

Chapter 3 Cultural, Social, and Economic Benefits and Uses

Introduction

Chapter 2 summarized the existing conditions, trends, and long term sustainability of the ecosystems found within the Chugach National Forest planning area. This chapter identifies the resources, multiple uses, and services of the planning area that provide benefits to people either directly or indirectly. Topics evaluated include: cultural resources and areas of tribal importance; land status and use patterns including access; designated areas; recreation and scenic character; social and economic conditions; ecosystem services and natural resource uses. This chapter is different from chapter 2 in that the focus is on the resources used and enjoyed by people.

This chapter focuses on three questions:

1. Which resources are commonly used by the public?
2. What are conditions and trends associated with these uses?
3. What is the contribution of these goods and services to social and economic sustainability?

Cultural Resources and Uses

For thousands of years, the lands that are today recognized as the Chugach National Forest have been inhabited by Alaska Natives. Today, the Kenai Peninsula is home to Dena'ina Athabaskan Indians, and the coastal areas of Prince William Sound are occupied by the Chugach Eskimo and Eyak Indians. Although Russian contact was made with Chugach Eskimo in Prince William Sound in 1741, no direct contact occurred again between Alaska Natives and Europeans until 1778. The 2002 Forest Plan FEIS (USDA, 2002c) provides an overview that summarizes millennia of Alaska Native prehistory, early historic period contact with Russia, and the historic era since the United States purchase of Alaska from Russia. The prehistoric and historic overview in the 2002 Forest Plan FEIS is sufficient for the current assessment process.

Protection and management of cultural and historic resources provide expanded knowledge and understanding of history, cultural and spiritual connections to heritage, scientific data about past cultures or historical conditions, and tourism that benefits rural economies. The value of historic properties on national forests is derived from the public's recognition that these nonrenewable resources are important and should be protected. Section 106 of the National Historic Preservation Act (NHPA) mandates that the impact of federally funded or permitted activities on historic properties, also referred to here as cultural resources, be considered prior to initiation of management activities. Section 110 of the NHPA directs Federal land managers to inventory, evaluate, and preserve cultural resources that are eligible (and nominate) and listed on the National Register of Historic Places (NRHP).

Relevant Information

- Partnerships with Tribes and other parties are essential for the preservation and management of cultural resources within the national forest and within the broader planning area.
- The Forest Service identifies, evaluates, and resolves potential effects to significant cultural resources that may be caused by implementation of management activities.

- Cultural resource management activities are conducted on accessible areas of the national forest. Cultural resource inventories have generally not been conducted in remote areas.
- Less than 10 percent of recorded sites within the national forest have been evaluated per the criteria of the NRHP.
- Condition assessments and preservation actions have not been identified and implemented for the 29 Priority Heritage Assets.
- Records and geospatial data for cultural resources across the national forest are incomplete.
- The Forest Service may need to develop a strategy to investigate and monitor potential effects of climate change (e.g. rising sea levels, receding glaciers) to cultural resources.
- Declining budgets limit the ability of the Forest Service to inventory and manage cultural resources, including records and artifacts collected from prehistoric and historic sites across the national forest.
- The effects of climate change may cause both harmful and beneficial effects to cultural resources. Potential harmful effects include damage or destruction to fragile resource sites in coastal areas caused by increased severity of storms or rising sea levels. A potential beneficial effect is that warming may reveal more high elevation cultural resources as ice retreats, thereby increasing knowledge of prehistoric cultures.

Cultural Resources

The full extent of cultural resources within the Chugach National Forest is largely unknown. Due to the remote and rugged nature of the landscape and resulting limited accessibility, approximately two percent of the national forest has been surveyed. The majority of the inventory within the national forest has taken place along the modern and historic road corridors and trail systems in the Kenai Peninsula and in Prince William Sound near Cordova and along the shoreline.

The 2002 Forest Plan provides some data about cultural resource sites that were known at the time, indicating 1,048 sites had been recorded for the national forest as of December 1999. As of February 2013, the National Resource Management Heritage records database indicates 2,373 recorded sites within the Chugach National Forest. This database indicates 228 sites, or less than 10 percent, of the recorded sites within the national forest have been evaluated for significance consistent with the NRHP, leaving more than 90 percent of the recorded sites to be evaluated. Table 40 displays heritage resources status by ranger district and the national forest.

Table 40. National Resource Management Heritage database for the Chugach National Forest

Location	Listed	Eligible	Not Eligible	Unevaluated	Totals
Forestwide	0	0	0	3	3
Seward Ranger District	6	117	45	799	967
Glacier Ranger District	2	22	14	583	618
Cordova Ranger District	10	12	1	762	785
Totals	18	150	60	2,147	2,373

Eighteen sites are listed on the National Register of Historic Places, with an additional 150 sites recognized as eligible for listing. Examples of these sites include the Sqilantnu Archaeological District along the Russian and Kenai rivers within the Seward Ranger District, the Iditarod National Historic Trail within the Seward and Glacier Ranger Districts, and the Cordova post office and court house within the Cordova Ranger District.

Since 2007, the Forest Service has identified 29 priority heritage assets (PHAs) from among the 168 listed and eligible sites. Distinct to the Forest Service, PHAs are prehistoric and historic sites that are selected

by the Forest Service to address specific needs, such as protection, stabilization, and rehabilitation. Current PHAs across the national forest include 10 within the Seward Ranger District, 10 within the Glacier Ranger District, and 9 within the Cordova Ranger District.

Some cultural resource sites previously managed by the Chugach National Forest are now owned and managed by Alaska Native corporations. Under the provisions of section 14(h)(1) of the Alaska Native Claims Settlement Act, regional ANCSA corporations have selected historically significant sites throughout the plan area. The laws and regulations pertaining to this provision of ANCSA allow regional corporations to obtain fee title to existing cemetery sites and historical places and provide that lands conveyed under this provision will be maintained and preserved solely as cemetery sites or historical places by the regional corporation.

Under the selection rights provided by ANCSA 14(h)(1), Chugach Alaska Corporation (CAC) has identified, for conveyance, ancestrally historic places within the boundaries of the Chugach National Forest. To date, not all of CAC's ANCSA 14(h)(1) selections have been surveyed or conveyed.

As of 2002, another ANCSA regional corporation, Cook Inlet Region, Incorporated (CIRI), had selected lands on the Kenai Peninsula for conveyance under the provisions of ANCSA 14(h)(1). However, these selections were relinquished in 2012 through implementation of the Russian River Land Act (P.L. 107-362), which provides for the protection of cultural resources and transferred ownership of historically significant lands.

Through implementation of the Russian River Land Act, CIRI released its remaining ANCSA 14(h)(1) land selections in the area in exchange for certain lands and interests, including a patent transferring restricted title to a 20-acre parcel within the Chugach National Forest near the intersection of the Sterling Highway with the Kenai River, a deed to cultural artifacts on 513 acres of the Kenai National Wildlife Refuge, and interim conveyance of a 42-acre tract within the Chugach National Forest, north of the confluence of the Russian and Kenai Rivers. This tract will be patented after survey. The relinquishment of CIRI's land selections unencumbered approximately 2,000 acres of Kenai National Wildlife Refuge and Chugach National Forest lands.

Other significant cultural resource sites within the Chugach National Forest include those designated by Congress. These include the Iditarod National Historic Trail, partially within both the Seward Ranger District and Glacier Ranger District; the Kenai Mountain-Turnagain Arm National Heritage Area within both the Seward Ranger District and Glacier Ranger District; and the Bering Expedition Landing Site (NHL), both within the Cordova Ranger District with the first located on Chugach Alaska Corporation lands and the latter located within the national forest on Kayak Island.

Condition and Trends of Cultural Resources

The Forest Service primarily manages cultural resources in compliance with Section 106 of the NHPA. That is, cultural resources are routinely identified and inspected during project development, and if they are found to be present, they typically would be avoided during implementation.

With Forest Service archeologists applying most of their time to project review (Section 106), less time is available for the management of PHAs and inventory of National Forest System lands (Section 110). Since the inception of PHAs in 2007, the Forest Service has not been able to visit the most remote sites and there is no evidence that condition assessments are developed or that preservation measures are applied to these property types.

Artifacts and records assembled from past research on prehistoric and historic sites across the national forest are stored across the national forest, sometimes with insufficient environmental controls and in

unsecure locations. Inventory of these collections are outdated with no records of inspections having been conducted during the past 10 years or more.

The effects of climate change may cause both harmful and beneficial effects to cultural resources. Potential harmful effects include damage or destruction to fragile resource sites in coastal areas caused by increased severity of storms or rising sea levels. A potential beneficial effect is that warming may reveal more high elevation cultural resources as ice retreats, thereby increasing knowledge of prehistoric cultures.

The Chugach National Forest program does not have the funds necessary to fully inventory cultural resources and to conduct inspections of and preservation actions on existing cultural resources as prescribed by Section 110 of the NHPA.

Increased collaboration with tribal parties and other parties is helping the Forest Service to manage cultural resources. An example is the partnership between the Kenaitze Indian Tribe, Cook Inlet Region Incorporated, USFWS, and the Forest Service established under the Russian River Lands Act to manage the Sqilantnu Archaeological District. In this case, the parties are working together to develop a management plan for future uses, preservation goals, and the storage, protection, dissemination, and interpretation of cultural materials for the benefit of the public.

Information Needs

The Chugach National Forest corporate database for cultural resource management, including geospatial information, is inconsistent and incomplete. The Chugach National Forest needs to update its inventory of cultural materials in its collection.

Areas of Tribal Importance

This section identifies the Tribes and Alaska Native Corporations that the Chugach National Forest coordinates with for their use in the plan area. These entities have certain rights related to their use of the national forest and have several areas of particular importance that may be affected by Forest Service management activities.

Relevant Information

- Alaska Natives value and utilize natural and cultural resources on the national forest landscape.
- Forest Service managers and appropriate staff consult with Alaska Native Tribes and Corporations on matters of traditional and contemporary importance during national forest program planning and implementation.
- The Forest Service could include additional plan components that continue to honor and reflect the importance of sites and places sacred to Alaska's Native people.

Tribes and Alaska Native Corporations associated with the Chugach National Forest

Tribes and Alaska Native Corporations within and adjacent to the plan area are displayed in the following table.

Table 41. Tribes and Alaska Native Corporations within and adjacent to the plan area

Federally Recognized Tribes	Village Corporation	Regional Corporation
Chenega Bay IRA Council	Chenega Corporation	Chugach Alaska Corporation
Native Village of Nanwalek	English Bay Corporation	
Native Village of Eyak	Eyak Corporation	
Native Village of Port Graham	Port Graham Corporation	
Native Village of Tatitlek	Tatitlek Corporation	
Chickaloon Native Village	Chickaloon-Moose Creek Native Association	Cook Inlet Region Incorporated
Eklutna Native Village	Eklutna, Incorporated	
Kenaitze Indian Tribe	Kenai Native Association, Incorporated	
Knik Tribe	Knikatu, Incorporated	
Ninilchik Village	Ninilchik, Incorporated	
Village of Salamatoff	Salamatoff Native Association, Incorporated	
Seldovia Village Tribe	Seldovia Native Association	
Native Village of Tyonek	Tyonek Native Corporation	

Existing Tribal rights

Alaska Native tribes have legal rights established by the National Historic Preservation Act of 1966 (NHPA), the American Indian Religious Freedom Act of 1978 (AIRFA), the Archeological Resources Protection Act of 1979 (ARPA), Alaska National Interest Lands Conservation Act of 1980 (ANILCA), the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), Executive Order 13007 (1996), and Executive Order 13175 (2000).

Beyond mention of Section 810 of ANILCA, the 2002 Forest Plan does not identify or discuss Forest Service responsibilities pertaining to resources, areas, or matters that would be of tribal importance. Likewise, it does not identify or discuss protection of cultural and spiritual sites beyond mention of the

listed laws and executive orders. However, the 2012 amendment to the 2002 Forest Plan replaced the heritage standard with language acknowledging the memorandum of understanding between the Forest Service, Kenaitze Indian Tribe, and Cook Inlet Region Incorporated for the Russian River Land Act and the Sqilantnu Archaeological District.

In December 2012, the USDA Office of Tribal Relations and the Forest Service issued a report to the Secretary of Agriculture regarding a review and recommendations on USDA policy and procedures about sacred sites. A Forest Service national group is currently working on implementation of the recommendations. Subsequently, the Departments of Defense, Interior, Agriculture, Energy, and the Advisory Council on Historic Preservation entered into a memorandum of understanding, based on Executive Order 13007, to improve the protection of and tribal access to sacred sites through enhanced and improved interdepartmental coordination and collaboration. The Forest Service Office of Tribal Relations is working with the interdepartmental working group to evaluate existing authorities, identify existing training programs for agency staff, and develop guidance for the implementation of this effort.

Areas of known Tribal importance

Interested and affected Tribes and Alaska Native Corporations have identified several resources within the Chugach National Forest that are of tribal importance. Subsistence resources include wildlife, fish, forest products, and wild edible plants and their habitats. Cultural resources include the Russian River and Sqilantnu Archaeological District, Palugvik Archaeological District, all ANCSA 14(h)(1) historic site selections that have been conveyed and those that remain in application status, all known prehistoric sites, and many early historic sites.

Conditions and Trends of Resources that Affect Areas of Tribal Importance and Tribal Rights

Through current consultations, the Forest Service has learned that Alaska Natives are concerned about improving environmental conditions that affect fish and wildlife habitat and improving access to areas where subsistence foods are traditionally harvested (see the Subsistence section).

Information Needs

Sites and areas within the national forest, other than the 14(h)(1) sites, that are sacred to Alaska Natives are mostly unknown.

Land Status and Ownership

Relevant Information

- Due, in part, to the land conveyances authorized by the Alaska Statehood Act and Alaska Native Claims Settlement Act, land ownership patterns in the Chugach National Forest continue to change. About one-quarter of the lands within the boundary of the national forest are now owned by other individuals or entities.
- Five Alaska Native corporations own lands surrounded by or adjacent to National Forest System lands within the Chugach National Forest boundary; many others own lands within the broader plan area. Nearly a half-million acres of former National Forest System lands extending across the three geographic areas of the national forest are now owned by Alaska Native corporations and thousands more have been selected by to fulfill land entitlements established by the Alaska Native Claims Settlement Act.
- The 2002 forest plan does not provide a monitoring and evaluation strategy for the more than 80,000 acres of surface conservation and timber easements held by the Forest Service. The Forest Service could consider a monitoring program for these interests.

Existing patterns of land status and ownership within and near the plan area

Ownership and land status patterns within the Chugach National Forest reflect the area's rich cultural and natural history.

Lands within the national forest are believed to have been occupied by humans for more than 10,000 years. Many first nations people, including Aleut, Chugach Eskimo, and Ahtna Athabaskan Indian, currently live within the plan area.

The United States acquired Alaska from Russia in 1867. In 1892, President Benjamin Harrison designated the first federal forest reserve in Alaska, the Afognak Forest and Fish Culture Reserve. A 1907 presidential proclamation created the Chugach National Forest and a 1908 executive order combined the Chugach National Forest with the Afognak Reserve.

Significant changes in ownership patterns followed enactment of the Alaska Statehood Act in 1958 and the Alaska Native Claims Settlement Act in 1971. These acts provided land selection rights to the new state and to ANCSA Corporations, and many lands within the national forest were selected.

In 1980, ANILCA changed the boundary of the Chugach National Forest and added lands on the Copper River Delta. ANILCA also affected the status of lands within the national forest, designating the Nellie Juan-College Fiord WSA in Prince William Sound and directing that lands within the Copper River Delta be managed for fish and wildlife and their habitat. These designations are discussed in greater detail in the Wilderness Study Area subsection within the Designated Areas section of this chapter.

In 1989, the Exxon Valdez oil spill occurred in Prince William Sound. Since that time, the Forest Service has acquired many large private parcels within the spill area, as well as thousands of acres of surface conservation easements, to provide habitat for the recovery of natural resources affected by the oil spill.

Land status

Private lands within and near the plan area are managed by several ANCSA regional and village corporations as well as other individuals and entities. These private lands are zoned or managed for a variety of purposes, including individual, community, or shareholder services.

Public lands within and near the plan area include lands managed by other agencies and also certain state, borough, and municipality lands. Federal public lands, such as the Kenai Fjords National Park and Wrangell-St. Elias National Park, share a border with the national forest. Two national wildlife refuges, the Kenai National Wildlife Refuge, which borders the Chugach National Forest to the west, and the Kodiak National Wildlife Refuge are near the plan area. The Bering Glacier Research Natural Area, managed by the Bureau of Land Management, borders the national forest to the east. State lands within the plan area include state parks and special management areas, such as the Kenai River and Prince William Sound special management areas. The Kenai Peninsula Borough manages some public lands in and around the plan area, while other public lands are located within the Municipality of Anchorage or in cities and unincorporated communities throughout Prince William Sound.

The land status designations of these public areas vary, but in general, most of these lands are managed for purposes related to conservation or recreation. The management status of the approximately 3,364,097 acres of water included within the national forest boundary varies depending on the agency or agencies responsible for managing a particular resource or use.

Most National Forest System lands within the plan area are open to mineral entry; however, certain lands have been withdrawn from entry by congressional action or administrative order. As of March 16, 2011, 9,403 acres within the Chugach National Forest had been withdrawn for recreation purposes, 4,615 acres for mineral development, and 214 acres for other purposes. Certain lands on the Copper River Delta were withdrawn by section 502 of ANILCA. Land status within this area, as well as other specially designated areas like the Nellie Juan-College Fiord WSA, is discussed in other sections of this assessment (see the Designated Areas section).

In addition to guidance contained in planning documents, the management status of public lands within the plan area is informed by documents associated with the establishment or designation of those lands for a particular purpose (proclamations, legislation, or executive orders), or by documents associated with the acquisition of those lands or interests from a private landowner (e.g., a patent or deed). In general, land status of both public and private lands within the plan area is largely informed by the terms of the land conveyance document. For example, the approximately 101,661 acres purchased by the Forest Service after the Exxon Valdez oil spill are managed, pursuant to the deeds, for purposes associated with restoration, and certain restrictions apply to their use. The conveyance documents for certain lands and interests in lands that were once part of the National Forest System but have since been transferred to state or private ownership similarly contain special terms that affect land status (e.g., public access easement reservations).

Ownership

Within the boundary of the Chugach National Forest, approximately 5,417,172 acres are National Forest System lands and approximately 900,680 acres are owned by other individuals or entities (USDA, 2012/2014). Please note that the acreage figures differ slightly from those in table 42. Table 42 includes data collected in 2011, while the acreage figures cited in the text were published in 2014. Other major landowners include the state of Alaska, ANCSA regional and village corporations, the Alaska Railroad, municipalities, cities, towns, and private individuals. The land status map in the map package appendix displays the land status and ownership within the boundary.

Statehood and Alaska Native Claims Settlement Act conveyances

Some National Forest System lands within the Chugach National Forest have been selected and are being transferred to state or private ownership as a result of the Alaska Statehood Act and ANCSA. The national forest experienced a net decrease between 2002 and 2012 of nearly 13,000 acres of National Forest System lands, due, in part, to conveyances authorized by the Alaska Statehood Act and ANCSA (USDA,

2002d). Special land status is accorded to National Forest System lands selected by the state or Alaska Native regional or village corporations under these acts during the interim period between selection and conveyance. For example, the state's concurrence is required before the Forest Service may authorize certain activities on National Forest System lands selected by the state.

Ownership of the surface and subsurface estate is split for certain lands within the plan area as a result of the transfer of ANCSA selections and other conveyances and acquisitions that affect only the surface or subsurface estate. In some cases, the subsurface estate is owned by another party while the surface is part of the National Forest System and is administered by the Forest Service. As of 2011, the subsurface estate of approximately 114,055 acres of National Forest System lands within the plan area was owned by another entity. Table 42 displays the acreage, status, and ownership of lands within the national forest boundary.

Table 42. Acreage by land status and ownership within the Chugach National Forest

Ownership	Acres
Alaska Railroad (approximate)	3,357
Chugach Alaska Corporation (CAC) conveyed	199,980
CAC selected national forest	2,150
CIRI selected national forest	961
Chenega conveyed	39,279
Dual selection	6,593
Eyak conveyed	91,008
Eyak selected national forest	10,796
Municipality, city, town, or private	12,719
National forest	5,105,836
National forest and CAC or state of Alaska (reserved mineral rights)	119,042
State conveyed (current ownership unknown)	401,912
State selected national forest	57,855
Tatitlek conveyed	97,354
Tatitlek selected national forest	72,146
Village overselected lands	4,700
Water	3,364,097

Partial interests

Various owners hold partial land interests within the plan area, such as mineral rights or conservation easements. Since the Exxon Valdez oil spill in 1989, the Forest Service has acquired from Native village corporations, conservation easements and timber conservation easements affecting thousands of acres of land, for the purpose of maintaining habitat important to the restoration of resources or services that were injured or reduced by the spill. On lands affected by the timber conservation easements, the Native village corporations generally retain all rights of surface ownership, except for the right to harvest timber. On Native village corporation lands affected by the conservation easements, the easements prevent uses of the property that will materially impair or interfere with its conservation values.

The 2002 forest plan provides management area direction for lands and interests in lands purchased with the goals of maintaining conservation values and restoring or enhancing injured resources from the Exxon Valdez oil spill. The 2002 plan does not, however, provide a monitoring and evaluation strategy for these

lands or interests in lands. Because the surface conservation easements and timber conservation easements affect non-National Forest System lands, traditional national forest management activities generally do not provide opportunities to monitor the condition of these lands. The Forest Service could develop a monitoring program to help ensure that the protective covenants of the easements are being met.

Rights-of-way and easements affect both private and public lands throughout the plan area. The Forest Service has reserved or acquired rights-of-way needed for public access and has granted private or other public entities rights-of-way for access across National Forest System lands. Special agreements have in part driven existing patterns of partial land ownership interests in the plan area. For example, an agreement executed on January 7, 1983, between the Forest Service, the state, and what is now CAC, provided for the reservation of several public access easements on lands to be conveyed to CAC and gave a right of access to CAC across National Forest System lands for access to the Bering River Coal Fields.

Condition and Trends in Land Status and Ownership

Ongoing implementation of the Alaska Statehood Act and ANCSA continues to produce changing land status and ownership patterns within the plan area. Social, economic, and ecological conditions within the broader landscape inform land status and ownership patterns; the Forest Service seeks to consolidate National Forest System lands where possible, to reserve or acquire public access easements where needed, and to include terms and conditions associated with the conservation of ecological resources where appropriate. Land ownership and status has also, in part, been driven by certain events, such as the Exxon Valdez oil spill, which prompted the acquisition of lands and interests in lands for resource recovery purposes.

Contribution to Social, Economic, and Ecological Sustainability

In 2002, opportunities for the consolidation of National Forest System lands to improve management effectiveness were limited by a lack of willing sellers and ongoing conveyances. Similar conditions exist today. Increasingly diverse ownership has the potential to affect social and economic conditions (for example, by providing challenges associated with access to National Forest System lands for subsistence purposes), as well as the potential to affect ecological conditions (an increasing number of utility and access corridors could increase the potential for spread of invasive species). These potential effects are discussed in other sections, as appropriate.

Information Needs

Data contained in table 42 should be updated to reflect the current status of acquired, selected and conveyed lands. Ownership data could be disaggregated by geographic area to support a more complete evaluation of status and trends.

Land Use

Special use permits allow occupancy or use of National Forest System lands under various authorities, including, but not limited to, the Organic Administration Act, Section 7 of the Granger-Thye Act, Title V, Federal Land Policy and Management Act, Alaska National Interest Lands Conservation Act, and the Act of May 26, 2000. The Forest Service currently administers approximately 330 special use authorizations, including 23 isolated cabins, 1 year round residence, 2 ANILCA cabins, 2 ANILCA shelters, 138 outfitter/guide permits, 6 recreation events, 2 fish hatcheries, 8 power lines and FERC-related activities, 7 telephone lines, 2 fiber optic cable, 31 electronic sites, 2 campground concessionaire, 12 roads, 3 resort, and 58 other various land use permits issued. Additionally the Forest Service administers an average of 15 temporary permits issued for filming or other short-term uses, therefore an exact number of permits issued at any one point in time can vary depending on the number of temporary authorizations issued.

Utility Corridors and Facilities

Five power line special use authorizations (SUAs) are currently issued. Two are issued to Chugach Electric Association, and one each is issued to Homer Electric, Cordova Electric Cooperative, and the City of Seward. There are three permits for FERC related hydropower activities, a hydropower dam on Cooper Lake, and two investigative study permits for hydropower feasibility on Grant Lake and Snyder Falls.

There are seven SUAs for telephone lines issued. There are two SUAs each issued to TelAlaska, and Alaska Communication Systems, and one each issued to GCI Communication Corporation, Yukon Telephone Company, and Cordova Telephone Cooperative.

There are two SUAs for fiber optic cable, one each issued to Cordova Telephone Cooperative, Inc. and TelAlaska.

Fish Hatcheries

There are two fish hatcheries under SUAs to the ADF&G. Both the Main Bay Hatchery and the Cannery Creek Hatchery are within the Glacier Ranger District.

The Main Bay Hatchery is a state-owned hatchery built in 1981 by the ADF&G Fisheries Rehabilitation, Enhancement and Development (FRED) Division as a chum salmon hatchery. It is in Main Bay in Prince William Sound approximately 40 miles southeast of Whittier. Prince William Sound Aquaculture Corporation (PWSAC) manages and operates the facility for ADF&G.

The Cannery Creek Hatchery is a state-owned hatchery built in 1978 by the ADF&G FRED Division as a pink and chum salmon hatchery. It is in the Unakwik Inlet in Prince William Sound, approximately 40 miles east of Whittier. This facility is also managed and operated by PWSAC for ADF&G.

The infrastructure's contribution to social, economic, and ecological sustainability is found in the Economic Impact of the Prince William Sound Aquaculture Corporation 2012 document (McDowell Group, Inc., 2012).

Communication Sites

There are 31 electronic site SUAs issued. Some communication sites have more than one permit holder. The 18 communication sites that are under SUA include:

1. Naked Island (5 SUAs), Glacier Ranger District
2. Point Pigot (1 SUA), Glacier Ranger District

3. Begich, Boggs Visitor Center roof top (2 SUAs), Glacier Ranger District
4. Portage Passage (behind RR depot) (1 SUA), Glacier Ranger District
5. Mount Thomas (1 SUA), Cordova Ranger District
6. Potato Point (1 SUA), Cordova Ranger District
7. Hitchinbrook Island (1 SUA), Cordova Ranger District
8. Heney Ridge (3 SUA), Cordova Ranger District
9. Johnstone Point (1 SUA), Cordova Ranger District
10. Jack Peak (1 SUA), Cordova Ranger District
11. 22 Mile (1 SUA), Cordova Ranger District
12. Windy Point (3 SUA), Seward Ranger District
13. Tern Lake (2 SUA), Seward Ranger District
14. Tern Peak (1 SUA), Seward Ranger District
15. Cecil Rhode Mt. (1 SUA), Seward Ranger District
16. Cooper Mountain (4 SUA), Seward Ranger District
17. Hope Mountain (1 SUA), Seward Ranger District
18. Sheep (Wilcott) Mountain (1 SUA), Seward Ranger District

There are communication site management plans for Naked Island, Point Pigot, Potato Point, Hitchinbrook Island, Johnstone Point, Jack Peak, 22 Mile, Windy Point, Tern Lake, Cooper Mountain, Hope Mountain, and Sheep (Wilcott) Mountain.

Trends in Land Use

There is a continued interest in conducting various forms of research in Prince William Sound and on the Kenai Peninsula. There has been an increase in interest to film within the national forest, including filming for various television programs, travel guides, and other ski/adventure related videos. The number of structures authorized within the national forest has remained constant; however, some of the existing infrastructure has been authorized for more than 30 years, and there is an increase in significant maintenance projects to address at the aging facilities. The transmission line on the Kenai Peninsula is currently undergoing a rebuild to replace existing line and structures that are 45-plus years old. Both Main Bay and Cannery Creek hatcheries have been in place for 30-plus years and are undergoing reconstruction of their aging facilities. Interest in establishing new communication sites has increased.

Infrastructure

Relevant Information

- Since 2005, fluctuating budgets have made it difficult to accomplish all the required annual maintenance on the Forest Service's administrative facilities. Only critical health and safety annual maintenance items are funded.
- Nearly 2.2 million dollars of maintenance is deferred for administrative facilities.

Administrative Facilities

The Facilities Master Plan for the Chugach National Forest provides current inventory information, analysis, and a plan of action for Forest Service managers.

Since 2002, the Forest Service has constructed a new office, two new housing complexes, installed a new modular office, and replaced three paint/fuel storage buildings with four new hazardous materials buildings. The Forest Service has also removed two facilities at the Whittier site, transferred the triplex located on Kodiak Island to the USFWS, and removed 11 administrative cabins.

