast Alaska. Prince of Wales Island has the most extensive road system in Southeast Alaska, ranging from paved scenic byways to logging roads that require four-wheel drive. These roads provide access to numerous areas with opportunities to fish, hike, camp, hunt, boat, and view wildlife.

Twenty-one outfitter/guides reported use in this area from 2013 to 2017, five of which used the area regularly (4 out of 5 years). An annual average of 1,869 service days were reported over this period. Use in this area was noticeably lower in 2017 than in previous years, with just 926 reported service days, about half the annual average (Table 3.10-5). Wildlife viewing accounted for 85 percent of reported service days, followed by hunting (7 percent). Use was reported at 75 locations, with the Dog Salmon fish pass wildlife viewing site and Polk Inlet accounting for 39 percent and 17 percent of service days, respectively. Reported use at Dog Salmon fish pass was mainly from 2014 to 2016; use at Polk Inlet was mainly reported in 2013.

The Craig Ranger District includes about 77,500 acres of lands in development LUDs outside of roadless, with about 13,700 acres of suitable old growth available for harvest and 17,000 acres of suitable young growth (Table 3.10-14). Existing suitable acres are located along the road systems throughout the non-roadless parts of the area, including areas near Dog Salmon fish pass and Polk Inlet. The Craig Ranger District use area includes Congressionally designated LUD II areas, as well the South Prince of Wales Wilderness.

Table 3.10-14
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Craig Ranger District Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	715,373	-1,872	-153,736	-36,446	-269,574	-715,373
Development LUDs - Not Roadless[2]	77,545	15,026	35,794	40,870	249,908	255,933
Suitable Old Growth	13,650	4,148	8,041	14,165	15,266	15,133
Suitable Young Growth	17,001	2,569	3,574	3,892	4,074	4,199

Note:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the Craig Ranger District would decrease under all of the action alternatives with drops ranging from about 1,900 acres (Alternative 2) to about 715,400 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation from about 270,000 acres (Table 3.10-14).

The total number of acres in development LUDs outside of roadless would increase under all alternatives with gains ranging from about 15,000 acres (Alternative 2) to 250,000 acres (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from about 4,100 acres (Alternative 2) to about 14,200 to 15,300 acres, which would more than double the amount available under Alternatives 4 to 6. Increases in suitable young-growth acres would range from about 2,600 acres (Alternative 2) to about 4,200 acres (Alternative 6) (Table 3.10-14). Suitable acres would mainly be added in the north central part of the area, near the communities of Craig, Klawock, and Hollis in the Twelvemile and Soda Bay IRAs (IRAs 534 and 505), with smaller concentrations on the south part of Sumez Island and east of Cholmondeley Sound. These additions would expand the areas presently available for harvest in the vicinity of Dog Salmon fish pass and Polk Inlet. Harvest of suitable acres in the vicinity of these areas under all alternatives would have the potential to conflict with existing outfitter/guide use.

K19 North Revilla

The North Revilla outfitter/guide use area is located on the Ketchikan-Misty Fjords Ranger District and consists of 70,400 acres, 83 percent of which are located in IRAs (Table 3.10-5). The North Revilla area encompasses the northern, non-wilderness portion of Revillagigedo Island, including Hassler Island and Black Island.

Eight outfitter/guides reported use in this area from 2013 to 2017, five of which used the area regularly (4 out of 5 years). An annual average of 213 service days were reported over this period (Table 3.10-5). Hiking accounted for most (82 percent) of reported use, followed by fishing (17 percent). Use was reported for three locations. Hiking use was reported at Klu Bay and the Orchard Lake Trail, with fishing reported at Orchard Lake.

The North Revilla use area includes about 9,400 acres of lands in development LUDs outside of roadless, with 2,200 acres identified as suitable for old-growth harvest and 2,300 acres suitable for young-growth harvest (Table 3.10-15). Existing suitable old-growth and young-growth acres occupy much of the non-roadless portions of this use area, including Hassler Island, along the south shoreline, and around Orchard Lake.

Table 3.10-15
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the North Revilla Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	58,474	-275	-275	-277	-13,234	-58,474
Development LUDs – Not Roadless[2]	9,384	245	245	245	13,203	13,203
Suitable Old Growth	2,181	78	78	2,384	2,655	2,655
Suitable Young Growth	2,278	5	5	133	144	154

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

Changes in roadless area acres in North Revilla would be minimal under Alternatives 2 to 4, with roadless designation removed from less than 300 acres. This total increases to 9,500 for Alternative 4, if acres designated as Timber Priority ARA are included with those removed.

Alternative 5 would remove roadless designation from about 13,200 acres, with Alternative 6 removing roadless designation from all lands in existing IRAs, approximately 58,500 acres (Table 3.10-15).

Alternatives 2 and 3 would have very little effect on development potential, as measured by acres in development LUDs outside of roadless, with each alternative adding about 250 acres, about 3 percent of the existing total.

Alternatives 5 and 6, on the other hand, would more than double existing development LUD acres without roadless designation, with a net increase of 13,200 acres under each alternative. Changes in suitable old-growth acres available for harvest would range from less than 100 acres (Alternatives 2 and 3) to an increase of about 2,400 to 2,700 acres under Alternatives 4 to 6, more than double the suitable old-growth acres under Alternative 1. Suitable old-growth acres would mainly be added on Black Island and north of the existing suitable acres on Revillagigedo Island. The action alternatives would each add less than 200 acres of suitable young growth. Harvest of existing suitable old-growth and young-growth acres under all of the alternatives would conflict with outfitter/guide use in this area. The old-growth acres that would be added under Alternatives 4 to 6 could potentially exacerbate these impacts if harvest to occur in these areas.

P1 Mitkof Island

The Mitkof Island outfitter/guide use area is located on the Petersburg Ranger District and consists of 109,302 acres, 32 percent of which are located in IRAs (Table 3.10-5). This use area encompasses all of Mitkof Island and includes the city of Petersburg.

Fifteen outfitter/guides reported use in this area from 2013 to 2017, five of which used the area regularly (4 out of 5 years). An annual average of about 928 service days were reported over this period (Table 3.10-5). Hiking accounted for more than half (59 percent) of reported service days, followed by camping (9 percent) and remote-setting nature tours (15 percent). Use was reported at 11 locations, with the Ideal Cove Trail accounting for 71 percent of reported service days, followed by Point Alexander (13 percent).

The Mitkof Island use area includes about 57,000 acres of lands in development LUDs outside of roadless (slightly more than half the total area), with about 15,600 acres of suitable old-growth available for harvest and 9,800 acres of suitable young-growth (Table 3.10-16). Existing suitable old-growth and young-growth acres are located along the existing road systems through the center of the island, as well as along the roads that wrap around the south side of the Sumner Mountains.

Table 3.10-16
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Mitkof Island Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	34,625	-28	-3,994	-4,091	-22,154	-34,625
Development LUDs – Not Roadless[2]	56,934	96	4,061	4,061	22,124	22,124
Suitable Old Growth	15,557	2	1,426	3,384	3,542	3,542
Suitable Young Growth	9,761	3	4	20	25	52

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the Mitkof Island use area would decrease under all of the action alternatives with drops ranging from less than 30 acres (Alternative 2) to about 34,600 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation from about 22,150 acres (Table 3.10-16).

The total number of acres in development LUDs outside of roadless would increase under all alternatives with gains ranging from less than 100 acres (Alternative 2) to 22,100 (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from about 1,400 acres (Alternative 3) to about 3,400 acres (Alternative 4) and 3,550 acres (Alternatives 5 and 6). Suitable old-growth acres would be added in three main locations under Alternatives 4 to 6, none of which would likely conflict with areas receiving relative high levels of existing outfitter/guide use.

Increases in suitable young-growth acres would be 50 acres or less under all of the action alternatives.

P08 North Lindenberg Peninsula

The North Lindenberg Peninsula outfitter/guide use area is located on the Petersburg Ranger District and consists of 75,600 acres, 78 percent of which are located in IRAs (Table 3.10-5). Located on the north end of Kupreanof Island, this use area is bordered to the north and east by Frederick Sound and includes Portage Bay.

Twelve outfitter/guides reported use in this area from 2013 to 2017, three of which used the area regularly (4 out of 5 years). An annual average of 278 service days were reported over this period (Table 3.10-5). Camping accounted for more than three-quarters (76 percent) of reported service days, followed by remote-setting nature tours (9 percent). Use was reported at 11 locations, with locations around Portage Bay accounting for 46 percent of reported service days, followed by Five Mile Creek (29 percent).

The North Lindenberg Peninsula use area includes about 13,800 acres of lands in development LUDs outside of roadless, with about 4,700 acres of suitable old-growth available for harvest and 3,700 acres of suitable young growth (Table 3.10-17). Existing suitable old-growth and young-growth acres are located along the existing roads on the east side of Portage Bay.

The number of roadless acres in the North Lindenberg Peninsula use area would decrease under all of the action alternatives with drops ranging from 10,500 acres (Alternative 2) to about 58,700 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation from about 48,600 acres (Table 3.10-17).

Table 3.10-17
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the North Lindenberg Peninsula Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	58,697	-10,523	-27,975	-28,021	-48,632	-58,697
Development LUDs – Not Roadless[2]	13,772	10,099	24,236	24,253	48,200	48,200
Suitable Old Growth	4,666	3,227	6,708	8,764	8,856	8,856
Suitable Young Growth	3,685	742	755	756	804	815

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The total number of acres in development LUDs without roadless designation would increase under all alternatives with gains ranging from about 10,100 acres (Alternative 2) to 48,200 (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from about 3,200 acres (Alternative 2) to about 8,800 to 8,850 acres (Alternatives 4 to 6) (Table 3.10-17). Old-growth acres would be added throughout the area under Alternatives 4 to 6. Increases in suitable young growth acres would range from about 750 to 800 acres under all of the action alternatives. Harvest of existing suitable old-growth and young-growth acres under all alternatives would conflict with outfitter/guide use in the area. The old-growth acres that would be added under Alternatives 4 to 6 could potentially exacerbate these impacts if harvest were to occur in these areas.

P12B Kuiu Island Road System

The Kuiu Island Road System outfitter/guide use area is located on the Petersburg Ranger District and consists of 134,850 acres, 31 percent of which are located in IRAs (Table 3.10-5). The Kuiu Island Road System area is located on the north end of Kuiu Island. The area includes the mainline and spur roads on Kuiu Island. Roads extend to Saginaw Bay, Security Bay, Rowan Bay, Bay of Pillars, Port Camden, and Three Mile Arm.

Nine outfitter/guides reported use in this area from 2013 to 2017, five of which used the area regularly (4 out of 5 years). An annual average of about 139 service days were reported over this period (Table 3.10-5). Hunting, mainly for black bear, and camping each accounted for about one-third (33 percent and 32 percent, respectively) of reported service days, followed by freshwater fishing (26 percent). Use was reported at 13 locations, with Kadake Creek and Port Camden each accounting for slightly more than one-quarter (26 percent) of reported service days, with various locations along the road system making up 24 percent.

The Kuiu Island Road System use area includes about 77,200 acres of lands in development LUDs outside of roadless, with about 14,700 acres of suitable old-growth available for harvest and 19,600 acres of suitable young-growth (Table 3.10-18). Existing suitable old-growth acres are located in the center of the area and north of Rowan Bay. Existing young-growth acres are distributed along the existing road system throughout the area.

The number of roadless acres in the Kuiu Island Road System use area would increase under Alternative 2 (3,400 acres) and decrease under the other action alternatives, with drops ranging up to about 41,200 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation from about 30,400 acres (Table 3.10-18).

Table 3.10-18
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Kuiu Island Road System Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	41,215	3,380	-3,632	-7,115	-30,442	-41,215
Development LUDs – Not Roadless[2]	77,174	-3,159	3,849	7,115	30,442	30,442
Suitable Old Growth	14,741	-1,281	1,147	4,247	4,248	4,248
Suitable Young Growth	19,585	0	0	25	34	49

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The total number of acres in development LUDs outside of roadless would decrease under Alternative 2, by about 3,200 acres. Increases in development LUD acres outside of roadless under the other action alternatives would range up to about 30,450 acres (Alternatives 5 and 6). Total suitable old-growth acres would decrease under Alternative 2, dropping by about 1,300 acres. Increases under the other action alternatives would range from 1,150 acres (Alternative 3) to 4,250 acres (Alternatives 2 to 4).

Increases in suitable young-growth would be about 50 acres or less under all alternatives. Suitable old-growth acres would mainly be added in the north central and southwest parts of this area. Harvest of existing suitable old-growth and young-growth acres under all alternatives would conflict with existing outfitter/guide use in this use area.

P21 Muddy River Area
The Muddy River Area outfitter/guide use area is located on the Petersburg Ranger District and consists of 63,357 acres, 68 percent of which are located in IRAs (Table 3.10-5). The Muddy River Area is located on the mainland east of Frederick Sound. The area includes the Thomas Bay road system, Patterson River, Muddy River, Point Agassiz, and a portion of Thomas Bay.

Eight outfitter/guides reported use in this area from 2013 to 2017, three of which used the area regularly (4 out of 5 years). An annual average of 347 service days were reported over this period (Table 3.10-5). Hiking accounted for more than three quarters (78 percent) of reported use, followed by camping (9 percent). Use was reported for seven locations, with relatively high use identified for Patterson River (62 percent), followed by Ruth Island, Thomas Bay (23 percent). Service days reported for Patterson River were mainly hiking, with some mountain goat hunting use also reported.

The Muddy Bay Area includes about 16,700 acres of lands in development LUDs outside of roadless, with about 2,900 acres identified as suitable for old-growth harvest and 4,200 acres suitable for young-growth harvest (Table 3.10-19). Existing suitable old-growth and young-growth acres are located along the existing road system and extend south along the Muddy River and Crystal Creek drainages reflecting past harvest in the area. Suitable old-growth acres are also located on Point Agassiz Peninsula and Deer Island.

Table 3.10-19
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Muddy River Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	42,959	4,591	-3,205	-7,801	-28,795	-42,959
Development LUDs – Not Roadless[2]	16,664	-3,343	4,340	7,688	28,700	28,700
Suitable Old Growth	2,891	-738	2,397	6,724	6,771	6,771
Suitable Young Growth	4,218	0	0	0	0	13

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

Changes in roadless area acres in the Muddy River Area would range from a net gain of about 4,600 acres under Alternative 2 to a net reduction of almost 43,000 acres under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 2 would also reduce the number of acres in development LUDs outside of roadless. Increases under the other alternatives would range up to 28,700 acres (Alternatives 5 and 6). There would be no change in suitable young-growth acres by alternative. Changes in suitable old-growth acres available for harvest would range from a net decrease (Alternative 2) to an increase of almost 6,800 acres (Alternatives 4 to 6) (Table 3.10-19).