The Forest Service currently manages 78 administrative facilities in three ranger districts. The Cordova Ranger District has 16 administrative buildings (14 in Cordova and 2 in Prince William Sound), the Glacier Ranger District has 13 administrative facilities in Girdwood and Portage Valley (all within the Kenai Peninsula geographic area), and the Seward Ranger District has 49 administrative buildings on sites next to Kenai Lake and in Seward (45 on the Kenai Peninsula).

The Chugach National Forest also has an office in Anchorage that provides administrative and technical support to each of the ranger districts. It is co-located with the Alaska Region's State and Private Forestry Office and the Pacific Northwest Research Station's Anchorage Forestry Sciences Lab in a leased facility.

Since 2005, fluctuating budgets have made it so that only critical health and safety annual maintenance items are funded. Nearly 2.2 million dollars of deferred maintenance is needed on the facilities. These are repair or replacement costs due to maintenance that was not performed when needed.

Water storage and dams

Information on water-related infrastructure is described in the Watershed and Hydroelectric Resources sections of this assessment.

Transportation corridors

Information on transportation-related infrastructure, including roads, trails, and boat ramps, is in the Recreation and Scenic Character section.

Utility corridors

See the Utility Corridors discussion.

Contribution to Social, Economic, and Ecological Sustainability

No studies have attempted to quantify or describe the direct benefits of Chugach National Forest infrastructure to social, economic, and ecological sustainability. Despite this, it is valuable to recognize and describe how the infrastructure plays a role in sustaining both the natural and cultural resources of the Chugach National Forest as well as the communities located inside and around the boundary of the national forest.

Utility corridors contribute to social, economic and ecological sustainability by transmitting power generated from renewable sources, such as hydropower, wind, and hydrokinetic.

Access Patterns

Most information for access is found in the Recreation and Scenic Character section, including information on roads, trails, motor vehicle and non-motorized access, and off-road vehicle access. This section provides information for non-recreational access, including access to and through private lands, and other administratively authorized access.

Relevant Information

- Public access continues to be affected by lands that are owned by other entities and by ongoing conveyances associated with ANCSA and the Alaska Statehood Act. Particular access challenges exist with regard to those lands of other ownership situated along roads, coastlines, or other access corridors.
- There are opportunities to maintain landscape scale connectivity across mixed ownerships where natural systems, such as watersheds and wildlife corridors, are shared.

Access to private lands

ANILCA provides statutory authority for access to non-federal lands located within the boundaries of public lands administered by the BLM and the Forest Service. ANILCA Section 1323 granted non-federal landowners, whose ownership lies within the boundaries of the National Forest System or is surrounded by public lands administered by the BLM in Alaska, the statutory right of access over public lands when such Federal lands are needed to provide for the reasonable use and enjoyment of non-federal lands. Section 1323(a) of ANILCA applies to National Forest System lands throughout the United States, and Section 1323(b) applies only to public lands administered by the BLM in Alaska.

1. An ANILCA access situation exists where National Forest System lands are the only reasonable option available for the landowner to access their land for its reasonable use and enjoyment. In such cases, the Forest Service is obligated by the statute to grant reasonable access.
2. A landowner's statutory right of access is limited to that which is adequate to secure to the owner the reasonable use and enjoyment of the subject non-federal land. The right of access is also subject to the reasonable rules and regulations set by the Secretary of Agriculture, as applicable.
3. The Forest Service, as the responsible land management agency, has discretion to determine the location, design, type, and extent of access that will be granted across Federal land, consistent with the provisions of ANILCA.
4. Forest Service regulations implementing Section 1323(a) of ANILCA are found at 36 CFR 251, Subpart D.
5. In ANILCA access cases, the responsible agency will grant the actual access authorization under special use authority of Title V of the Federal Land Policy and Management Act of 1976 (FLPMA). A Forest Service decision to grant access must be made in compliance with the National Environmental Policy Act of 1969 (NEPA). Access authorizations must be conditioned to assure that the use and occupancy of Federal lands for access purposes is exercised in a manner that complies with all applicable laws and regulations, including NHPA and ESA.

Access to public lands and open space connections

The 2002 Forest Plan recognized that lands owned or managed by other entities within the plan area served as barriers to those seeking access to National Forest System lands. Public access continues to be affected by lands that are owned by other entities and by ongoing conveyances associated with ANCSA and the Alaska Statehood Act. Particular access challenges exist with regard to those lands of other ownership situated along roads, coastlines, or other access corridors. As of 2002, the Forest Service had not been actively acquiring rights-of-way, easements, fee simple title, or other interest in lands to obtain

legal rights of access to all National Forest System lands. Since 2002, the Forest Service has been actively working to acquire interests in land, such as trail easements, to ensure public rights of access; the Forest Service has acquired 28 permanent or temporary rights-of-way for roads, trails, or other access facilities, such as bridges or parking lots. Of these acquired rights-of-way, seven have secured perpetual access to the Chugach National Forest. About 13 miles of road and trail access was gained through acquisition of these perpetual 17(b) easements.

Since 2002, additional 17(b) easements were established to provide access through lands conveyed to ANCSA corporations. The majority of 17(b) easements are on the Copper River Delta. During trails validation in 2006 and 2007, it was determined that not all ANCSA 17(b) easements would be considered National Forest System Trails (NFSTs) and thus not receive regular maintenance. Currently 25 17(b) easements are considered NFSTs, while 33 of them are not. The use of motorcycles and OHVs are allowed on 17(b) easements but may not be compatible with trail design or with topographic or environmental conditions. Motor vehicle use may or may not be allowed on the public lands that the easement leads to. As a result, only easements that are maintained for motor vehicle use are shown on the Forest Service's annual Motor Vehicle Use Map.

The plan area includes private lands that are currently maintained in a natural state (timber or conservation easements limit the development of approximately 80,430 acres). Much of the plan area is surrounded by other public land units managed for conservation purposes. Because natural systems, such as watersheds and wildlife corridors, are shared between these ownerships, significant opportunities exist to maintain landscape scale connectivity. See the Recreation and Scenic Character section for more information on the recreation opportunities found in these surrounding public lands.

Access to land-based special use permit areas

Special use permits authorize land based uses throughout the plan area. Power lines authorized on the Kenai Peninsula require motor vehicle access to the rights-of-way. These access points require mitigation to prevent unauthorized access. The isolated cabins authorized under ANILCA §1303. (a) are accessible by river. Some of the communication sites have road access, while others are accessible via helicopter. Much of the land based use authorized for Prince William Sound is via boat, including ANILCA set-net camps, research camps, fish hatcheries, and a fish weir. Access for research camps and other activities within the plan area on the Kenai Peninsula is generally via the Alaska Railroad, the road, snowmobile, and by foot.

Contribution to Social, Economic, and Ecological Conditions

Communities and businesses in and near the national forest rely on utility corridors and communication sites. Dams and hatcheries support fish populations which in turn support subsistence, sport, and commercial fishing within and beyond the boundary of the Chugach National Forest.

Information Needs

Land status and ownership data (see table 42) should be updated to reflect the current status of National Forest System Lands conveyed to Alaska Native corporations or the state under ANCSA and the Alaska Statehood Act. Ownership data could be disaggregated by geographic area to support a more complete evaluation of status and trends.

Designated Areas

A designated area is an area or feature identified and managed to maintain its unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch (36 CFR §219.19).

This section of the assessment describes existing statutorily and administratively designated areas located within the Chugach National Forest, as well as any identified potential need and opportunity for additional designated areas. Statutorily designated areas are designated by Congressional act or Presidential executive order. Administratively designated areas can be recommended by the responsible official, but are designated by the Secretary of Agriculture, Secretary of the Interior, Secretary of Transportation, Federal Highways Administration, Chief of the Forest Service, or regional forester.

Existing designated areas within the Chugach National Forest (see the designated areas and areas recommended for designation map in the map package appendix) include wilderness study areas, wild and scenic rivers, national heritage areas, national historic landmarks, national historic trails, areas designated by ANILCA, inventoried roadless areas, national recreation trails, research natural areas, and scenic byways.

Relevant Information

- Two new designated areas have been created since 2002: the Kenai Mountains-Turnagain Arm National Heritage Area on the Kenai Peninsula and the Alaska Marine Highway Scenic Byway in Prince William Sound.
- Attributes of wilderness character, including undeveloped landscapes and opportunities for solitude and primitive recreation, vary within the Nellie-Juan-College Fiord WSA according to location and season.
- The Kenaitze Indian Tribe and Cook Inlet Region Inc. have expressed a desire to nominate the Sqilantnu Archaeological District within the Seward Ranger District to the National Historic Landmark Program.
- The Palugvik Site National Historic Landmark property was conveyed to Chugach Alaska Corporation on May 14, 2013, in compliance with ANCSA 14(h)(1).
- Since 2004, the Forest Service has identified 186 miles of trail to be managed as part of the Iditarod National Historic Trail, including management direction consistent with the Comprehensive Management Plan for the Iditarod National Historic Trail.

Wilderness Areas

There are no designated wilderness areas within the Chugach National Forest.

Wilderness Study Areas

A wilderness study area (WSA) is National Forest System lands designated by Congress for further study before congressional designation (or not) as a wilderness area. The Forest Service implements policies to manage WSAs to preserve wilderness characteristics.

In 1980, ANILCA (P.L. 96-487, Title VII, Sec. 704) established the Nellie Juan-College Fiord WSA. The WSA includes 1,968,730 acres of National Forest System lands, 22,550 acres of Forest Service public easements, and 206,890 acres of private lands surrounding western Prince William Sound (see the designated areas map and areas recommended for designation map in the map package appendix). WSAs are managed to maintain their wilderness character while recognizing and allowing for the specific exemptions in ANILCA.

The most comprehensive analysis of wilderness character in the WSA is in the 2012 Chugach National Forest Wilderness Character Monitoring Report. Results of this monitoring effort suggest that:

- Overall natural conditions prevail in the WSA with few non-native species observed (one animal; one invertebrate; and few plant species)
- No management actions are occurring that would affect the untrammeled quality of the WSA
- Much of the WSA lacks evidence of human development
- Many opportunities for solitude and primitive recreation are present

Since wilderness character monitoring was not initiated until 2012, trend information specific to the WSA is not available. Recent studies and field observations, however, do lend themselves to identifying trends and conditions that may have influenced the wilderness character of the WSA. Recent studies done in Prince William Sound suggest boat use has substantially increased in western Prince William Sound since the opening of the Anton Anderson Memorial Tunnel in 2000 (Poe, Gimblett, & Itami, 2010; Wolfe, 2007). Results from these studies identify outfitter/guide use, visitor use, and vessel density as highest in WSA locations closest to Whittier and fish hatcheries. Also, Forest Service staff members have observed and documented the use of mechanized equipment and motor vehicles either for access or participation in other activities, which has an impact on wilderness character. The primary activities documented in these observations include use of snowmachines, chainsaws, and helicopters. Snowmachine use, which is allowed in the WSA for purposes of subsistence and traditional activities, has been documented in the WSA between Whittier and Blackstone Bay and within areas accessible from the Nellie Juan Lake area. The Forest Service is currently working to better understand the location and extent of snowmachine use in the WSA. Also, the use of chainsaws for felling both live and dead trees has been reported in the WSA, especially near shore. Finally, unauthorized flightseeing helicopter landings have recently been documented on lands around Columbia Bay.

Potential need and opportunity designated wilderness areas or for additional WSAs

All inventoried roadless areas (16 units) within the Chugach National Forest were reviewed for wilderness area potential as part of the 2002 plan revision. It is the most thorough and recent wilderness assessment for the national forest. The 2002 Forest Plan Record of Decision (ROD) (USDA, 2002b) recommended 1,412,230 acres for wilderness area designation, all within the Nellie Juan-College Fiord WSA. Several areas within the WSA were excluded from recommendation for reasons described in the ROD, including:

- Expected increase in visitation as a result of the completion of the Anton Anderson Memorial Tunnel
- Potential for heli-skiing in the Columbia Glacier basin
- Commercial fishery at Main Bay
- Input from the villages of Tatitlek and Chenega Bay
- Possible allowances for mineral exploration and development in areas such as Knight Island

The ROD did not recommend inclusion of any lands in the Bering Lake Roadless Area, citing the preference for more flexibility to manage recreation and fish and wildlife resources and to allow for development of mineral potential.

The 2012 Wilderness Character Monitoring Report describes variations in wilderness character within the WSA and may inform wilderness area potential and need in areas recommended and not recommended for wilderness area designation in 2002. The report indicates intact wilderness character in the Columbia Glacier drainage north of the Heather Island moraine due to the glacier's continuing rapid retreat, which creates unique scenic, scientific, recreational, educational, historic, and geologic features, as well as

outstanding opportunities for solitude and primitive recreation. Some features are singular to Columbia Bay, including the glacier's fresh water discharge, which contributes more to global sea level rise than any other Alaskan glacier (Colgan, Pfeffer, Rajaram, Abdalati, & Balog, 2012), presenting unique educational opportunities and geologic features. In addition, since 2002 the Columbia Glacier has retreated to within a few miles of a portion of the WSA not recommended for wilderness area designation in the 2002 Forest Plan. Research predicts the glacier will retreat to well within the area during the next decade (Colgan, Pfeffer, Rajaram, Abdalati, & Balog, 2012).

Several other sources have also identified how visitors value wilderness character qualities in Prince William Sound, especially within the WSA, suggesting there is a need to protect and maintain these qualities (Poe, Gimblett, & Itami, 2010; USDA, 2011b; Wolfe, 2007).

Recent input from conservation groups and others during the development of this assessment indicates some level of public support for a wilderness area designation in and near the WSA. Little or no public support has been recorded for recommending wilderness area designations for lands not in or near the WSA. These preliminary observations may identify public preferences and concerns.

While the above sources address wilderness character in the WSA and may inform the potential and need for wilderness area designation in that area, little or no work has been done since 2002 to assess wilderness character elsewhere within the Chugach National Forest.

Known opportunities to highlight unique recreational or scenic areas

The 2002 analysis of Chugach National Forest inventoried roadless areas identified many areas that possess unique recreational and scenic qualities, such as natural conditions and opportunities for solitude that could be highlighted through wilderness designation. For detailed information on these areas, see the Recreation and Scenic Character section of this chapter. Within the WSA, Poe et al. (Poe, Gimblett, & Itami, 2010) identified four keystone recreational experiences that are exceptional or unique to Prince William Sound, including experiencing tidewater glaciers, finding solitude, hunting, and wildlife viewing. The WSA includes the largest number of tidewater glaciers in any one geographic region in Alaska, and the combination of terrestrial and marine wildlife, including birds, makes this area a destination for wildlife viewing.

Scientific or historical information suggesting a unique opportunity to highlight educational, historical, cultural, or research opportunities

Within the WSA, evidence of unique scientific and research opportunities was reflected by the recommendation of two and designation of one research natural area in the 2002 Forest Plan.

RNA management direction in the 2002 Forest Plan emphasizes non-manipulative research and maintenance of natural diversity and ecological processes and can be consistent with preserving wilderness character. Wilderness area designation can also provide a buffer of protection around RNAs to support the purpose of these areas. See the RNA section for more information on these areas.

Known important ecological roles potentially supported by special area designation

Special area designation has the potential to support important ecological roles throughout the planning area. These include the protection of shorebird, waterfowl, marine mammal, and salmon habitat in the Copper River region and the protection of brown bear, wolf, and salmon habitat on the Kenai Peninsula. Some of these roles already benefit from existing congressional designations, including the Kenai National Wildlife Refuge Wilderness Area on the Kenai Peninsula and the ANILCA Sec. 501(b) fish and wildlife habitat conservation designation for the Copper River Delta.

In Prince William Sound, special area designation could protect ecological roles associated with the direct interface of terrestrial and marine ecosystems among the region's numerous fiords, islands, and protected waters. Contributions of spawning salmon to wildlife and forest growth; of forest runoff to marine food webs supporting salmon, other fish, and marine mammals; and the delivery of nutrients to the ocean food web from tidewater glacier runoff all represent important ecological functions that could benefit from special area designation.

Specifically, the current WSA is thought to play a role in:

- Carbon sequestration (see Carbon Stocks section)
- The study and understanding of post-glacial plant succession
- Studying the northwest limits of the natural range of yellow-cedar (*Callitropsis nootkatensis*)

Contributions to economic, social, and ecological sustainability

Despite the limited awareness that the land is managed as a WSA, a robust recreation and tourism industry centered on wilderness character occurs in this part of the Chugach National Forest. It includes tour boats, boat rental shops, water taxis, outfitters, cruise ship visitation, and guided hunting, fishing, kayaking, and other activities (Fay, Colt, & White, 2010; Poe, Gimblett, & Itami, 2010). The industry is especially evident in gateway communities along the road system, including Whittier and Valdez, but it also supports economic activity in Anchorage and other communities (Fay, Colt, & White, 2010).

Wilderness area designation, similar to other area designations, provides additional protection to the resources that make the area distinctive and helps to make the area a more notable destination for visitors. Wilderness character in the WSA provides social benefits, including unique opportunities for education, subsistence, tradition, inspiration, research, time with family/friends, and opportunities for young people to experience nature. For instance, for the past three years, the Forest Service and Alaska Geographic have worked together to conduct youth expeditions to the WSA to introduce youth to wildlands in general and wilderness character specifically.

Existing Inventoried Roadless Areas

Inventoried roadless areas (IRAs) are defined as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act. In 1972, the Forest Service initiated a review of National Forest System roadless areas larger than 5,000 acres to determine their suitability for inclusion in the National Wilderness Preservation System. The second and final review process, known as Roadless Area Review and Evaluation II (RARE II), resulted in a nationwide inventory of roadless areas. Since the completion of RARE II, Congress has designated some as wilderness areas, and additional reviews have been conducted through the land management planning process and other large-scale assessments. The 2001 Roadless Area Conservation Rule (36CFR§294) establishes prohibitions on road construction, road reconstruction, and timber harvesting in IRAs on National Forest System lands.

There is no single designation that applies to roadless area management. Roadless areas on the Chugach National Forest are managed through 2002 Forest Plan management area prescriptions and standards and guidelines. The common theme of these prescriptions is that they prohibit or limit road construction and timber harvest activities that would significantly alter the landscape.

Appendix C of the 2002 Forest Plan FEIS provides an extensive description of 16 IRAs totaling 5,434,710 acres, or approximately 99 percent of the national forest, that were inventoried in 1996. Roadless areas were evaluated on the basis of the area's capability and availability for wilderness designation and the need for wilderness designation (USDA, 2002e). As part of the inventory and

wilderness needs evaluation process, areas within one-quarter mile of improved roads, small donuts created by roads surrounding a parcel of land, and lands of other ownership were excluded from the inventory, while lands selected but not yet conveyed were included.

Table 43 displays a list of the IRAs, acreages for 2002 and 2013, and the change in acreage. Acreage differences are due to ongoing land conveyances as some National Forest System lands within the Chugach National Forest are being transferred to state or private ownership as a result of the Alaska Statehood Act and ANCSA (see discussion in the Land Status and Ownership section above).

Table 43. Inventoried roadless areas within the Chugach National Forest

Roadless Area	2002 Acres	2013 Acres	Change in Acres
01 Resurrection	224,460	224,380	80
02 Boston Bar	53,590	53,520	70
03 Johnson Pass	153,020	152,390	630
04 Kenai Lake	212,960	197,990	14,970
05 Kenai Mountains	306,580	305,970	610
06 Twentymile	198,560	198,390	170
07 Nellie Juan	734,100	712,710	21,390
08 Prince William Sound Islands	119,520	118,300	1,220
09 College Fiord	1,129,610	1,113,460	16,150
10 Fidalgo-Gravina	316,660	255,300	61,030
11 Montague Island	205,270	204,830	440
12 Hinchinbrook-Hawkins Islands	144,470	136,040	8,430
13 Copper River Wetlands	88,650	82,880	5,770
14 Sheridan Glacier	231,810	222,850	8,960
15 Bering Lake	966,240	956,030	10,210
16 Tasnuna River	349,540	342,570	6,970
Total	5,434,710	5,277,610	157,100

Information Needs

Inventoried roadless areas will be assessed as part of the wilderness evaluation in the forest plan revision process. During this process, the acreage for each IRA will be updated to reflect changes due to recent or ongoing land conveyances.

Wild and Scenic Rivers

The National Wild and Scenic River System (NWSRS) is a system of free-flowing rivers designated by Congress. Wild and scenic rivers offer outstanding natural, heritage, or recreational features that are protected for future generations. During forest planning, the Forest Service evaluates rivers that cross National Forest System lands and recommends rivers suitable for inclusion in the NWSRS. Wild and scenic rivers are managed to protect their free-flowing characteristics and their particular outstandingly remarkable values.

For a river to be included in the NWSRS, it must meet the tests of eligibility and suitability. To be eligible, a river must be free flowing and possess river or river-related values that are judged to be outstandingly remarkable. To be suitable, the benefits of designation should outweigh the disadvantages. It involves considering the land ownership in the area; the land uses that would be affected; public, state,

and local government interest in the river's designation; estimated costs; and any other issues raised during the planning process.

As of 2013, there are no designated wild and scenic rivers within the Chugach National Forest.

Potential need and opportunity for additional wild and scenic rivers

In 2002, all named rivers and glaciers (more than 760) and many unnamed rivers within the national forest were examined and evaluated to identify outstandingly remarkable river-related features that would make them eligible for inclusion in the NWSRS. Twenty-three rivers, in whole or in part, were found to be eligible for designation (see table 44).

The regional forester recommended nine of these eligible river segments to the Chief of the Forest Service as suitable for inclusion in the NWSRS, a total of 82.4 miles. Three river segments were recommended for wild designation, two for scenic designation, and four for recreational designation. Additional analysis conducted on additional rivers after the 2002 Forest Plan was appealed revealed that Child's Glacier was also eligible as a scenic river, so it has been managed in the same manner as the recommended river segments. Table 45 describes each river segment in terms of its recommended classification and outstandingly remarkable values.

Table 44. River segments within the Chugach National Forest determined eligible for inclusion in the National Wild and Scenic River System

River Name	Outstandingly Remarkable Value(s)	Wild	Scenic	Recreational
		miles		
Bear Creek	Geologic feature	0	0	3.4
Sixmile Creek	Recreational whitewater boating, scenery and visual features	0	5.7	0
East Fork Sixmile Creek	Recreational whitewater boating, scenery and visual features	0	5.6	0
Canyon Creek	Geologic feature	0	6.8	0
Snow River	Scenery and visual features	23.8	0	0
Twentymile River (complex)	Synergistic effects of combined special resource values	14.2	0	0
Palmer Creek	Scenery and visual features	0	10.9	0
Portage Lake and Glacier	Scenery and visual features, recreational values	4.7	2.3	0
Portage Creek	Scenery and visual features	0	0	6.2
Kenai River	Fisheries value	0	0	5.5
Russian River	Fisheries and prehistoric values	14.3	3.0	0
Columbia Glacier	Geologic feature	19	0	0
Coghill River	Fisheries, recreational values, scenery and visual features	11.5	0	0
Cascade Creek	Visual feature (waterfall)	2	0	0
Nellie Juan River	Recreational whitewater boating, scenery and visual features	25.1	0	0
Martin Glacier	Geologic feature	18	0	0
Martin River and Lake	Scenery and visual features, geologic feature, fisheries, recreational values	24.5	1.8	0
Alaganic Slough and unnamed tributary	Historic/cultural values	0	13	0

River Name	Outstandingly Remarkable Value(s)	Wild	Scenic	Recreational
		miles		
Copper River (lower; delta complex)	Scenery and visual features, historic and cultural values, fisheries and wildlife values, geologic feature	24.3	1	0
Copper River (upper)	Scenery and visual features, recreational values, fisheries values	51.3	0	0
Bering River and Lake	Scenery and visual features, recreational values, fisheries values	6.6	25.2	0
Katalla River	Fisheries values	4.8	7.1	0
Nellie Martin River	Fisheries value	0.4	1.6	0
Number 1 River	Recreational whitewater boating and geologic values.	6.7	0	0
Total river miles by potential classification		251.2	84	15.1
Total miles of eligible river segments		350.3		

Table 45. River segments within the Chugach National Forest determined both eligible and suitable and recommended in 2002 for inclusion in the National Wild and Scenic River System

River Segment	Miles	Classification	Outstandingly Remarkable Values
East Fork Sixmile Creek	5.6	Recreational	Recreation (white water boating), scenery and visual features
Sixmile Creek	5.7	Recreational	Recreation (white water boating), scenery and visual features
Portage Creek	6.2	Recreational	Scenery and visual features
Twentymile River	14.2	Scenic	Synergistic effects of combined special resource values
Russian River, lower	4.9	Recreational	Fisheries and heritage resource (prehistoric) values*
Russian River, upper	12.4	Wild	Fisheries and heritage resource (prehistoric) values
Snow River, lower	9.1	Scenic	Scenery and visual features
Snow River, upper	14.7	Wild	Scenery and visual features
Nellie Juan River, lower	9.6	Wild	Recreation (white water boating), scenery and visual features
Total	82.4		

*During the Forest Plan Review 2002-2012, an omission in the documentation of outstandingly remarkable river-related features in the eligibility evaluation for the lower Russian River was discovered. The evaluation clearly identifies recreation as one of its outstandingly remarkable river related features but neglected to identify it as such in the FEIS (USDA, 2002c).

To date, no further action has been taken on these recommendations. Congress has the authority to make decisions on designations to the NWSRS after approval of recommendations by the Chief of the Forest Service and the Secretary of Agriculture.

Since 2002, the nine recommended river segments and Childs Glacier have been managed according to the three management area prescriptions (wild river, scenic river, and recreational river) developed to protect their free flowing characteristics, tentative classification, and outstandingly remarkable values for which they were recommended.

Since 2002, the Forest Service has not conducted any additional studies to identify the need or opportunity to add rivers or glaciers to those already recommended, and no information needs have been identified.

Contribution of wild and scenic rivers to social, economic, and ecological sustainability

The benefits of wild and scenic rivers are multifaceted. They include providing managers with tools or mechanisms to protect free-flowing condition. Wild and scenic river designation, or recommendation, also provides for the protection of water quality and outstandingly remarkable values. Status as a WSR aids in making a river more attractive as a recreation and tourism destination. For instance, guided rafting on Sixmile Creek is the most popular commercial recreation opportunity within the Chugach National Forest. Also, fishing on the Russian River provides not only guided recreation opportunities but supports the broader Alaska tourism industry, including businesses in southcentral Alaska that provide services for anglers. Benefits, however, are not only economic. Benefits tend not to be only economic, however. One study looking at the perceptions of community benefits of two WSRs found that local citizens valued the rivers as a source of community pride, aesthetic beauty, and ecological integrity (Smith & Moore, 2011).

National Heritage Areas

The National Park Service (NPS), which is responsible for the National Heritage Area (NHA) program, describes NHAs as “places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape” (NPS, 2013). The designation of NHAs is generally a community-driven effort led and managed by local citizens and organizations.

There is one NHA within the Chugach National Forest, the Kenai Mountains-Turnagain Arm National Heritage Area (KMTA NHA), managed by the Kenai Mountains-Turnagain Arm Corridor Communities Association (KMTA-CCA). The KMTA NHA was established by Congress in 2009 and encompasses almost half of the Kenai Peninsula, stretching from the communities of Bird to Seward and from the eastern part of the Kenai National Wildlife Refuge to the western bays of Prince William Sound.

These boundaries overlay several other designated areas and areas recommended for designation, including the Iditarod National Historic Trail (INHT), the Seward Highway Scenic Byway/All-American Road, all of the rivers recommended for inclusion in the National Wild and Scenic River System, and the Resurrection Pass and Williwaw National Recreation Trails. The KMTA NHA focuses on the theme of transportation for mining and settlement, including Alaska Native use, gold rushes, contemporary placer mining, trail and wagon road development, the Iditarod National Historic Trail, railroad, and highway development. The goal of the Kenai Mountains-Turnagain Arm NHA is to recognize, preserve, and interpret the historic, scenic, and natural recreational resources and cultural landscapes of the Kenai Mountains-Turnagain Arm historic transportation corridor, and to promote and facilitate the public enjoyment of these resources. The NHA management plan, developed by the KMTA-CCA, was completed in January 2012 and has been submitted to the Secretary of the Interior for approval. The Forest Service played a key role in development of the management plan and is a sponsor of many of the NHA projects.

The 2002 Forest Plan includes goals and objectives for what was then known as the Kenai Mountains-Turnagain Arm Heritage Corridor. These goals and objectives directly tie in to the goal of the KMTA NHA described previously, and have guided the Forest Service’s participation in the management plan. Due to the remote and rugged nature of the landscape, the extent of the heritage resource base within the National Historic Area is still largely unknown. The NHA contains some of the most well-known heritage resources in the state, including the Alaska Railroad, the Iditarod National Historic Trail, and the Squalintnu Archaeological District, so there are many opportunities to partner with KMTA-CCA on activities related to these sites and projects.