Suitable old-growth acres would mainly be added in the south portion of the area. Harvest of existing suitable old-growth and young-growth acres under all alternatives would conflict with outfitter/guide use in this area. The old-growth acres that would be added under Alternatives 4 to 6 could potentially exacerbate these impacts if harvest were to occur in these areas.

TBRD 00 Thorne Bay Ranger District

The TBRD 00 outfitter/guide use area, which consists of the entire Thorne Bay Ranger District, encompasses about 902,000 acres, 40 percent of which are located in IRAs (Table 3.10-5). The Thorne Bay Ranger District is located on the northern half of Prince of Wales Island. The largest island in Southeast Alaska, Prince of Wales Island has an extensive road system that provides access to numerous areas with opportunities to fish, hike, camp, hunt, boat, and view wildlife. The Thorne Bay Ranger District is known for its cave systems and karst topography.

Twenty-seven outfitter/guides reported use in this area from 2013 to 2017, 11 of which used the area regularly (4 out of 5 years). An annual average of 1,239 service days were reported over this period. Use in this area was lower in 2017 than in previous years, with about 870 reported service days, slightly more than two-thirds of the annual average (Table 3.10-5). Freshwater fishing accounted for 43 percent of reported service days, followed by sightseeing (20 percent), and camping (13 percent) and remote-setting nature tours (13 percent). Use was reported at 65 locations, with the El Capitan Cave interpretative site accounting for 39 percent, followed by locations along Staney Creek (9 percent) and Thorne River (8 percent).

The Thorne Bay Ranger District includes about 328,000 acres of lands in development LUDs outside of roadless, with about 62,400 acres of suitable old-growth available for harvest and 127,000 acres of suitable young-growth (Table 3.10-20). Existing suitable acres are located along the road systems throughout the non-roadless parts of the area. The Thorne Bay Ranger District use area includes Congressionally designated LUD II areas, as well the Coronation Island, Warren Island, and Karta River Wildernesses.

Table 3.10-20
Change in Roadless Area, Development LUDs without Roadless Designation, and Suitable Timber by Alternative for the Thorne Bay Ranger District Outfitter/Guide Use Area

	Total Acres	Change from Alternative 1 (acres)				
Management Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Roadless Area[1, 2]	356,596	10,601	-177,576	-64,363	-130,321	-356,596
Development LUDs – Not Roadless[2]	327,916	4,355	54,027	58,168	125,863	125,863
Suitable Old Growth	62,407	1,866	13,676	20,255	21,218	21,218
Suitable Young Growth	127,019	1,054	1,109	1,320	1,322	1,536

Notes:
[1] Changes in roadless area acres for Alternative 3 include LUD II acres, which would be removed from roadless classification, but would still be managed in a roadless condition.
[2] Roadless acres managed as Timber Priority ARA under Alternative 4 are included in the roadless area total and excluded from the development LUD total, which has the effect of understating the changes in these categories.

The number of roadless acres in the Thorne Bay Ranger District would increase by 10,600 acres under Alternative 1 and decrease under all the other action alternatives, with 357,000 acres removed under Alternative 6, which would remove regulatory roadless prohibitions from all lands. Alternative 5 would remove roadless designation for about 130,300 acres (Table 3.10-20).

The total number of acres in development LUDs outside of roadless would increase under all alternatives with gains ranging from about 4,400 acres (Alternative 2) to 126,000 acres (Alternatives 5 and 6). Increases in suitable old-growth acres available for harvest would range from about 1,900 acres (Alternative 2) to about 20,300 acres (Alternative 4) and 21,200 acres (Alternatives 5 and 6). Increases in suitable young-growth acres would range from about 1,100 to 1,300 acres across all the action alternatives (Table 3.10-20). Suitable old-growth acres would be added throughout the area, with larger additions near Klawock in the Kogish IRA (IRA 509) and Karta IRA (IRA 510), with relatively large gains in the northwest part of the area in the El Capitan IRA (IRA 517). These additions are not expected to conflict with outfitter/guide use at the most visited locations in this use area because changes are not proposed in those areas.

Cumulative Effects

This section considers the incremental effects of the alternatives when added to other past, present, and reasonably foreseeable actions. The effects of past and present actions on recreation are included in the *Affected Environment* portion of this section, which discusses current recreation facilities and activities on the Tongass. Past actions include past timber harvest and road building that has facilitated roaded recreation and changed ROS settings, as well as the development of recreation facilities, such as cabins, campgrounds, interpretive sites, and visitor centers. Present actions include the impacts of current management policies on existing recreation patterns, particularly those that are authorized by special use permits. For commercial outfitter/guide use, recent and reasonably foreseeable actions include ongoing capacity determinations and use allocations on many Ranger Districts (USDA Forest Service 2009b, 2009c, 2012d, 2012e, 2017e). Some use areas are currently at capacity, which could serve to exacerbate potential displacement effects from long-term changes in roadless area management.

The number of cruise ship passengers visiting the region remains a significant source of current and future recreation demand on the Tongass. Current recreation patterns on the Tongass also reflect past timber harvest and road building activities on adjacent private and Alaska Native corporation lands, as well as wildland recreation opportunities on federal- and state-managed lands elsewhere in the region.

Reasonably foreseeable actions on NFS lands include the projected levels of future timber harvest and other developments that are used in the preceding analysis to assess the potential impacts of the alternatives on the supply of recreation opportunities, recreation use, and commercial outfitter/guide use. Other reasonably foreseeable actions include regional transportation development as defined by the State Transportation Plan and the Forest Service Alaska Region Long Range Transportation Plan, as well as road paving on Prince of Wales Island, the closing of roads, and construction of the Angoon Airport. In

addition, the expansion of cities like Juneau, Ketchikan, and Sitka, recreational cabin development, land auctions by the State, and land adjustments could include additional road construction, timber harvest, and facility construction. It is not possible at this time to predict exactly which roads would be developed or their likely impact on future recreation patterns.

Reasonably foreseeable future actions also include an expected growth in recreation and tourism businesses, as well as the development of additional fishing and other lodges. This type of development would facilitate additional recreation and tourism in the region and on the Forest. Human settlement expansion around the region's larger cities, as well as residential expansion that could potentially result from state land auctions, would likely result in increased demand for a range of recreation activities, with some developments favoring developed recreation opportunities, and others more dependent on undeveloped lands. Mining activities are expected to expand at existing sites, including Greens Creek on Admiralty Island and Kensington Gold Mine north of Juneau, as well as possible future sites, including the Bokan Mountain and Niblack sites on the southern end of Prince of Wales Island. Mining projects are for the most part expected to have a negative effect on recreation activities, because most recreational activities are incompatible with these types of land use.

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Scenery

Affected Environment

The Tongass offers a variety of scenery to its visitors, from mountain ranges and the glaciers of the mainland to low-lying marine landscapes composed of intricate waterways, bays, and island groups. The Forest is viewed from a variety of vantage points, including the communities of Southeast Alaska, the Alaska Marine Highway ferry route, cruise ship routes, existing road systems, popular small boat routes and anchorages, developed recreation sites and facilities, and hiking trails. Visitor-related flight seeing via small aircraft is increasing in popularity and provides aerial views of the forest landscape.

The Forest Service developed a Visual Management System (VMS) in 1974 to integrate aesthetic considerations into large-scale resource management decisions. Due to advances in technology, as well as the increased demand for high-quality scenery, the Scenery Management System (SMS) was released in 1996. The SMS integrates the increased understanding of ecosystem processes and cultural landscapes in identifying the effects of various management practices on scenic resources. The SMS was used in this analysis to inventory existing scenic resources, provide measurable scenic quality management objectives for each portion of the landscape, and estimate the landscape's sensitivity based on the visibility from priority travelways and use areas.

To apply the SMS to the Forest, a viewshed analysis of the entire Tongass was completed using the Tongass Geographic Information System (GIS) and is described in the Scenery section of the 2016 Forest Plan FEIS (USDA Forest Service 2016b). This viewshed analysis was completed separately for each Ranger District and was based on the viewsheds of selected points along Visual Priority Routes and Use Areas. The analysis included identification of distance zones, which were subsequently overlaid with the Land Use Designations (LUDs) to generate the Scenic Integrity Objectives (SIOs) (refer to the Forest-wide standards and guidelines in the Forest Plan for details on how SIOs were determined for each LUD).

Existing Scenic Integrity

The existing scenic resources of the Tongass encompass everything from vast tracts unmodified by human activity to areas of heavily modified landscapes. Existing Scenic Integrity (ESI) ratings are used by the Forest Service to analyze the degree of intactness of the landscape character. These ratings are used to categorize the degree of alteration visible in the landscape on a continuum from a natural setting to a heavily altered landscape. The ratings apply to the broad landscape affected, not just the acres altered. As described below, ESI ratings range over six levels of integrity, from Very High to Unacceptably Low.

- **Very High**—Landscapes where the valued landscape character is intact with only minute deviations, if any. The existing landscape character and sense of place is expressed at the highest possible level.
- **High**—Landscapes where the valued landscape character appears intact. Deviations may be present, but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- **Moderate**—Landscapes where the valued landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- **Low**—Landscapes where the valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but compatible or complimentary to the character within.
- **Very Low**—Landscapes where the valued landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed.

- **Unacceptably Low**—Landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern or scale from the landscape character.

Table 3.16-1 in the 2016 Forest Plan FEIS (USDA Forest Service 2016b) displays the percent of acres of each ESI for the Tongass. A breakdown between "seen" and "seldom seen" areas is presented. Seen areas are those areas that can be viewed in the foreground, middleground, or background from inventoried Visual Priority Routes and Use Areas with a concern level of 1 or 2, the travelways and use areas with the highest number of users. Seldom seen areas are all the rest of the Forest. The ESI for wilderness is also included in this table. Approximately 88 percent of the Tongass is rated as a Very High ESI, which is a visually unaltered condition. About 10 percent of the land is rated as Low, Very Low, or Unacceptably Low, which indicates noticeable development activity. The remainder of the Forest is rated as High or Moderate. Some of the wilderness acres have a High or lower rating. This is mostly due to the landscape effect of developments adjacent to wilderness and past development activities within wildernesses.

Under the Forest Plan, all land has a designated LUD, which guides the types and intensity of development actions. The LUDs designate the SIOs for each area, which define the degree to which the natural landscape can be altered, and provide guidelines for timber harvest, road building, and other activities to ensure they are conducted in a way that allows the scenic objectives to be achieved. A LUD may have different SIOs depending on the distance zone (foreground, middleground, background) in which the development activity is to take place.

SIOs are classified using the same terms outlined above for ESI: Very High, High, Moderate, Low, and Very Low. The Unacceptably Low rating is only used to inventory existing conditions and cannot be used as a management objective.

- The current adopted SIOs for all land within the Tongass are displayed in Table 3.11-1. This table separates the percent of acres of each SIO into five categories: foreground, middleground, background, seldom seen, and other (municipal watersheds and non-wilderness national monuments where the SIO is determined on a project-by-project basis). The Very High SIO is typically assigned to wilderness; however, it is not used for Tongass wilderness because of the potential alterations allowed under the Alaska National Interest Lands Conservation Act (ANILCA). The vast majority of wilderness acreage will be managed through the specific wilderness plans with a Very High SIO. Thus, over 60 percent of the Tongass is to be managed at the High or Very High Scenic Integrity level.
- Demand for scenic quality can be represented by the increase in visitor-related travel to the Tongass, as well as a heightened awareness and sensitivity of Alaskan residents to scenic resource values. This results in a strong indirect connection between scenic resource values and the economy of Southeast Alaska. For example, Southeast Alaska's Inside Passage is advertised and promoted by the Alaska Department of Commerce, cruise ship operators, and the Southeast Alaska Tourism Council. Their marketing strategy focuses on the scenery of the Tongass as a major attraction. The visitors to Southeast Alaska arrive with expectations and an image of the environment and scenery awaiting them. If current trends continue, demand for viewing scenic landscapes will increase. A report published by the Alaska Department of Community and Economic Development shows that the largest number of visitors (1.96 million) for 2013-2014 was 5,000 more than the last record set in 2007-2008. This increase also represents a 6 percent increase over 2012-2013.

Lands adjacent to the Alaska Marine Highway, cruise ship routes, flight-seeing routes, high-use recreation areas, and other marine and land-based travel routes will be seen by more people, more frequently, and for greater duration.

Table 3.11-1
Adopted Scenic Integrity Objectives for the Tongass (percent)

	Scenic Integrity Objective					
Category	High	Moderate	Low	Very Low	Other[1]	Total
Foreground	7.6	3.6	1.4	0.0	0.6	13.2
Middleground	18.2	7.2	2.4	6.0	0.5	34.2
Background	0.8	0.4	0.0	0.1	0.0	1.4
Seldom seen	34.2	8.7	0.0	7.5	0.9	51.2
Unmapped	0.0	0.0	0.0	0.0	0.0	0.0
Total	**60.7**	**19.8**	**3.9**	**13.5**	**2.0**	**100.0**

[1] Includes land in the Municipal Watershed and Non-wilderness National Monument LUDs. SIOs in these LUDs are to be determined on a project-by-project basis. Generally, the High SIO will be met.

Source: USDA Forest Service, GIS. Numbers are not exact and may not sum correctly due to rounding.

Environmental Consequences

The Tongass has adopted specific management objectives for scenic resources (i.e., SIOs) for each LUD in the Forest. The adopted SIOs indicate the desired or acceptable level of human-induced alteration to the valued landscape character. No changes in the SIOs or related Scenery standards and guidelines are proposed under any alternative. Harvest of old growth would follow the SIOs of the 2016 Forest Plan for all alternatives. However, the Forest Plan relaxes the SIOs for young-growth harvest to increase the availability of young growth, especially in the first few decades. In other words, all alternatives have reduced SIOs in viewsheds where young growth is to be harvested. As a result, the current SIO designated for the LUD in which young-growth harvest takes place is not likely to be met in many cases.

Adopted SIOs can be thought of as an indicator of long-term cumulative effects. SIOs are adopted to provide a threshold for the amount of modification to the landscape during land-altering activities; therefore, land may have an adopted SIO of Low, but currently meet the High SIO.

The potential effects to the scenic resource are primarily described in the following two ways:

1. A display of acres of each SIO adopted for suitable young growth, along with LUD, for each alternative.
2. A display of the effects of each alternative on a selected group of key viewsheds throughout the Tongass (described below).

Indirect and Cumulative Forest-wide Effects

Changes in Scenic Integrity Objective Acres

The Forest Plan relaxes the SIOs for young-growth harvest to Very Low, no matter what the SIO is currently, in all development LUDs. However, young-growth harvest is also allowed in the Old-Growth Habitat LUD and there is no change in the SIO for this LUD (it would remain High). All alternatives would follow these same SIO definitions for young-growth harvest. Table 3.11-2 displays the acres of suitable young growth in each SIO that would result from the six alternatives.

Overall old-growth and young-growth harvest would be similar under all alternatives. However, the distribution of harvest acres would vary based on the locations of suitable forest land. As shown in Table 3.11-2, the vast majority of young-growth harvest areas would have Very Low SIOs in all alternatives, which could result in negative effects on scenery. The only variation from Very Low SIOs would occur for young-growth harvest in Old-Growth Habitat LUDs. These harvest areas would have High SIOs. All alternatives would have similar percentages of High SIOs.

Table 3.11-2
Scenery Integrity Objectives for Suitable Young Growth by LUD and Alternative (percent)

	Alternative					
SIO/LUD	**1**	**2**	**3**	**4**	**5**	**6**
Very Low/Timber Production	60%	61%	61%	61%	61%	60%
Very Low/Modified Landscape	23%	23%	22%	22%	22%	22%
Very Low/Scenic Viewshed	6%	6%	6%	6%	6%	6%
High/Old-Growth Habitat	11%	11%	11%	11%	11%	12%
Total Young-Growth Suitable Acres	**334,974**	**344,262**	**347,917**	**348,561**	**350,580**	**353,881**

[1] Consists of unmapped areas.
Note: Numbers are based on GIS estimates and are not exact due to rounding.

Effects on Selected Viewsheds

To help focus the visual effects on more familiar areas, the alternatives were analyzed by selected large viewsheds in the Tongass. These 23 viewsheds were selected for their popularity and intensity of public use and travel and are the same as those analyzed in the EIS associated with the 1997 Forest Plan (USDA Forest Service 1997a) and in the EISs associated with the 2008 and 2016 Forest Plan FEIS (USDA Forest Service 2008b, 2016b). They technically represent a series of viewsheds along a travelway and take in entire VCUs. Table 3.11-3 compares suitable and projected harvest acres for young-growth and old-growth timber under the six alternatives for each of the viewsheds. The table also includes the total acres of each viewshed and the percent of each viewshed consisting of non-NFS lands. Acres that are seldom seen or unseen from any viewpoint along the travelway are excluded from the viewshed, which are displayed in Figure 3.11-1.

While the previous section of this effects analysis summarized overall effects by alternative, this section is intended to be a viewshed-specific assessment of effects. As such, it takes into account past harvest and represents a cumulative assessment of scenery effects. Listed below are some summary points that can be observed from the viewshed-specific assessment:

- Three of the 23 viewsheds (Hyder/Salmon River Highway, Stephens Passage, and Mendenhall Glacier) include less than 500 acres of suitable young growth in all alternatives.
- Six of the 23 viewsheds (Hyder/Salmon River Highway, Mendenhall Glacier, Stephens Passage, Ernest Sound, Lynn Canal, and Salmon Bay Lake) include less than 150 acres of suitable old growth in all alternatives.
- In most viewsheds, the highest effects on scenery would be associated with Alternatives 5 and 6, followed in order by Alternatives 4, 3, 2, and 1.
- Viewsheds with the highest potential for negative effects from young-growth harvest include Chatham Strait, Duncan Canal, Frederick Sound, Lynn Canal, and Stikine Strait, based on both the percent increase and the increase in acreage of young growth suitable and projected harvest relative to Alternative 1.
- Viewsheds with the highest potential for negative effects from old-growth harvest include Duncan Canal, Eastern Passage, Frederick Sound, Stikine Strait, Tenakee Inlet to Tenakee Springs, and Zimovia Strait, based on both the percent increase and the increase in acreage of old growth suitable and projected harvest relative to Alternative 1.

Table 3.11-3
Suitable/Projected Harvest (in acres) for Young Growth and Old Growth in Selected General Viewsheds [1,2]

Viewshed and Category	Alternative 1	2	3	4	5	6
Behm Canal (West)						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	803	803	803	803	803	846
Very Low SIO-Foreground/Middleground	8,114	8,114	8,114	8,115	8,127	8,127
Suitable OG Acres – All SIOs and Dist. Zones	8,223	8,226	8,405	9,205	9,420	9,420
Projected YG Harvest Acres in Seen Area over 100 Years	7,586	7,360	7,283	7,270	7,238	7,204
Projected OG Harvest Acres in Seen Area over 100 Years	1,522	1,413	1,170	1,008	1,013	1,013
Total Acres in Viewshed (2% is Non-NFS)	48,956	48,956	48,956	48,956	48,956	48,956
Carroll Inlet						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	86	86	86	86	86	91
Very Low SIO-Foreground/Middleground	7,026	7,312	7,312	7,312	7,312	7,312
Suitable OG Acres – All SIOs and Dist. Zones	6,342	7,135	9,068	9,756	9,756	9,756
Projected YG Harvest Acres in Seen Area over 100 Years	6,051	6,106	6,042	6,031	5,997	5,945
Projected OG Harvest Acres in Seen Area over 100 Years	1,174	1,226	1,262	1,068	1,045	1,045
Total Acres in Viewshed (6% is Non-NFS)	52,422	52,422	52,422	52,422	52,422	52,422
Chatham Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	2,326	2,326	2,326	2,326	2,326	2,898
Very Low SIO-Foreground/Middleground	4,850	4,850	4,875	4,938	4,940	4,940
Suitable OG Acres – All SIOs and Dist. Zones	8,136	8,174	10,447	12,451	12,516	12,516
Projected YG Harvest Acres in Seen Area over 100 Years	6,105	5,923	5,881	5,922	5,889	6,293
Projected OG Harvest Acres in Seen Area over 100 Years	1,505	1,404	1,454	1,363	1,346	1,346
Total Acres in Viewshed (4% is Non-NFS)	107,411	107,411	107,411	107,411	107,411	107,411
Cholmondeley Sound						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	91	91	91	91	91	96
Very Low SIO-Foreground/Middleground	711	727	727	727	728	728
Suitable OG Acres – All SIOs and Dist. Zones	1,040	1,043	1,200	1,726	1,726	1,726
Projected YG Harvest Acres in Seen Area over 100 Years	682	675	668	666	664	662
Projected OG Harvest Acres in Seen Area over 100 Years	192	179	167	189	186	186
Total Acres in Viewshed (21% is Non-NFS)	36,157	36,157	36,157	36,157	36,157	36,157
Clarence Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	1,182	1,175	1,186	1,187	1,195	1,290
Very Low SIO-Foreground/Middleground	17,271	17,386	17,665	17,684	17,864	17,864
Suitable OG Acres – All SIOs and Dist. Zones	9,969	10,590	12,352	13,772	13,773	13,773
Projected YG Harvest Acres in Seen Area over 100 Years	15,699	15,320	15,395	15,383	15,447	15,379
Projected OG Harvest Acres in Seen Area over 100 Years	1,845	1,793	1,695	1,489	1,463	1,463
Total Acres in Viewshed (11% is Non-NFS)	200,380	200,380	200,380	200,380	200,380	200,380

Table 3.11-3 (continued)
Suitable/Projected Harvest (in acres) for Young Growth and Old Growth in Selected General Viewsheds [1,2]

Viewshed and Category	Alternative					
	1	2	3	4	5	6
Duncan Canal						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	351	351	351	351	351	362
Very Low SIO-Foreground/Middleground	1,919	2,448	2,448	2,448	2,477	2,477
Suitable OG Acres – All SIOs and Dist. Zones	1,619	2,782	4,316	4,416	4,416	4,416
Projected YG Harvest Acres in Seen Area over 100 Years	1,931	2,310	2,286	2,282	2,292	2,280
Projected OG Harvest Acres in Seen Area over 100 Years	299	478	601	484	475	475
Total Acres in Viewshed (0% is Non-NFS)	69,641	69,641	69,641	69,641	69,641	69,641
Eastern Passage						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	342	342	342	342	342	468
Very Low SIO-Foreground/Middleground	2,344	2,428	2,428	2,428	2,465	2,465
Suitable OG Acres – All SIOs and Dist. Zones	4,251	4,680	8,361	8,361	8,361	8,361
Projected YG Harvest Acres in Seen Area over 100 Years	2,285	2,287	2,263	2,259	2,275	2,355
Projected OG Harvest Acres in Seen Area over 100 Years	787	804	1,163	916	899	899
Total Acres in Viewshed (9% is Non-NFS)	135,673	135,673	135,673	135,673	135,673	135,673
Ernest Sound						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	31	31	31	31	31	53
Very Low SIO-Foreground/Middleground	464	464	464	464	464	464
Suitable OG Acres – All SIOs and Dist. Zones	0	0	0	0	0	0
Projected YG Harvest Acres in Seen Area over 100 Years	421	408	404	403	401	415
Projected OG Harvest Acres in Seen Area over 100 Years	0	0	0	0	0	0
Total Acres in Viewshed (7% is Non-NFS)	36,131	36,131	36,131	36,131	36,131	36,131
Frederick Sound						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	526	590	596	596	590	635
Very Low SIO-Foreground/Middleground	7,424	8,183	8,196	8,197	8,218	8,218
Suitable OG Acres – All SIOs and Dist. Zones	9,085	11,647	15,728	20,509	20,601	20,601
Projected YG Harvest Acres in Seen Area over 100 Years	6,764	7,241	7,181	7,168	7,139	7,108
Projected OG Harvest Acres in Seen Area over 100 Years	1,680	1,995	2,183	2,241	2,211	2,211
Total Acres in Viewshed (2% is Non-NFS)	163,068	163,068	163,068	163,068	163,068	163,068
Salmon Bay Lake						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	256	256	256	256	256	256
Very Low SIO-Foreground/Middleground	1,103	1,103	1,103	1,103	1,103	1,103
Suitable OG Acres – All SIOs and Dist. Zones	12	12	14	14	14	14
Projected YG Harvest Acres in Seen Area over 100 Years	1,156	1,121	1,109	1,107	1,091	1,091
Projected OG Harvest Acres in Seen Area over 100 Years	2	2	2	2	1	1
Total Acres in Viewshed (0% is Non-NFS)	8,422	8,422	8,422	8,422	8,422	8,422

Table 3.11-3 (continued)
Suitable/Projected Harvest (in acres) for Young Growth and Old Growth in Selected General Viewsheds [1,2]

Viewshed and Category	Alternative					
	1	2	3	4	5	6
Icy Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	16	16	16	16	16	132
Very Low SIO-Foreground/Middleground	2,421	2,442	2,442	2,442	2,564	2,564
Suitable OG Acres – All SIOs and Dist. Zones	8,060	8,237	8,424	10,514	11,179	11,179
Projected YG Harvest Acres in Seen Area over 100 Years	2,074	2,029	2,008	2,004	2,091	2,165
Projected OG Harvest Acres in Seen Area over 100 Years	1,491	1,415	1,172	1,151	1,202	1,202
Total Acres in Viewshed (5% is Non-NFS)	71,116	71,116	71,116	71,116	71,116	71,116
Lynn Canal						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	1	1	1	1	25	83
Very Low SIO-Foreground/Middleground	42	646	646	696	928	928
Suitable OG Acres – All SIOs and Dist. Zones	91	91	91	98	106	106
Projected YG Harvest Acres in Seen Area over 100 Years	36	534	528	568	772	812
Projected OG Harvest Acres in Seen Area over 100 Years	17	16	13	11	11	11
Total Acres in Viewshed (15% is Non-NFS)	234,253	234,253	234,253	234,253	234,253	234,253
Mendenhall Glacier						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	0	0	0	0	0	0
Very Low SIO-Foreground/Middleground	0	0	0	0	0	0
Suitable OG Acres – All SIOs and Dist. Zones	0	0	0	0	0	0
Projected YG Harvest Acres in Seen Area over 100 Years	0	0	0	0	0	0
Projected OG Harvest Acres in Seen Area over 100 Years	0	0	0	0	0	0
Total Acres in Viewshed (3% is Non-NFS)	55,266	55,266	55,266	55,266	55,266	55,266
Peril Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	1,804	1,804	1,804	1,804	1,804	1,868
Very Low SIO-Foreground/Middleground	6,518	6,478	6,478	6,518	6,521	6,521
Suitable OG Acres – All SIOs and Dist. Zones	3,437	3,407	3,407	5,330	6,270	6,270
Projected YG Harvest Acres in Seen Area over 100 Years	7,080	6,836	6,764	6,784	6,748	6,736
Projected OG Harvest Acres in Seen Area over 100 Years	636	585	474	584	674	674
Total Acres in Viewshed (7% is Non-NFS)	189,194	189,194	189,194	189,194	189,194	189,194
Hyder						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	0	0	0	0	0	0
Very Low SIO-Foreground/Middleground	186	186	186	186	207	207
Suitable OG Acres – All SIOs and Dist. Zones	21	21	21	21	24	24
Projected YG Harvest Acres in Seen Area over 100 Years	158	154	152	152	166	166
Projected OG Harvest Acres in Seen Area over 100 Years	4	4	3	2	3	3
Total Acres in Viewshed (3% is Non-NFS)	23,278	23,278	23,278	23,278	23,278	23,278

Table 3.11-3 (continued)
Suitable/Projected Harvest (in acres) for Young Growth and Old Growth in Selected General Viewsheds [1,2]