Potential need and opportunity for additional national heritage areas

As of 2014, no other areas within the Chugach National Forest have been identified or evaluated as potential NHAs.

Contribution of national heritage areas to social, economic, and ecological sustainability

A national study used six NHAs as a case study to estimate that NHAs contribute nearly 13 billion dollars to the economy and support 148,000 jobs (NPS, 2013). The NHA management plan for the KMTA NHA identifies goals and themes that help describe potential contributions to sustainability, of which a few are described here. First, the NHA is working to strengthen the sense of community in the towns within the area through their heritage resources. At the same time, this will help to promote the protection, as well as the enjoyment, of those heritage resources. NHA staff members have also developed a school curriculum called Trails Across Time to be used in Alaska studies programs to help students learn about the area's heritage in a place-based manner. Designation may help promote tourism in local communities, which would support small businesses and local museums. Lastly, the NHA is a valuable partner to local, state, and Federal land managers in managing the heritage resources of the area.

National Historic Landmarks

National Historic Landmarks (NHLs) are buildings, sites, structures, or objects that are recognized by the United States government for national-level historical significance. The Secretary of the Interior has the authority to formally record, and the National Park Service has the authority to administer these properties.

There are two NHLs within the boundary of the Chugach National Forest, though only one is on National Forest System lands. Both are in Prince William Sound and one is within the Cordova Ranger District.

The Bering Expedition Landing Site, located on Kayak Island, was designated a NHL on June 2, 1978. According to the NPS NHL Program, "Here [in 1741] naturalist Georg W. Steller, surgeon aboard Vitus Bering's *St. Peter*, made the first attempts at contact between Europeans and Alaskan natives. His investigations are among the first contributions to the West's knowledge of the natural and human history of the region." The precise landing site on Kayak Island is not known and no remains of the visit have been located on the island.

The Palugvik Site NHL, located on Hawkins Island, was designated a NHL on December 29, 1962. The NHL property constitutes a portion of the larger Palugvik Archaeological District, which is an area that provides evidence of long-established Chugach Eskimo traditional culture. Providing further information on the location and content of the district and NHL associated with Palugvik is restricted by the Secretary of the Interior pursuant to Section 304 of the National Historic Preservation Act, which provides for authority to withhold from disclosure to the public information that may cause significant invasion of privacy, risk harm to the resources, or impede the use of a traditional religious site by practitioners. The NHL property was conveyed to Chugach Alaska Corporation (an Alaska Native Settlement Claims Act regional corporation) on May 14, 2013, under authority of ANCSA 14(h)(1).

Potential need and opportunity for additional national historic landmarks

The Kenaitze Indian Tribe and Cook Inlet Region Inc. (respectively a federally recognized tribe and an Alaska Native Settlement Claims Act regional corporation) have expressed a desire to nominate the Sqilantnu Archaeological District in the Seward Ranger District to the NHL Program.

National Trails

The National Trails System was established by the National Trails System Act of 1968 as amended. The types of trails described in the legislation include national scenic trails, national historic trails, and national recreation trails. One national historic trail and two national recreation trails occur within the Chugach National Forest. National recreation trails, although administratively designated, are discussed here. There are no designated national scenic trails within the Chugach National Forest.

National historic trails

The National Trails System Act states the purpose of national historic trails is for the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment. National historic trails may only be designated by Congress. The act, as amended in 1978, established the Iditarod National Historic Trail (INHT), which consists of a route approximately 2,400 miles long connecting Seward to Nome, including connecting trails, across multiple Federal, State, municipal, and private lands. The Bureau of Land Management, identified as the trail administrator for the INHT, led an extensive multi-agency/partner effort to develop the Iditarod National Historic Trail Seward to Nome Route Comprehensive Management Plan (CMP) (BLM, 1986).

Since 1986, several trail segments have been planned, constructed or reconstructed along the Seward-Girdwood INHT route by various Federal, state, or other entities, primarily near or through the communities of Seward and Girdwood, based on CMP recommendations.

In 2004, the Forest Service began an expansive project (Seward-to-Girdwood Iditarod National Historic Trail Project, also known as the INHT Southern Trek) to fully develop a commemorative route following the Seward-Girdwood segment of the INHT as described in the CMP. The decision was signed on January 23, 2004; however, connecting these existing trails is still ongoing. The selected alternative authorizes approximately 186 miles of trail to be managed as part of the INHT providing opportunities for motor vehicle and non-motorized recreation in both winter and summer. The decision approves 82 miles of trail reconstruction, 77 miles of new trail construction, 32 major (greater than 20 feet) and 50 minor trail bridges, 8 new or reconstructed trailheads, interpretive signing at 36 trailheads, and construction of up to 6 new public use cabins. The INHT Southern Trek decision also established a corridor on Portage Lake for non-motorized watercraft, which modified an existing closure for the lake. In 2012, the State Office of History and Archeology submitted a nomination to the Secretary of the Interior to add the INHT to the National Register of Historic Places. Accomplishments from 2004 to 2014 include more than 180 miles of trail location, 65 miles of trail restoration and construction, installation of 7 major bridges and numerous minor bridges, construction of one new trailhead, and restoration of one historic cabin.

National recreation trails

The National Trails System Act states that national recreation trails are established to provide a variety of outdoor recreation uses in or reasonably accessible to urban areas. Unlike national scenic and historic trails, the Secretary of the Agriculture may establish and designate national recreation trails.

The Resurrection Pass and Williwaw Nature Trails are the two National Recreation Trails within the Chugach National Forest, both designated in 1979. The Resurrection Pass Trail is a 39-mile road accessible trail that links the communities of Hope and Cooper Landing. The trail is managed for non-motorized use in the summer and is a popular destination for hiking, backpacking, horseback riding, and mountain biking. There is both motor vehicle and non-motorized use in the winter. The Kenai Winter Access ROD signed in 2007 amended the 2002 Forest Plan and authorizes winter motor vehicle access every other winter from December 1 to April 30 (USDA, 2007a). There are seven public use cabins along the trail available for rent. These developed recreation sites receive some of the highest use of any cabins

within the Chugach National Forest in both summer and winter. In 2013 and 2014, Seward Ranger District staff conducted a study of backcountry use on several trail systems on the Kenai Peninsula, including the Resurrection Pass Trail, to recommend ways to holistically manage guided and non-guided use, including offering additional guided opportunities.

The Williwaw Nature Trail within the Glacier Ranger District was a three-quarter mile interpretive loop trail in the Portage Valley when first designated. It was accessible from the Williwaw campground, with 14 interpretive stations where hikers could participate in interpretive or self-guided hikes to learn about fish, wildlife, glaciers, and other natural features. A bridge near the trailhead washed away, and the trail was reconstructed following a different route. Today, the Williwaw Nature Trail is 1.3 miles long and follows Williwaw Stream, a salmon spawning channel. The trail serves as an interpretive opportunity for both spawning salmon and fish habitat. The fish habitat was created by converting Portage Valley gravel borrow pits into lakes that serve as salmon habitat.

Potential need and opportunity for additional national trails

The Forest Service has not identified a specific need or opportunities for additional national trails. There may be potential for additional national recreation trails within the national forest, including the identification of additions to the national water trails system, which was established in 2012 by the Secretary of the Interior as a new class of national recreation trails. The long-distance nature of scenic and historic trails, and other specific requirements, makes it unlikely that any other of these types of trails would be designated within the Chugach National Forest.

Contribution of national trails to social, economic, and ecological sustainability

National trails provide a unique recreational experience by providing extended routes that link communities and offer multi-day or even multi-week opportunities. The section of the INHT that runs through the Chugach National Forest provides a sense of history for local communities and visitors, who may be drawn to trails with a national designation. Designation also creates partnering opportunities, such as working with the Iditarod Historic Trail Alliance, KMTA NHA staff, and the Seward Trailblazers. Designation identifies special historic features that make the trail exceptional, which helps to protect them by increasing public awareness and appreciation.

Research Natural Areas

A research natural area (RNA) is an area managed by the Forest Service in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes; commercial and most public uses are not allowed. RNAs are selected from relatively undisturbed areas to represent the spectrum of natural ecosystems and special or unique characteristics of scientific importance. RNAs are managed with an emphasis on non-manipulative research, monitoring, education, and the maintenance of natural diversity, allowing natural physical and biological processes to prevail without human intervention.

Relevant Information

- There is an opportunity to review and compare areas having special or unique characteristics of scientific importance and to determine if such areas would enhance the spectrum of natural ecosystems within the existing research natural areas network.

Existing research natural areas

Of seven areas considered for RNA designation for the 2002 Forest Plan, four were selected in the record of decision in addition to the previously established Green Island RNA (see the designated areas and areas

recommended for designation map in the map package appendix). The five RNAs total 21,500 acres and include:

1. Kenai Lake-Black Mountain (3,800 acres in the Kenai Peninsula geographic area)
Contains a representative range of Sitka spruce-white spruce-Lutz spruce forest and a wide diversity of vegetation types (USDA, 2007c).
2. Wolverine Glacier (7,000 acres in the Prince William Sound geographic area)
Represents a mid-elevation glacier with a diversity of tundra plant communities. Extensive glaciology research has occurred at the site since the mid-1960s. This area is within the Nellie Juan-College Fiord WSA (USDA, 2007e).
3. Green Island (2,500 acres in the Prince William Sound geographic area)
Includes old-growth forests, beaches uplifted by the 1964 Great Alaska Earthquake, important haulout sites for harbor seals and Steller sea lions, marine bird colonies, and close linkages between terrestrial and highly productive marine environments (USDA, 1997).
4. Olsen Bay Creek (6,700 acres in the Prince William Sound geographic area)
Non-manipulative anadromous fisheries research was conducted here for more than 50 years. The area also contains a wide diversity of lower and upper elevation vegetation types and landforms (USDA, 2007d).
5. Copper Sands (1,500 acres in the Copper River Delta geographic area)
This area is a barrier island and includes breakwater sandbars. It is a site of active vegetation succession on sand dunes (USDA, 2007b).

The Forest Plan Review 2002-2012 reported that these RNAs are being managed in a manner consistent with the RNA prescription that focuses on allowing natural conditions to prevail, usually by eliminating or limiting human intervention.

Potential opportunity for additional research natural areas

There is an opportunity to review and compare the spectrum of natural ecosystems and special or unique characteristics of scientific importance.

Contribution to Social, Economic, and Ecological Sustainability

Because RNAs are managed in a natural state, they can function as a control when evaluating long-term effects and ecological change on more intensively managed areas. By encompassing a wide range of habitats, RNAs can provide habitat for little known or unknown forms of biological diversity, including insects, fungi, and soil organisms. In short, RNAs can function as biological repositories, safeguarding habitats, species, and natural processes for the future.

Heritage resources within RNAs are likely protected by the designation since ground-disturbing activities are limited. Management activities for recreation uses, habitat improvement, and resource development are not emphasized in RNAs. Recreation uses that interfere with the purpose of the RNA may be restricted and harvest of forest products is not allowed except for subsistence use as defined by ANILCA.

Scenic Byways

The National Scenic Byways (NSB) Program was established by the Intermodal Surface Transportation Efficiency Act of 1991, administered by the Federal Highways Administration (FHWA). The NSB program recognizes roads as national scenic byways or all-American roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities to “create a distinctive collection of American roads, their stories and treasured places.” To be designated as a national scenic byway, a road must significantly meet criteria for at least one of the above six intrinsic qualities. For the all-American roads

designation, criteria must be met for multiple intrinsic qualities. There are 150 designated scenic byways and 31 all-American roads in 46 states. Similar to the NSB Program, each state has a scenic byways program, which is usually administered by the state's department of transportation.

Recognized for its scenic, natural, historical, and recreational values, the 127-mile Seward Highway holds triple designation: Alaska scenic byway, USDA Forest Service scenic byway, and all-American road. The Seward Highway was designated as an Alaska scenic highway in 1993, a national scenic byway in 1998, and as an all-American road in 2000.

The Alaska Marine Highway, spanning a length of 3,500 miles and connecting 33 communities along the coastline of southeast and southcentral Alaska, was designated by FHWA as an all-American road in 2005. All routes within the Alaska Marine Highway System (AMHS) are, collectively, an all-American road. It is also considered an Alaska scenic byway. The Alaska Marine Highway Scenic Byway was designated in 2002. The Alaska Marine Highway System Byway Corridor Partnership Plan (ADOT & PF, 2002) was developed as part of the designation process, with detailed actions described in plans created for separate segments of the Alaska Marine Highway.

The Prince William Sound and the Kenai Peninsula Segment Corridor Plan highlights the intermodal links in southcentral Alaska, including the Seward Highway and Alaska Railroad, and connections between the communities of Cordova, Valdez, Whittier, the Village of Chenega Bay, and Seward. ADOT (ADOT & PF, 2011b) reports a significant increase in passengers on segments in Prince William Sound during the past decade.

Potential Opportunity for Additional Scenic Byways

Three routes designated as state scenic byways provide access for national forest visitors. The Sterling Highway and Alaska Railroad on the Kenai Peninsula are surrounded by National Forest System lands as is the Copper River Highway on the Copper River Delta. All three of these routes provide access to Forest Service managed recreation sites, including campgrounds, cabins, and trailheads. State scenic byways are designated based on criteria very similar to that of the national program. They could be identified as potential additional designated national scenic byways.

Contribution of Scenic Byways to Social, Economic, and Ecological Sustainability

Designation as a scenic byway, like other designated areas, provides prestige and visibility to the route at a national or state level, which can help promote tourism and protect the resources that make the highways worthy of special recognition. Scenic byways also serve as a forum for partnerships and collaboration between public, private, and non-profit sectors. For instance, the Forest Service has worked as a partner with the Alaska Department of Transportation, the Alaska Railroad, local visitor bureaus, and travel industry representatives on marketing and implementation plans for the Seward Scenic Byway, leading to more efficient and effective management. Similar efforts have been undertaken for the AMHS Scenic Byway, as it connects numerous communities and provides access to and through many different state and Federal parks, refuges, and forests.

A literature review of several studies of scenic byway economic impacts found that most studies identified economic benefits from the byway but that conclusions about overall economic impacts are difficult to establish due to variable types and quality of methodology (Petraglia & Weisbrod, 2001).

Areas Designated by the Alaska National Interest Lands Conservation Act

This section describes existing conditions for statutorily designated areas within the plan area that are provided specific management direction by ANILCA. The section also provides information to support

evaluation of possible future conditions and trends. Internal sources of information were referenced for current conditions.

Existing Conditions for ANILCA-Designated Areas

With ANILCA, Congress created, expanded, and revised Federal public lands across the state of Alaska. Section 501(a) of ANILCA added four areas totaling 1,893,390 acres to the Chugach National Forest: Nellie Juan, College Fiord, Copper/Rude River, and Controller Bay. In addition, Section 501(b) provides specific direction for the management of the Copper/Rude River addition, as well as existing National Forest System lands in the Copper and Bering rivers area.

Specifically, ANILCA states “that the conservation of fish and wildlife and their habitat shall be the primary purpose for the management” of the Copper, Bering, and Rude rivers area (a 501(b) area).

The 2002 Forest Plan includes direction for managing the fish and wildlife resources of the 501(b) area. Specifically, the plan includes three classes of 501(b) prescriptions that apply to lands within this area, each providing for the conservation of fish and wildlife and their habitats and a variety of multiple uses. All three prescriptions have fish and wildlife conservation as their primary goal (USDA, 2002a). Overall, these 501(b) prescriptions affect 1,563,950 acres.

Permits and authorizations for use of lands in the Copper River Management Area may only be issued with a determination that the authorized activity is consistent with conservation of fish, wildlife, and their habitat (36 CFR 24.22(a)). Section 502 of ANILCA withdrew the hardrock minerals within lands added by ANILCA to the Copper River area from location, entry, and patent under the United States mining laws.

Contribution to Ecological, Social, and Economic Sustainability

The 501(b) area is a productive coastal wetland that supports healthy runs of all five species of Pacific salmon. The Copper River watershed provides critical salmon spawning habitat, which sustains commercial fishing operations, canneries, sport, and subsistence fishing. The wild salmon harvest of the Copper River watershed is one of the most significant in the state of Alaska.

Bald eagles, shorebirds, seabirds, brown bear, black bear, wolf, moose, deer, mountain goats, and small furbearers also occur in the area. The State of Alaska has designated much of the 501(b) area a critical habitat area (AS 16.20.600). The area is used for hunting and wildlife viewing. Sport and subsistence harvest of moose in the area contributes considerably to the local rural subsistence lifestyle. Each spring, the Copper River Delta is a key stopover site for millions of migrating shorebirds and has been designated a Western Hemisphere Shorebird Reserve Hemispheric Site.

Conditions and Trends affecting the ANILCA Section 501 (b) Area

The 1964 earthquake uplifted certain lands within the 501(b) area by several feet. The resulting vegetation succession continues to alter habitat type and availability. Tidal marshes are being replaced with shrub and tree vegetation. This trend is expected to affect the capacity of the area to support certain wildlife populations in their current numbers and distribution.

Information Needs

This area is one of the largest contiguous wetlands on the Pacific Coast of North America. The relatively unfragmented nature of the Copper River Management Area provides a unique opportunity for scientific study. More information on fish and wildlife populations and their habitat would contribute to better

understanding of current conditions and trends and inform management decisions in support of the goals of the ANILCA 501(b) designation.

Recreation and Scenic Character

This section provides an overview of the existing condition and, where information is readily available, trends, possible future conditions, and sustainability of the recreation and scenery resources within the Chugach National Forest. After the Relevant Information subsection, which provides a snapshot of selected key points related to recreation and scenery, an overview of Forest Service recreation and scenery management is provided. The next subsections describe the existing condition of recreation settings, scenery, and recreation opportunities by geographic area, including opportunities for guided activities, connecting people with nature, and for recreation on lands in other ownership. Recreation infrastructure and recreational access are two important components in delivering a suite of recreation opportunities, and these are described in more detail. Following that description, recreation use and trends are examined both at the state and national forest level, including areas where there are competing demands and/or user conflicts within the national forest. Where possible, recreation use information is provided by geographic area. Much of the available information is forestwide and is presented at that level. Lastly, this section will discuss whether recreation opportunities and scenic quality within the Chugach National Forest are sustainable, and how they contribute to the economic, ecological, and social sustainability in the plan area.

Relevant Information

- Eighty-two percent of respondents during the 2008 NVUM survey were very satisfied with the quality of their recreation experience.
- Ninety-five percent of respondents planned to return to Prince William Sound. Only 10 percent reported negative encounters with other users during their visit.
- Opportunities for connecting people with nature have evolved, expanded, and diversified across the national forest and in local communities.
- Motor vehicle use and non-motorized activities continue to generate interest.
- Limited monitoring of unauthorized motor vehicle use citations and public input indicate that current users generally understand where motor vehicle use is allowed. The number of citations decreased from more than 80 in 2006 and 2008 to 17 in 2011.
- Greater access to Prince William Sound and continued land conveyances have led to an increased concern of trespass on Alaska Native Corporation lands along the shoreline.
- There has been an observed diversification of summer and winter recreation activities on the Kenai Peninsula, with an increase in mountain biking, backcountry skiing, and trail running.
- Visitors to the Begich, Boggs Visitor Center during the past five years has decreased from 100,000 in 2010 to 69,000 in 2012, a 30 percent drop, primarily due to a reduction in use by commercial tours.
- An increase in boat and upland use in Prince William Sound is indicated by traffic through the Anton Anderson Memorial Tunnel to Whittier, which increased from 176,000 vehicles in 2002 to nearly 235,000 vehicles in 2010. Though use of the tunnel peaked in 2007 and has been decreasing since, use in 2012 is 25 percent greater than use in 2002.
- A decade-long study in Prince William Sound (Twardock, Monz, Smith, & Colt, 2010) found that campsites along beaches increased 27 percent and that total impacts at existing campsites expanded from 43 to more than 73 square meters.
- Demand is generally being met for Chugach National Forest recreation settings and opportunities, though the need for cabins and campgrounds in western Prince William Sound and the Kenai Peninsula during much of the summer remains unmet.
- The Forest Service could consider revising recreation use capacities and guided use allocation models used in the 2002 Forest Plan and developing a consistent approach to establishing capacities.
- The INHT and Whistle Stop projects have increased recreational access by providing new trails in the Kenai Mountains.

- The Kenai Winter Access Plan (USDA, 2007a) adjusted the areas open for winter motor vehicle access within the Seward Ranger District.
- The Copper River Highway has been closed since 2011 at mile 36 because of a bridge failure. It is uncertain when this bridge will be replaced, so road access to the Childs Glacier campground and day use site is currently unavailable.

Recreation and Scenery Management

Since 2002, the Forest Service's national approach to recreation management has evolved to provide settings and opportunities that are socially, economically, and environmentally sustainable for local residents and visitors alike. This approach is laid out in the Forest Service Framework for Sustainable Recreation (USDA, 2010c). The framework provides a vision, guiding principles, goals, and areas of focus for recreation management on National Forest System lands. The overall goal of sustainable recreation is to provide diverse natural and cultural recreation opportunities in cooperation with partners, while protecting the natural, cultural, and scenic environment for present and future generations. It also recognizes the challenges of operating and maintaining a system of recreation facilities and highlights the importance of considering financial sustainability when managing recreation resources.

The Forest Service uses a system called the Recreation Opportunity Spectrum (ROS) to describe different recreation settings across the national forest (see the ROS map in the map package appendix). The system describes settings in seven classes with specific, defined attributes (USDA, 1986). ROS classes range from highly modified and developed places to primitive, undeveloped settings. Attributes typically considered in describing the settings are scenic quality; type and degree of access; remoteness; level of development; social encounters; and the amount of on-site management. The seven different ROS classes are described in detail in the 2002 Forest Plan.

These ROS classes have also been used to establish recreation carrying capacities, where more developed settings allow for a higher number of people, based on a number of people in a given area at one time. The concept of capacity and its validity continues to be debated, as well as what factors should be used to determine capacity, but most recreation managers and researchers recognize the value of using capacities to maintain recreation settings and opportunities (Graefe, Cahill, & Bacon, 2011; Whittaker, Shelby, Manning, Cole, & Haas, 2011). Recreation use capacities for the 2002 Forest Plan were developed using ROS coefficients, which led to high theoretic capacities that do not likely represent levels of use that could be sustained without degrading recreation experiences and natural resources. Since 2002, the Forest Service has developed site-specific capacities for many areas across the national forest but has used different methodologies and approaches. It may be valuable to develop a consistent approach for establishing recreation use capacities and to re-assess theoretic capacities at the broad geographic area level. Also, allocations for guided recreation use in the 2002 Forest Plan range from 30 to 50 percent of total use, which is only reached in a handful of locations, particularly on rivers. In general, these allocations for guided use are too high and could be adjusted to better reflect recreational use patterns.

ROS, capacities, and sustainable recreation have helped guide Chugach National Forest recreation management in the past. However, there is a greater emphasis on recognizing the value of specific recreation sites and opportunities, the importance of financial sustainability, connecting people with nature, and the connection between cultural resources and nature-based recreation in this assessment.

The 2002 Forest Plan and FEIS provided an inventory of the ROS classes by acreage. More than 95 percent of the almost 5.4 million acres are in either the Primitive or Semi-Primitive classes, with developed Roaded Natural settings occurring along road corridors. Since 2002, project implementation has not changed ROS class acreage. Table 46 displays the current distribution of ROS classes by geographic area.

Table 46. Recreation opportunity spectrum classes (acres) for the Chugach National Forest

ROS Class	Copper River Delta	Kenai Peninsula	Prince William Sound	Totals
Primitive	1,334,973	5,952	1,166,189	2,507,114
Semi-primitive non-motorized	19,818	198,008	1,335,090	1,552,916
Semi-primitive non-motorized (winter motor vehicle use allowed)	112,760	523,588	83,341	719,689
Semi-primitive motor vehicle use allowed	189,702	365,329	22,011	577,042
Roaded natural	17,164	70,611	569	88,344
Roaded modified	0	649	0	649
Rural	0	6,623	0	6,623

Source: Chugach National Forest GIS database (2014).

The Forest Service also recognizes scenery as an important resource in and of itself. Since the late 1990s, the Forest Service has inventoried existing and desired scenery levels and included impacts to scenery as a consideration in program and project planning. Scenery in natural settings across the national forest is a key component of sustainable recreation management as it serves not only as a backdrop for all types of recreation, but also the primary resource for tourism.

Scenery is evaluated by a process called the Scenery Management System (SMS). This is a two-part process to: (1) assess current scenic conditions and identify the relative importance of the viewed landscape and (2) identify management goals and objectives for the viewed landscape. The first part involves defining and mapping five components to systematically describe the existing scenery and develop scenic classes. These five components follow and are explained in detail in the 2002 Forest Plan FEIS (USDA, 2002c):

1. Describe existing landscape character
2. Identify the existing scenic integrity
3. Identify the existing scenic attractiveness
4. Determine the concern levels and landscape visibility
5. Determine the scenic classes

The second part involves defining and mapping two components using information developed in the first part. These two components are:

1. Define landscape character goals
2. Map scenic integrity objectives

The valued attributes of the landscape character description are used as a frame of reference for determining the existing scenic integrity level (SIL). The SIL indicates the degree of intactness and wholeness of the landscape character, and helps locate and rank areas in need of scenic rehabilitation. It serves as a benchmark for monitoring landscapes to assess changes associated with planned management activities. Conversely, SIL is a measure of the degree of visible disruption of landscape character. A landscape with very minimal visual disruption is considered to have high SIL. Landscapes with increasingly incompatible scenic attributes are viewed as having diminished SIL. Six terms are used to describe the levels of existing scenic integrity, ranging from very high to unacceptably low. Most of the Chugach National Forest landscape has a very high scenic integrity level.

Recreation settings, scenic quality, and recreation opportunities

Copper River Delta

Spanning 700,000 acres, the Copper River Delta provides spectacular scenery, wildlife, massive valley glaciers, and wild and remote settings. It is an ideal location for primitive recreation. The Copper River Delta is much like Prince William Sound in that it is extremely wild and remote with extensive primitive and semi-primitive recreation opportunities. Along the 50-mile Copper River Highway connecting Cordova and Childs Glacier, the roaded natural ROS setting allows for relatively high use of facilities in a few areas. A railroad was constructed that ran along and through the Copper River Delta connecting the Kennicott mine to Cordova, which operated in the early 1900s (Kesti, et al., 2004). The Eyak people have called the Copper River Delta area home for millennia. The Copper River Delta was also the setting for ambitious European traders and American settlers and played a role in early Forest Service history. Scenic integrity within the Copper River Delta remains unchanged with the exception of private lands that have been logged, the Copper River Highway, and a cell phone tower at the junction of the Copper River Highway and the Copper River.

Developed facilities include six public use cabins and improved day use opportunities at four locations along the Copper River Highway. Developed sites are grouped in enclaves along the highway, with the land in-between left undeveloped. Two boat ramps provide access for water-based recreation opportunities to much of the Copper River Delta. Several trails provide opportunities to explore the wetlands, forests, and alpine zones of the Copper River Delta and also maintain access through lands of other ownership.

Important recreation sites include the Childs Glacier recreation site that was expanded to include pavilions, RV sites, and tent campsites in 2004. The highway has been closed at mile 36 since 2011 where the Copper River washed out a bridge, making the campground, at least temporarily, inaccessible by road, but still accessible by boat via the Copper River. Other sites include McKinley Trail cabin, trail, and mine, where visitors can explore remnants of an old mining operation and stay in the Forest Service's oldest public use cabin. At the Alaganik Slough boardwalk and boat ramp, visitors can watch wildlife and explore the Copper River Delta by boat.

Kenai Peninsula

The steep mountains, rivers, glaciers, and a relatively small road and trail system for the size of the land base means there are few access points to undeveloped backcountry areas. The result is concentrated use in valley bottoms or along corridors where access is available and there are recreation facilities. Recreation settings range from areas of major development and higher concentrations of people along the road and trail corridors to remote, undeveloped areas in the backcountry with little use and no development.

Much of the Kenai Peninsula scenery remains the same as it was before the 2002 Forest Plan. Noticeable deviations in the landscape character are concentrated along the existing travelways of the Kenai Peninsula and are associated with road construction and reconstruction. Additionally, the high voltage transmission line paralleling the Seward Highway reduces the scenic integrity in certain locations when viewed from the Seward Highway. Privately owned parcels along the road are gradually being developed. This development is a foreground to national forest views. Spruce beetle killed trees altered scenery in the 1990s and was a major issue during development of the last plan. Since then, however, vegetation management projects have removed much of the spruce beetle-killed trees and encouraged other plant material to grow. This diversified canopy increases the scenic quality of the area by making a texturally varying plant pallet.