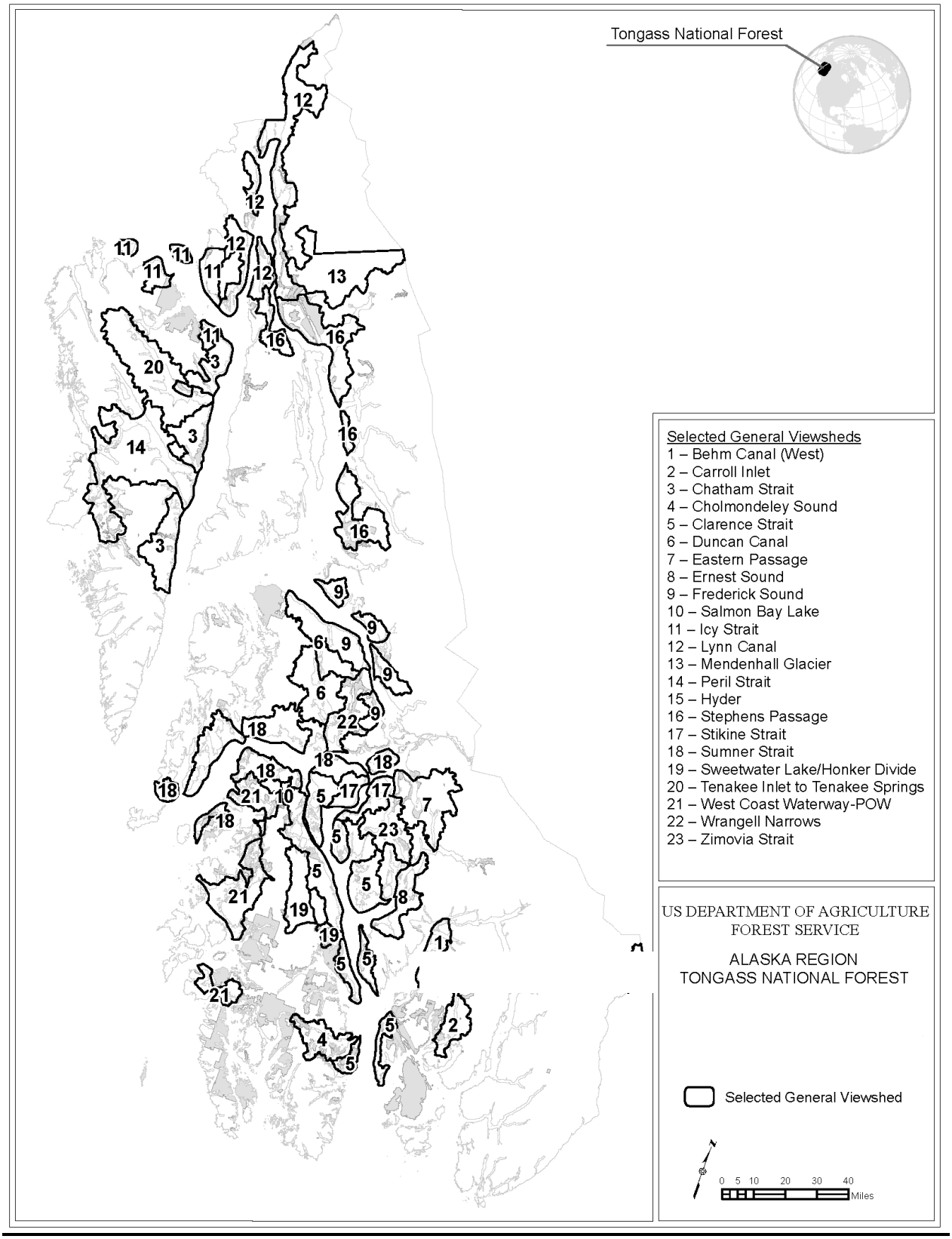
Viewshed and Category	Alternative					
	1	2	3	4	5	6
Stephens Passage						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	0	0	0	0	0	156
Very Low SIO-Foreground/Middleground	159	165	165	186	258	258
Suitable OG Acres – All SIOs and Dist. Zones	47	47	47	50	50	50
Projected YG Harvest Acres in Seen Area over 100 Years	135	136	135	152	209	332
Projected OG Harvest Acres in Seen Area over 100 Years	9	8	7	5	5	5
Total Acres in Viewshed (26% is Non-NFS)	258,966	258,966	258,966	258,966	258,966	258,966
Stikine Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	350	361	367	367	361	511
Very Low SIO-Foreground/Middleground	3,231	3,802	3,803	3,856	3,958	3,958
Suitable OG Acres – All SIOs and Dist. Zones	2,025	2,301	2,318	4,136	5,281	5,281
Projected YG Harvest Acres in Seen Area over 100 Years	3,047	3,436	3,406	3,442	3,500	3,588
Projected OG Harvest Acres in Seen Area over 100 Years	363	373	304	438	554	554
Total Acres in Viewshed (0% is Non-NFS)	60,654	60,654	60,654	60,654	60,654	60,654
Sumner Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	898	898	898	898	898	936
Very Low SIO-Foreground/Middleground	20,232	20,231	20,246	20,272	20,291	20,291
Suitable OG Acres – All SIOs and Dist. Zones	13,338	13,430	13,600	16,170	16,175	16,175
Projected YG Harvest Acres in Seen Area over 100 Years	17,977	17,440	17,269	17,258	17,174	17,044
Projected OG Harvest Acres in Seen Area over 100 Years	2,463	2,303	1,889	1,758	1,727	1,727
Total Acres in Viewshed (5% is Non-NFS)	151,274	151,274	151,274	151,274	151,274	151,274
Sweetwater Lake/Honker Divide						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	2,586	2,586	2,586	2,586	2,586	2,586
Very Low SIO-Foreground/Middleground	6.911	6,972	6,974	6,974	6,974	6,974
Suitable OG Acres – All SIOs and Dist. Zones	467	467	466	467	467	467
Projected YG Harvest Acres in Seen Area over 100 Years	8,079	7,888	7,807	7,793	7,748	7,676
Projected OG Harvest Acres in Seen Area over 100 Years	86	80	65	51	50	50
Total Acres in Viewshed (9% is Non-NFS)	107,353	107,353	107,353	107,353	107,353	107,353
Tenakee Inlet to Tenakee Springs						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	1,147	1,147	1,147	1,147	1,147	1,149
Very Low SIO-Foreground/Middleground	2,600	2,602	2,602	2,602	2,641	2,641
Suitable OG Acres – All SIOs and Dist. Zones	4,801	5,246	6,342	9,629	9,629	9,629
Projected YG Harvest Acres in Seen Area over 100 Years	3,187	3,094	3,061	3,056	3,069	3,043
Projected OG Harvest Acres in Seen Area over 100 Years	888	901	882	1,054	1,035	1,035
Total Acres in Viewshed (1% is Non-NFS)	152,402	152,402	152,402	152,402	152,402	152,402

Table 3.11-3 (continued)
Suitable/Projected Harvest (in acres) for Young Growth and Old Growth in Selected General Viewsheds [1,2]

Viewshed and Category	Alternative					
	1	2	3	4	5	6
West Coast Waterway-POW						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	2,009	2,020	2,020	2,024	2,024	2,057
Very Low SIO-Foreground/Middleground	10,779	10,822	10,822	10,835	10,839	10,839
Suitable OG Acres – All SIOs and Dist. Zones	5,482	5,389	6,197	6,880	6,880	6,880
Projected YG Harvest Acres in Seen Area over 100 Years	10,880	10,599	10,488	10,482	10,425	10,354
Projected OG Harvest Acres in Seen Area over 100 Years	1,004	910	810	712	700	700
Total Acres in Viewshed (15% is Non-NFS)	139,547	139,547	139,547	139,547	139,547	139,547
Wrangell Narrows						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	514	561	561	561	561	587
Very Low SIO-Foreground/Middleground	2,260	2,397	2,397	2,397	2,432	2,432
Suitable OG Acres – All SIOs and Dist. Zones	5,904	6,493	6,596	8,438	8,872	8,872
Projected YG Harvest Acres in Seen Area over 100 Years	2,360	2,441	2,416	2,411	2,424	2,424
Projected OG Harvest Acres in Seen Area over 100 Years	1,092	1,116	918	924	954	954
Total Acres in Viewshed (26% is Non-NFS)	87,438	87,438	87,438	87,438	87,438	87,438
Zimovia Strait						
Suitable YG Acres by SIO & Dist. Zone						
High SIO-Foreground/Middleground	663	666	666	666	666	730
Very Low SIO-Foreground/Middleground	2,807	3,155	3,181	3,195	3,198	3,198
Suitable OG Acres – All SIOs and Dist. Zones	4,450	5,501	7,052	8,128	8,128	8,128
Projected YG Harvest Acres in Seen Area over 100 Years	2,952	3,154	3,141	3,147	3,132	3,154
Projected OG Harvest Acres in Seen Area over 100 Years	823	945	981	890	874	874
Total Acres in Viewshed (12% is Non-NFS)	82,695	82,695	82,695	82,695	82,695	82,695

[1] SIO terms are defined in the *Affected Environment* portion of this section.
[2] The numbers in this table are approximate acres seen from a Visual Priority Travel Route and Use Area.

Figure 3.11-1
Map of Selected General Viewsheds



Behm Canal (West)
All alternatives would have similar acres of suitable young growth in the Behm Canal West viewshed. Suitable old-growth acres would be similar for Alternatives 1, 2, and 3 and would be 10 to 15 percent higher for Alternatives 4, 5, and 6.

However, projected harvest in this viewshed would generally decrease for both young growth and old growth for the alternatives that include greater acreages of suitable lands. This is because harvest levels would remain the same under all alternatives and alternatives with greater acreages of suitable lands would experience a lower harvest rate on a per acre basis. Therefore, the total harvest acres for a viewshed depends on the total suitable acres in the viewshed relative to the total suitable acres in all other viewsheds.

In some areas, particularly on the Revilla Island side of the west Canal, existing harvest is likely near the level allowed by the adopted SIOs. Additional harvest may need to be deferred in some areas in the coming decade. A high portion of the existing harvest acres are along the beach fringe in all alternatives.

Clearcutting and patch cutting, with up to 10-acre openings, are allowed, but a 200-foot shoreline buffer would be maintained, which would help conceal the opening created by clearcuts. Therefore, all alternatives could have localized higher effects during the first few decades.

Carroll Inlet
Suitable acres of young growth in Carroll Inlet would increase by about 4 percent for all action alternatives relative to Alternative 1. Suitable acres of old growth would increase by 13 and 43 percent under Alternatives 2 and 3, respectively, relative to Alternative 1, and by 54 percent under Alternatives 4, 5, and 6. Again, however, projected harvest levels would decrease or increase slightly under each of the action alternatives because the constant harvest levels dictated by the Forest Plan would be spread over larger acreages of suitable forest lands.

Carroll Inlet has experienced relatively heavy past harvest and existing harvest is likely near the level allowed by the adopted SIOs in some areas. Additional harvest may need to be deferred in localized areas in the coming decade depending on the SIO. A high portion of young-growth acres are scattered along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10-acre openings, are allowed, but a 200-foot shoreline buffer would be maintained, which would help conceal the opening created by clearcuts. Therefore, all alternatives could have localized moderate effects during the first few decades.

Chatham Strait (West side)
Suitable young-growth acres in this viewshed would be similar under Alternatives 1 and 2, increase by about 1 percent or less under Alternatives 3, 4, and 5, and increase by about 9 percent under Alternative 6. Suitable old-growth acres would also be similar under Alternatives 1 and 2, would increase by 28 percent under Alternative 3, and would increase by about 54 percent under Alternatives 4, 5, and 6. Again however, young-growth and old-growth projected harvest under the action alternatives would be the same or less than under Alternative 1, with the exception of young-growth harvest under Alternative 6, which would increase by about 3 percent.

Chatham Strait has experienced relatively high past harvest but much of it is in seldom seen areas. Further, the number of young-growth acres of harvestable age within the next decade is very limited (USDA Forest Service 2016b, Table 3.16-5). Therefore, all of the alternatives are expected to have low effects during the first few decades.

Cholmondeley Sound
In this viewshed, suitable young-growth acres would be similar under all alternatives, varying by less than 3 percent. Using Alternative 1 as the baseline, suitable old-growth acres, however, would increase by 15 percent under Alternative 3, and by 66 percent under Alternatives 4, 5, and 6. Suitable old-growth acres would be almost identical under Alternatives 1 and 2. Projected young-growth and old-growth harvest would be less than the Alternative 1 level for all alternatives.

Cholmondeley Sound has experienced limited past harvest on NFS lands, but high past harvest on non-NFS lands. About 27 percent of the viewshed consists of non-NFS lands. The number of young-growth acres of harvestable age within the next decade is very limited (USDA Forest Service 2016b, Table 3.16-5) and the projected harvest of old growth is less than 200 acres over the next 100 years. Therefore, with the possible exception of Alternatives 5 and 6, all of the alternatives are expected to have relatively low effects during the first few decades. However, additional harvest may need to be deferred in localized areas near non-NFS land, especially where harvest includes openings in the beach fringe.

Clarence Strait
Clarence Strait is a large viewshed (over 200,000 acres), extending along both sides of the strait, from its northern end south to Gravina Island. The viewshed includes portions of the South Etolin Wilderness Area, which would have an SIO of High under all alternatives; however, a Very High SIO would likely be achieved.

Relative to Alternative 1, the suitable young-growth acres would vary by 4 percent (Alternatives 5 or 6) or less and suitable old-growth acres would increase by up to 38 percent (under Alternatives 4, 5, and 6). However, because of the constant overall harvest level under all alternatives, projected harvest acreage would be at Alternative 1 levels or less for both young growth and old growth.

Clarence Strait has experienced considerable past harvest, but much of it is not readily visible from the Strait, so much of the viewshed appears relatively pristine. However, the number of young-growth acres of harvestable age within the next decade is considerable (USDA Forest Service 2016b, Table 3.16-5). A number of these acres are scattered along the beach fringe, especially along Prince of Wales and adjacent islands. Therefore, all alternatives could have localized moderate effects during the first few decades.

Duncan Canal
In the Duncan Canal viewshed, suitable young-growth acres would increase from 23 to 25 percent and the projected harvest would increase from 18 to 20 percent under all action alternatives. However, suitable old-growth acres would increase from 72 to 173 percent and projected harvest would increase from 59 to 101 percent under the action alternatives.

Duncan Canal has experienced considerable past harvest on the east side of the Canal, but much of it is not readily visible from the Strait. However, the number of young-growth acres of harvestable age within the next decade exceeds 100 acres (USDA Forest Service 2016b, Table 3.16-5). A number of these acres are scattered along the beach fringe in all alternatives. Therefore, all alternatives could have local effects along the travelway during the first few decades.

Eastern Passage
Suitable young-growth acres for each alternative vary by only 9 percent, with the highest acreage in Alternatives 5 and 6. The increase in suitable old-growth acres relative to Alternative 1 would range up to 97 percent in Alternatives 4, 5, and 6. Projected young-growth harvest would vary by 4 percent or less under the alternatives but projected old-growth harvest would range up to 48 percent more acres than under Alternative 1.

Eastern Passage has experienced considerable past harvest on the Wrangell Island side, but much of it is not readily visible from the Passage. A few older young-growth acres are scattered along the beach fringe in all alternatives.

Therefore, all alternatives could have local effects along the travelway during the first few decades.

Ernest Sound
Both suitable and projected harvest acres in the Ernest Sound viewshed for young growth and old growth do not vary significantly among the alternatives. There are no suitable old-growth acres under any alternative.

Ernest Sound has experienced considerable past harvest on Deer Island and along the beach to the north. A considerable number of young-growth acres of harvestable age during the next decade occur

within the viewshed (USDA Forest Service 2016b, Table 3.16-5) and most of these acres are along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10-acre openings, are allowed, and a 200-foot shoreline buffer would mitigate opening size.

Therefore, all alternatives could have localized effects during the first few decades.

Frederick Sound

In the Frederick Sound viewshed, suitable young-growth acres would increase from 10 to 11 percent and the projected harvest would increase from 5 to 7 percent under all action alternatives. However, suitable old-growth acres would increase more substantially under all alternatives ranging from 28 percent under Alternative 2 to 127 percent under Alternatives 5 and 6. Projected harvest would increase from 19 percent under Alternative 2 to 33 percent under Alternative 4.

Frederick Sound is a large viewshed (163,000 acres) along Kupreanof Island and the mainland. Frederick Sound has experienced considerable past harvest in local areas on Kupreanof Island and along the mainland. It includes a substantial acreage of young-growth of harvestable age within the next decade (USDA Forest Service 2016b, Table 3.16-5). Some of these acres are along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10-acre openings, are allowed, and a 200-foot shoreline buffer would mitigate opening size. Therefore, all alternatives could have localized moderate effects during the first few decades.

Salmon Bay Lake

In the Salmon Bay Lake Viewshed, suitable acres of young growth and old growth would remain the same as Alternative 1 acres under all alternatives. Projected harvest would remain the same as Alternative 1 or be slightly lower. Harvest of old growth would be 2 acres or less.

None of the alternatives would have any young-growth acres that would be of harvestable age within the next decade (USDA Forest Service 2016b, Table 3.16-5). Therefore, none of the alternatives are expected to have more than minor effects on scenery in the next few decades.

Icy Strait

Icy Strait would experience limited effects due partly to the Wilderness LUDs on Pleasant and Lemesurier Islands and the LUD II at Point Adolphus. Wilderness areas would have an SIO of High under all alternatives, but would likely achieve an SIO of Very High.

Suitable young growth and projected harvest acres would be similar under Alternatives 1, 2, 3, and 4 varying by only one suitable acre and up to 3 percent for projected harvest acres. Under Alternatives 5 and 6, suitable young growth would increase by about 10 percent. For suitable old-growth acreage, Alternatives 1, 2, and 3 would vary by up to 5 percent, while these acres would increase by 30 to 39 percent under Alternatives 4, 5, and 6. Projected old-growth harvest, however, would be lower under all action alternatives because of the fact that Forest-wide harvest would be constant under all alternatives.

No young-growth acres of harvestable age within the next decade occur in the viewshed (USDA Forest Service 2016b, Table 3.16-5). Therefore, minor effects are expected to occur under any alternatives during the first few decades.

Lynn Canal

Scenic effects within the Lynn Canal Viewshed would be very limited under Alternative 1 because of minor suitable acreages of young growth and old growth. In addition, very minor differences would result under all alternatives for old growth suitable and projected harvest acreages. In contrast, young-growth suitable and projected harvest acreages would increase considerably for all action alternatives, especially for Alternatives 5 and 6. However, projected young-growth harvest over 100 years would be less than 900 acres for all alternatives, or less than 0.4 percent of this large viewshed (234,000 acres).

Mendenhall Glacier

No effects would occur in the Mendenhall Glacier Viewshed under any of the alternatives. No suitable young growth or old growth occurs within the viewshed.

Peril Strait/Neva-Olga Strait/Sitka
This viewshed is a large one (189,000 acres) that begins near Sitka and wraps around the northern end of Chichagof Island and the southern end of Baranof Island. Young growth suitable acres would vary insignificantly under all alternatives, and projected harvest acres for young growth under all action alternatives would be less than under Alternative 1. Suitable old-growth acres would be relatively constant for Alternatives 1, 2, and 3, but would increase by 55 to 82 percent under Alternatives 4, 5, and 6. Projected old-growth harvest acres would be less than Alternative 1 for Alternatives 2, 3, and 4, but would be 6 percent higher under Alternatives 5 and 6.

The Peril Strait complex has experienced considerable past harvest in local areas, mostly on Chichagof, Kruzof, and adjacent small islands. The number of young-growth acres of harvestable age within the next decade is substantial for all alternatives (USDA Forest Service 2016b, Table 3.16-5). Many of these acres are along the beach fringe in all alternatives. Clearcutting or patch cutting, with up to 10-acre openings, are allowed in the beach fringe, along with a 200-foot shoreline buffer, which would mitigate opening size. Therefore, all alternatives could have local moderate effects during the first few decades.

Hyder/Salmon River
Only minor amounts of suitable young-growth and old-growth acres occur in this viewshed under all of the alternatives. Therefore, little to no impacts related to scenic quality are expected to occur.

Stephens Passage
Stephens Passage is a large viewshed (259,000 acres) running between Admiralty Island and the mainland. It excludes the majority of the wilderness portion of the Admiralty National Monument.

Young growth suitable acres are relatively minor under all alternatives and old growth suitable acres are insignificant. Only Alternatives 5 and 6 have a projected young-growth harvest over 200 acres. Although many of the young-growth acres are older stands in the beach fringe, they are scattered throughout the large viewshed.

Stikine Strait
This viewshed covers the corridors between Etolin, Zarembo, and Woronkofski Islands. Suitable young growth would increase under the action alternatives by 16 percent for Alternatives 2 and 3 and by 18 to 25 percent for Alternatives 4, 5, and 6. Projected young-growth harvest would also increase under all action alternatives ranging from 12 percent for Alternative 3, to 18 percent for Alternative 6. Suitable old growth would be about 14 percent higher under Alternatives 2 and 3, but up to 161 percent higher under Alternatives 4, 5, and 6. Projected old-growth harvest would be similar under Alternatives 1, 2, and 3, ranging from 3 percent higher to 16 percent lower than Alternative 1, but would be 21 percent higher under Alternative 4 and 53 percent higher under Alternatives 5 and 6.

The Stikine Strait Viewshed has experienced considerable past harvest in most areas within the viewshed. The number of young-growth acres of harvestable age within the next decade are relatively low, but many of these acres are along the beach fringe.

Sumner Strait
The Sumner Strait Viewshed is a large viewshed (152,000 acres) along northern Prince of Wales, Kosciusko, Kuiu, Kupreanof, Zarembo, and other islands. It includes portions of the Kuiu Wilderness and the Mt. Calder/Mt. Holbrook and Salmon Bay LUD II areas. These areas would have an SIO of High but would likely achieve an SIO of Very High.

Suitable young-growth acres in this viewshed are essentially the same under all alternatives. Suitable old-growth acres are also similar for Alternatives 1, 2, and 3, but increase by 21 percent for Alternatives 4, 5, and 6. Projected old-growth and young-growth harvest, however, would decrease for the action alternatives because all alternatives would have the same overall harvest level. The number of young-growth acres of harvestable age within the next decade is relatively high (USDA Forest Service 2016b, Table 3.16-5), and many of these acres are along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10 acre openings, are allowed in addition to a 200-foot shoreline buffer, which

would mitigate opening size. Therefore, all alternatives could have relatively high effects along the shoreline during the first few decades.

Sweetwater Lake/Honker Divide
Suitable young-growth and old-growth acres are essentially the same under all alternatives in this viewshed. Therefore, there would be essentially no difference among the alternatives.

The Sweetwater Lake/Honker Divide Viewshed has experienced relatively heavy past harvest in some portions. Additional harvest may need to be deferred in localized areas in the coming decade.

Tenakee Inlet to Tenakee Springs
This is a large viewshed (152,000 acres), which contains the Trap Bay and Kadashan LUD II areas, which have an SIO of High under all alternatives. The viewshed also contains land designated as Research Natural Area and Wild River LUDs, which also have a High SIO under all alternatives.

Suitable young-growth acres are essentially the same under all alternatives in this viewshed, so there would be essentially no difference among the alternatives in terms of young growth. Old-growth suitable acres, however, would increase by 9 to 32 percent under Alternatives 2 and 3 and by 101 percent under Alternatives 4, 5, and 6. Similarly, projected harvest would increase by up to 1 percent for Alternatives 2 and 3 and by 17 to 19 percent for Alternatives 4, 5, and 6.

The Tenakee Inlet to Tenakee Springs Viewshed has experienced considerable past harvest in many areas within the viewshed. The number of young-growth acres of harvestable age within the next decade is considerable (USDA Forest Service 2016b, Table 3.16-5). Many of these acres are along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10-acre openings, are allowed in addition to a 200-foot shoreline buffer, which would mitigate opening size. Therefore, all of the alternatives could have relatively high localized effects during the first few decades.

West Coast Waterway/Prince of Wales
This large viewshed (141,000 acres) contains the Mt. Calder/Mt. Holbrook LUD II area, which would have an SIO of High under all alternatives. Suitable young-growth acres and projected harvest acres would vary by only 1 and 5 percent, respectively, under all alternatives. Suitable old-growth acres would generally increase and range up to 26 percent (Alternatives 4, 5, and 6) higher under the action alternatives relative to Alternative 1. However, projected old-growth harvest in the viewshed would decline under the action alternatives relative to Alternative 1, because of the fact that all alternatives would have the same overall harvest level and the action alternatives would spread that harvest over a larger suitable area.

The West Coast Waterway/Prince of Wales Viewshed has experienced relatively heavy past harvest in many areas within the viewshed. The number of young-growth acres of harvestable age within the next decade is relatively high (USDA Forest Service 2016b, Table 3.16-5). Many of these acres are along the beach fringe in all alternatives. Clearcutting and patch cutting, with up to 10-acre openings, are allowed along with a 200-foot shoreline buffer, which would mitigate opening size. Therefore, the alternatives could have relatively high localized effects during the first few decades.

Wrangell Narrows
Suitable young-growth acres would be up to 9 percent higher for the action alternatives relative to Alternative 1, and projected harvest acres would be up to 3 percent higher under the action alternatives. Suitable old-growth acres would generally increase and range up to 50 percent (Alternatives 5 and 6) higher under the action alternatives relative to Alternative 1. However, projected old-growth harvest acres in the viewshed would range from 2 percent higher to 16 percent lower under the action alternatives relative to Alternative 1, because all alternatives would have the same overall harvest level and the action alternatives would spread that harvest over a larger suitable area.

The Wrangell Narrows Viewshed has experienced relatively high past harvest in many areas within the viewshed and includes 26 percent non-NFS lands.

However, the number of young-growth acres of harvestable age within the next decade is relatively low. Most of these acres are along the beach fringe and, therefore, all of the alternatives could have localized effects during the first few decades.

Zimovia Strait

The Zimovia Strait Viewshed runs between Etolin and Wrangell Islands. Suitable young-growth acres would be 10 to 13 percent higher for the action alternatives relative to Alternative 1 and projected young-growth harvest acres would be about 7 percent higher under all action alternatives. Suitable old-growth acres would generally increase and range from 24 percent (Alternative 2) up to 83 percent (Alternatives 4, 5, and 6) higher under the action alternatives relative to Alternative 1. Projected old-growth harvest acres in the viewshed would also increase ranging up to 19 percent higher under the action alternatives relative to Alternative 1.

The Zimovia Strait Viewshed has experienced relatively high past harvest in some areas within the viewshed. There are a considerable number of young-growth acres of harvestable age over the next decade within the viewshed (USDA Forest Service 2016b, Table 3.16-5). Most of these acres are along the beach fringe in all alternatives and, therefore, all alternatives could have localized moderate effects during the first few decades if these isolated beach units are harvested. Actual effects depend on the type of harvest implemented.

Non-Timber Actions

A range of other developments may occur within areas removed from roadless designation or in areas where roadless designations have been modified, as occurs under the action alternatives. These other developments include mining related actions, energy development, transmission lines, state highway development, and others. Essentially all of these developments are allowed under Alternative 1 so changes in their likelihood are expected to be minor.

Effects from these projects on scenery would heavily depend on site-specific plans. In general, project activities that would impact scenery could include mine development and expansion; new access road construction; forest clearing and ground disturbance; dam, powerhouse, and penstock construction; transmission line construction; and others. There is a wide range of types and sizes for these disturbances and facilities and the eventual impacts to scenery will depend on the location and design features. All potential impacts to scenery resources would be addressed during the permitting and licensing of the projects, and would include National Environmental Policy Act assessment.

The impacts to scenery associated with the action alternatives are expected to be similar to those associated with Alternative 1, as these alternatives would make only minor changes to regulations that affect the potential for their development. Impacts associated with Alternative 1 are expected to be slightly lower because of the development of slightly fewer projects over the long term; however, the Alternative 1 standards and guidelines for scenery related to these other projects are similar to the plan components of the action alternatives.

Although on a site-specific basis differences would occur, on a Forest-wide basis the scenery effects associated with all of the alternatives would show little differences because of the small number of projects likely to be developed.

Cumulative Effects

This section considers the incremental effects of the alternatives when added to other past, present, and reasonably foreseeable actions. The effects of past and present actions on scenery are included in the *Affected Environment* portion of this section, which discusses the level of scenic quality on the Tongass. Past actions include past timber harvest and road building, as well as the development of facilities and mines, which have resulted in reduced ESIs in many areas.

Present actions include the impacts of current management policies on scenery; these have resulted in modifications to SIOs.

Reasonably foreseeable actions on NFS lands include the projected levels of future timber harvest and other developments that are used in the preceding analysis to assess the potential impacts of the alternatives on the scenic quality. Other reasonably foreseeable actions include regional transportation development as defined by the State Transportation Plan and the Forest Service Alaska Region Long-Range Transportation Plan, as well as road paving on Prince of Wales Island, the closing of roads, and construction of the Angoon Airport. In addition, the expansion of cities like Juneau, Ketchikan, and Sitka, recreational cabin development, land auctions by the State, and land adjustments could include additional road construction, timber harvest, and facility construction.

It is not possible at this time to predict exactly which roads, energy projects, or other projects would be developed or their likely impact on future scenic integrity. Human settlement expansion is expected to occur around the region's larger cities with residential expansion also expected as a result of state land auctions. These developments would likely result in increased impacts on scenery. Mining activities are expected to expand at existing sites, including Greens Creek on Admiralty Island and Kensington Gold Mine north of Juneau, as well as possible future sites, including the Bokan Mountain and Niblack sites on the southern end of Prince of Wales Island. Mining projects are for the most part expected to have a negative local effect on scenery. Overall, the cumulative effects of past, present, and future actions on scenery are expected to be adverse, but are not expected to be substantially different than the effects associated with the actions addressed under direct and indirect effects.

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Subsistence

Affected Environment

Harvest and use of natural resources for food, shelter, clothing, transportation, handicrafts, and trade, commonly called "subsistence," has a long history in Alaska. Alaska Native peoples engaged in subsistence for thousands of years prior to statehood; living off the land is the core of Alaska Native peoples' culture. In more recent history, non-Native people living in rural Alaska have come to rely on natural resources for their livelihoods as well (Office of Subsistence Management 2016). Harvest and use of natural resources for food, shelter, clothing, transportation, handicrafts, and trade, commonly called "subsistence", has a long history in Alaska. Alaska Native peoples' engaged in subsistence for thousands of years prior to statehood; living off the land is the core of Alaska Native peoples' culture. In more recent history, non-Native people living in rural Alaska have come to rely on natural resources for their livelihoods as well (Office of Subsistence Management 2016).

Within the context of Southeast Alaska's seasonal and cyclical resource-based employment, subsistence harvest of fish and wildlife resources takes on special importance. The use of these resources may play a major role in supplementing cash incomes during periods when the opportunity to participate in the wage economy is either marginal or nonexistent. Because of high prices of commercial products provided through the retail sector of the cash economy, especially in remote communities, the economic role of locally available fish and game takes on added importance.