The Kenai Peninsula offers a range of opportunities reasonably accessible to large numbers of people, including the residents of cities and towns in southcentral Alaska. Every year, hundreds of thousands of residents and tourists are attracted to the Kenai Peninsula by its scenery, world class sportfishing, opportunities for viewing fish and wildlife, and a multitude of recreation activities available along its trails, roads, and at developed facilities. Compared to the other two geographic areas, the Kenai Peninsula has a substantial infrastructure, including a major visitor center, 19 public use cabins, 14 campgrounds, and hundreds of miles of trail for both summer and winter recreation. Almost all of the major valleys have either a road, trail, or railroad. The Seward Highway National Scenic Byway and All-American Road, the only road heading south from Anchorage, winds along Turnagain Arm and through the heart of the eastern Kenai Peninsula, providing access to a variety of other roads, communities, and recreation facilities. Trails provide short to multi-day opportunities to explore the diverse types of landscapes in the area. Rivers and lakes across the area provide opportunities for motorboating and non-motorized boating. In the winter, snowmachining and cross-country skiing opportunities are among many of the winter opportunities found throughout the area. Community organizations have begun grooming the Trail River and Russian River campgrounds for cross-country skiing.

Several important recreation sites within the national forest are in this area. In the northeast portion of the Kenai Peninsula area is Portage Valley, which includes the Begich, Boggs Visitor Center, two campgrounds, and eight miles of trail, including the Trail of Blue Ice, Portage Creek, Portage Lake, and Portage Glacier. These sites are within 45 miles of Anchorage residents and provide a variety of relatively close day use and overnight opportunities. During the winter, Turnagain Pass on the Kenai Peninsula provides outstanding opportunities for motor vehicle use and non-motorized activities. Paralleling the Hope Highway, Sixmile Creek is a world-class whitewater destination with several sections of Class V rapids requiring a high level of skill to navigate. Further south along the Sterling Highway, the Russian River and its strong runs of sockeye salmon attracts nearly 100,000 local and visiting anglers from around the world every year, creating a very high concentration of anglers during the peak season. The Forest Service is working with other state and Federal agencies to manage the Russian and Kenai rivers confluence area, where human-bear interactions are very common. At the K'beq Interpretive Site, managed by the Kenaitze Indian Tribe in cooperation with the Forest Service, visitors can learn about the Athabascan Denai'na people and culture. Some of the important trails include the Resurrection Pass National Recreation Trail and the Johnson Pass, Russian Lakes, Lost Lake, Winner Creek, and Crow Pass trails.

Two major projects initiated since 2002 are expanding recreation opportunities and capacity on the Kenai Peninsula: the development of the INHT Southern Trek between Seward and Girdwood and the Whistle Stop Project. The purpose of the INHT Southern Trek project is to develop a commemorative route between Seward and Girdwood that provides winter and summer recreational opportunities and associated economic development opportunities. The Forest Service manages 186 miles of trails as part of the INHT, including construction or reconstruction of approximately 159 miles of trails. The project also allows for the construction of up to six new public use cabins. It also opened a corridor on Portage Lake for non-motorized boat travel, which was previously closed to all boat use except for one commercial tour boat. This project also highlights the rich cultural history of the Kenai Peninsula through interpretation along the trail and at associated sites (Benoit, et al., 2004).

The Whistle Stop Project is a partnership between the Alaska Railroad and Forest Service to develop new recreational opportunities along the railroad, which passes through the Kenai Mountains between Portage and Moose Pass. The project decision authorizes the construction of up to 5 whistle stops, 30 miles of trail, 6 public use cabins, a group campsite, and dispersed campsites (USDA, 2006). The Spencer Glacier Whistle Stop opened in 2007. Since then, more than 20,000 people have visited the site for hiking,

camping, rafting, rock climbing, viewing Spencer Glacier, and learning about glacial geology and Alaska Railroad history. The Grandview Whistle Stop was completed in 2013.

Both of these projects are within the Kenai Mountains-Turnagain Arm National Heritage Area, which was designated by Congress in 2009. More information on the National Heritage Area is in the Designated Areas section.

Prince William Sound

One of the largest saltwater sounds in the world, Prince William Sound is a land of spectacular scenery. With the Chugach Mountains providing a backdrop of perennially snow covered peaks, the narrow fiords and tidewater glaciers, old growth forests, and alpine tundra create breath-taking scenery. Black bear, brown bear, mountain goats, Sitka black-tailed deer, nesting shorebirds, and haulouts for Steller sea lions all occur on land. In the marine waters orcas, humpback whales, Dall's porpoises, sea lions, harbor seals, and all five species of Pacific salmon occur. Like the Kenai Peninsula, Prince William Sound has been the home of Alaska Natives for thousands of years. Suqpiak peoples harvested fish, wildlife, and other foods throughout Prince William Sound. Residents of Chenega Bay, Tatitlek, and the Native Village of Eyak continue these practices, along with other rural Alaska residents. Many of the most accessible spots along the shore have been used by boat-based travelers for hundreds or thousands of years. Early European explorers, traders, and settlers also traveled to and through Prince William Sound, giving us many of the place names currently used in the area (Charnon, et al., 2005).

Wild and remote with access by watercraft from nearby towns, floatplane or helicopter, recreation settings are primarily undeveloped and dispersed. Prince William Sound predominantly has primitive and semi-primitive recreation settings. The western half of Prince William Sound includes the 2.1 million acre Nellie Juan-College Fiord WSA designated in 1980, which is managed to provide opportunities for solitude and primitive-style recreation. Activities are generally marine-oriented, with the Chugach National Forest providing the backdrop for both water and land-based activities. Scenery in Prince William Sound for the most part looks undisturbed, much like it did when Captain Cook sailed these waters and recorded what he saw. Steep-walled canyons or fiords carved by glaciation, islands teeming with birds, and the rugged tree covered coast all offer great viewing opportunities. The exceptions to this are areas where timber harvest occurred on lands previously in private ownership.

The 1,800 miles of rugged, remote shoreline of Prince William Sound provide outstanding opportunities for a variety of day use and overnight recreation activities. Due to the challenges of accessing this vast landscape, opportunities for solitude can be found in almost every bay and cove, though areas in the vicinity of towns and main travel routes tend to have more motorboat and non-motorized boat use. Key experiences in Prince William Sound include viewing and camping near tidewater glaciers, viewing a diversity of terrestrial and marine wildlife, and hunting (Poe, Gimblett, & Itami, 2010). Over 250 primitive user-created campsites are spread across Prince William Sound, mostly in the western half with closer access from Whittier (Smith M. A., 2010). The Forest Service used local natural materials to improve a few of the more highly-used campsites to protect natural resources. Sixteen Forest Service cabins throughout Prince William Sound are accessed by boat or float plane, providing a destination or base for other activities, such as hunting, fishing, and backcountry skiing. The Alaska Marine Highway includes several segments that cross Prince William Sound and connect Whittier, Chenega Bay, Valdez, and Cordova.

Two important sites in Prince William Sound include Blackstone Bay and Columbia Glacier, which provide glacier viewing and backcountry camping relatively close to Whittier and Valdez, respectively. Both of these sites are in the WSA.

Guided opportunities

Recreating within many parts of the Chugach National Forest requires excellent outdoor skills and/or specialized equipment. Some people may not have the requisite skills or equipment yet still desire to participate in a particular activity or to visit a remote area of the national forest. Where such services are needed or desired, commercial outfitters and guides are present to assist people and enhance their recreation experience. Outfitters and guides operating within the national forest are required to have a special use permit authorizing them to provide commercial services to the public.

The Forest Service authorizes commercial activities via special use permits to facilitate the public's participation in recreation activities and to provide services that add value to a recreation activity. Some of the key opportunities provided by outfitter/guides within the Chugach National Forest include big game hunting, fishing, heli-skiing, whitewater rafting, and kayaking, along with a wide variety of other recreation activities. As of 2013, there are approximately 150 outfitters and guides that operate within the Chugach National Forest.

Three facilities are authorized as resorts under special use authorization. The Portage Glacier Lodge and Portage Glacier Cruises facility are both authorized on the Glacier Ranger District in Portage Valley. The Montague Island Lodge is authorized on the Cordova Ranger District, but has never been developed.

Copper River Delta

Hunting is the predominant use for outfitter/guide permits issued in the Copper River Delta area. Other authorized outfitter/guide use includes hiking and sightseeing experiences on the developed trails and recreation areas. There is one special use permit authorized for heli-skiing. Several Copper River guides are authorized to camp at sites along the shoreline during the summer months and provide access to the Childs Glacier Campground.

Kenai Peninsula

There are a wide variety of guided opportunities in the Kenai Peninsula area in both summer and winter. In the summer, some examples include viewing Portage Glacier by boat, rafting trips down Sixmile Creek and Placer River, jet boat tours up Twentymile River, ice climbing in Portage Valley and Spencer Glacier, hiking tours on several trails, tours of the Begich, Boggs Visitor Center, horseback riding, and helicopter supported dog sled tours to name a few. In the winter, snowmachine tours and heli-skiing are the most popular activities. Currently, the only guides operating on the Kenai River under special use permit with the Forest Service are those that leave the river and bring their clients above the high-water mark to fish or participate in other guided activities. Previously, guides were required to hold a permit to float the section of the river that crosses National Forest System lands.

Prince William Sound

Most special use permit holders operating in Prince William Sound enter the area through Whittier or Valdez. Most of the kayak supported camping and boat-based hiking and day uses under outfitter/guide permits are based out of Whittier and Valdez. Hunting is another outfitted and guided activity commonly occurring in Prince William Sound.

Recreation events

Recreation events are defined in the Code of Federal Regulations as a recreational activity conducted on National Forest System lands for which an entry or participation fee is charged. Several recreation events have been permitted annually within the Chugach National Forest. These include the Crow Pass Crossing, Lost Lake Run, and a triathlon near Seward to name a few. The Soggy Bottom 100-mile mountain bicycle

race has occurred since 2003. The Resurrection Pass 50- and 100-mile ultramarathons are events held without a permit, as these races do not charge an entry fee. There may be other recreation events as well.

Opportunities for Connecting People and Nature

Chugach Children's Forest

In 2008, the national forest became a Children's Forest, a symbolic designation that created new and innovative opportunities for connecting Alaska's youth and communities with the outdoors. The Children's Forest builds these connections through innovative partnerships, particularly with Alaska Geographic, and community engagement. The four overarching themes of the Children's Forest, as stated in the project's strategic plan (USDA, 2010e) are:

1. Healthy outdoor activities and communities
2. Outdoor-oriented education and careers
3. Stewardship and civic participation
4. Understanding climate and environmental change and local solutions

A portion of the Portage Valley has become a youth-managed section of the national forest, where students work with natural resource managers to develop projects in the area. Dozens of students have also had extended experiences through expeditions to remote landscapes within the Chugach National Forest. Through the Chugach Children's Forest program, the Forest Service is increasing volunteer opportunities for stewards of all ages and helping to train the next generation of land managers through internship opportunities.

Naturewatch, Interpretation, and Conservation Education (NICE) program

Since 2002, the Forest Service's Naturewatch, Interpretation, and Conservation Education (NICE) program has changed significantly, increasing opportunities for interpretation and education where the Forest Service can leverage its resources through partnerships and reducing some programs that rely solely upon Forest Service staff and funding. These NICE programs complement recreation and watchable wildlife opportunities while increasing the public's understanding of natural and cultural history and the relation to land management techniques.

Chugach National Forest staff also organizes, leads, and/or participates in a number of events that highlight unique features in their respective communities. These events provide opportunities to connect with a diversity of community members and help develop knowledge, skills, and a sense of shared stewardship. Forest Service employees often collaborate with a variety of Federal, state, tribal, and local government, and non-profit organizations. For instance, employees have participated and supported tribal-related culture camps in all three geographic areas during the past decade.

Copper River Delta

The Forest Service has partnered with other state and Federal agencies, foreign governments, and non-profit organizations to develop the Copper River International Migratory Bird Initiative, or CRIMBI, to strengthen conservation of migratory birds along the entire flyway through effective international partnerships and action on the ground. Community events include the annual Shorebird Festival in May and the Fungus Festival in September.

Kenai Peninsula

The Begich, Boggs Visitor Center (BBVC) remains the top Chugach National Forest destination for the public to learn about the cultural and natural resources of the area, though visitation has declined during

the past decade. Several improvements to the infrastructure at BBVC have taken place since 2002. In 2004, a classroom facility, the Portage Valley Learning Center, was added to the visitor center to increase educational opportunities. The theater was updated with a new projector, screen, and sound system in 2005 and a new movie about the Chugach National Forest was completed in 2013. The Whistle Stop partnership with the Alaska Railroad has also provided new opportunities to connect with the public. The Forest Service provided interpreters on board the Alaska Marine Highway ferries in Prince William Sound up to 2013. The BBVC season has also been reduced, eliminating winter hours of operation due to budget constraints.

The Forest Service has spearheaded an effort on the Russian River called the Streamwatch Program to reduce human-bear conflicts and natural resource damage at this highly used fishing destination by partnering with Federal, state, local, and non-profit organizations. This partnership has recently expanded to include the entire Kenai River corridor.

In 2010, the Forest Service and its partners initiated the Iditarod Trail to Every Classroom project (iTREC!) to develop place-based service learning opportunities in schools and communities along the Iditarod National Historic Trail. The yearlong professional development program provides teachers with place-based service learning skills to help today's youth become lifelong stewards of Alaska's public lands, natural resources, and cultural heritage. Teachers from Cordova have also participated in this training. Community events include Kid's Fishing Days, the Fungus Fair in Girdwood, and some one-time events, such as Budburst and BioBlitz in Portage Valley.

Prince William Sound

The interpretive partnerships that operate out of BBVC have expanded into Prince William Sound; interpretive guides now provide onboard interpretive programming for Major Marine Tours and Phillips Cruises and Tours.

The Crooked Creek Information Site in Valdez is open from Memorial Day to Labor Day and includes exhibits, bird viewing, and spawning salmon.

Opportunities on lands of other ownership

Alaska has about 168 million acres of land (about 46 percent of the state) that are managed for wildland recreation (AKDNR, 2009). Not surprisingly, there are numerous and diverse recreational opportunities on Federal, state, borough/municipality and private lands adjacent to the Chugach National Forest. These lands include state parks across the Kenai Peninsula, Prince William Sound, and Resurrection Bay along with the Kenai National Wildlife Refuge, Kenai Fjords National Park, Wrangell-St. Elias National Park, privately owned lodges in or near communities and on private lands, and a major ski resort in Girdwood.

Copper River Delta

The largest national park in the nation, Wrangell-St. Elias National Park, shares the Copper River as a boundary with the Chugach National Forest to the east. The park has more than 9 million acres of designated wilderness areas and totals 13.2 million acres. In 2011, the national park had only 65,000 visitors (NPS, 2012), meaning that there are outstanding opportunities for solitude and backcountry experiences. Fourteen cabins are available for rent. The Kennecott Mine National Historic Landmark is a destination for culture-based recreation. The park headquarters also features a visitor center.

Kenai Peninsula

Chugach State Park, located between Girdwood and Anchorage, offers the easiest access to wildland outdoor recreation for Anchorage residents. The park includes an extensive trail system, including

approximately 20 miles of the INHT from Crow Pass to the Eagle River Nature Center, as well as two cabins and a rental yurt. There are also three campgrounds in the park, including the Bird Creek Campground along Turnagain Arm.

The Kenai River Special Management Area was created in 1984 and designated as a state park to manage one of the most heavily used freshwater fisheries in Alaska. As many as 100,000 or more anglers converge annually on the Russian and Kenai rivers to catch salmon for several weeks in the summer. The area is managed to protect natural and cultural resources and to manage Kenai River recreational and commercial uses, including public facilities.

The Kenai National Wildlife Refuge shares most of the western boundary of the Chugach National Forest, divided by the Russian River. Most of the lands immediately adjacent to the national forest are designated wilderness areas. The refuge maintains 110 miles of trails, and also provides visitors with several canoe routes, a unique opportunity in the area. Sixteen cabins are available for rent across the refuge. The USFWS and Forest Service work collaboratively to manage the Russian River fishery.

To the south of the refuge, Kenai Fjords National Park offers glacier viewing opportunities, hiking, and boat-based opportunities within easy access of Seward. The Exit Glacier area offers the only road and trails access in the park and also includes the Exit Glacier Nature Center, which provides interpretive materials on the cultural and natural resources of the park. Three public cabins are available for rent; two are accessible by boat and the third is only available in the winter.

The communities of Girdwood, Hope, Moose Pass, Cooper Landing, and Seward all provide additional opportunities for outdoor recreation, including lodges, trails, and outfitter and guiding businesses. The Alyeska Ski Resort and Hotel in Girdwood is the largest ski resort in Alaska, offering 1,500 acres of groomed and ungroomed skiing on 76 runs and 3,200 vertical feet (2,500 feet lift-accessible).

Several wildlife cruises, kayak trips, and fishing charters are offered out of Seward and Whittier during the summer. There are other lodging options, including the Summit Lake Lodge and a hut, formerly the Forest Service managed Manitoba Cabin, managed by the Alaska Huts Association along the Seward Highway corridor.

Prince William Sound

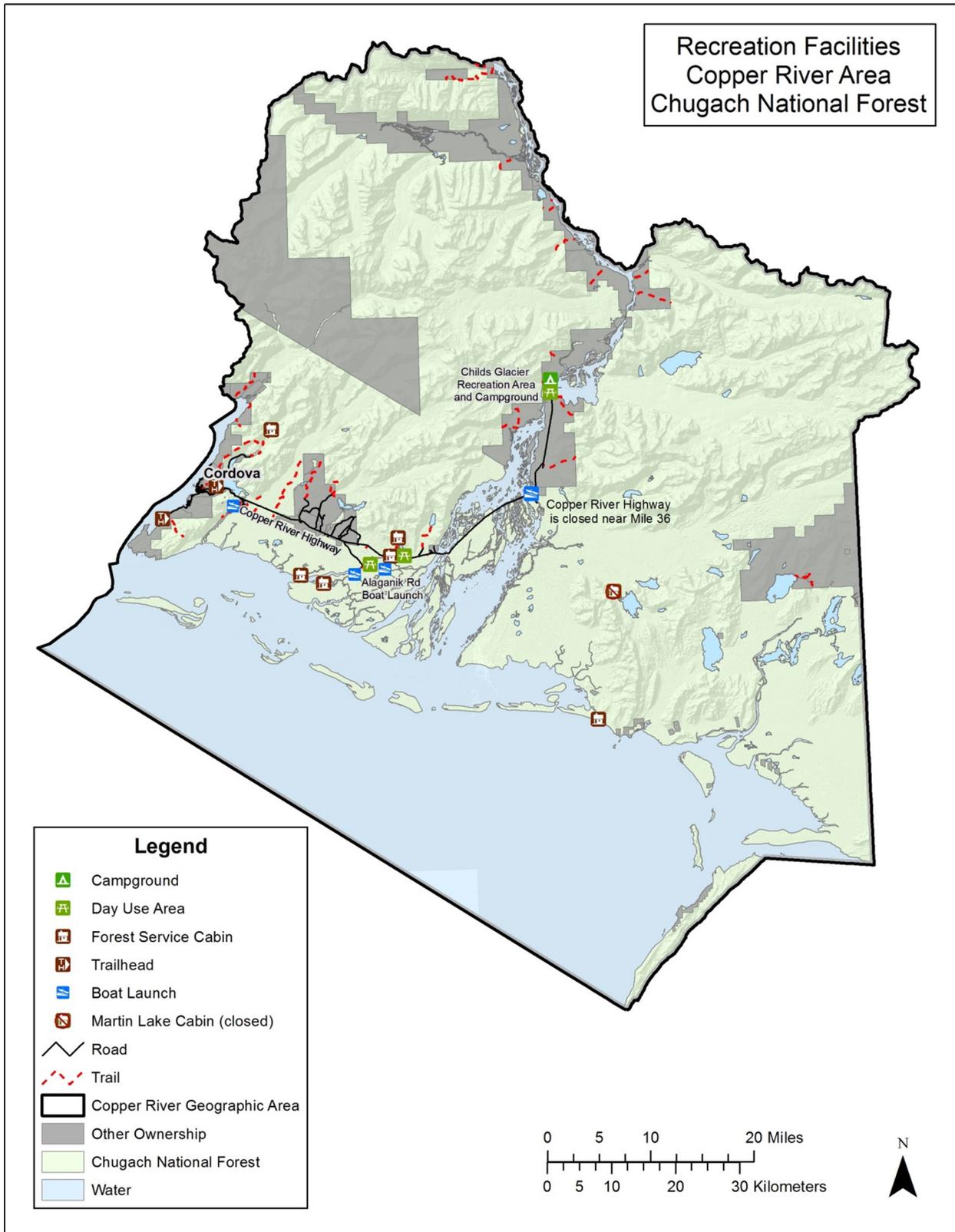
There are 14 marine state parks in Prince William Sound and 5 more are in Resurrection Bay outside of Seward. The management plan for these parks provides for some facilities as well as numerous natural areas to provide undeveloped recreation opportunities (AKDNR, 1995). Cabins are available for rent in parks closer to towns, including two near Valdez, one near Whittier, and four near Seward, as well as some constructed tent platforms at more popular campsites. These parks are accessible by boat or float plane. The state plans to construct three more cabins as part of a plan to help meet public demand for facilities in Prince William Sound and to develop a Prince William Sound Marine Trail, in cooperation with the Forest Service, which would run from Whittier to Valdez (Blackwell, personal communication, 2012). The Prince William Sound gateway communities of Whittier, Valdez, and Cordova provide overnight accommodations, equipment rentals, and guided opportunities for fishing, hunting, and sightseeing visitors. There is also a public use cabin built in 2011 in Iktua Bay owned by the Chenega Corporation.

Recreation Infrastructure and Access

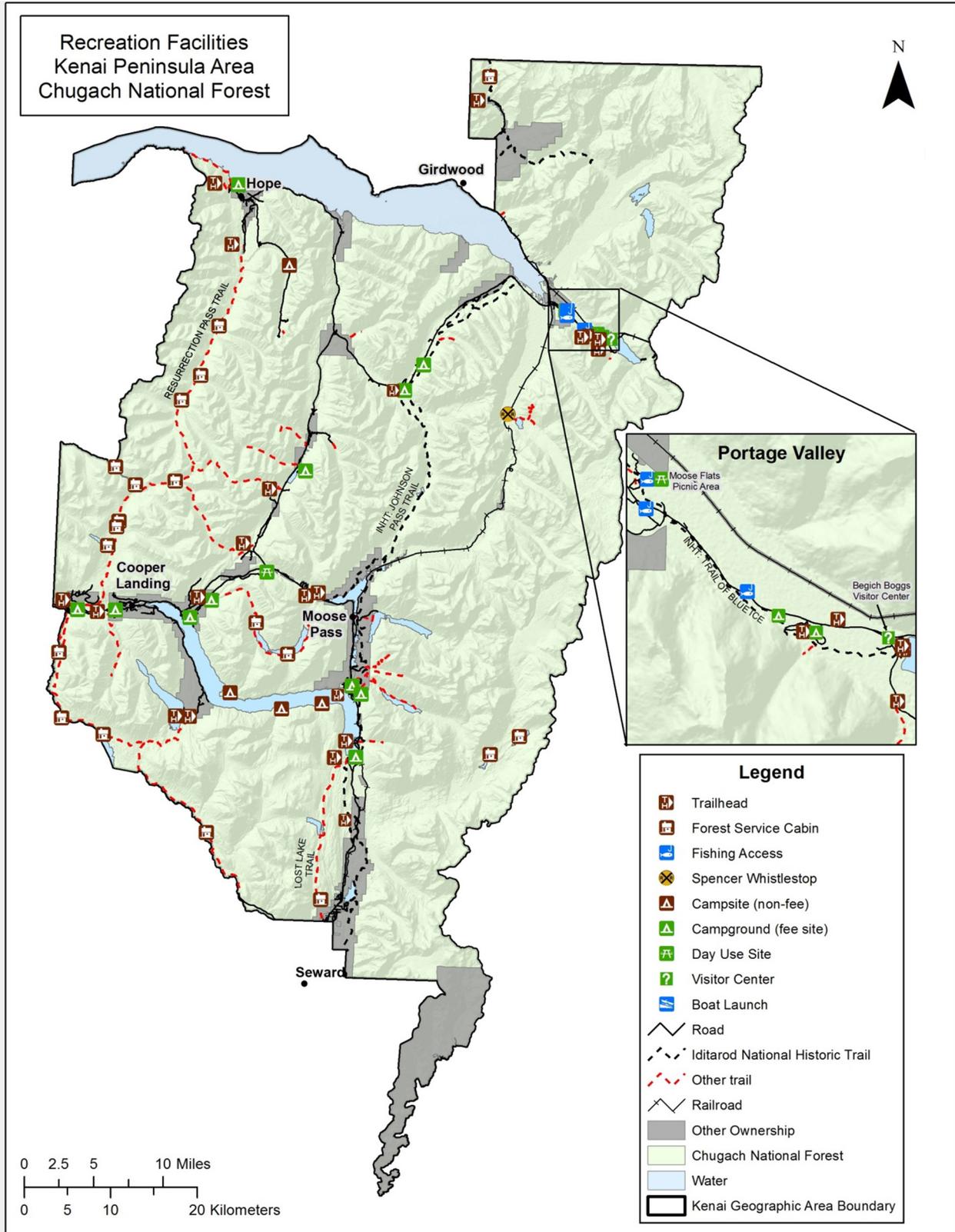
Recreation facilities

The Forest Service manages more than 100 recreation sites to provide a variety of recreation opportunities across the national forest. These sites include campgrounds, public use cabins, visitor centers and information sites, trailheads, boat ramps, and day use areas. Most of these, except for the public use cabins, are accessible along the existing road system. Cabins are found mostly in more remote backcountry settings and are accessible by trail, boat, or float plane. The following sections will provide a description of each type of recreation facility included in the Forest Service's Infra recreation site database. Capacity of the site is determined by the number of people a site can accommodate multiplied by the number of days the site is open for public use. People at one time (PAOT) days are used to represent the total capacity. The annual operations and maintenance costs, as well as the total amount of deferred maintenance, are provided for each type of recreation site. Operations and maintenance costs are established in Infra for each site based on tasks associated with its constructed features, such as a bulletin board, sign, toilet, or picnic table. Deferred maintenance is maintenance that was scheduled to be performed, whether on an annual or cyclical basis, but was delayed for some reason.

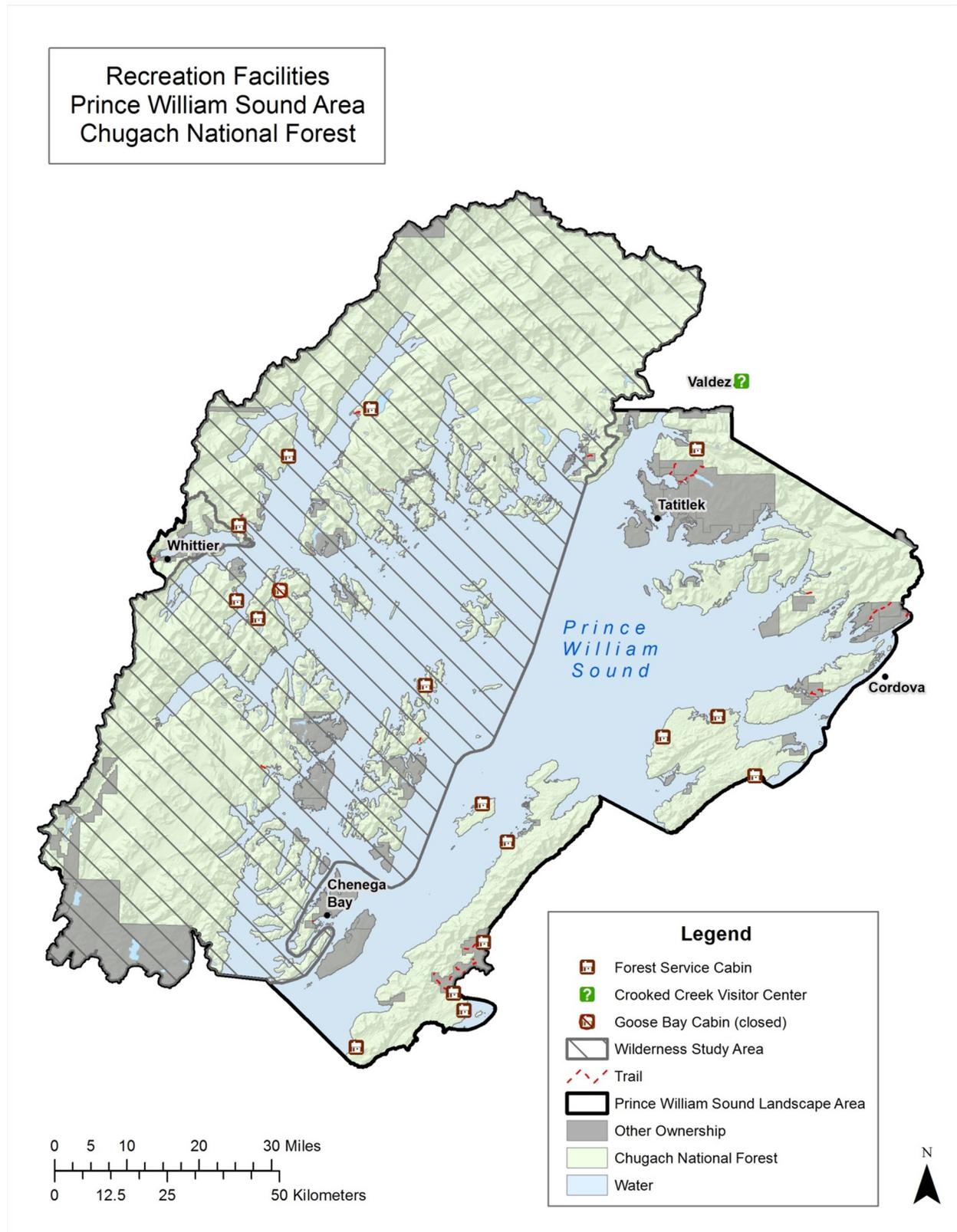
Maps 8, 9, and 10 display the locations of recreation facilities in each of the geographic areas.