Native and non-Native communities both have high subsistence participation rates and rely heavily on wild foods, with approximately 79 percent of rural households in Southeast Alaska using wild game and 95 percent using fish (Fall 2016). The opportunity to participate in subsistence activities reinforces a variety of cultural and related values in both Native and non-Native communities. For example, the distribution of harvested fish and wildlife contributes to the cohesion of kinship groups and community stability through the sharing of resources.

Subsistence resources provide the foundation for Native culture, forming the basis for different clans and potlatch ceremonies, as well as reinforcing basic values of respect for the earth and its resources. Participating in subsistence activities contributes to the self-reliance, independence, and ability to provide for oneself; values that social surveys indicate are important reasons why many non-Native people move to or remain in Southeast Alaska (USDA Forest Service 1997a).

The Legal Context for Subsistence Use

Congress defined subsistence use in Title VIII of the 1980 Alaska National Interest Lands Conservation Act (ANILCA). Section 803 of ANILCA as:

> "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal, or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands." The provisions in ANILCA established a harvest priority for rural residents in an attempt to protect subsistence resource harvest. Under ANILCA, in times of resource scarcity or when demand exceeds biologically sound harvest levels, subsistence harvests have priority over other consumptive use of resources. In practice, state or federal fish and wildlife management authorities would limit commercial, sport, or other harvests before subsistence harvests are limited. The Alaska legislature subsequently passed a regulation to comply with ANILCA, but in 1989, the Alaska Supreme Court ruled in *McDowell v. State of Alaska* that a harvest priority for rural residents conflicted with the state constitution, which guarantees all Alaskans equal access to the state's natural resources. This ruling took the state out of compliance with ANILCA, and the federal government has managed subsistence resources on federal lands in Alaska since 1990. As a

result, federal subsistence harvests of fish and wildlife on the Tongass are presently managed by the Forest Service (Schroeder and Mazza 2005).

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

Abundance and Distribution

Southeast Alaska subsistence resources include terrestrial wildlife (including deer, moose, mountain goat, black and brown bear, furbearers, and small game), waterfowl (including ducks, geese, and seabirds), marine mammals (harbor seal), salmon, other finfish, marine invertebrates, plants, and firewood. The abundance and distribution of these resources on the Tongass is described in the 1997 Forest Plan FEIS (USDA Forest Service 1997a), as well as in other sections of this EIS.

Access

Road building, a byproduct of timber harvesting and, to a lesser extent, mining, is an important agent of change in Southeast Alaska. New road networks often provide greater access to previously unconnected areas and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the potential for increased competition. On Prince of Wales Island, for example, areas that have become connected by road are now more easily reached by local residents and other nearby communities. Road systems tend to bring more people into an area and also give subsistence hunters access to previously remote regions and provide a greater opportunity for subsistence harvest.

Southeast Alaska comprises isolated islands unconnected by road systems; however, with the transportation means available (floatplanes, ferry systems, automobiles, and boats), Southeast Alaska residents are very mobile in their subsistence resource use activities. Wrangell, the fifth-largest community in Southeast Alaska, for example, has documented their subsistence gathering from the southern tip of Prince of Wales Island to Yakutat, covering most of the islands in between (Kruse and Muth 1990).

Competition

The Tongass, with nearly 17 million acres of largely undeveloped land, includes extensive subsistence resources. These resources are not, however, distributed or used evenly across the Forest. Where the resources are confined to island groups or river systems and access is costly or nonexistent, use of the resources is low. Where the resource is abundant, and a community is present but access by other communities is costly, the resource tends to be used primarily by the community that resides in the area. Where resources are abundant and access is readily available to local and other communities of Southeast Alaska, competition for resources may exist.

Increased competition may result when less expensive access to the area or within the area is provided. Such is the case when road systems are established to local communities. When areas historically not used for subsistence purposes are made available because of easier, more cost-effective access, the new area then tends to be used. When communities with road access to abundant resources are connected to a ferry system or to commercial air services, competition for the resources may be generated from outside communities with lower abundance of the same resource.

Examples of the effect of ease of access are readily available in Southeast Alaska. Chichagof Island, Prince of Wales Island, and the Yakutat Forelands at one time were isolated portions of the Tongass with limited use from communities in the vicinity. Today, road construction, primarily a result of timber harvest activities, has created relatively large areas that are easily accessed from local communities. Access provided by ferry systems and small commuter planes to Chichagof and Prince of Wales Islands allows

relatively easy access from off-island communities. Access to the Yakutat Forelands has been made easier because of commercial jet service and ferry service to the community of Yakutat.

Subsistence Users

Under ANILCA, only rural Alaska residents qualify for priority use of subsistence hunting and fishing on federal lands. Alaska residents living in urban areas can harvest under State subsistence, sport, personal use, or commercial regulations on federal public lands, but not under federal subsistence regulations. Following the Alaska Supreme Court's 1989 ruling in *McDowell v. State of Alaska*, all Alaska residents qualify as subsistence users on state lands with federal lands continuing to be managed under ANILCA.

In 2017, Southeast Alaska had an estimated population of 72,915, with the majority (about 91 percent) living in established communities (either incorporated cities or Census Designated Places [CDP]) (Alaska Department of Labor [DOL] 2018).

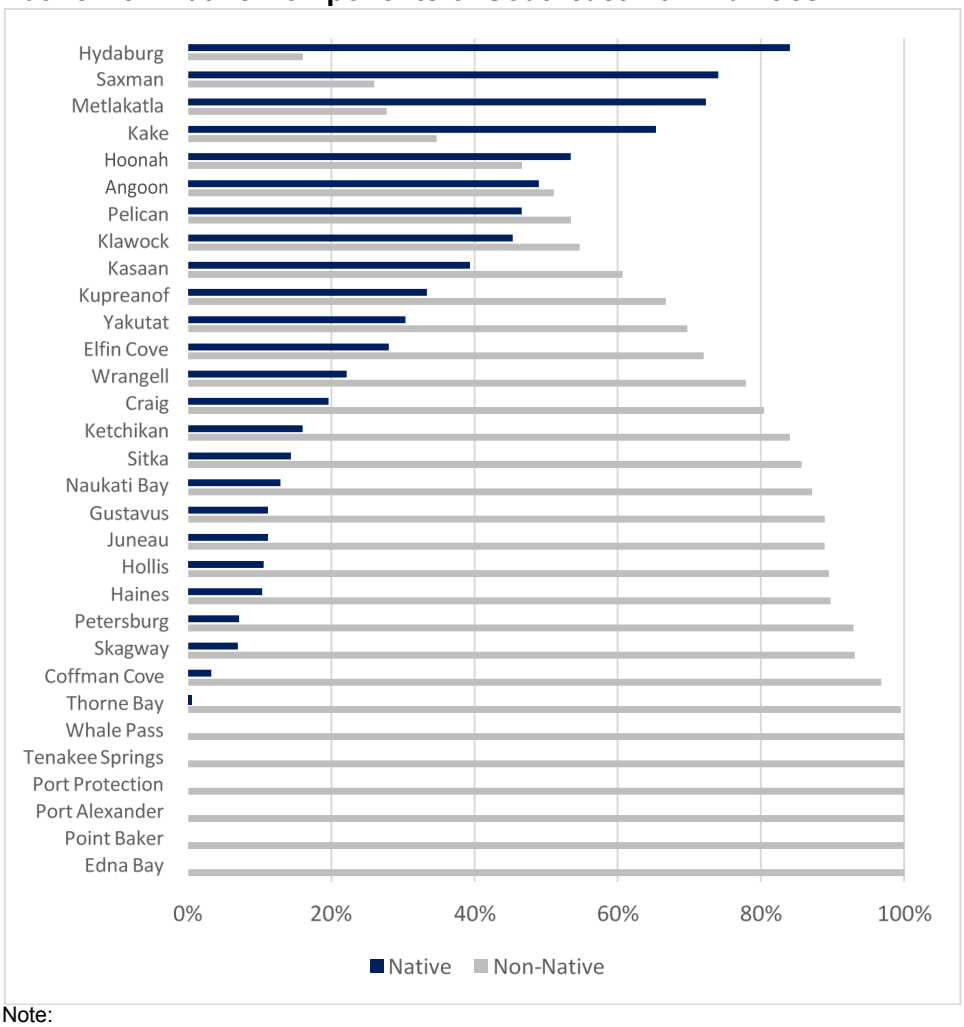
Almost two-thirds (63 percent) of the area's population lived in the city and borough of Juneau (44 percent) or Ketchikan Gateway Borough (19 percent), the only two communities considered as urban areas for subsistence purposes. An additional 22 percent of the area's population resided in the communities of Sitka, Petersburg, Wrangell, and Haines. The remaining share of the population living in established communities lived in communities ranging in size from Excursion Inlet with 11 people to Metlakatla with 1,422 people (Alaska DOL 2018).

A relatively small number of Southeast Alaska residents live at remote isolated locations. These include people living at home sites throughout Southeast Alaska, at summer fishing sites along the outer coast, tree thinners camped near areas where they have Forest Service contracts, trappers, and people living on floathouses and fishing boats. This diverse group is typically transient, generally has very low cash income, and is closely tied to non-commercial harvest of fish, game, and other renewable natural resources.

Alaska Natives made up an estimated 17 percent of the region's population in 2017 (including Juneau and Ketchikan), and an estimated 24 percent for rural communities (excluding Juneau and Ketchikan) (Figure 3.12-1). These rural communities include places that are predominately Native, such as Hydaburg, Saxman, Metlakatla, and Kake where Alaska Natives make up an estimated 84 percent, 74 percent, 72 percent, and 65 percent of the population, respectively; other communities that are predominately non-Native, like Edna Bay, Point Baker, and Whale Pass; and places with more mixed ethnicity where Alaska Natives range from about one-third to two-thirds of the population (Figure 3.12-1).

The Bureau of Indian Affairs identifies 17 localized Indian tribes in the region, including the Metlakatla of the Annette Island Reserve. At the time of contact, tribes occupied seasonal camps and temporary villages throughout traditional territories. In the late 1800s, the individual tribes of the region coalesced at what had been their winter villages. The area's extant tribes live within their earlier territories and use a similar set of subsistence resources and in this way maintain long standing ties to place. For Native people, this tie to place and the harvest and use of traditional foods are key elements in fostering Native cultural identity (Alaska Native Heritage Center 2014).

Figure 3.12-1
Native/Non-Native Components of Southeast Communities



Note:
[1] Estimates are annual totals developed as part of the 2013-2017 American Community Survey 5-Year Estimates.
Source: U.S. Census Bureau 2018a

Economy

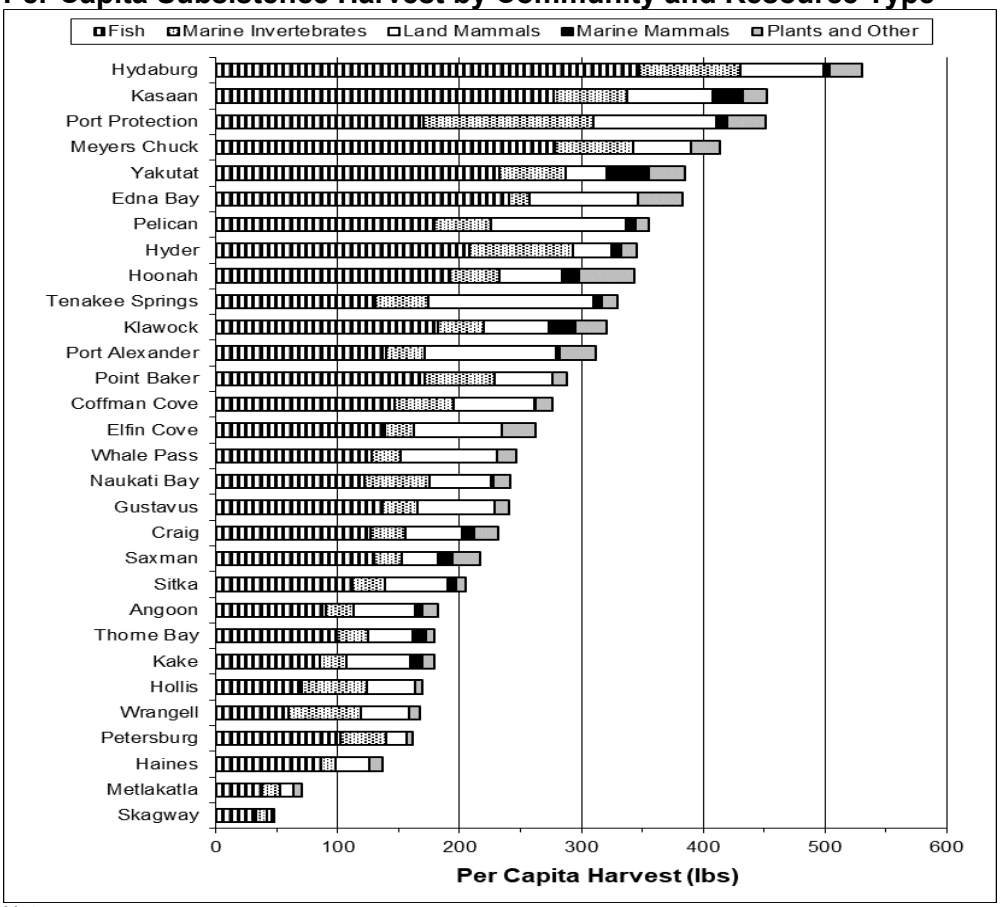
Subsistence use of fish and wildlife has been and continues to be an important component of the economies of Southeast Alaska communities. In Native communities, harvest and use of wild resources supported the subsistence-based economy that predated the introduction of cash income. In the modern era, beginning in the late-1700s, the economies of Native communities have undergone a progressive transformation, incorporating cash income into the subsistence-based system. Southeast Alaska communities that were settled primarily by non-Native immigrants have also depended on a mix of subsistence use of wild resources and cash income.

Cash income in most Southeast Alaska rural communities is limited and intermittent, and frequently supports the purchase of fuel and equipment that are part of subsistence harvest technology. Subsistence harvests have been found to fill essential food needs in most rural communities in the region. These harvests are also customarily shared among community residents and between members of different communities. Some subsistence products are traded and bartered within the region. Subsistence harvests are not geared toward market sale or commercial profit. A mixed subsistence-market economy in which subsistence harvests and cash income are complementary characterizes the economies of most of the region's rural communities (Wolfe 2004).

Subsistence research conducted in Southeast Alaska over the past two decades has included detailed community studies, use area mapping, household surveys, and studies of specific subsistence harvests. During the 1980s, the Forest Service supported research that examined the impacts of timber harvests on the Tongass on subsistence resources in the area. The Tongass Resource Use Cooperative Survey (TRUCS) was completed in 1988. Data from TRUCS are summarized in the 1997 Tongass Land Management Plan Revision FEIS (USDA Forest Service 1997a).