Map 8. Recreation facilities in the Copper River Delta geographic area



Map 9. Recreation facilities in the Kenai Peninsula geographic area



Map 10. Recreation facilities in the Prince William Sound geographic area

Public Use Cabins

There are 41 cabins scattered across the Chugach National Forest that vary in size and style, with a capacity of six to eight people. Total PAOT days are 91,500. Most are equipped with propane or wood stoves, wooden furniture and bunks, and a separate outhouse. Although the 2002 Forest Plan and subsequent projects proposed the building of a number of new cabins, no additional cabins have been constructed since 2002. Instead, the Forest Service's emphasis has been placed on maintaining and replacing existing cabins. One new cabin is planned for construction in the near future as part of the Whistle Stop Project. The Alaska Huts Association currently has a planning permit to assess the feasibility of constructing and operating a facility near the Spencer Glacier Whistle Stop.

During the past 10 years, 17 cabins have been replaced or reconstructed through capital investment funds. As of 2012, two of the 41 cabins are not available to the public: Goose Bay Cabin and Martin Lake Cabin. These cabins sustained damage in the winter of 2011-12 due to record snowfall. The Resurrection River Cabin within the Kenai Peninsula is not available for reservations due to access problems caused by trail bridges failing, but is still open for use. The McKinley Trail Cabin near the Copper River Highway is the only historic cabin open for public use within the national forest.

The annual operations and maintenance (OM) costs to complete 100 percent of tasks for the Chugach National Forest cabin program is approximately 320,000 dollars, or an average of about 8,500 dollars per cabin. Cabins located in a remote setting that have high occupancy rates have higher annual OM costs. Cabins are available for nightly rent at a cost ranging from 25 to 45 dollars per night. Using 2012 as a benchmark, Chugach National Forest cabins generated 180,000 dollars in revenue, and the Forest Service spent approximately 280,000 dollars on OM, or about 88 percent of the total need. Cumulative deferred maintenance on cabins totals 398,000 dollars.

Campgrounds

There are 15 fee campgrounds within the Chugach National Forest. Fourteen are within the Kenai Peninsula, with a total of 419 campsites and more than 374,000 PAOT days between Memorial Day and Labor Day. These campgrounds are accessed via the state highways that cross through the national forest. The Childs Glacier Campground and day use area is located within the Copper River Delta at the end of the Copper River Highway and has 18 campsites and 64,000 PAOT days from Memorial Day to Labor Day. There are also three non-fee campgrounds without amenities, with an additional 12,000 PAOT days.

Two new campgrounds have been constructed since 2002: the Childs Glacier day use site was improved and expanded to include camping in 2004, and a new 25-person walk-in campsite was built at Spencer Glacier as part of the Whistle Stop Project. Tenderfoot, Trail River, and Porcupine campgrounds were all reconstructed since 2002 to bring facilities up to standard and to accommodate larger vehicles.

Since the mid-1990s, 13 of the campgrounds have been operated by a concessionaire through a special use permit to reduce OM costs at fee sites and to provide opportunities for private enterprise within the Chugach National Forest. Revenue generated from special use authorization fees are reinvested in the campgrounds, including annual and cyclical maintenance needs, as well as improvements. Childs Glacier and the Spencer Group campsites are operated by the Forest Service. The total annual OM need for 100 percent of tasks at campgrounds is 435,500 dollars. In fiscal year 2012, the Forest Service invested 236,000 dollars in annual OM at the campgrounds, or 54 percent of the total need. Cumulative deferred maintenance for campgrounds is 903,000 dollars. All campgrounds are available for public use, with services available the week prior to Memorial Day (if snow is melted) through Labor Day weekend. One loop of the Trail River Campground was closed in 2012 due to damage caused by flooding and was re-opened in 2013.

There are 57 recreation facility fee sites within the national forest. Table 47 displays these fee sites by type.

Table 47. Recreation facilities fee sites within the Chugach National Forest by geographic area

Geographic Area	Campgrounds	Cabin	Major Visitor Center
Kenai Peninsula	14	19	1 (BBVC)
Prince William Sound	0	16	0
Copper River Delta	1	6	0

Visitor Centers

The Chugach National Forest has one major visitor center, the Begich, Boggs Visitor Center, and one information site in Valdez, the Crooked Creek Information Site (CCIS). The BBVC facility is owned and operated by the Forest Service. Both facilities are generally open to the public between Memorial Day and Labor Day. The CCIS facility was replaced in 2011 and is owned by the City of Valdez and operated by the Forest Service through a 25-year lease agreement. Depending on the availability of funding, the BBVC has been open during weekends in the winter, as well as from early May to late September. Capacity at the BBVC is 206,000 PAOT days. At the CCIS, capacity is 17,250 PAOT days.

The BBVC has 335,000 dollars in deferred maintenance, while CCIS has 51,000 dollars. The CCIS deferred maintenance is from the displays, which are outdated and need to be replaced. Several repairs have been made to the BBVC over the past decade, eliminating approximately 250,000 dollars of deferred maintenance.

The BBVC is a fee site while the CCIS is a non-fee site. The fee charged at the BBVC for access to the film and exhibits was incrementally increased from 1 dollar in 2008 to 5 dollars in 2011 to help defray OM costs. The total annual OM need for the BBVC is 850,000 dollars, which includes maintenance of associated facilities, including a lift station, bunkhouse, and nearby vault toilets (477,000 dollars for the BBVC alone). One challenge with the BBVC is that the facility must be maintained throughout the entire year, even though it is only open to the public seasonally. Total CCIS annual OM need is 68,000 dollars. In fiscal year 2012, net revenue at the BBVC was 38,000 dollars. The Forest Service invested 340,000 dollars at the BBVC and 65,000 dollars at the CCIS in annual OM.

Non-fee Sites

There are 62 non-fee day use sites, including picnic areas, trailheads, boat ramps, fish and wildlife viewing sites, and interpretive sites within the Kenai Peninsula and Copper River Delta geographic areas (see table 48). These sites play an important role in providing a range of recreational opportunities. There are no non-fee sites within the Prince William Sound geographic area. All of the sites are accessible by road, with the exception of the Whistle Stop facilities, which are primarily reached by train. Sites vary in their level of development and capacity; some include vault toilets, shelters, and picnic tables, while others may only have a kiosk or interpretive panel. The Forest Service has improved several non-fee sites during the past decade and constructed three new sites as part of the ongoing development of the Whistle Stop and INHT Southern Trek projects.

Table 48. Recreation non-fee facilities within the Chugach National Forest by geographic area

Facility Type	Geographic Area			Totals
	Kenai Peninsula	Prince William Sound	Copper River Delta	
Trailhead	20	0	11	31
Day Use Site	7	0	3	10
Campground (non-fee)	4	0	0	4
Wildlife Viewing Site	2	0	0	2
Snowpark	1	0	0	1
Interpretive Site	3	0	8	11
Picnic Site	1	0	2	3
Totals	38	0	24	64

All of the non-fee sites are open for use. The total annual OM need to complete 100 percent of tasks for day use non-fee sites is 573,000 dollars. In fiscal year 2012, the Forest Service invested 296,000 dollars in annual OM at non-fee sites to accomplish all critical health and safety related maintenance and repairs, as well as some cyclical maintenance. Deferred maintenance for all of these sites combined is 915,494 dollars.

Recreation Access

This section provides an overview of existing recreation-related access and highlights changes since 2002, including an assessment of the roads and trails infrastructure. Information on other types of access can be found in the Land Use section. The annual operations and maintenance costs, as well as the total amount of deferred maintenance, are provided for this infrastructure. Operations and maintenance costs, including deferred maintenance, are established in Infra for each site based on tasks associated with its constructed features.

Developed access within the Chugach National Forest is limited. Most roads and trails are concentrated within the Kenai Peninsula. There are no public roads within Prince William Sound and only one main road and a few spur roads on the Copper River Delta. The Copper River Highway is not connected to the rest of the state's road system; hence access to Cordova is via the Alaska State Marine Highway, commercial airline, and private aircraft and boats. The same applies to trails, with most occurring on the Kenai Peninsula and a few in Prince William Sound and the Copper River Delta. Access from the mainland to Prince William Sound is through Whittier, Valdez, and Cordova. In Prince William Sound, the protected marine waters provide access for all types of boats and float planes. Boat ramps, providing access to lakes and rivers, occur along the road system on the Kenai Peninsula and Copper River Delta. A series of easements also provide access through private land in the Copper River Delta. Lakes throughout the national forest provide access for floatplanes. In summer overland travel is very difficult without developed routes as glaciers and glacier streams, steep mountainous terrain, and dense alder thickets make travel very difficult even for the most adventurous (see the summer motor vehicle recreation access map in the map package appendix). In winter, access is better. With adequate snow cover, much of the national forest is accessible by snowmachine or skiing, as alder thickets and streams are no longer barriers to travel. Steep terrain still limits access in many areas, so different types of user groups are often concentrated in lower-lying areas (see the winter motor vehicle recreation access map in the map package appendix).

Access has not changed significantly since 2002 across much of the Chugach National Forest, though some differences are worth noting. The INHT and Whistle Stop projects have increased recreational

access by providing new trails in the Kenai Mountains. Second, the Kenai Winter Access Plan (USDA, 2007a) adjusted the areas open for winter motor vehicle access within the Seward Ranger District. Third, the Copper River Highway has been closed since 2011 at mile 36 because of a bridge failure. It is uncertain when this bridge will be replaced, so road access to the Childs Glacier campground and day use site is currently unavailable. The campground and day use site remain open, however, with access currently provided by private boats or permitted outfitters and guides. Last, the Anton Anderson Memorial Tunnel, which provides road access to Whittier, was completed in 2000. Alaska department of transportation records show there has been a 25 percent increase in annual traffic from 2002 to 2010 (ADOT & PF, 2011b), which suggests there has been a similar increase in boat traffic in Prince William Sound.

Roads

The Forest Service classifies maintenance of National Forest System Roads (NFSRs) by five maintenance levels (ML): ML 1 through ML 5. ML 1 roads are closed to motor vehicle use. ML 2 roads are maintained for high-clearance motor vehicles. ML 3 through 5 roads are maintained for passage by standard passenger cars during the normal season of use with increasing degrees of user comfort and convenience with increasing MLs. Table 49 displays a summary of miles for each road ML (1 through 5). MLs 1, 2, and 3 roads are typically single lane roads with turn-outs. ML 1 and ML 2 roads are usually native surface or gravel and ML 3 roads are typically gravel surfaced. ML 4 and ML 5 roads are typically double lane roads with a well maintained gravel surface or pavement. Annual grading is performed on MLs 3 through 5 roads that get the most use. Brushing of roads occurs on a 5-year or longer rotating basis as needed on MLs 2 through 5 roads. Other maintenance activities include drainage system repairs (culverts, ditches) and pavement repairs (crack sealing, etc.).

The national forest road system consists of NFSRs as well as roads under different jurisdictions (state, county, municipality, special use permit holders, and others). There are a total 95 miles of NFSRs, and another 210 miles of state highways and major state roads throughout the Chugach National Forest (Seward, Sterling, Hope, and Copper River highways; Crow Creek Road; Portage Glacier Road; Snug Harbor Road; Primrose Landing; and Herman Leirer Road (formerly Exit Glacier Road)). These state highways and roads form the backbone of the road system, providing access to the NFSRs and most of the developed recreation sites. These include roads that provide only summer access and roads that provide both summer and winter access to National Forest System lands. The Motor Vehicle Use Map (MVUM) shows where and when NFSRs are open to the public. Seventy-five percent of these roads are on the Kenai Peninsula and the remaining 25 percent on the Copper River Delta. There are no NFSRs in Prince William Sound, and access to Forest Service lands is by state or local roads, boat, or plane. Almost all NFSRs are categorized as very low volume roads where the average daily traffic is 400 vehicles per day or less. Only seasonal use at Russian River Campground has been shown to exceed the very low volume classification.

The Chugach National Forest roads system has been reduced by two miles since 2002. The 2002 Forest Plan appendix B shows a total of 97 miles of inventoried road. In 2012, the Forest Service conducted a roads validation in an effort to obtain consistency between the 2002 Forest Plan, the Infra data, and the MVUM. The total number of NFSRs miles was subsequently reduced even with the addition of some small trailhead and day use roads. Data displayed for roads in table 49 is from the Infra roads database.

Table 49. Chugach National Forest road miles by maintenance level

Geographic Area	ML 1	ML 2	ML 3	ML 4	ML 5	Totals
Kenai Peninsula	3.8	21.9	34.8	10.6	0.2	71.3
Copper River Delta	5.6	4.9	13.2	0.0	0.0	23.7
Prince William Sound	0.0	0.0	0.0	0.0	0.0	0.0
Totals	9.4	26.8	48.0	10.6	0.2	95.0

The road system includes six road bridges. Refer to table 50. Two of these bridges (Sheridan Road and Tern Lake) were constructed to replace culverts through the Aquatic Organism Passage program. Palmer Creek Bridge 2 was closed in 2012 due to log stringer failure and discussion regarding replacement of this bridge is currently in progress. The process to begin replacement of the Trail River Bridge will begin as soon as funds become available. Bridges are inspected bi-annually in conformance with the National Bridge Inspection Standards.

Table 50. Chugach National Forest road system bridges

Bridge	Location	Type	Length	Year Built
Sheridan Road Bridge	Copper River Delta	Glulam Slab	46	2006
Tern Lake Bridge	Kenai Peninsula	Glulam Slab	41	2009
Trail River Bridge	Kenai Peninsula	Glulam Girder	142	1965
Milk Creek Bridge	Kenai Peninsula	Glulam Girder and Floorbeam	42	1980
Palmer Creek Bridge 1	Kenai Peninsula	Timber Frame	32	1957
Palmer Creek Bridge 2	Kenai Peninsula	Log Stringer	17	2000

Source: Chugach National Forest Infra Database (2014)

From 2009 through 2012, the Forest Service invested an average of 108,000 dollars per year for annual road and bridge maintenance (mainly road brushing and grading). In addition, the Forest Service spent approximately 50,000 dollars on road washout repair work on the Kenai Peninsula. In 2013, the Forest Service spent approximately 77,000 dollars on annual road and bridge maintenance and an additional 50,000 dollars on repairs due to late 2012 flooding damage. About two-thirds of the gravel surfaced roads will need new surfacing within the next five years or they will become increasingly difficult to maintain to passenger car comfort standards. All of the paved roads at present need some type of pavement repair or maintenance. In recent years, funding for roads maintenance has not been adequate to cover needed maintenance and repair work and is expected to decrease in the future.

Trails

Trails provide access to the vast areas of the Chugach National Forest without roads, typically beginning from an existing road or saltwater shore. Several trail systems also provide links to and between roads and communities, such as the 36-mile Resurrection Pass Trail that connects Cooper Landing and Hope. Access to fishing and hunting activities, Forest Service cabins, and winter skiing and snowmachining is facilitated with trails.

The Forest Service uses a trail class system of 1 to 5 that describes the different levels of development, with 1 being the least developed and 5 being the most developed. The Chugach National Forest has approximately 516 miles of NFSTs spread across the entire national forest, including both summer and winter trails. The system includes a variety of trail types, from very primitive to highly developed paved trails. There are 402 miles of summer trails and 114 miles of snow trails. Eighteen miles of summer trails and 86 miles of winter trails are open to motor vehicle use. While there are other unauthorized trails

within the Chugach National Forest, NFSTs are the only trails that are maintained. Data on the amount, condition, and deferred maintenance for trails is from the Infra Trails database. Table 51 displays a summary of miles for each trail class by geographic area.

Table 51. Chugach National Forest snow and terra trail miles by geographic area trail class

Geographic Area	Trail Class							Totals
	Class 1	Class 2	Class 2 (Snow)	Class 3	Class 3 (Snow)	Class 4	Class 5	
	miles							
Copper River Delta	42	7	0	35	3	0.3	0.2	87.5
Kenai Peninsula	8	83	101	183	10	11	5	401
Prince William Sound	18	10	0	0	0	0	0	28
Totals	68	100	101	218	13	11.3	5.2	516.5

Since 2002, the Chugach National Forest trails system has had a net reduction of almost 40 miles. The 2002 Forest Plan FEIS showed a total of 555 miles of inventoried trail. In 2007, the Forest Service conducted a trails validation and subsequently reduced the number of miles of NFSTs to less than 500 miles. Since 2002, approximately 35 miles of new class 3 through 5 trails have been built on the Kenai Peninsula, including portions of the INHT Southern Trek, trails associated with the Whistle Stop project, and the 4.5-mile Trail of Blue Ice in Portage Valley. Other reconstruction projects were completed to improve the sustainability of the trails system and reduce deferred maintenance, including the Winner Creek Trail near Girdwood, Sheridan Glacier Trail on the Copper River Delta, Alice Smith and Crater Lake trails near Cordova, and the Hope Point Trail near Hope (completion scheduled in or after 2014). Total trail mileage is also subject to change based on results of trail condition surveys, which are done for each trail on a cyclical basis.

The trail system includes 145 trail bridges, ranging in size from 5 to 280 feet. Nine new bridges have been constructed since 2002 as part of the INHT and Whistle Stop Projects, including a 280-foot, single span wood truss bridge near the Spencer Glacier Whistle Stop.

Approximately 65 percent of Chugach National Forest trails meet all of the Forest Service National Trail Quality Standards. Table 52 displays the trails meeting standard by trail class. A number of flood events in 2011 and 2012 have impacted several trails near water bodies, including a portion of the Iditarod Trail near Seward and a segment of the Trail of Blue Ice in Portage Valley. Power Creek Trail near Cordova was damaged significantly during record snowfalls in the winter of 2011-12, was repaired in 2013 and 2014. Two bridges on the Resurrection River trail also failed during flood events in the mid-2000s and have not been replaced.

Table 52. Chugach National Forest snow and terra trail miles that meet standard by trail class and geographic area

Geographic Area	Trail Class							Totals
	Class 1	Class 2	Class 2 (Snow)	Class 3	Class 3 (Snow)	Class 4	Class 5	
	miles							
Kenai Peninsula	0	28	85	139	0	11	5	268
Prince William Sound	9	7	0	0	0	0	0	16
Copper River Delta	22	0	0	34	0	0.3	0.2	56.5
Totals	31	35	85	173	0	11.3	5.2	340.5

In 2012, the Forest Service invested approximately 870,000 dollars in trail maintenance. The deferred maintenance for trails totals 1.4 million dollars, mostly for trails on the Kenai Peninsula. Approximately 500,000 dollars of this deferred maintenance is identified for trail bridges in the Infra database, mostly for trail bridges on the Kenai Peninsula. A capital investment project was approved in 2002 that, if funded, would significantly reduce trail bridge deferred maintenance.

Off-road motor vehicle access

Tables 53 and 54 display acres open to summer and winter motor vehicle use across the national forest. During the summer, access for motor vehicle recreation is limited. The largest area within the Chugach National Forest open to summer motor vehicle recreation is in the Copper River Delta area north of the Copper River Highway, with access at mile 9 of the highway. Evidence of motor vehicle use in the area has been found across anadromous streams, suggesting the need to reassess management of summer motor vehicle access in this open area and possibly change the open area boundaries. There also are areas at miles 27 and 34 of the highway and several islands in eastern Prince William Sound that are open to OHV use on non-vegetated land. Motor vehicle use on navigable rivers is allowed. Motorized watercrafts are not allowed on Portage Lake, except for the M/V Ptarmigan which is authorized by a special use permit. Planes are generally allowed to land anywhere within the Chugach National Forest. There are more restrictions for helicopter landings, including a general prohibition in the WSA.

Table 53. Summer motor vehicle access within the Chugach National Forest (acres)

Type of Access	Geographic Area			Totals
	Kenai Peninsula	Prince William Sound	Copper River Delta	
Open to all motor vehicle use	0	94	163,323	163,417
Open to helicopters, closed to OHVs	257,264	5,022	421,052	683,338
Open to motor vehicle use in non-vegetated areas only	0	6,607	27,356	33,963
Open to motor vehicle use on designated routes only, open to helicopters	156,662	10,287	52	167,001
Totals	413,926	22,010	611,783	1,047,719

Source: Chugach National Forest GIS Database (2014)

During the winter, much of the national forest is open to snowmachine use as long as there is adequate snow, with exceptions identified in the 2002 Forest Plan, as amended by the Kenai Winter Access Plan (USDA, 2007a). Several areas have been identified for heli-skiing on the Kenai Peninsula and Copper

River Delta. The public has indicated that there is snowmachine use in an area closed to motor vehicles that is accessed from Valdez. Snowmachines also continue to access the western portion of the WSA between Whittier and Seward. The Forest Service is assessing use in the WSA to understand the extent of use in the area and is reviewing policy to determine how to manage such use in accordance with ANILCA access provisions.

Table 54. Winter motor vehicle access within the Chugach National Forest (acres)

Type of Access	Geographic Area			Totals
	Kenai Peninsula	Prince William Sound	Copper River Delta	
Open to all motor vehicle use	691,864	237,163	1,175,772	2,104,799
Open to snowmachines, closed to helicopters	0	0	389,602	389,602
Open to all motor vehicle use until March 31 (closed after March 31)	9,216	0	0	9,216
Open to helicopters, closed to snowmachines	23,340	0	0	23,340
Season on/season off; alternating year motor vehicle/non-motorized use	153,661	0	0	153,661
Totals	878,081	237,163	1,565,374	2,680,618

Source: Chugach National Forest GIS Database (2014)

Access to the land in Prince William Sound is primarily from the water, with recreation use concentrated along the shorelines mostly during the summer months. Whittier is the most popular point of access given its proximity to Anchorage, followed by Valdez and Cordova on the eastern side of the sound.

Recreational Use Trends (Demand)

The following section describes recreation activities and use levels within the Chugach National Forest during the past decade using readily available data sources. Forestwide information includes two iterations of the Forest Service National Visitor Use Monitoring (NVUM) survey conducted in 2001 and 2008 and 2002 Forest Plan monitoring results for developed and commercial recreation. Registration logs, transportation counts, and project-specific data also provide insight into use levels in specific areas. Because of the diversity of sources and methodologies, few conclusions on use trends are made. The NVUM survey methodology was changed between 2001 and 2008, as were the methods for calculating occupancy rates at developed recreation sites. Data on the amount of commercial recreation has only been consolidated for 2011 through 2013. Many of the other available data were gathered at a specific site for a specific project or facility for a limited amount of time, so do not show use for the entire span of the last decade. Keeping in mind these limitations and noting that few trends can be clearly explained, each of the sources provides insight into the types of activities people participate in and amount of recreation use within the national forest.

Recreation and tourism in Alaska

Studies conducted in the past decade show that participation in outdoor recreation is higher per capita in Alaska than in the rest of the United States and that activities that are currently popular will continue to be so in the future (Bowker, 2001; Hall, Heaton, & Druger, 2009). The Statewide Comprehensive Outdoor Recreation Plan (SCORP) (AKDNR, 2009) surveys Alaskans every five years to determine their outdoor recreation activities and what opportunities they would like to have available in the future. Results of the

2008 to 2012 survey show 96 percent of all respondents said parks and outdoor recreation is important to their lifestyle. The top three outdoor activities in the 2009 survey were hiking, fishing, and hunting.

Alaska's population is increasing, so demand for recreation by residents will also likely increase, assuming newcomers have the same desires to participate as do current residents. The five most common activities, scenic driving, wildlife viewing, biking, off-road driving, and fishing, are not expected to change between 2000 and 2020, though the biggest increase in percentage of people participating in an event are expected to be in backcountry skiing, canoeing and floating, tent camping, hiking, and biking (Bowker, 2001). Non-resident participation in fishing, wildlife viewing, and hunting are expected to significantly increase (Bowker, 2001).

Additional crowding at popular sites and growing conflict among different users may be an issue across Alaska, though most residents feel they have adequate access to outdoor recreation facilities and generally do not feel crowded (AKDNR, 2009). Facility condition and maintenance are significant concerns of residents. Winter sports participation is projected to increase, whereas there has been a decline elsewhere in the country. Southcentral and southeast Alaska are the most populated, and the heaviest recreation use from both residents and visitors occurs there.

Chugach National Forest use

NVUM results for the Chugach National Forest last round of surveys in fiscal year 2008 estimated 657,000 total site visits, and 498,000 national forest visits (a national forest visit may include more than one site visit) (USDA, 2010d). The first round of NVUM results estimated 903,505 total site visits and 630,000 national forest visits in 2001 (USDA, 2004c). As mentioned above, this does not necessarily reflect a downward trend as NVUM methods changed between the first and second rounds.

Visitation may also be inferred by various transportation-related statistics with routes to and through the Chugach National Forest (Fay, Colt, & White, 2010). The Anton Anderson Memorial Tunnel was opened in 2000 and provides road access to Whittier and Prince William Sound via the Portage Highway. Traffic totals for the tunnel increased 25 percent from 2002 to 2012, though use of the tunnel has declined from the peak in 2007 (ADOT & PF, 2011b). The Alaska Marine Highway has several segments that connect communities in Prince William Sound. Marine highway use has steadily increased since 2002 on the southwest segments, which includes Prince William Sound and the Aleutian Islands. Passengers increased from 50,216 in 2000 to 81,224 in 2011 (ADOT & PF, 2011a). Passengers on the Alaska Railroad's Coastal Classic and Glacier Discovery Trains, which run between Anchorage and Seward, totaled 57,763 in 2010, 71,699 in 2011, and 66,542 in 2012 (ARRC, 2013).

Several studies show that certain activities have remained popular between 2002 and 2012. In both 2001 and 2008, people recreating within the Chugach National Forest engaged most frequently in day use activities, including viewing scenery, hiking, relaxing, and viewing wildlife, which is similar to survey results across the nation (USDA, 2010d). Fishing is more common within the Chugach National Forest (20 percent) than at the national level (7.4 percent). Another 19 percent of NVUM participants listed fishing as an activity that they would have liked to have done during their stay but did not (White E. M., 2010). Other studies looking at activity patterns for visitors and Alaska residents also list viewing wildlife, hiking, and fishing as some of the most popular activities (AKDNR, 2009; Hall, Heaton, & Druger, 2009; McDowell Group, 2011). Day cruises and wildlife viewing are also the most popular commercially-guided activities for visitors to the Chugach National Forest, though these activities may not actually take place within the national forest (White & Stynes, 2010). Use projections out to 2020 predict that these uses will continue to be the most popular activities in Alaska (Bowker, 2001). Visitation to the BBVC, once the most visited attraction in southcentral Alaska, has been declining during the past decade. Based on door counter totals, there has been a 30 percent decrease in visitation to the BBVC,

from a high of just 100,000 in 2010 to a low of 69,000 in 2012, at least partially due to a drastic reduction in use by commercial tours.

While day use accounts for most of the visitation to the Chugach National Forest, overnight use is also common and has remained relatively static during the past decade at cabins and developed campgrounds but may be increasing at backcountry campsites. Information on use at campgrounds and cabins is retrieved through the national reservation system and campground concessionaire records. Use at cabins during the high season (Memorial Day to Labor Day for most cabins) has been relatively stable from 2002 to 2012, averaging 60 percent occupancy during this period, with a high of 66 percent in 2005, and a low of 58 percent in 2008, 2009, and 2010. Cabins on the Kenai Peninsula and in western Prince William Sound generally had higher occupancy rates than cabins in eastern Prince William Sound and the Copper River Delta. During the peak season of use, however, many cabins are at nearly 100 percent occupancy. For the 14 campgrounds on the Kenai Peninsula from 2003 to 2012, average occupancy during the summer was 56 percent. The highest rate was in 2004 at 65 percent, and the lowest was 51 percent in 2009. Annual occupancy for cabins and campgrounds is displayed in table 55.

Observations and studies have found higher overnight use at certain backcountry campsites, particularly in Prince William Sound. Twardock et al. (2010) studied beaches consistently for more than a decade and found that the number of campsites increased by 27 percent and total impacts at existing campsites expanded from 43 square meters to more than 73. Some established campsites in Blackstone Bay and other popular areas were re-inforced with native materials to reduce further expansion of vegetation impacts. Backcountry rangers have also observed an increase in camping in the Lost Lake area near Seward, where there is potential for impacts to alpine vegetation. Management of backcountry camping is an area that may need further study and emphasis in the future.

Table 55. Chugach National Forest cabin and campground occupancy during the high and peak seasons*

Facility/ Geographic Area	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Cabins										
Kenai Peninsula	70%	68%	73%			69%	69%	70%	76%	76%
Prince William Sound	58%	62%	67%			52%	55%	53%	57%	48%
Copper River Delta	35%	34%	42%			42%	36%	35%	35%	29%
Campgrounds**										
Kenai Peninsula	62%	67%	62%	61%		53%	53%	53%	53%	53%

Blank cells indicate years where data is not readily available.

*High season is from Memorial Day to Labor Day for most facilities. Some cabins have different high seasons.

Peak season includes three day weekends and all other weekends from Memorial Day and Labor Day.

**Overflow use at campgrounds was included in overall occupancy rates from 2003 to 2006, but not from 2008 to 2012. This accounts for at least some of the difference in occupancy rates during these periods.

As part of the 2008 round of NVUM surveys, participants were asked whether they participated in a commercially-guided activity during their visit to the Chugach National Forest. Among Alaska residents, guides and outfitters were used very infrequently. However, about 42 percent of non-resident visits included the use of a guide or outfitter at some point during the trip (White & Stynes, 2010). Monitoring in 2011 and 2012 provides some additional information about guided recreation preferences. Reported use by outfitters and guides during the summers of 2011 and 2012 show that the three most popular guided activities were rafting on the Kenai Peninsula, camping in Prince William Sound, and hiking on the Kenai Peninsula. The unit of measure for commercial use is the user day, which is one client for one day. Total user days reported between Memorial Day and Labor Day were 16,337 in 2011 and 14,801 in 2012. Use

on the Kenai Peninsula accounts for about 70 percent of the total commercial activities within the national forest. Another important commercial activity, not factored in to the above numbers (because it is a winter activity) is helicopter assisted skiing, which occurs on the Kenai Peninsula and the Copper River Delta, totaling approximately 1,800 user days each year. Annual data for years prior to 2011 is still being consolidated.

Recreation use by different racial and ethnic groups

No studies have been done specifically looking at patterns and trends in participation by different racial and ethnic groups in outdoor recreation within the Chugach National Forest. The NVUM studies, however, do provide a demographic snapshot of visitor use. Comparing demographic data from NVUM and census data for the Municipality of Anchorage, Kenai Peninsula Borough, and the Valdez-Cordova census area provided in the Social and Economic Condition section of this assessment gives an indication of how well local populations of racial and ethnic groups are represented in Chugach National Forest visitor use. Results of this comparison show that the Asian and Pacific Islander population is relatively well-represented, while the Alaska Native and black/African-American population is underrepresented. The white population, at more than 93 percent of visitors compared to just more than 70 percent of the local population, is overrepresented.

There are likely many reasons for this, making it difficult to know why. First, geography may play a role, as Chugach National Forest recreation opportunities are almost an hour's drive from Anchorage, which is generally more diverse than other towns in the plan area, while a multitude of parks, trails, lakes, and facilities in Anchorage provide opportunities closer to home. More than 65 percent of NVUM respondents were from Anchorage zip codes, so distance and alternative opportunities have not prevented the majority of visitors from coming to the Chugach National Forest.

Activity preference may be another reason, as most of the recreational opportunities provided by national forests, including the Chugach National Forest, have traditionally been pursued disproportionately by white visitors. A few specific activities, however, are more likely to draw more racially and ethnically diverse users and may be linked to cultural values tied to the resource. For instance, a study of Eulachon subsistence/personal use in and near the Twentymile River during 2002 found that only 19 percent of respondents were Caucasian, while 24 percent were Filipino and 19 percent were Alaska Native (Spangler, Spangler, & Norcross, 2003). Subsistence-related activities, such as the Eulachon fishery or subsistence harvests in Prince William Sound, may draw a more diverse user group than those activities considered recreation, but might not be captured as a national forest visit well by NVUM data because of the location or timing of the activity.

Competing demands and user conflicts

Because the infrastructure and terrain concentrates recreation use on a relatively small part of the land base, meeting demand for both winter motor vehicle and non-motorized uses and activities has been an issue. It is not clear whether this has become a bigger issue since 2002 or not, though the Forest Service undertook multiple planning projects to manage motor vehicle and non-motorized access. An extensive planning effort to re-assess winter motor vehicle access on the Kenai Peninsula was completed in 2007, which led to a revised access management plan to provide motor vehicle access on Resurrection Pass every other year while preserving opportunities for quiet winter recreation. In general, the distribution of motor vehicle and non-motorized areas, particularly in the winter, has worked well, though it does not satisfy everyone. The Forest Service has collected data on unsolicited input concerning motor vehicle and non-motorized uses since 2010. Comments show a balance between desiring more motor vehicle opportunities and concerns about motor vehicle incursions into non-motorized use areas. The number of citations for unauthorized motor vehicles has decreased from 86 in 2006 to 17 in 2011. As mentioned in the Subsistence section of the assessment, there is also some tension created where motor vehicle access

for subsistence purposes is allowed in an area that is not open for motor vehicle recreation, which also presents other management challenges. These comments have been echoed in recent public meetings and other input received during this assessment phase.

In addition to broader access management planning, the issue of motor vehicle and non-motorized recreation use has been significant in two other planning efforts on the Glacier Ranger District. The Three Rivers Management Plan (USDA, 2010f) and the Chugach Powder Guides Helicopter Skiing decision (USDA, 2004a) both attempted to balance the competing interests of non-motorized and motor vehicle user groups in areas on the Kenai Peninsula. Some conflicts between guided and non-guided hunters were identified, particularly in eastern Prince William Sound, possibly due to guides and other users not being aware of local norms (Poe, Gimblett, & Burcham, 2010). Conflicts between different types of river users were also found in studies of use on Twentymile River (USDA, 2010d) and Eyak River (Lang, 2010), particularly between anglers and motorized watercraft.

Another concern is trespass on Alaska Native Corporation (ANC) lands in Prince William Sound, which may have increased since 2002 as boat activity has increased from Whittier and additional lands along the shoreline have been conveyed. The Forest Service, in cooperation with ANCs, is working on strategies to eliminate trespass.

There is also evidence from public comments that conflicts are emerging between non-motorized groups, particularly horseback riders and mountain bikers, where use overlaps. The scope of this issue is not well understood. Another emerging conflict that has been identified involves trapping in popular winter recreation areas on the Kenai Peninsula.

Finally, it is important to recognize the potential impacts to and from wildlife as a result of recreation occurring in wildlife habitat. For instance, Goldstein et al. (2010) found some overlap between high-quality brown bear winter den habitat and recreation in the Turnagain Pass area, leading to some potential for disturbance of hibernating bears. The increase in winter recreation may also have an impact on mountain goats and Dall's sheep where activities overlap with habitat. Also, human-bear encounters, mostly on the Kenai Peninsula, have resulted in maulings and several bears killed in defense of life and property. This issue is discussed in more detail in other sections of the assessment.

Meeting the demand

Based on existing information, the Chugach National Forest generally seems to be meeting current demand for most outdoor recreation uses and current Alaska resident and non-resident visitors are satisfied with their experience. The overall satisfaction results from NVUM showed that almost 82 percent of the people who visited were very satisfied with the overall quality of their recreation experience. Another 14 percent were somewhat satisfied. Less than 1 percent expressed any level of dissatisfaction. The 2001 NVUM results are very similar, as the vast majority of visitors rated satisfaction of various items either good or very good, the two highest scores (USDA, 2004c). Survey results from user studies in Prince William Sound validated results from the NVUM report; current visitors are very satisfied with their experience, do not feel crowded, and are not being displaced due to negative encounters or crowding (Poe, Gimblett and Itami 2010; M. A. Smith 2010). Perception of crowding is another indicator used to describe visitor experience. Within the Chugach National Forest, NVUM results show that crowding is not perceived as a problem by the majority of visitors. On a scale of 1 (hardly anyone there) to 10 (overcrowded), day use developed sites were rated 4.7, overnight use developed sites averaged 4.3, and undeveloped areas rated the lowest at 3.9. In 2001, 67 percent of visitors at developed day use sites, 84 percent at overnight use sites, and 90 percent in general forest areas gave crowding ratings of 5 or less (USDA, 2004c). Other use studies (Poe, Gimblett, & Itami, 2010; Smith M. A., 2010;

USDA, 2010d) support the finding that crowding is not often perceived as a problem and is not displacing current users.

Another indication that the Chugach National Forest is meeting demand is a comparison of allocated commercial days to actual used days. Outfitters and guides are allocated days based on their request for days within a defined recreation capacity for an area, which is directly linked to the type of recreation setting. Frequently, guides have not used all of their allocated days. For example, from 2008 through 2012, the Forest Service special uses database showed that outfitters and guides only used 32 percent of their total allocated days on a series of trail systems on the Seward Ranger District. Nonetheless, the Forest Service continues to receive new requests for special use permits for guided activities, and under the 2002 Forest Plan, there is still capacity available for more commercially-guided use across the national forest. The Forest Service is working towards offering new guided opportunities as part of the Whistle Stop project and elsewhere across the national forest. At developed recreation sites, the Chugach National Forest is meeting demand overall, but may not be meeting demand for cabins during the summer on the Kenai Peninsula and in western Prince William Sound, and for campgrounds during the peak summer days (weekends and holidays) and during salmon runs. Cabins in these areas are extremely difficult to reserve; it is common for people to try to book these months in advance and find there are no nights available. Use reports for the past decade show that campgrounds near the Russian River often had overflows in camping during salmon runs. Despite similar facilities in communities and other lands adjacent to the Chugach National Forest, demand for these facilities has remained high. There also continues to be demand for greater access to the national forest for both winter and summer recreational activities.

Sustainability of Recreation Opportunities and Scenic Character

Trends between 2002 and 2012 described in this chapter indicate recreation opportunities and scenic character have been sustained within the Chugach National Forest; scenic integrity continues to be high and there continues to be a wide range of opportunities in natural landscapes. During the past 10 years, the Forest Service has been able to develop additional opportunities through large scale projects like the INHT and Whistle Stop and to expand and to diversify ways of connecting people with nature. Investments in cabins and campground reconstruction have maintained the capacity of developed sites across the national forest. Use has increased at some sites and decreased at others, though not to the point where opportunities and settings have changed or been eliminated. With limited recreation facilities, trails, and roads, remote backcountry opportunities in natural settings abound.

The biggest challenge in sustaining recreation opportunities in the future, however, will be maintaining existing recreation infrastructure and access throughout the national forest while demand for recreation opportunities increases and diversifies. Many new types of activities may compete for use of the same areas, leading to potential user conflicts. It will also be a challenge to meet the needs of different user groups if new facilities are needed to accommodate that use.

As facilities of all kinds, as well as trail and road bridges, get older or get damaged, it will be a challenge to reconstruct or replace them in a timely fashion. The cost of replacing cabins and reconstructing campgrounds is increasing, while maintenance and capital funds have generally decreased. Broadly speaking, these facilities, roads, and trails are currently in good condition, but deferred maintenance continues to rise. If trends continue, some trails, roads and facilities may need to be decommissioned. The Forest Service, through several planning processes, has worked to prioritize recreation facilities, trails, and roads to operate and maintain across the national forest. The Recreation Facility Analysis (RFA) process, completed in 2006, identified cabin rate increases, volunteers, and partnerships as ways to extend the capacity to cover operations and maintenance costs. The Forest Service is updating the RFA in 2015 to ensure that funds are being used to maintain the most important recreation facilities and may do a similar

analysis for prioritizing the trails and roads systems. A regional approach to administering the roads program is being explored to see how much cost savings could be realized. Other Federal funding grants and programs are being pursued.

This assessment shows little if any change in scenic character within the national forest. Spruce beetle killed trees from the 1990s had a major visual effect on national forest scenic integrity, but vegetation management projects and decay have removed many of these dead trees. They are now part of the natural succession and give the canopy of many areas of the Chugach National Forest a diversified look. The trend of continuing development in privately owned parcels along the travel corridors continues. This development does not change the scenic integrity of the national forest as a whole, but can alter the foreground of the viewshed for people traveling the highways within the Chugach National Forest. There are some activities that cause concerns for maintaining the high and very high scenic integrity within the Chugach National Forest.

Highways traversing the national forest are under-designed for today's traffic loads. Alaska Department of Transportation has plans to upgrade and reroute highways within the Chugach National Forest, which could negatively impact scenic integrity. The most notable project being planned is a reroute of the Sterling Highway. One alternative being analyzed shows the highway would be constructed near Juneau Falls, altering the scenery and experience of hikers on the southern three to four miles of the Resurrection Pass Trail.

Debris from the large earthquake and tsunami in Japan in 2012 is washing ashore in many areas of Prince William Sound, with potentially large accumulation on Kayak, Hinchinbrook, and Montague Islands. Large items and large quantities of debris could have a negative impact on Prince William Sound scenic beauty.

Contribution to Social, Economic, and Ecological Sustainability

Based on the NVUM estimates from 2008, the estimated 498,345 annual visits to the Chugach National Forest generated 85 million dollars in visitor spending that supports an estimated 976 full and part time jobs (direct and secondary) each year in the local economy (see the Social and Economic Conditions section for more information) (White & Stynes, 2010). The AVSP (McDowell Group, 2011) reports that Alaska visitors spend an average of 941 dollars per person on their trip excluding transportation to and from the state, with air travel visitors spending the most, at 1,455 dollars per person. More than 150 outfitters and guides operate within the Chugach National Forest for part or all of their business, and most of them live in communities within or near the national forest. Revenue from recreation contributes directly, at around 200,000 dollars annually, to the sustainability of the recreation resource itself through cabin rentals and visitor center visitation.

The value to visitors and local residents from the recreation resource goes beyond economic generation. Literature on sense of place describes how public lands recreation creates meaning for local residents and visitors alike, both on an individual and community level (Farnum, Hall, & Kruger, 2005). As the 2009 SCORP survey showed, a vast majority of Alaskans, especially in rural and small town settings, rate outdoor recreation opportunities as important to them. As a more specific and detailed example, Amsden et al. (2011) showed how complex interactions with other community members, visitors, and natural settings all helped form a sense of place for residents of Seward. Reed and Brown (2003) identified the importance of public land environmental attributes to the quality of life in 12 communities in and around the Chugach National Forest, including scenic quality and providing opportunities for wildlife viewing and outdoor recreation. Lastly, during the public meetings described in chapter 1, comments about changing or maintaining recreation opportunities outnumbered all other comments combined.

Along with providing value to local residents and visitors, outdoor recreation opportunities also help people understand the value of land for conservation and build a sense of shared stewardship of these public land resources. Community events like the Shorebird and Salmon Festivals in Cordova highlight how natural places and wildlife are intertwined with towns. Since the early 1900s, hunting and fishing enthusiasts have led or participated in fish and wildlife conservation efforts. The recognition of the value of wildlife, however, has continued to evolve as participation in wildlife viewing, in Alaska and elsewhere, continues to increase (Mockrin, Aiken, & Flather, 2012). Recreation has also been a forum to build a personal health and land conservation ethic in the next generation through expeditions across the national forest.

Information Needs

Forestwide use patterns in the backcountry and trail system

Recreation use data for the Chugach National Forest are usually gathered on an as-needed, project-by-project basis. This means that data is often gathered through different methods and only provides a snapshot in time at a specific location or several locations. Occupancy data at cabins, campgrounds, and the BBVC generally provide consistent annual data, and NVUM provides a forestwide picture of visitor use, but use at non-fee sites where registration is not required can only be estimated. These uses, to name a few, include kayaking in Prince William Sound, winter recreation, backcountry camping, and trail use. Monitoring at some backcountry overnight sites, including the Lost Lake area and western Prince William Sound, indicates increased use and thus the potential for resource damage in some areas. The Forest Service could develop a cyclical monitoring system using trail counters to better understand, at a minimum, use patterns on the trail system where visitors are accessing the backcountry. Parking lot counts could also be taken periodically to develop trends in use at certain locations and seasons. The information would give managers a more complete idea of the amount, timing, and types of use occurring within the national forest.

Trends in outfitted and guided opportunities and use

Outfitters and guides are allocated a certain number of user days each year and are required to report their actual use annually. The Forest Service should be able to show trends in number of guides and location and amount of use in a concise manner. Consolidated data on outfitter and guide use, however, is currently only available for 2011 and 2012. Allocation and use data is available in records filed for the national forest but needs to be consolidated into a single database. Amount and location of use could also be mapped to show where guided use is more and less common.

Climate change impacts on recreation facilities, access, and use

Literature on climate change impacts to tourism and recreation continues to grow (Hamilton & Tol, 2004; Richardson & Loomis, 2004; Shaw & Loomis, 2008), providing a foundation to assess this topic at a smaller, local setting. A more detailed analysis of climate change impacts to recreation within the Chugach National Forest potentially would be valuable to inform future recreation planning, particularly for a national forest that offers a variety of snow-based recreational opportunities. A study could analyze potential impacts of climate change on recreation to assess the resilience of current opportunities, access, and facilities to dynamic land and seascapes.

Social and Economic Conditions

This section identifies and evaluates available information relevant to the plan area for social and economic conditions. Please note that subsections refer to the Municipality of Anchorage, Kenai Peninsula Borough, and Valdez-Cordova census areas and are not the same as the Copper River Delta, Kenai Peninsula, and Prince William Sound geographic areas.

Relevant Information

- Populations are changing, creating new demands for amenities and services. Key demographic trends include growing ethnic diversity (especially among younger populations) in the region and an aging population. The magnitude and type of amenities, goods, and services to support those shifting demographics could be considered for change.
- The travel and tourism industry accounts for 17 percent of employment in southcentral Alaska and is projected to grow by 12.5 percent for Alaska as a whole by 2020. The Chugach National Forest is a major attraction for regional tourism activities.
- Approximately 500,000 recreational visits to the Chugach National Forest (2008), including sport fishing, are estimated to support 1,062 jobs of which 84 percent (894 jobs) are from non-local visitor spending (i.e., new dollars).
- Commercial fishing is the largest forest resource-related sector in southcentral Alaska. Fish habitat within the Chugach National Forest plays a vital role in sustaining fisheries that support commercial fishing, sport fishing, and processing industries that account for large percentages of economic output in the study area.
- Secure Rural School (SRS) payments and Chugach National Forest Federal spending together support approximately 440 jobs per year (71 and 367 jobs per year respectively).
- The impacts of the 2007-2008 recession, as well as projected recovery rates and optimism among businesses, differ across communities.
- Job growth is greater for the Kenai Peninsula and Anchorage, where economic diversity and resilience is higher, compared to slower growth in the Valdez-Cordova census area.
- Growing employment and economic opportunities are occurring in healthcare and retirement, tourism, and other services in the study area.

Regional and Community Overview: Identifying the Study Area

This subsection describes the social, cultural, and economic conditions for the study area and communities surrounding the Chugach National Forest. Data assessed generally includes the past 10 years, but periods of time may differ depending on available information sources.

The study area adopted for the social and economic assessment is southcentral Alaska and consists of the Municipality of Anchorage, which includes Girdwood; the Kenai Peninsula Borough; and the Valdez-Cordova census area. These areas include the communities of Anchorage; Chenega Bay; Cooper Landing; Cordova, which includes Eyak; Hope, which includes Sunrise; Kenai; Moose Pass; Seward; Soldotna; Sterling; Tatitlek; Valdez; and Whittier.

The social and economic influence of the Chugach National Forest extends beyond the Chugach National Forest boundary. Physically, Anchorage overlaps with small portions of the Kenai Peninsula and Prince William Sound geographic areas. The Kenai Peninsula Borough overlaps with the Kenai Peninsula geographic area and the western edge of the Prince William Sound geographic area, while the Valdez-Cordova census area overlaps with the Copper River Delta and Prince William Sound geographic areas (see table 56). Resource conditions and management decisions in each of the geographic areas may have a direct or indirect effect on social and economic conditions in different parts of the study area, as well as

outside the study area. Refer to the Subsistence, Cultural Resources and Uses, and Ecosystem Services sections for cultural conditions.

Table 56. Overlap between towns or areas and Chugach National Forest geographic areas

Place	Geographic Area Overlap
Anchorage Municipality	Small parts of the Kenai Peninsula and Prince William Sound
Kenai Peninsula Borough	Kenai Peninsula and western edge of Prince William Sound
Cooper Landing	Kenai Peninsula
Hope	Kenai Peninsula
Moose Pass	Kenai Peninsula
Kenai	Kenai Peninsula
Seward	Kenai Peninsula
Soldotna	Kenai Peninsula
Sterling	Kenai Peninsula
Valdez-Cordova census area	Prince William Sound and Copper River Delta
Chenaga Bay	Prince William Sound
Tatitlek	Prince William Sound
Whittier	Prince William Sound
Cordova	Copper River Delta
Valdez	Prince William Sound

Similar to the State of Alaska as a whole, the subregions and communities within the study area have been subjected to a number of boom and bust cycles linked to the development and use of a variety of resources since the late 1800s. These fluctuations and cycles and the corresponding uncertainty have had dramatic impacts on social and economic conditions and trends. Details about conditions and trends and potential links to the Chugach National Forest are discussed in the following sections.

Conditions and Trends

Demographics

Alaska is the Nation's largest state with 16 percent of the country's land base. Although it is geographically large, Alaska has the third smallest population and the lowest population density in the country.

The Municipality of Anchorage, with slightly less than half of the state's total population, is the largest population center in Alaska. It is characterized by an urban economy and lifestyle, which is quite different from the smaller, rural communities in the Kenai Peninsula Borough and the Valdez-Cordova census area.

The Municipality of Anchorage has a majority of the population and businesses in the study area, a number of which may be affected by the Chugach National Forest. However, the potential impacts of the national forest on people in smaller communities within the study area may be more profound. For this reason, it is important to examine conditions and identify trends for the three areas individually.

The study area population is approximately 352,000 as of 2011, with a majority in the Municipality of Anchorage (287,000) followed by the Kenai Peninsula Borough (55,000) and Valdez-Cordova census area

(9,600) (see table 57). The population of the Municipality of Anchorage has more than tripled since statehood in 1959. Figure 15 displays population trends from 1990 to 2011 for the United States, Alaska, and the three study areas. The Municipality of Anchorage's population has increased by 27 percent (approximately 61,000 residents), similar to the population growth for Alaska, and slightly less than for the United States. In contrast, populations grew by 35 percent (14,000 residents) for the Kenai Peninsula Borough and decreased by 4 percent (356 residents) in the Valdez-Cordova census area.

The percentage of the population described as white has decreased across all regions since 1998 (ADLWD, 2010a). The black/African-American percentage in these regions has also decreased, but to a smaller degree. Table 57 shows that the percentage of study area populations characterized as white and as black/African-American are lower than the United States. The percentage of the study area population characterized as Native Americans, including Alaska Natives, (7 percent) is lower than the state of Alaska (14 percent), but is still substantially greater than the United States (0.8 percent). The Valdez-Cordova census area contains a high percentage of Native Americans, of which Alaska Natives make up a vast majority (88 percent). The percent of population described as Native American in 2000 and 2010 ranges from 8 to 9 percent for Anchorage and the Kenai Peninsula Borough, and 15 to 16 percent for the Valdez-Cordova census area based on Alaska Department of Labor and Workforce Development reports (ADLWD, 2013a).

The percent of Asians has increased in Anchorage and the Kenai Peninsula Borough since the 2002 Forest Plan was approved. Data evaluated indicate that the percentage of Native Hawaiian and other Pacific Islanders has remained relatively constant. However, changes in how demographic data are reported since 1998 has resulted in data inconsistencies and uncertainty about the significance of small percentage changes in population characteristics. State reports indicate that Anchorage became more racially diverse from 1980 (15 percent non-white) to 2010 (34 percent non-white), with Asians, Pacific Islanders, and Alaska Natives increasing in percentage of total Anchorage population (ADLWD, 2013d). The fast-growing component of the Anchorage population is younger and more diverse (Goldsmith, Howe, & Leask, 2005). Alaska's Hispanic population grew 52 percent between 2000 and 2010, with an average age of 24 in 2010; Anchorage is home to 56 percent of the Hispanic population in Alaska (ADLWD, 2013c).

Table 57. Population characteristics for the United States, Alaska, and southcentral Alaska from 2007 to 2011¹ (US Census Bureau, 2013)

Population Segment	Alaska	Municipality of Anchorage	Kenai Peninsula Borough	Valdez-Cordova Census Area	Study Area	United States
White alone	472,504	193,404	46,520	6,884	246,808	227,167,013
Black or African American alone	23,426	15,844	305	52	16,201	38,395,857
Native American*	97,628	18,720	4,008	1,568	24,296	2,502,653
Asian alone	35,912	22,013	773	336	23,122	14,497,185
Native Hawaiian and Other Pacific Is. alone	6,848	5,520	93	27	5,640	500,592
Some other race alone	8,981	5,147	275	107	5,529	15,723,818
Two or more races	55,404	26,742	2,744	622	30,108	7,816,654
Total Population	700,703	287,390	54,718	9,596	351,704	306,603,772
Percent of Total						
White alone	67.4%	67.3%	85.0%	71.7%	70.2%	74.1%
Black or African American alone	3.3%	5.5%	0.6%	0.5%	4.6%	12.5%
Native American*	13.9%	6.5%	7.3%	16.3%	6.9%	0.8%
Asian alone	5.1%	7.7%	1.4%	3.5%	6.6%	4.7%
Native Hawaiian and Other Pacific Is. Alone	1.0%	1.9%	0.2%	0.3%	1.6%	0.2%
Some other race alone	1.3%	1.8%	0.5%	1.1%	1.6%	5.1%
Two or more races	7.9%	9.3%	5.0%	6.5%	8.6%	2.5%

¹Data represent averages for the period 2007 to 2011 as per American Community Survey methods.

*Native American includes American Indian, Alaska Native, and Non-specified tribes.

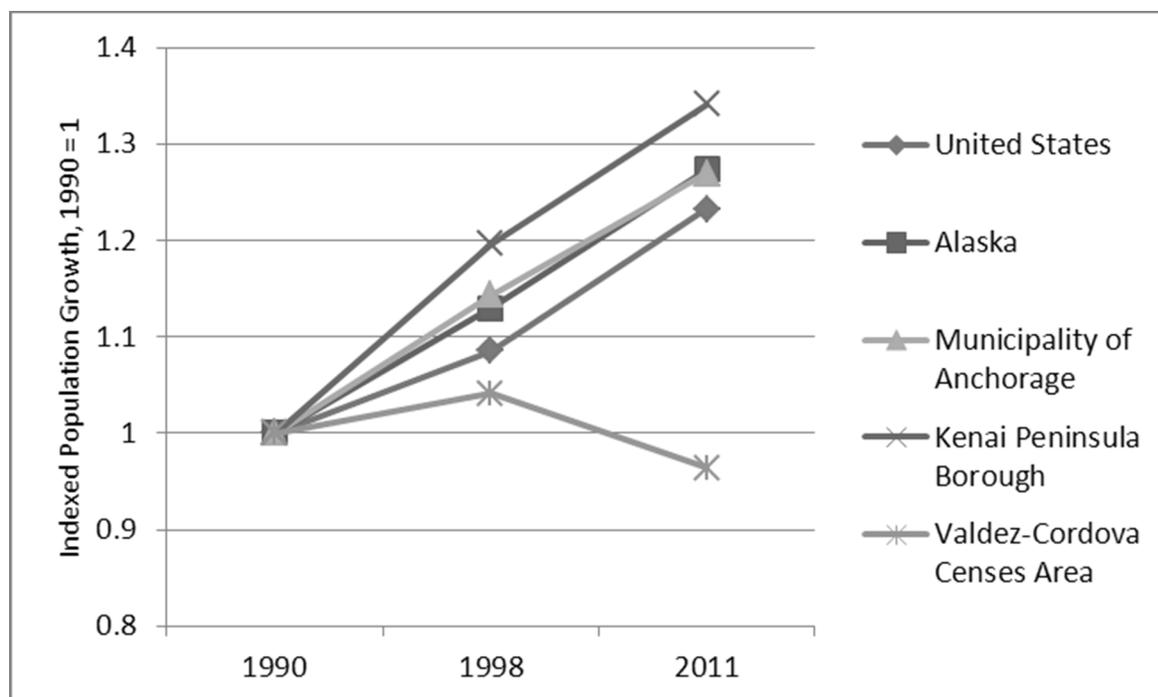


Figure 15. Population growth from 1990-2011 for the United States, Alaska, the Municipality of Anchorage, the Kenai Peninsula Borough, and the Valdez-Cordova Census Area (standardized for comparison) (US Census Bureau, 2013).