From 1987 to 2001, interviews were conducted with 1,064 households in 24 Southeast Alaska communities as part of the Tongass Land and Resource Management Plan (Forest Plan) subsistence administrative studies. This fieldwork was conducted cooperatively with the Forest Service, Alaska Department of Fish and Game (ADF&G), and the area's tribes and communities all participating. Summary data from this and past community harvest assessments were compiled from the ADF&G Subsistence Community Profile Database (www.state.ak.us) and harvest levels are presented by community and species in Figure 3.12-2. The data presented in this figure are the most recent available in the ADF&G database. The year these data were collected does, however, vary by community, and the data summarized should be considered a general overview of harvest patterns rather than an exact representation of current harvest activities.

Figure 3.12-2
Per Capita Subsistence Harvest by Community and Resource Type



Note:
The year these data were collected varies by community, as follows:
1987: Elfin Cove, Gustavus, Hyder, Metlakatla, Meyers Chuck, Pelican, Port Alexander, Skagway, and Tenakee Springs
1996: Kake, Point Baker, Port Protection, and Sitka 1997: Craig,
Hydaburg, and Klawock
1998: Coffman Cove, Edna Bay, Hollis, Kasaan, Naukati Bay, and Thorne Bay 1999: Saxman
2000: Petersburg, Wrangell, and Yakutat
2012: Angoon, Haines, Hoonah, Hydaburg, and Whale Pass Source: ADF&G 2006, 2014

The findings of this research are summarized in an unpublished paper by Schroeder and Mazza (2005) who identify a number of key subsistence characteristics that are evident in these data and generally consistent with the following past findings:

- Wild foods account for a large share of the diet for residents of the studied communities, ranging from 48 pounds per capita for Skagway in 1987 to over 500 pounds per capita for Hydaburg in 2012 (Figure 3.12-2). The average American diet includes about 225 pounds of meat, fish, and poultry on a per capita basis. In more than half of the identified communities, wild foods came close to, or exceeded, this national average (Figure 3.12-2). Although residents of subsistence communities purchase food, most could meet their entire protein need from wild sources.
- Marine resources, including fish, mammals, and plants, comprise the majority of subsistence harvests in all communities when measured by food weight. Marine resources account for more than half of total per capita harvest in all Southeast Alaska communities, ranging from 55 percent in Tenakee Springs to 88 percent in Skagway (Figure 3.12-2).
- More recent subsistence harvest levels in the main Native communities and the larger non-Native communities appear very similar to harvest levels estimated in the late 1980s or before. Harvest levels identified in the recent assessments conducted in Angoon, Hoonah, Hydaburg, Kake, Petersburg, Wrangell, and Yakutat, for example, are very similar to those identified in earlier studies. In a few communities, such as Coffman Cove, Kasaan, Klawock, and Port Protection, there are larger differences in harvest levels over time. However, these differences seem to be more influenced by special events or small community sizes than by patterned changes in subsistence harvests.
- Subsistence harvest levels vary considerably from community to community. Recent research and other data suggest that intercommunity variability may not be fully explained by ethnicity, income, community size, or access to resources. Other factors, such as community demographic composition, cultural traditions and orientations, and community history, may have a larger influence on harvest levels than more easily analyzed standard socioeconomic variables.
- Subsistence harvesters use a wide variety of species, but use tends to be concentrated on a relatively small number of species. In Yakutat, for example, individual subsistence harvesters use as many as 65 of the 150 different species that are harvested in the community, but 84 percent of overall community harvest (in food weight) involves just 10 species. That said, the contribution of a particular species to the total subsistence harvest generally appears to vary from year to year, although the overall total harvest in food weight may remain nearly constant.
- A small number of high harvesting households account for a disproportionate share of the total community harvest and tend to harvest more fish and wildlife than their family members can consume. The surplus is distributed to other subsistence users through a kinship network and through barter and trade. These networks are also used to distribute specialty subsistence products such as herring roe and eulachon (hooligan) oil, which are produced in large quantities in only a few communities. In Yakutat, for example, just 25 percent of subsistence households account for about 75 percent of total community subsistence harvest (in terms of food weight), with the lowest harvesting 50 percent of households taking just 8 percent of the total community harvest.

Subsistence Use Areas

Historically, subsistence use occurred where access to the resources cost less in energy than the resources gathered. Many of the gathering activities occurred in easily accessible areas. These activities occurred close to settlements where they could be accessed by foot or boat. Over time, as new technology developed, ease of access meant a movement outward into new resource use areas. The advent of motorized boats and the development of road systems associated with timber harvest activities have had a substantial influence on subsistence gathering activity in Southeast Alaska. Today, all communities use motorized boats and many are tied to nearby lands by road systems.

The distribution of subsistence harvest activity is described in further detail in the 1997 Tongass Land Management Plan Revision FEIS, with traditional household deer hunting areas mapped in Appendix H. These areas were identified based on the 1987 TRUCS (Kruse and Muth 1990). The traditional household deer hunting areas mapped in Appendix H show that the road systems are extensively used.

This is particularly true on Prince of Wales Island. These maps also show that subsistence use tends to be concentrated in close proximity to individual communities and along beaches.

Each of the communities in Southeast Alaska has a distinct home range where concentrated use occurs, with a wide range of use typically occurring on a less concentrated scale outside the normal home range. More than half (54 percent) of all households surveyed in rural Southeast Alaska in 1987 traveled a minimum of 11 miles by boat to reach the one reliable deer hunting area that they chose to describe in TRUCS (Kruse and Muth 1990). An additional 18 percent of all households also used boats to reach their reliable deer hunting area, but traveled shorter distances (10 miles or less). Only 15 percent of all households used cars or trucks to travel to their most reliable areas. Thirteen percent used some other form of transportation, such as airplanes, walking, all-terrain vehicles, and the Alaska Marine Highway System (Kruse and Muth 1990).

While the majority of use occurs within about a 15-mile radius of rural communities, nearly all of the forested lands of the Tongass are used to some degree for subsistence deer hunting (USDA Forest Service 1997a). Appendix H in the 1997 Tongass Land Management Plan Revision FEIS also displays, by community, the individual WAAs where approximately 75 percent of the average annual deer harvest occurred.

Kruse and Muth (1990) found that nearly one-half of the households harvesting deer mentioned the existence of clearcuts of various ages occurring in presently reliable areas (44 percent), most-often-used areas (48 percent), and areas no longer used (55 percent). They also reported that old-growth forests were mentioned as most reliable by 90 percent of households harvesting deer, were most-often-used areas by 91 percent of households, and were areas no longer used by 90 percent of those households harvesting deer.

Many of the fish and wildlife resource values of Southeast Alaska watersheds, based on the VCU classification of the Tongass, are summarized in the 1998 Tongass Fish and Wildlife Resource Assessment (ADF&G 1998). This report shows the relative value of areas for black bear, brown bear, deer, sport fishing, salmon production, and subsistence use. This resource assessment also included a ranking of the VCUs that have the highest community values.

Environmental Consequences

The analysis of the likely effects of the DEIS alternatives on subsistence resources and uses is presented in two parts. Effects on subsistence resources and uses important to each rural community are discussed individually by community in Appendix E. This section provides a Forest-wide evaluation that assesses the three factors related to subsistence uses identified by ANILCA: abundance and distribution, access, and competition. This general analysis relies on the community discussions and also on the Forest-wide effects analyses from the related resource sections (primarily *Fish* and *Wildlife* from the Key Issue 3 discussion) where abundance and distribution are of concern.

Section 810 of ANILCA requires the Forest Service, in determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of NFS lands in Alaska, to evaluate the potential effects on subsistence uses and needs, followed by specific notice and determination procedures should there be a significant possibility of a significant restriction of subsistence uses. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the evaluation:

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

Considerations of abundance and distribution, access, and competition (by non-rural residents) are mentioned.

It should be noted that the term "significant" as used in this context does not have the same definition as used in the implementing regulations for the NEPA. See 40 CFR 1508.27 for definitions of "significant" in a NEPA context.

The U.S. District Court Decision of Record in *Kunaknana v. Watt* provided additional clarification. In part it states:

> "restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites, or major increases in non-rural resident hunting."

Direct and Indirect Effects

Abundance and Distribution

Based on the 1987 survey information compiled as part of TRUCS, 61 percent of subsistence resources (by weight) are fish or marine invertebrates, 21 percent are deer, 4 percent are other land mammals, and another 3 percent are marine mammals. More recent community data compiled by ADF&G (2014) indicate that fish and marine invertebrates still comprise the majority of subsistence harvest per capita (in pounds). As shown in Figure 3.12-2, the share of total subsistence harvest that consists of fish and marine invertebrates ranges from 55 percent in Tenakee Springs to 88 percent in Skagway.

The subsistence analysis conducted for the 1997 Forest Plan Revision FEIS found that the primary subsistence resource likely to be significantly affected by the alternatives was Sitka black-tailed deer. Some effects to fish habitat may also result from land management activities, but the magnitude of the effects could not be calculated. Alternatives with more roads and timber production within riparian management areas and/or beach and estuary fringe were found to generally have the highest potential for adverse effects to fish and wildlife resources in the Tongass.

As a result of their association with old-growth forest habitat, which is the main terrestrial habitat type affected by the alternatives, deer are considered the "indicator" for potential subsistence resource consequences concerning the abundance and distribution of the resources. The community-based subsistence discussions presented in Appendix E largely focus on deer, which is, in most cases, by far the largest terrestrial component of subsistence food resources.

Both the 1997 Forest Plan Revision FEIS and 2008 Forest Plan Amendment FEIS concluded that deer habitat capabilities in several portions of the Tongass may not be adequate to sustain the current levels of deer harvests, and that implementation of any of the 1997 and 2008 alternatives could, therefore, be accompanied by a significant possibility of a significant restriction on the abundance and/or distribution of subsistence uses of deer. This possibility was largely due to the continuation of reduced habitat capabilities resulting from past habitat alterations, which is why it applied to all alternatives.

The 2016 Forest Plan EIS found that the possibility of a significant restriction, resulting from a change in abundance or distribution, would be less than the possibility under the 1997 Forest Plan or 2008 Forest Plan for all of the alternatives considered in that EIS because of the lower anticipated rates of timber harvest. Further, although the harvest of old growth is likely to have negative effects on deer habitat, the vast majority of the harvest proposed under the 2016 Forest Plan EIS alternatives represented the harvest of young-growth stands that are currently in the stem exclusion stage of plant succession.

The interagency deer habitat capability model was used to assess existing habitat capability within the planning area. Table 3.3b-2 (*Wildlife* section) summarizes the modeled deer habitat capability by biogeographic provinces. Forest-wide, approximately 89 percent of the original (1954) habitat capability remains, ranging from 72 to 100 percent depending on the biogeographic province. The greatest reductions in deer habitat capability have occurred in provinces where timber harvest has been concentrated (the North Central Prince of Wales, East Baranof, and Etolin Island and vicinity biogeographic provinces). Harvesting these stands currently in the stem exclusion stage would convert them to the stand initiation stage or open them up to provide more light to forage, which is generally of much higher value to deer. As a result, the harvest under all of the 2016 Forest Plan EIS alternatives would have both adverse and beneficial effects on deer habitat, depending on the stand.

The alternatives evaluated in this EIS would all harvest approximately the same amounts of young-growth and old-growth acres and, therefore, the risk of a significant restriction would be the same under all of the alternatives. In the short term, the effects of past harvest would override the effects of new harvest during the next 10 years. In the long term, future harvesting of old growth would decrease substantially following the young-growth transition under all of the alternatives, reducing the risk of a significant restriction when viewed in the context of past Forest Plan harvest projections. Total maximum old-growth harvest over 100 years would be approximately 42,500 acres under all of the alternatives.

Access

Subsistence users typically hunt and fish in traditional areas surrounding their communities. Many of the communities in Southeast Alaska are compact, centralized places surrounded by undeveloped land with limited infrastructure. Most subsistence food production is supported by a central or core use area surrounding a community. Traditional household deer hunting areas are identified for 32 communities in Southeast Alaska in Appendix H to the 1997 Forest Plan EIS. Access to and use of surrounding areas for subsistence activities may be guided by local customary rules, as well as federal and state regulation and economic considerations, with traditional use areas for different communities often overlapping at their margins. Customary rules guiding subsistence harvest may be related to local histories and social customs of clans and communities (Wolfe 2004).

This EIS is programmatic, meaning that it examines direction and allowable activities for broad land areas, rather than schedule specific activities in specific locations. This makes it difficult to evaluate the effects of the alternatives on particular groups of subsistence users or resources. The following discussion addresses potential impacts at the programmatic or forest scale and assesses relative potential impacts in terms of overall proposed road construction and timber management activities.

Viewed at this scale, none of the alternatives would directly limit the use of public lands for the purposes of subsistence gathering activities. Traditional access methods would remain available under all the alternatives for present and foreseeable future activities. Access methods differ by Game Management Unit (GMU). Those subsistence users who use a boat as their primary method of access may have temporary and localized disruptions where young-growth harvest occurs in the beach fringe.

Data on documented deer harvest by transportation type are available at the GMU level. Data from the 2013 Deer Management Report are presented by transportation type and GMU in Table 3.12-1. GMU 4, the ABC Islands (Admiralty, Baranof, and Chichagof Islands), accounted for slightly more than half (52 percent) of reported deer harvested in Southeast Alaska in 2013 (5,434 deer), with GMU 2, Prince of Wales Island, accounting for more than a third (36 percent) (3,702 deer). Hunters accessing hunting areas by boat accounted for 63 percent of total deer harvest in 2013. Hunters accessing the area by highway vehicle accounted for 53 percent of total deer harvest. The relative share of harvest by transportation type varies by GMU, with boat access, for example, accounting for 84 percent of harvest in GMU 1B, but just 27 percent in GMUs 1C and 2. Highway vehicle was the most frequently used method of access in GMU 2, Prince of Wales Island, accounting for almost two-thirds (65 percent) of deer harvest in 2013 (Table 3.12-1). This relatively high share reflects the more densely roaded nature of Prince of Wales Island and may be considered generally indicative of the effects of timber harvest and associated road building in areas connected to communities and the marine highway system.

New road construction is likely to result in the development of new use patterns around some communities, but these changes are not likely to lead to a significant possibility of a significant restriction of subsistence access to the resources. New use patterns may, however, favor some subsistence groups and disadvantage others. Subsistence access may be via a number of different transportation types and often involves more than one form of transportation.

Subsistence users may, for example, access an area via boat followed by road (and on-foot) or via boat and on-foot, with types of access varying by location and user. Some hunters may access specific areas using more than one form of transportation, but others may favor one form of transportation over another, say highway vehicle over foot.