Table 58 displays the change in age distribution from 2000 to 2011 with age categories separated into five age groups for the study area. Though the population of Alaska continues to be one of the youngest in the nation, the population is aging as baby boomers grow older. Youth populations (i.e., under 18) have decreased by 3.6 percent in the study area, while age groups under 44 in aggregate have decreased. Age groups 45 and above have increased by 7.1 percent. The same trend in aging population occurs for the three separate subareas, with the results being somewhat more pronounced within the Kenai Peninsula Borough and the Valdez-Cordova census area (i.e., approximately 10 to 11 percent increase in age groups 45 and above).

The 45-64 age group represents the highest percentage of men and women in the study area. From 2000 to 2011, the age category with the largest estimated increase was 45 to 64 (25,140), and the age category with the largest estimated decrease was 35 to 44 (-11,579). Men slightly outnumber women in all age groups, except for the group of 65 and older.

Population growth in the study area, with the exception of the Valdez-Cordova census area and demographic shifts, including aging populations and potentially growing numbers of Chugach National Forest users, suggest changes in the magnitude and types of demands for different Chugach National Forest amenities, goods, and services, as well as the manner in which the national forest contributes to social and economic sustainability. The desires and needs of an aging population are likely to differ from younger age groups, with consequences for local employment and economic development. Greater population diversity in the Municipality of Anchorage, including increasing Alaska Natives, Hispanics, Asians, and Pacific Islanders, as well as younger age groups and families within those minority groups, may also create new demands for Chugach National Forest amenities.

Table 58. Change in age distribution from 2000-11 for the study area*

Age	Kenai Peninsula Borough		Municipality of Anchorage		Valdez-Cordova Census Area		Study Area	
	2000	2011	2000	2011	2000	2011	2000	2011
Under 18	14,859	13,149	75,871	74,716	3,019	2,366	93,749	90,231
18-34	9,071	10,518	64,999	76,199	1,883	1,860	75,953	88,577
35-44	9,074	6,886	48,210	39,512	1,979	1,286	59,269	47,684
45-64	13,038	18,310	56,961	76,217	2,700	3,312	72,699	97,839
65 and over	3,649	5,855	14,242	20,746	614	772	18,505	27,373
Total Population	49,691	54,718	260,283	287,390	10,195	9,596	320,169	351,704
Percent of Total								
Under 18	29.9%	24.0%	29.1%	26.0%	29.6%	24.7%	29.3%	25.7%
18-34	18.3%	19.2%	25.0%	26.5%	18.5%	19.4%	23.7%	25.2%
35-44	18.3%	12.6%	18.5%	13.7%	19.4%	13.4%	18.5%	13.6%
45-64	26.2%	33.5%	21.9%	26.5%	26.5%	34.5%	22.7%	27.8%
65 and over	7.3%	10.7%	5.5%	7.2%	6.0%	8.0%	5.8%	7.8%

*The data in this table are calculated by ACS using annual surveys conducted from 2007 through 2011 and are representative of average characteristics during this period (US Census Bureau, 2013).

Employment and income

Long-term trends

Long-term trends in levels and types of employment in the study area reflect boom and bust cycles in a number of economic sectors and mirrors trends in Alaska as a whole (though the timing of growth cycles may vary). The Municipality of Anchorage economy originally grew in response to military buildup during World War II, with oil development triggering a new wave of growth in the 1970s, followed closely by increases in trade and service jobs (Goldsmith, Howe, & Leask, 2005). Expanding tourism fueled subsequent economic growth and diversity in Anchorage. In the 1990s, growth was slow yet steady, and oil production declined. Since 2000, increases in Federal spending have boosted employment. Anchorage and other areas of Alaska are subject to the fluctuating nature of energy markets/supplies, Federal spending, and tourism, resulting in a workforce that is more transient compared to other areas of the country.

The economies of other areas and communities within the study area are also subject to boom and bust cycles. Tourism has been one of the fastest growing sectors on the Kenai Peninsula Borough during the past 20 years, but has also been one of the hardest hit by the recession. Economic development in the central part of the Kenai Peninsula, including Kenai, Soldotna, and Sterling, was originally driven by homesteading and fishing. Oil discoveries triggered population growth in the 1950s (KPEDD, 2010). The central Kenai Peninsula economy has since diversified to include retail and services. More recently, oil production has decreased, and commercial fishing earnings have fluctuated.

Beginning in the late 1800s, mining (gold, silver, and copper) and transportation (supply hub) were key drivers in the establishment of Valdez in Prince William Sound (ADLWD, 2009). Mining declined after World War I and commercial fishing took its place until fish stocks crashed in the 1950s. Federal spending supported job growth during World War II, and the Trans-Alaska pipeline resulted in a growth explosion in the 1970s. Oil transport continues to be important, but commercial fishing and fish processing have re-emerged as key industry sectors in Valdez.

The Chugach National Forest is capable of contributing to the viability and stability of some production opportunities and job sectors (e.g., fishing and tourism) but has little influence over other sectors (e.g., oil and gas). The Chugach National Forest is also capable of providing amenities and services that affect the lifestyles and desire of some people to live in the region (e.g., retirees) that could influence spending in other job sectors (e.g., services and healthcare). Projecting long-term cycles or fluctuations in market conditions, government spending, and demographic trends that are all subject to uncertain environmental and social conditions is difficult. Improved understanding of future fluctuations, cycles, and shifts may help inform decisions about Chugach National Forest resource allocation and management that supports specific uses and opportunities, thereby contributing to social and economic sustainability. Alternatively, in absence of better understanding, management decisions supporting a diverse suite of opportunities over time may help mitigate risks to social and economic sustainability.

Employment in Alaska, the Municipality of Anchorage, and the Kenai Peninsula Borough follow similar growth trends with growth of approximately 40 percent between 1990 and 2010 (in contrast to growth of 20 percent in the United States as a whole) (see figure 16). Employment in the Valdez-Cordova census area has been more variable with little overall growth during that time. Based on the same data, employment growth from 2000 to 2010 was 15 percent for the State of Alaska, 10 percent for the Kenai Peninsula Borough and 14 percent for Anchorage. Employment for the Valdez-Cordova census area grew by 1 percent during this time, in comparison to a growth of 2 percent for the United States. Total employment growth for 2010 to 2020 is projected to be 12 percent for the State of Alaska (ADLWD, 2012).

The 2011 unemployment rate for the study area (6.7 percent) was lower than that of the United States (8.9 percent in 2011) due to low unemployment in Anchorage (6.1 percent). Unemployment was higher in the Kenai Peninsula Borough and Valdez-Cordova census area (9.2 to 9.4 percent). The unemployment rate for the study area has fluctuated from a low of 5.2 percent (1998) to a high of 8.3 percent (1992); unemployment highs also occurred in 2003 and 2009-10 (USDC, 2012a).

These results suggest that the impact and recovery from the 2007-08 recession varies by sub-region within the study area; the Municipality of Anchorage and the Kenai Peninsula Borough are experiencing positive growth (possibly as a result of more diverse and resilient economies), while the Valdez-Cordova census area has been slower to recover.

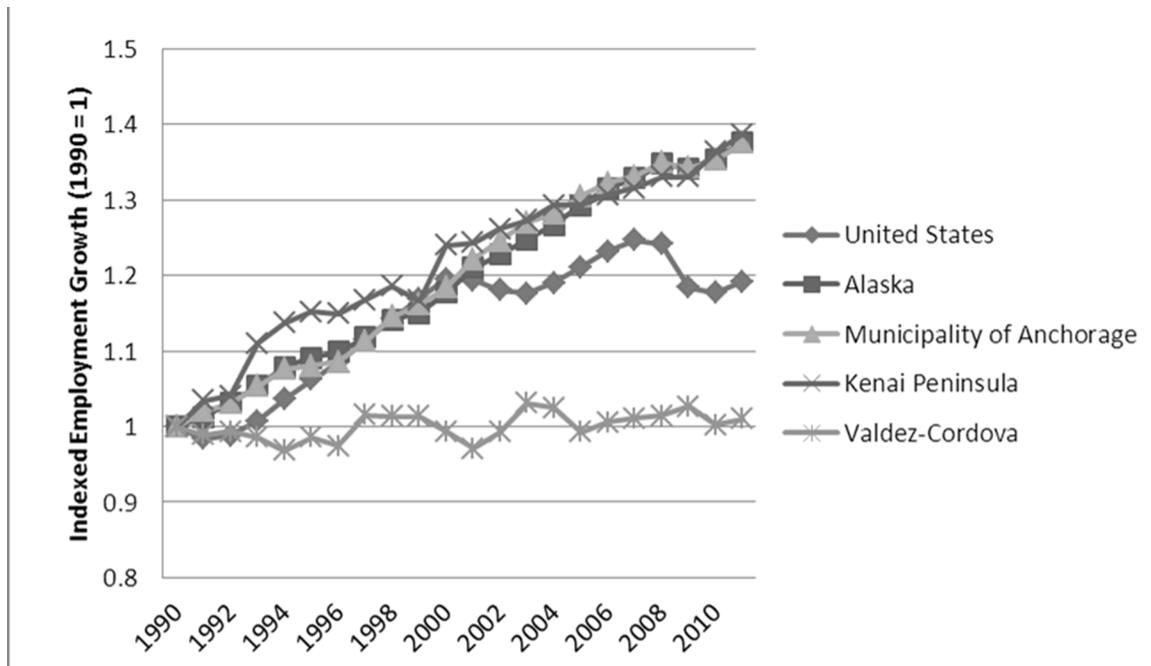


Figure 16. Employment trends of the United States, Alaska, the Municipality of Anchorage, Kenai Peninsula Borough, and Valdez-Cordova census area. The data are standardized for comparison. Note: All employment estimates used in this portion of the document refer to average annual employment. Here, one employment unit is equivalent to 12 months of full or part-time work. Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System 2013

While employment statistics help explain overall growth in economic activity, personal income statistics more directly measure the economic benefits residents receive. Similar to the state of Alaska as a whole, the study area regions display similar trends in total personal income growth (see figure 17) generally increasing except for the 2008 to 2009 period. However, income growth for individual study area regions was somewhat lower than that of Alaska, with the Kenai Peninsula Borough being the area with the most growth and Valdez-Cordova census area having the least growth (less than that of the United States).

Personal income can be divided into two main categories; earned income and unearned income (see figure 18). Earned income includes all wage and salary earnings, including wages paid by self-proprietors to themselves. Unearned income includes all non-labor income: government transfer payments to individuals (e.g., social security) and income from property or other investments. Between 1970 and 2011, unearned income increased from 11 to 31 percent of total personal income in the study area as a whole. As components of unearned income, transfer payments, including government payments to retirement, disability, medical, unemployment, etc., increased from 3 to 15 percent and dividends/interest/rents increased from 8 to 16 percent during that time. Unearned income has not changed as much over the last 10 years in the study area, fluctuating between 27 and 32 percent of total personal income; however, age-related transfer payments (e.g., retirement and disability payments and Medicare) rose from 3 to 5 percent of total personal income between 2000 and 2011 (11 to 16 percent of non-labor income), consistent with aging population trends (US Census Bureau, 2013). These results underlie the growing importance of unearned income, reflecting shifts in demographics and aging populations, and potentially affecting local demand for Chugach National Forest services and amenities.

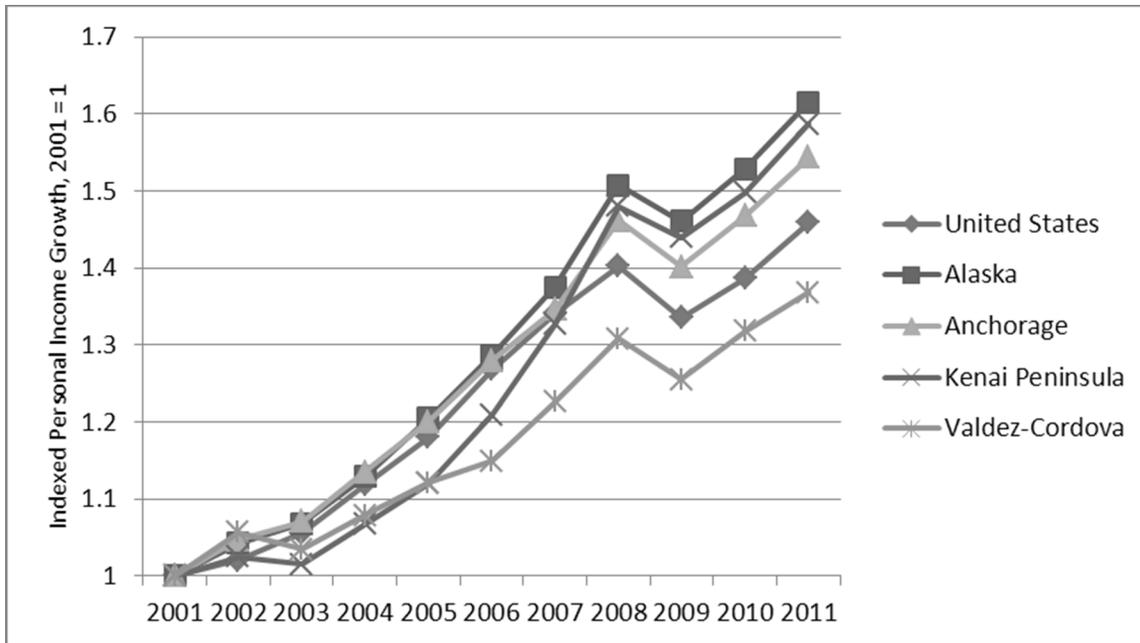


Figure 17. Total personal income trends in the United States, Alaska, Municipality of Anchorage, the Kenai Peninsula Borough, and Valdez-Cordova census area from 2001-2011 (not adjusted for inflation) Sources: U.S. Department of Commerce. Bureau of Economic Analysis, Regional Economic Information System. 2013.

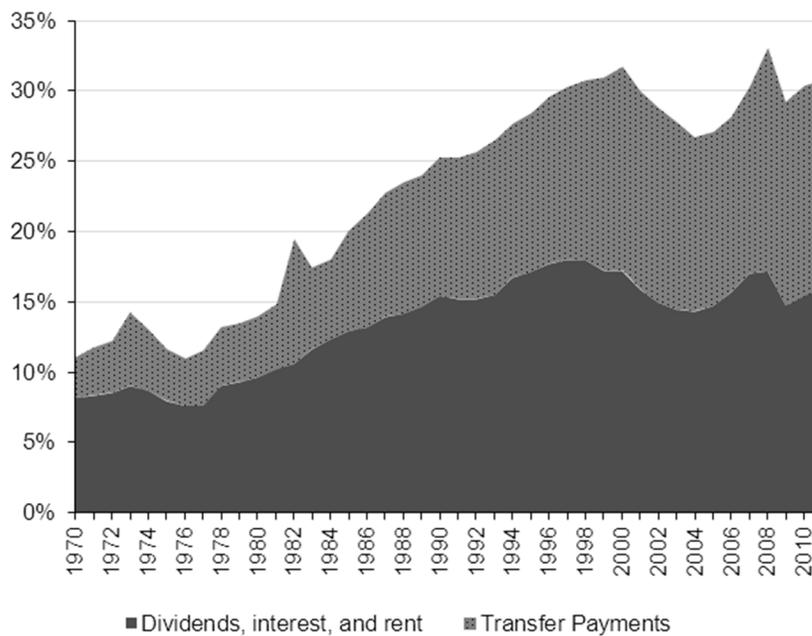


Figure 18. Unearned income, percent of total personal income for the southcentral Alaska study area (US Census Bureau, 2013)

Employment by industry

Table 59 displays data on employment by industry. The four main industries that use forest-related resources in Alaska are commercial salmon fishing and processing, tourism and recreation (including sport fishing), wood products, and minerals (excluding oil and gas). Forest-related resources are included in the “Agriculture, forestry, fishing and hunting, and mining” industry category in table 59. It is important to note that this category in table 59 does not include employment associated with the processing and support services linked to resource harvesting. Production activities associated with these industries occur inside and outside the national forest, and in many cases the Chugach National Forest is not the only source of the resources upon which they rely.

In 2011, 5.2 percent of total employment in Alaska was estimated to be in industries that use forest-related resources (see table 59). For the period from 2010 to 2020, employment in Alaska is projected to grow by 8.3 percent in natural resource and mining-related industries (ADLWD, 2012). The Kenai Peninsula Borough (12.1 percent) and Valdez-Cordova census area (6.5 percent) have higher percentages of employment in forest resource-related industries than the Municipality of Anchorage (3.4 percent) (see table 59).

Table 59. Employment percentage by industry in 2011, listed according to the North American Industry Classification System (NAICS)

Industry	Alaska	Municipality of Anchorage	Kenai Peninsula Borough	Valdez-Cordova Census Area	Study Area	U.S.
Percent of Total						
Agriculture, forestry, fishing and hunting, mining	5.2%	3.4%	12.1%	6.5%	4.8%	1.9%
Construction	8.3%	7.1%	8.6%	8.2%	7.3%	6.8%
Manufacturing	4.0%	1.8%	4.4%	6.4%	2.3%	10.8%
Wholesale trade	2.1%	2.9%	1.9%	4.1%	2.8%	2.9%
Retail trade	11.0%	11.3%	11.2%	7.8%	11.2%	11.5%
Transportation, warehousing, and utilities	7.7%	8.0%	6.2%	9.0%	7.8%	5.1%
Information	2.1%	2.4%	2.4%	5.6%	2.5%	2.3%
Finance and insurance, and real estate	4.5%	5.9%	2.9%	3.0%	5.4%	6.9%
Prof., scientific, mgmt., admin., and waste mgmt.	8.3%	10.7%	5.5%	6.8%	9.9%	10.5%
Education, health care, and social assistance	22.7%	21.7%	22.0%	24.9%	21.8%	22.5%
Arts, entertain., rec., accommodation, and food	8.3%	9.4%	10.3%	7.0%	9.5%	9.0%
Other services, except public administration	4.5%	4.6%	5.1%	4.1%	4.7%	4.9%
Public administration	11.3%	10.7%	7.4%	6.7%	10.1%	4.9%

Note: The agriculture, forestry, fishing and hunting and mining sector does not include processing and support services linked to resource harvesting; manufacturing, trade, warehousing, and other industry sectors include operations associated with seafood processing and other support services.

Travel and tourism

For the past 20 years, tourism has been a growing industry in the study area, but it has also been one of the hardest hit industries in recent years due primarily to poor or variable national economic conditions. Travel and tourism consist of sectors that provide goods and services to visitors, and the local population, and contribute to the local economy. These sectors include retail trade; passenger transportation; arts, entertainment, and recreation; and accommodation and food.

Information regarding employment in tourism helps demonstrate the importance of that sector of the economy across the different areas in the study area. Travel and tourism accounts for 16 to 17 percent of employment in the study area as well as subregions as of 2010 (see table 60). These percentages are slightly greater than that of the United States (15 percent). Tourism employment is somewhat more concentrated in transportation (e.g., cruise lines) and part-time seasonal jobs compared to the nation as a whole.

In 2011, employment supported by visitors, excluding recreational spending by local residents, was estimated to be 18,900 jobs in the southcentral region of Alaska, representing 7 percent of total employment in the region (ADLWD, 2013b). Visitor-related employment in the southcentral region in 2011 was higher than 2010; reflecting the first increase in annual visits to Alaska in four years, and suggesting continuing recovery from the recession. After steadily increasing between 2002-03 and 2007-08, the Alaska visitor market plateaued, then declined in response to the nationwide economic recession and declining cruise ship traffic. The 2011-12 visitor volume was still 7 percent below the peak volume (1,961,500 visitors) of 2007-08, but 19 percent higher than in 2002 (ADLWD, 2013b). Employment within the leisure and hospitality industry is projected to grow by 12.5 percent for 2010 to 2020 for Alaska, slightly higher than overall employment growth of 12 percent across all industries (ADLWD, 2012), suggesting potential for slight increases in percentages of total jobs associated with recreation and tourism. Additional analysis is needed to identify the proportion of the tourism jobs attributable to expenditures by visitors to the Chugach National Forest (see the Employment Supported by the Chugach National Forest section).

Tourism employment grew from 1998 to 2010 in all sub-regions in the study area. Tourism employment in the Kenai Peninsula Borough and Valdez-Cordova census area fluctuates but still experienced growth from 1998 to 2010. The Municipality of Anchorage experienced more continuous and slightly greater growth at 23 percent during the same period (US Census Bureau, 2013).

Table 60. Percentages of travel and tourism-related employment in 2010 (US Census Bureau, 2013)

Travel and Tourism-related Employment	Alaska	Municipality of Anchorage	Kenai Peninsula Borough	Valdez-Cordova Census Area	Study Area	U.S.
Percent of Total						
Travel and Tourism-related	17.0%	16.4%	17.1%	16.2%	16.5%	15.1%
Retail Trade	2.3%	2.1%	2.2%	2.4%	2.2%	2.8%
Gasoline Stations	0.7%	0.4%	1.0%	0.9%	0.4%	0.8%
Clothing and Accessory Stores	0.9%	1.1%	0.4%	1.1%	1.0%	1.4%
Misc. Store Retailers	0.8%	0.7%	0.8%	0.3%	0.7%	0.6%
Passenger Transportation	2.5%	2.4%	1.3%	2.1%	2.3%	0.4%
Air Transportation	2.3%	2.3%	0.8%	1.6%	2.1%	0.4%
Scenic and Sightseeing Transport	0.2%	0.1%	0.5%	0.4%	0.1%	0.0%
Arts, Entertainment, and Recreation	1.9%	1.8%	1.7%	2.4%	1.8%	1.8%
Performing Arts and Spectator Sports	0.5%	0.6%	0.0%	0.0%	0.5%	0.4%
Museums, Parks, and Historic Sites	0.1%	0.1%	0.2%	0.3%	0.1%	0.1%
Amusement, Gambling, and Rec.	1.3%	1.1%	1.4%	2.1%	1.1%	1.3%
Accommodation and Food	10.3%	10.2%	11.9%	9.3%	10.3%	10.1%
Accommodation	2.5%	2.2%	3.4%	4.5%	2.3%	1.6%
Food Services and Drinking Places	7.8%	8.0%	8.5%	4.8%	8.0%	8.5%
Non-travel and Tourism	83.0%	83.6%	82.9%	83.8%	83.5%	84.9%

Commercial fishing and seafood processing

Commercial fishing was identified as being the largest forest resource-related sector in southcentral Alaska in the FEIS for the 2002 Forest Plan (see Fish section in this chapter for more details about potential economic impacts associated with Chugach National Forest contributions to commercial fisheries).

The three subareas within the economic study area display fluctuating levels of commercial fishing income during the last several decades. Income peaked in the late 1980s at 70 million dollars per year for Kenai Peninsula Borough and 60 million dollars per year for Municipality of Anchorage (1995), accounting for 3.6 percent and 0.2 percent of total annual earned income respectively. Annual income for the Valdez-Cordova census area peaked at approximately 35 million dollars, accounting for 4.8 percent of total earned income. By 1998, commercial fishing income decreased to approximately 25 million dollars for the Kenai Peninsula Borough, 10 million dollars for the Valdez-Cordova census area, and to 12 million dollars for the Municipality of Anchorage. From 2001 to 2011, earnings from commercial fishing in the study area remained the same for the Municipality of Anchorage at 12 million dollars, but rose significantly for both the Kenai Peninsula Borough. Over the longer term, commercial fish harvest values have fluctuated for the Kenai Peninsula Borough with peaks in 1988 and 1992 and lows in 1980, 1984, 1998, and 2001. Commercial fishing earnings have grown between 2002 and 2010 (ADLWD, 2010b). Fish processing income (separate from commercial fishing) was believed to be approximately equal again in magnitude to earnings from the commercial fishing sector at the time. Within the Kenai Peninsula

Borough, fish processing occurs in Kenai, Soldotna, Sterling, Seldova, and Seward, accounting for 52 percent of manufacturing sector jobs in these communities (ADLWD, 2010b).

Today, salmon fisheries are recognized as a major economic driver in the area. A relatively new industry, oyster mariculture, shows promise for future growth for the commercial fishing and seafood industry for the Kenai Peninsula Borough (KPEDD, 2010).

The volatility of commercial fishing income is likely due to various economic and ecological forces beyond the national forest's boundary and control. However, it is recognized that the Chugach National Forest plays a critical role in the health and sustainability of fisheries supporting both commercial and recreational activity (see Fish section in this chapter). Forest Service management has the potential to indirectly affect commercial fishing, but the impact is difficult to predict (USDA, 2002c).

Rivers within the national forest are renowned for salmon fishing, bringing thousands of people to the area. A number of private businesses directly or indirectly support recreational fishing within the Chugach National Forest, and are addressed in the Recreation and Scenic Character section in this assessment. These businesses are affected by the status of salmon runs and administration of the salmon season by ADF&G.

Other economic sectors

The biological or physical attributes maintained by the Chugach National Forest help support a number of other business and community enterprises. Wildlife/landscape artists, trappers, arts and crafts suppliers, tanning operations, and local food markets may rely directly or indirectly on specific botanical, wildlife, or fish resources for use or inspiration. Detailed information was not readily available to describe the economic trends associated with these sectors; however, values are described and recognized in other sections of this assessment (see Wildlife, Subsistence, and Ecosystem Services sections in this chapter).

Timber and wood products

The Alaska Report to the Timber Jobs Task Force reports that the timber industry in southcentral and interior Alaska is largely limited to small mills and cottage manufacturing industries (Alaska Timber Jobs Taskforce, 2012). In contrast to the southeast Alaska, the southcentral and interior regions of the state do not have a history of large volume, heavily commercialized wood product industries. The southcentral and gulf coast regions have experienced significant declines in the quality of timber as both regions suffered from widespread spruce bark beetle infestations. In the Anchorage and Matanuska-Susitna metropolitan areas, the State of Alaska continues to provide commercial timber sales. Decreased housing starts have resulted in less land clearing and increased demand on the state to provide fuelwood sales for both personal and commercial markets. Much of the southcentral industry focuses on value-added product development, including log cabin kits, dimensional lumber, custom beams, and other building materials.

There are an estimated 105 Alaska-owned wood product businesses in areas and communities surrounding the Chugach National Forest, with a majority (63) in the Municipality of Anchorage (Alaska Timber Jobs Taskforce, 2012). Current timber industry activity in the Kenai Peninsula Borough includes the exportation of woodchips from the southern peninsula and one sawmill with value added timber operations. The increase in availability of small timber sales in recent years has enabled small operators to expand their operations.

Timber related employment, including growing, harvesting, mills, and wood products manufacturing, is relatively small in the study area. Employment in this sector in Anchorage was 1.1 percent in 2010 and 0.1 to 0.2 percent in the Kenai Peninsula Borough and Valdez-Cordova census area, respectively (USDC, 2012b).

According to the Forest Plan Review 2002-2012 (USDA, 2012b), demand for timber from the national forest was low in 2002 and was expected to remain low during the life of the 2002 Forest Plan.

See the Timber and Ecosystem Services sections for additional detail about timber, wood for fuel, fiber, and other forest products.

Employment supported by the Chugach National Forest

The primary ways the Chugach National Forest impacts jobs and income that can be modeled quantitatively include:

- Recreational visitor spending in the local area, including wildlife and fish-based recreation (see the Recreation and Scenic Character section for details about visitor use)
- Spending of transfer payments to states/counties (e.g., Secure Rural School payments)
- Spending of salary and non-salary Federal funds by the Forest Service (e.g., expenditures on staff, materials, contracting, etc.)

Other activities related to resource use and extraction, such as timber harvest, gathering of other forest products, and mining, occur within or can be linked to the Chugach National Forest, as discussed in other sections of this chapter. However, in a number of these cases, the magnitude of the activity is relatively small and hard to assess relative to the regional economy as a whole, making it difficult to accurately model economic impacts. See the Renewable and Nonrenewable Energy and Mineral Resources sections in this assessment and the Timber section in this chapter for information about contributions by these respective resource areas to social and economic sustainability.