Table 3.12-1
Deer Harvest by Game Management Unit and Transportation Type, 2013

GMU Number[1]	Area[2]	Deer Harvested	Percent of Deer Harvested by Transportation Type[3]					
			Airplane	Boat	3- or 4-Wheeler	Highway Vehicle	Foot	Unknown
1A	Ketchikan[4]	265	NA	NA	NA	NA	NA	NA
1B	Petersburg[5]	89	1	84	4	1	6	4
1C	Juneau	413	0	27	0	47	21	5
2[5]	Prince of Wales Island	3,702	3	27	NA	65	2	3
3	Central Islands	474	2	38	8	42	3	7
4	ABC Islands[6]	5,434	8	73	0	9	3	7
	Total[7]	**10,377**	**556**	**5,333**	**41**	**3,289**	**343**	**549**
	Percent of Total	100	5	53	0	33	3	5

Notes:
NA = not available; ABC Islands = Admiralty, Baranof, and Chichagof Islands
[1] Game Management Units (GMUs) are a geographic unit of measurement established and used by ADF&G.
[2] Harvest estimates are reported totals only and do not include estimates of unreported and illegal harvest.
[3] These data were compiled as part of ADF&G's mandatory hunt report cards issued in conjunction with deer harvest tickets. Hunters report transportation method for traveling to their hunting areas. Numbers may not sum to 100 percent due to rounding.
[4] Airplane data are not available for this GMU.
[5] The foot category for this GMU includes 1 percent of hunters that used a horse/dog team to access their hunting area.
[6] In GMU 2, 3- or 4-Wheelers were accounted for in the Highway Vehicle category.
[7] Total deer harvested by transportation type exclude Unit 1A, where transportation information is not available.
Source: ADF&G 2015

While there would be some new road access under all alternatives in the long run, nearly all new roads constructed under the alternatives would be closed following harvest. These roads would, therefore, not be available for use by highway vehicles or high-clearance vehicles. They may, however, be available for access by other methods and would, as a result, have the potential to affect existing subsistence patterns. The action alternatives would increase the acres available for timber harvest, but harvest levels are expected to remain the same across all alternatives. As a result, the amount of new or reconstructed road miles would be similar across the alternatives, but would be lowest under Alternatives 1 and 2 and highest under Alternatives 4, 5, and 6. Alternative 3 would likely result in more roads than Alternatives 1 and 2, and fewer than Alternatives 4 through 6.

Some subsistence users have a preference for unroaded areas. Viewed at a programmatic level, Alternatives 1 and 2 would likely have the lowest impact on subsistence users who prefer unroaded areas because timber harvest would be limited to areas outside existing IRAs under Alternative 1 and areas outside and roaded roadless under Alternative 2. These alternatives would, therefore, tend to increase road density in already developed areas rather than provide new access to presently undeveloped areas.

Another potential access impact relates to the effects of clearcut harvesting on the landscape. Subsistence hunters have varying opinions on the effects of clearcut harvest on hunting success. Some hunters say that timber harvest clearcuts are productive for some years after harvest, while others prefer not to use clearcuts. Hunters interviewed on Prince of Wales Island, for example, reported that the best hunting in clearcut areas begins approximately 2 years after an area is logged, with hunt quality typically starting to decline 9 years after the area was cut (Brinkman 2006). Concern has been expressed by hunters that clearcuts in the process of regrowth become impassable to hunters after a period of time (Galginaitus 2004). Young-growth harvest would likely improve hunting in many previously harvested areas, particularly those stands that are currently in the stem exclusion stage of plant succession. Harvesting these stands would convert them to the stand initiation stage which would initially increase forage quantity and quality for deer, and therefore provide for increased hunting opportunities in these areas for a period of time (see the *Wildlife* section).

In addition to long-term access effects, timber management activities may also have short-term, temporary displacement effects for subsistence users because it is standard practice to close logging

roads to outside traffic when logging is taking place. Subsistence users who use existing roads for access would be preempted from using those roads for the duration of logging activity in the affected area. These types of effects would, however, be short term and temporary, and would not be likely to lead to a significant possibility of a significant restriction of subsistence access to the resources. In addition, as previously noted, most or all new roads would be closed following harvest.

Competition

Almost two-thirds (63 percent) of the population in Southeast Alaska in 2014 resided in Juneau (44 percent) or Ketchikan (19 percent) and is, therefore, considered non-rural from a subsistence perspective (Alaska DOL 2018).

Residents in the remaining communities are considered rural. Competition for the more abundant wildlife and fisheries resources near rural communities is affected by a number of factors, including fish and game regulations, the mobility of community residents, the Forest-wide distribution of game species, decreases in resource populations as a result of habitat reductions and/or over-harvest, and types of community access, such as roads, ferries, and commercial air services.

The following assumptions were made for the purposes of evaluating potential impacts to competition:

- New road construction adjacent to communities with ferry access will result in increased competition from outside communities.
- New road construction adjacent to existing road systems where interties between communities exist will result in increased competition from surrounding communities associated with the interconnected roads.
- Habitat reductions will result in increased competition if regulations allow sport use to remain constant, with the same number of users seeking fewer huntable resources.
- The demand for resources will remain constant or increase slightly as the habitat capability remains the same or declines over time.

Given these assumptions, the 1997 Forest Plan Revision FEIS concluded that implementation of Alternative 11 (the Selected Alternative) would result in a significant possibility of a significant restriction of subsistence use of deer by increasing competition for some subsistence resources by non-rural, as well as rural residents. This was judged most likely to occur on Chichagof, Baranof, and/or Prince of Wales Islands, where competition for deer and some other land mammals was identified as heavy, and habitat capability had already been reduced as a result of timber harvest.

Cumulative Effects

The significant possibility of a significant restriction, resulting from a change in competition, would still exist but be less than the possibility under Alternative 11 (the Selected Alternative) of the 1997 Forest Plan Revision FEIS for all of the alternatives considered in this EIS because of the much lower anticipated rates of timber harvest and road construction.

Cumulative effects are discussed in four categories.

1. **Effects Resulting from Timber Harvesting of Private Lands**. Alaska Native corporation lands adjacent to the Tongass support extensive timber harvest operations, and old-growth forest wildlife habitat capability on Alaska Native corporation lands (especially that for deer) has declined. This decline has occurred primarily on North Chichagof, Kupreanof, Admiralty (localized), and Prince of Wales Islands, as well as in some mainland areas. The resulting lower habitat capabilities on these private lands are likely to increase hunting demands in adjacent National Forest areas, increasing competition and potentially leading to reduced hunter success, reduced or eliminated sport seasons, and in some places reduced or eliminated subsistence seasons.
2. **Effects from Past Activities**. Timber harvest has been more influential in changing the landscape than any other use of the resources of the Tongass. Timber harvest has

historically been accompanied by road building, log transfer facility development, and reductions in old-growth forest habitat.

3. **Effects of Present Activities**. Implementation of the 2016 Forest Plan established an annual average PTSQ of 46 MMBF prior to the young-growth transition, with annual old-growth harvest stabilized at 5 MMBF following the transition to support small operators and specialty products. Under this plan, an estimated total of 24,000 acres of old-growth habitat would be converted to young-growth habitat after 25 years, with a total of 42,500 old-growth acres converted after 100 years. These estimates are assumed to remain the same under all of the alternatives considered in this EIS, with similar miles of road construction and reconstruction anticipated under each alternative, as discussed in the *Effects* section, above. Two mining operations, the Greens Creek Mine on Admiralty Island and Kensington Mine north of Juneau, are currently operating.
4. **Effects of Reasonably Foreseeable Future Activities**. Timber harvest activities have typically been accompanied by new access and often increased use of subsistence resources by rural and non-rural residents. The effects of timber harvest on deer habitat capability would be reduced over time as harvest areas transition from old growth to young growth under all alternatives.

Counting all lands in Southeast Alaska, an estimated 86 percent of the original old growth remains today. After 100 years of implementing any of the alternatives, it is estimated that the percentage of the original old growth remaining would be 82 percent, due to combined harvest on NFS and non-NFS lands, assuming maximum rates of harvest. Although the percentage reduction would not be high overall, areas of concentrated harvest could have higher effects on subsistence. Areas of concentrated harvest are described in the *Biological Diversity* section, which quantifies the estimated effects of cumulative future harvest on the amount of old growth by biogeographic province for all of Southeast Alaska (see Tables 3.9-16, 3.9-17, and 3.9-18 in Appendix C of this DEIS).

Timber harvest of Alaska Native corporation lands is anticipated to continue at a relatively low but constant level over the next decade. New land conveyances under Public Law 113-291 could result in some previously unharvested areas being logged.

Actual mineral development is difficult to predict, but effects to subsistence resources would be highly localized where it does occur. Appendix B provides a full list of all the projects considered in the cumulative effects analysis.

ANILCA Determination

Public hearings on subsistence issues for the proposed Alaska Roadless Rule will be held in communities throughout Southeast Alaska between the Draft and Final versions of this EIS and an ANILCA determination may be made in the record of decision, if appropriate.

Environmental Justice

Affected Environment

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participating in, denying persons the benefits of, or subjecting persons to discrimination under such programs, policies, and activities because of their race, color, or national origin.

Race and ethnicity are shown by borough in Table 3.13-1. According to the most recent Census estimates, approximately 63 percent of the population of Southeast Alaska is White. American Indian and Alaska Native was identified as the largest minority group, accounting for 15 percent of the total Southeast Alaska population. Table 3.13-1 indicates that there are relatively large proportions of Alaska Natives in Prince of Wales-Hyder, Hoonah-Angoon, and Yakutat. The populations of Haines, Juneau, Petersburg, and Skagway in contrast, have relatively low proportions of Alaska Natives, below the Southeast Alaska average of 15 percent.

Alaska Native populations are identified as a percentage of total population by community in Table E-1 in Appendix E. This information is presented graphically in Figure 3.12-1 (in the *Subsistence* section). These data indicate that 16 of Southeast Alaska's 32 communities have Alaska Native populations that comprise a larger share of total population than the regional average. Alaska natives comprised a particularly large share of total population in Hydaburg (84 percent), Saxman (74 percent), Metlakatla (72 percent), Kake (65 percent), and Hoonah (53 percent), all considered traditional Native communities.

Table 3.13-1
Race/Ethnicity by Borough/Census Area[1]

Geographic Area	Total Population	Percent of Total Population				
		White[2]	American Indian and Alaska Native[2]	Hispanic or Latino	Other Race[2,3]	Two or More Races[2]
Haines Borough	2,537	79	7	3	4	7
Hoonah-Angoon CA	2,146	44	37	5	6	8
Juneau City and Borough	32,434	65	11	6	9	8
Ketchikan Gateway Borough	13,745	64	14	5	9	9
Petersburg Borough	3,275	67	7	11	8	7
Prince of Wales-Hyder CA	6,473	45	40	4	2	9
Sitka City and Borough	8,810	62	13	6	8	10
Skagway Municipality	1,038	79	5	7	5	5
Wrangell City and Borough	2,475	64	21	3	3	9
Yakutat City and Borough	682	44	28	6	8	15
Southeast Alaska	**73,615**	**63**	**15**	**6**	**8**	**9**
Alaska	738,565	62	14	7	10	7

CA = Census Area
[1] Estimates are annual totals developed as part of the 2013-2017 American Community Survey 5-Year Estimates.
[2] Non-Hispanic only. The Federal Government considers race and Hispanic/Latino origin (ethnicity) to be two separate and distinct concepts. People identifying as Hispanic or Latino origin may be of any race. In this table people identifying as Hispanic or Latino are included in the Other Race category only.
[3] The "Other Race" category presented here includes census respondents identified as Black or African American, Asian, Native Hawaiian and Other Pacific Islander, or Some Other Race.
Source: U.S. Census Bureau 2018a

Median household income and the percent of households below the poverty line are presented by borough in Table 3.13-2. Statewide, the estimated share of the population below the poverty line was 9.2

percent in 2017. Median household income was approximately $76,100. Juneau is the only borough in the region with median household income above the state median. Median household income as a share of the state median in the other boroughs ranged from 68 percent in Prince of Wales-Hyder to 93 percent in Haines, Sitka, and Skagway (Table 3.13-2). The share of the population below the poverty level in 2017 ranged from 5.6 percent in Skagway to 16.0 percent in Prince of Wales-Hyder. Statewide, the share of the population below the poverty level was 10.2 percent (Table 3.13-2).

The percent of households below the poverty line and the median household income are identified by community in Table E-1 in Appendix E. The U.S. Census identified 16 communities in Southeast Alaska with 10 percent or more of their population below the poverty line. All but three of the communities identified in Table E-1 where data are available had median household incomes below the state average.

Table 3.13-2
Income and Poverty by Borough/Census Area[1]

Geographic Area	Median Household Income		Population Below the Poverty Level
	2017 Dollars	Percent of State Median	
Haines Borough	70,640	93%	8.4%
Hoonah-Angoon CA	57,900	76%	11.1%
Juneau City and Borough	90,749	119%	7.4%
Ketchikan Gateway Borough	67,321	88%	10.6%
Petersburg Borough	63,490	83%	7.8%
Prince of Wales-Hyder CA	52,114	68%	16.0%
Sitka City and Borough	70,765	93%	9.2%
Skagway Municipality	70,673	93%	5.6%
Wrangell City and Borough	56,094	74%	11.7%
Yakutat City and Borough	64,583	85%	6.2%
Alaska	**76,114**	**100%**	**10.2%**

CA = Census Area
[1] Estimates are annual totals developed as part of the 2013-2017 American Community Survey 5-Year Estimates.
Source: U.S. Census Bureau 2018b, 2018c

Environmental Consequences

As discussed elsewhere, this EIS is programmatic and, as such, examines direction and allowable activities for broad land areas, rather than schedules specific activities in specific locations. The action alternatives would increase the acres available for timber harvest, but harvest levels are expected to remain the same across all alternatives. In addition, while there may be some variation by alternative, the amount of new or reconstructed road miles is expected to be broadly similar across all alternatives. This makes it difficult to evaluate the effects of the alternatives on particular communities or populations.

The potential effects of the alternatives on the economic and social environment of Southeast Alaska are discussed in the *Key Issue 2* section of this document. The principal regional effects would be those associated with changes in the timber industry and recreation and tourism. There could also be potential effects upon subsistence use and heritage resources that have particular significance for Alaska Native populations. The effects of the alternatives on communities are discussed by community in Appendix E. Changes in roadless management and acres are estimated for each community area. Impacts to subsistence are discussed in the *Subsistence* section. Overall effects on heritage resources are expected to be low under all the alternatives because of the protection offered by Forest-wide standards and guidelines. The potential effects of the alternatives upon heritage resources are expected to be the lower than under the 2008 Forest Plan because of the lower allowable amount of potential timber harvest.

Areas designated as Roadless Priority and Community Priority ARAs would explicitly allow the cutting, utilization, customary trade, and removal of trees for the purposes of Alaska Native customary and traditional uses, as well as road construction deemed necessary by a federally recognized Tribe for

access to Alaska Native cultural sites. This type of use would also be allowed in Timber Priority ARAs, which allow timber harvest and road construction.

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