Method for estimating economic impacts

Economic impact analysis is used to estimate how the Chugach National Forest contributes to regional employment and labor income. Economic impacts analysis evaluates direct, indirect, and induced effects using region-specific multipliers derived from input-output models. Input-output analysis is a means of examining the production and consumption relationships between different industries, services, businesses, government sectors, and consumers (e.g., households) within an economy. Economic impact analysis allows one to examine the effect of a change in one or several economic activities on the economy for a region, all else being held constant.

The IMPLAN modeling system (IMPLAN, 2009) was used to examine the direct, indirect, and induced economic impacts of the Chugach National Forest. IMPLAN multipliers are derived from cross-sectional data regarding employment, output, and expenditures from a single point in time that should be consistent with the period of time for activity data (e.g., IMPLAN multipliers should be based on 2008 data if recreational visit numbers are from 2008 surveys). Data used by IMPLAN to create economic impact models specific for the impact area surrounding the Chugach National Forest are compliant with the Data Quality Act (Section 515 of Public Law 106-554). The impact area is assumed to consist of the Municipality of Anchorage, the Kenai Peninsula Borough, and the Valdez-Cordova census area, consistent with the boundaries of the analysis area defined for assessing social, cultural, and economic conditions. Summaries of economic impact results from recent studies follow.

Recreation

Based on NVUM survey results, the Forest Service estimated that 498,345 visits to the Chugach National Forest occurred in 2008 (USDA, 2008). Supplemental NVUM surveys were completed to improve the reliability of recreational visitor use data for calculating economic impacts (White & Wilson, 2008). Visitor spending is the basis for direct impacts and is assumed to include expenditures on a variety of

items and services, such as fuel, food, lodging, and guided opportunities. Using the NVUM visitation numbers from 2008, and the supplemental survey information, it is estimated that 498,345 recreational visits to the Chugach National Forest (from 2008) generated 83 million dollars in visitor spending by both local and non-local visitors. This level of spending is estimated to support 1,062 jobs (804 full and part-time direct jobs plus 259 full and part-time induced and indirect jobs) in the study area during a year. Approximately 84 percent of jobs (894 jobs) are supported by visits from non-Alaskans. Spending by non-local visitors is more likely to introduce new money into the local economy, compared to local residents who are likely to spend their money locally on other goods and services (and still support local employment), even in the absence of Chugach National Forest recreational opportunities. Economic impacts from recreation are therefore often based on non-local spending. Additional details about the types of recreational activities and the nature of recreational visits are described in the Recreation and Scenic Character section in this assessment.

Payments to local governments

Counties receive a portion of the revenues generated on National Forest System lands through the Secure Rural Schools and Community Self Determination Act (2000) and subsequent reauthorizations of this Act. Payments are allocated to counties for use in different types of programs or projects, including schools and roads (Title I); projects to benefit forest lands (Title II); and search, rescue, and Firewise community efforts (Title III). Secure Rural Schools payments generated from the Chugach National Forest are displayed in table 61. Aggregate Secure Rural Schools' payments declined from a high of 6.9 million dollars in 2009 to 4.5 million dollars in 2013.

Counties also receive Payment in Lieu of Taxes to replace tax revenue lost due to the public nature of lands administered by Federal agencies (1976 Payments in Lieu of Taxes Act). The amount is based on the amount of acreage administered by certain Federal agencies, population, a schedule of payments, the Consumer Price Index, other Federal payments made in the prior year, and the level of funding allocated by Congress. Annual Payment in Lieu of Taxes associated with the Chugach National Forest has varied from 4.1 million to 5 million dollars in aggregate for the Municipality of Anchorage (15 to 16 percent of funds), Kenai Peninsula Borough (57 to 63 percent of funds), and Valdez-Cordova census area (22 to 27 percent of funds) for 2009 through 2013, as compiled by Alexander (2013).

Table 61. Chugach National Forest Secure Rural Schools payments (in dollars) 2009 through 2013 (Alexander, 2013)

Type of Payment	2009	2010	2011	2012	2013
Title I: Schools and Roads	5,845,760	5,203,213	4,496,492	4,390,197	3,788,254
Title II: Projects Benefitting National Forest Lands	1,023,396	910,827	787,515	745,912	650,209
Kenai Peninsula Borough	153,522	139,604	113,962	108,450	98,185
Anchorage Borough	23,480	20,569	18,452	17,812	16,576
Cordova	283,258	242,881	213,211	194,957	163,111
Valdez	503,907	455,566	397,112	387,693	336,233
Whittier	13,793	12,233	10,676	10,098	8,726
Chugach REAA	45,436	39,973	34,102	26,902	27,379
Title III: Search and Rescue	0	0	0	23,061	13,297
Totals	6,869,156	6,114,040	5,284,007	5,159,170	4,451,760

Secure Rural Schools payments may be affected by Forest Service management, but Payment in Lieu of Taxes is less likely to be affected. As such, results from IMPLAN modeling (IMPLAN, 2009) are presented here to demonstrate the potential economic impacts from use of Secure Rural Schools' payments. Assuming 2011 Secure Rural Schools payments levels of 4,496,000 dollars under Title I (50 percent allocated to schools and 50 percent allocated to roads) and 788,000 dollars under Title II (100 percent allocated to national forest projects), Secure Rural Schools payments linked directly to the Chugach National Forest are estimated to support 71 jobs (full or part-time) and approximately 4 million dollars in income (2012 dollars) in a year.

Chugach National Forest spending

Spending by the Forest Service of approximately 25 million dollars (2010 Chugach National Forest budget) is estimated to support 367 full or part-time jobs and 24 million dollars in labor income in the impacted area. This result includes direct, indirect, and induced impacts. The 2010 Chugach National Forest budget was split evenly between salary and non-salary expenditures.

Special use permits

The wide variety of special use permits for the Chugach National Forest illustrates how the Forest Service affects local and regional economies. Numbers and types of special use permits are summarized in the Land Use section of this assessment.

Economic impacts of non-local or tourist spending on commercial operations linked to recreation and tourism are facilitated by special use permits issued by the Forest Service to outfitters and guides. Details about special use permits for guided opportunities are provided in the Recreation and Scenic Character section of this assessment. Quantified economic impacts associated with other types of special uses are not readily available and are therefore not provided in this assessment. However, more details about other types of special uses within the Chugach National Forest are presented in other relevant program sections in this assessment.

Environmental Justice

Poverty data is displayed in table 62. The Census Bureau uses a set of income thresholds that vary by family size and composition to characterize poverty. A family or an unrelated individual that falls below the relevant poverty threshold is classified as being below the poverty level. The percent of people below the poverty level in the region is similar to or slightly below levels for Alaska and below that of the United States for 2011 (8 percent; ranging from 6.7 percent in Valdez-Cordova census area to 9.1 percent in the Kenai Peninsula Borough). Poverty levels may be higher or lower for individual communities within the study area (see table 63).

For public land managers, understanding whether different races and ethnicities are affected by poverty can be important. People with limited income and from different races and ethnicities may have different needs, values, and attitudes as they relate to public lands. In addition, proposed activities on public lands may need to be analyzed in the context of whether minorities and people who are economically disadvantaged could experience disproportionately high and adverse effects. Information compiled does not indicate substantially higher poverty, by race or ethnicity, for individual subareas with the exception of Native Hawaiian and Oceanic populations in the Valdez-Cordova census area.

Table 62. Poverty data for 2011 with categories broken into people, families, people below poverty, and families below poverty (estimates for 2007 through 2011) (USDC, 2012b)

Group	Alaska	Municipality of Anchorage	Kenai Peninsula Borough	Valdez-Cordova Census Area	Study Area	U.S.
People	684,608	281,124	53,327	9,427	343,878	298,787,998
Families	170,948	70,070	14,673	2,524	87,267	76,507,230
People Below Poverty	65,111	22,045	4,860	631	27,536	42,739,924
Families below poverty	11,032	3,804	806	105	4,715	8,000,077
Percent of Total						
People Below Poverty	9.5%	7.8%	9.1%	6.7%	8.0%	14.3%
Families below poverty	6.5%	5.4%	5.5%	4.2%	5.4%	10.5%

Table 63. Percentage of people by race and ethnicity below poverty (averages for 2007 through 2011) (USDC, 2012b)

Race or Ethnicity	Alaska	Municipality of Anchorage	Kenai Peninsula Borough	Valdez-Cordova Census Area	Study Area	U.S.
White alone	6.6%	5.3%	8.4%	3.8%	5.9%	11.6%
Black or African American alone	10.6%	10.5%	12.1%	0.0%	10.4%	25.8%
Native American*	21.0%	16.6%	17.5%	18.0%	16.8%	27.0%
Asian alone	10.1%	11.3%	1.4%	0.0%	10.8%	11.7%
Native Hawaiian and Oceanic alone	17.7%	19.5%	0.0%	74.1%	19.6%	17.6%
Some other race alone	7.5%	6.6%	0.0%	0.0%	6.1%	24.6%
Two or more races alone	12.6%	13.6%	12.1%	11.9%	13.4%	18.7%
Hispanic or Latino alone	10.3%	9.5%	5.8%	4.7%	9.2%	23.2%
Non-Hispanic/ Latino alone	6.5%	5.1%	8.5%	3.8%	5.7%	9.9%

* Native American includes American Indian, Alaska Native, and Non-specified tribes.

Note: Poverty prevalence by race and ethnicity is calculated by dividing the number of people by race in poverty by the total population of that race. The data are calculated by American Community Survey Office (ACS) using annual surveys conducted from 2007 to 2011 and are representative of average characteristics during this period.

Other Social Conditions and Trends

Education and language

Education attainment refers to the level of education completed by people 25 years and older in terms of the highest degree or the highest level of schooling completed. Conditions regarding education and language may have implications for Forest Service activities linked to outreach, interpretive programs, and other student programs. The value of the Chugach National Forest as it relates to education and research is discussed in the Ecosystem Services section.

The percentage of people earning high school (and higher) degrees increased in the study area from 1990 to 1998 according to the FEIS for the 2002 Forest Plan, and that percentage increased again from 1998 to 2011 (USDC, 2012b). Increases ranged from 1 percent in Anchorage to 8 percent for Valdez-Cordova Census Area. High school graduation rates for the study area (92 percent) and subareas were similar to those of the State of Alaska and greater than the rate for the United States (85 percent) in 2011. Attainment of a Bachelor's degree or higher is greater for the Municipality of Anchorage (32 percent) and lower for the Kenai Peninsula Borough and Valdez-Cordova census area (23 and 24 percent, respectively) when compared to attainment rates for the state and the United States (28 percent). As is the case with poverty, educational attainment may vary for some individual communities within the study area.

Knowing the primary language of the population is important for public land managers who are trying to communicate with citizens of communities adjacent to public lands. It is important to know whether a significant portion of that population can communicate effectively in English. If this is not the case, public outreach, meetings, plans, and implementation may need to be conducted in multiple languages. The percent of the population speaking a language other than English in the study area is similar to or below that of Alaska as a whole as well as the United States for 2007 through 2011, though Asian and Pacific Islander languages are spoken among a greater percentage of people in Anchorage.

Housing

Housing status is an indicator of the housing market and provides information on the stability and quality of housing as a component of overall community and social sustainability, welfare, and lifestyle support for certain areas. The data is used to assess the demand for housing, to identify housing turnover within areas, and to better understand the population within the housing market over time.

Seasonal or recreational homes are often an indicator of the desirability of a place for recreation and tourism. This could also be used as an indicator of recreational and scenic amenities, which can be one of the economic contributions of public lands. Understanding the relative growth rates of housing is relevant for public lands managers in the context of the wildland-urban interface, and as an indicator of overall economic growth. The year the home was built also provides information on the age of the housing stock, which can be used to forecast future demand for services, such as energy consumption and fire protection.

Housing occupancy is high for the Municipality of Anchorage (93 percent) but lower for the Kenai Peninsula Borough (74 percent) and particularly low for the Valdez-Cordova census area (63 percent) when compared to the state (83 percent) on average for 2007 through 2011. This is explained in large part by the relatively high numbers of seasonal or recreational homes in the Kenai Peninsula Borough (19 percent) and the Valdez-Cordova census area (27 percent) versus the Municipality of Anchorage where only 1.4 percent of housing is seasonal. High percentages of seasonal housing are suggestive of demand for scenic, recreational, or other attributes that appeal to the public (not uncommon in areas surrounding National Forest System lands).

Housing availability for the study area (0.7 to 1.0 percent of housing is for sale) is consistent with the rest of Alaska (0.8 percent) but lower than the United States (1.5 percent). Housing for rent in the study area (0.8 to 1.6 percent of housing) is slightly lower than that of the state (1.8 percent) and lower than the United States (2.5 percent). Housing availability in general is therefore somewhat lower for the study area, recognizing that demand for housing may vary substantially for different communities. Based on age of construction, rates of construction have been slower in the Valdez-Cordova census area, somewhat higher in the Municipality of Anchorage, and highest for the Kenai Peninsula Borough.

In terms of housing affordability, housing costs and gross rents as a percent of household income in the Valdez-Cordova census area are less than the rest of the study area, the state of Alaska, and the United States. Housing costs compared to household income for the Municipality of Anchorage and Kenai Peninsula Borough are mostly consistent with the state as a whole, though still somewhat lower than the United States. However, gross rents as a percent of income appear slightly higher for the Municipality of Anchorage (USDC, 2012b).

Disabilities

The Center for Personal Assistance Services (PAS) has compiled state and national data on the prevalence of overall disability and of self-care difficulty (see table 64). The aging of the United States population is expected to bring about large increases in the demand for PAS over the coming decades.

For the Municipality of Anchorage, the percent of the population aged 65 or older with self-care difficulties (10.1 percent) is slightly higher than that of Alaska or the United States (8.8 to 9.1 percent). For the Kenai Peninsula Borough, the percent of the population aged 18 to 64 and 65 and older with self-care difficulties (3.3 percent and 11.8 percent, respectively) is somewhat higher than that of Alaska or the United States (1.8 percent and 8.8 to 9.1 percent, respectively); the percentage of the Kenai Peninsula Borough population aged 18 to 64 with an independent living difficulty (5.5 percent) is also somewhat higher than Alaska or the United States (2.9 percent to 3.4 percent). Persons with self-care difficulty are a subset of those with an independent living difficulty.

Table 64. Estimated number of persons in the Municipality of Anchorage and Kenai Peninsula Borough with self-care difficulty or independent living difficulty by age (with comparable estimates for the state and the nation) (Center for Personal Assistance, 2014)

Area	Ages 18-64			Ages 65 and over		
	Total persons	With a self-care difficulty	With an independent living difficulty	Total persons	With a self-care difficulty	With an independent living difficulty
Municipality of Anchorage	180,365	1.8%	2.9%	20,119	10.1%	14.4%
Kenai Peninsula Borough	34,628	3.3%	5.5%	5,728	11.8%	16.4%
Alaska	438,463	1.8%	2.9%	51,173	9.1%	14.7%
United States	189,239,988	1.8%	3.4%	38,279,866	8.8%	16.4%

Non-Market Benefits and Values

The Chugach National Forest provides a range of resources and amenities (natural, built, and human capital) that contribute to a suite of goods and services valued by people living outside of the study area and beyond the State of Alaska. Many of these benefits are difficult to value in dollars or justify in terms of jobs and income and are therefore categorized as non-market benefits. Beneficiaries range from local residents to the public in general, including individuals and groups outside of Alaska, and even the international community.

To help illustrate potential types of values, a comprehensive survey in 12 communities surrounding the Chugach National Forest was conducted to better understand how the local public values the national forest (Reed & Brown, 2003). The Relevant Information indicated that public land environmental attributes are basic to community quality of life, suggesting that the protection of clean air and water, scenic quality, and open and undeveloped areas, along with providing opportunities for wildlife viewing and outdoor recreation are important. The Relevant Information confirms that the Chugach National Forest has the ability to affect the quality of life of the communities neighboring it (Reed & Brown, 2003). Similar studies of community preferences are summarized in the 2002 FEIS and given consideration in the Ecosystem Services section in this chapter.

A review and assessment of the full spectrum of both market and non-market benefit conditions and trends linked to and affected by the Chugach National Forest is interdisciplinary in scope and expertise. As such, separate sections of this assessment are dedicated to the assessment of those benefits. Refer to the Ecosystem Services and the other program-specific sections in this chapter for details about non-market values and benefits.

Social and Economic Sustainability

Sustainability is, “The capability to meet the needs of the present generation without compromising the ability of future generations to meet their needs.” Furthermore, economic sustainability refers to the capability of society to produce and consume or otherwise benefit from goods and services, while social sustainability is the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities

The Chugach National Forest is not responsible for deciding what goods, services, networks, traditions, cultures, and activities are most needed or desired; only the public or society can define what they need today and in the future. However, information about social, cultural, and economic conditions and trends provides clues about the needs of present and future generations. When considered in combination with

current resource and ecosystem conditions and trends of the Chugach National Forest, this information helps demonstrate how the national forest can provide resources that support the capabilities of society to produce and consume goods and services as well as relationships, culture, and activities that maintain vibrant communities (and therefore contribute to social and economic sustainability).

More specifically, this section and other sections of chapter 3 provide information about public needs and social and economic conditions potentially affected by national forest resources. Chapter 2 of this assessment provides information about resource conditions and trends that help determine if and how the Chugach National Forest contributes to goods and services that satisfy public needs and influences social and economic sustainability, now and into the future. Aggregate consideration of information in chapters 2 and 3, within an interdisciplinary setting, is therefore necessary to inform decisions about how national forest management should guide contributions to social and economic sustainability. Some examples of how the Chugach National Forest might contribute to social and economic sustainability include:

- Providing opportunities to build relationships and facilitate interaction with stakeholders through activities, such as educational outreach through the Chugach Children’s Forest program and Classrooms for Climate and through subsistence harvest activities.
- Restoring/maintaining national forest resources and providing opportunities to use resources that directly or indirectly support jobs and income in communities within the study area.
- Offering a variety of unique national forest resource conditions and experiences that are valued by communities and people outside of Alaska (the existence of Chugach National Forest resources and amenities may play a role in the sustainability of social conditions well beyond areas and communities within the social and economic study area).

Information Needs

The following information gaps or needs have been identified; more details in these areas related to social and economic sustainability may help to inform subsequent steps in the plan revision process:

- Recreational visitor trends and projections (local and non-local), by area and gateway community
- Factors affecting (or constraining) recreational visitor days within the Chugach National Forest, including primary factors affecting sport fishing days and experience
- Needs and demands for Chugach National Forest goods and services by minority groups
- Local public perceptions about new or developing types of economic or business opportunities that may benefit from Chugach National Forest resources
- Expectations or projections about long-term fluctuations or cycles in market conditions in the Chugach National Forest study area and Alaska, including specific types of recreational or tourism demand (e.g., cruise ships and the Alaska Railroad Corporation), transportation (e.g., ferries and highway construction), affecting shifts in residential development and visitor traffic, and alternative and renewable energy
- Conditions and trends regarding non-traditional businesses, community programs, and organizations that may directly or indirectly rely on wildlife, plants, or other forest resource conditions or access
- Area and community-specific vulnerability and perceived risks to social and economic sustainability—short and long-term

Ecosystem Services

The Chugach National Forest provides a broad suite of goods and services that are important to the public, help meet community needs and preferences, and sustain livelihoods. These goods and services are the benefits of ecosystems and are referred to as ecosystem services.

Some benefits derived from National Forest System lands are obtained by direct use or consumption of goods or services (e.g., wood products, water, forage, fish, and wildlife, and recreational opportunities). Other services provide benefits indirectly or through non-consumptive means, as they support and regulate ecosystem integrity (e.g., climate regulation, water filtration, pollination, nutrient cycling, flood control, and biodiversity).

Ecosystem services are defined as the benefits people obtain from ecosystems and can be grouped into the following four types:

1. *Provisioning services*
The products or commodities obtained from forest ecosystems, such as clean air, fresh water, fiber, forage, fuel, minerals, and food
2. *Regulating services*
The benefits obtained from an ecosystem's ability to impact or influence environmental conditions that affect people's lives, such as carbon sequestration, water filtration and storage, and insect and disease control
3. *Supporting services*
The category of ecosystem services that are often described as intermediate services that contribute to the production of other ecosystem services and sustainability of integrated ecological, social, and economic systems
4. *Cultural services*
The nonmaterial benefits people derive from forests, such as educational, aesthetic, spiritual and cultural heritage values; recreational experiences; and tourism opportunities

While the Chugach National Forest provides a broad range of goods and services to the public, this assessment attempts to consider available information about this range of benefits and services and then narrow the list by identifying a *preliminary* set of services that: (1) are thought to be most important to people in the broader landscape and (2) would be most affected by Forest Service management.

The types of information used to help determine if these two conditions are met include:

- *Condition and trend of the service*
Is it getting worse? Is it stable? Is it not known?
- *Drivers*
Do people want more or less of the service, or does evidence suggest the public will desire more or less in the future, or is it unknown?
- *Ecosystem characteristics that help to provide the service*
Are national forest resources or ecosystem functions under threat or in need of maintenance that are critical inputs to the production of the service? Is there uncertainty?
- *Management actions, land uses, or other activities expected to occur*
During the next 15 years, what is expected to occur that could affect the service (adversely or beneficially)?
- *Outside influences*
Are actions or changing conditions on lands of other ownership, beyond the authority of the Forest Service, which could be affecting the service?

The identification of key ecosystem services relied on input from the public participation process, a review of available reports and studies, and specialist input. Public comments collected during this phase were reviewed to identify the potential benefits associated with the four ecosystem service categories (see the Public Feedback section in chapter 1). In addition, documents from past planning efforts as well as external publications, including research papers, white papers, dissertations, and survey summaries specific to the region surrounding the Chugach National Forest, were reviewed. This information, along with resource specialist input, was then collated into a matrix describing the types of service benefits the national forest offers.

An evaluation of available information from public input, reports/studies, and resource specialists resulted in the preliminary identification of seven key ecosystem services. The following table displays the seven key ecosystem services grouped by the type of service they provide.

Table 65. Ecosystem services grouped by the service they provide

Type of Ecosystem Service	Key Ecosystem Service
Provisioning	Water quantity and quality Animals and plants as food and resources Wood as a renewable energy and fuel source
Regulating	Carbon sequestration and impacts of climate change
Cultural	Recreational experiences Education and research
Supporting	Sustaining biodiversity, intact ecosystems, and connectivity for global ecological processes

In this section of the assessment, key ecosystem services are organized by category and the supporting evidence for each is summarized. The list will be finalized during the revision phase and may be changed with the receipt of new information. A number of support services associated with ecosystem conditions or processes are considered in greater detail as part of other resource or program sections in this assessment. As such, reference is made, where appropriate, to other sections rather than create duplicative text or redundant service descriptions.

Provisioning Services

Water quantity and quality

Description and geographic scale

Water quality and quantity is important to all living things. As such, the Chugach National Forest plays a critical role in protecting the water resources not only for the people and animals that live within and downstream from the national forest but for those who recreate on or depend on National Forest System lands for their livelihood. The influence of the quantity and quality of water resources is far reaching.

Conditions and trends, drivers, and ecosystem characteristics

The Aquatic Ecosystems–Watersheds section in chapter 2 describes conditions and trends, system drivers and stressors, and ecosystem characteristics for water quality and quantity. These discussions will not be repeated here.

Influence beyond Forest Service authority

The management of water necessitates an interagency approach. The Chugach National Forest provides an example where water links the terrestrial environments from high elevation glaciers through wetland ecosystems to the ocean. In cases where watersheds cross jurisdictional boundaries, adjacent land owners, such as Native Corporations, and local, state, and Federal agencies must work together to manage the quality and quantity of water in the planning area and affected landscapes.

Animals and plants as food and resources*Description and geographic scale*

Alaskans and people from around the world use, and in many cases, depend on the fish, wildlife, and plants produced by the Alaskan natural environment (Newton & Moss, 2009). Collection, utilization, and transfer of wild foods are interwoven into the culture of Alaska (Brown & Burch Jr., 1992). Subsistence has been a way of life among Native and rural populations. Fish, wildlife, and plants of the Chugach National Forest provide an essential food source to thousands of people within and outside Alaska. Traditional native proteins in Alaska (i.e., deer, caribou, moose, and fish) are more nutritious to consumers in terms of dense protein, iron, Vitamin B12, polyunsaturated fats, monounsaturated fats and omega-3 fatty acids than equivalent store bought food (Johnson, Nobmann, Asay, & Lanier, 2009). In addition, they are low in saturated fat, added sugar, and salt.

Berries and greens are high in water and macronutrients and have fewer empty calories than processed foods. The act of hunting, fishing and gathering of native foods is energy intensive and further contributes to the health of the participant. The act of hunting, trapping, fishing, and gathering and processing the meat, fur, fish, or berries is socially and culturally important to many Alaskans (Johnson, Nobmann, Asay, & Lanier, 2009). Alaska Natives have collected plants and mushrooms for thousands of years. Objects created by contemporary artists include basketry, beadwork, fur clothing and art, carvings in wood, bone or antlers, artworks created from locally harvested materials, such as porcupine quills and salmon skin, are economically important (Newton & Moss, 2009). Plant fruits and berries, nuts, flowers, leaves, stems, and roots, as well as mushrooms and seaweed are used for food, dye, and art objects. Located within the most developed area of Alaska, the wildland products of the Chugach are easily accessible to residents and visitors and are often incorporated into commercial products.

The culture and tradition of hunting, trapping, gathering, and fishing has complex social and economic implications for forest management. For instance, management of salmon habitat and watershed resources directly links to people's livelihood and survival if the community depends on the harvest of salmon from local waters. Trapping constitutes significant portions of time for participants, who are motivated not only by the collection of furs but also by the wildland experience. Hunting for food or trophies is an inherent social activity in Alaska and throughout the world by those that hunt, driven as much by the experience as by the trophy or meat harvested.

Conditions and trends, drivers, and ecosystem characteristics

The Aquatic Ecosystems–Fish and Terrestrial Ecosystems sections in chapter 2 and the Fish, Wildlife, Plants, and Subsistence sections in chapter 3 provide in depth details about the conditions and trends and system drivers and stressors affecting animals and plants as food resources.

The ecosystem characteristics that maintain animals and plants are described throughout the ecosystem section of this assessment (chapter 2). All elements of ecosystems within the planning area must be considered, including terrestrial and aquatic habitat and the riparian and wetland systems that link them.

These discussions will not be repeated here.

Influence beyond Forest Service authority

The influence of other authorities and administrators of lands of other ownership is significant in managing for the provision of animals and plants as resources utilized by people. Hunting and fishing is mostly regulated by the state of Alaska, unless superseded by the Federal Subsistence Board. Subsistence and personal use of plants and mushrooms does not require a permit, but commercial harvest of special forest products does. To prevent overharvesting within high-use areas and specific watersheds, permits issued for the Kenai Peninsula geographic area are limited (USDA, 2002a).

Because personal (non-commercial) gathering of plants, berries, and mushrooms does not require a permit, little data are available on where people harvest and to what extent. Monitoring plots have been established near Girdwood to address concern over the potential overharvest of fern fiddleheads.

Wood as a renewable energy and fuel source

Description and scale

There is an increased demand for firewood from the national forest. There is increasing competition for firewood, and access is often a challenge. Firewood is very important to local communities within and adjacent to the Chugach National Forest.

Conditions and trends

The assessment of timber resources, including current condition and current harvest and production trends, are addressed in the Timber section. Similarly, biomass conditions and trends are discussed in the Carbon Stocks section.

Drivers

High fuel costs drive demand for fuelwood, in addition to the lifestyle common in Alaska. Access and availability have also become an issue. With inventoried roadless areas making up 99 percent of the Chugach National Forest, the ability to provide access to fuelwood that is more than one-quarter mile from a road is limited.

Ecosystem characteristics

General characteristics of forest vegetation of the Chugach National Forest are summarized in the Terrestrial Ecosystems and Timber sections of this assessment.

Influence beyond Forest Service authority

The influence of non-National Forest System lands is significant in the provisioning of fuelwood. On the Copper River Delta, the Cordova Ranger District coordinates with state agencies, DOT, and the City of Cordova to provide fuelwood to residents. It may be necessary to apply this partnership model in other areas as easily accessible fuelwood becomes uncommon.

Regulating Services

Carbon sequestration and impacts of climate change

Description and geographic scale

Carbon dioxide (CO₂) plays a critical role in climate change. Accounting for carbon sequestration, storage, and flux in forests is becoming a topic of increasing interest for forest land owners.

Conditions and trends, drivers, and ecosystem characteristics

The Carbon Stocks and Climate Change sections in chapter 2 provide details about the conditions and trends and system drivers and stressors affecting carbon sequestration.

The Carbon Stocks section of chapter 2 provides in depth details about ecosystem characteristics.

These discussions will not be repeated here.

Influence beyond Forest Service authority

Carbon sequestration and its climate change implications are difficult to address in national forest planning efforts and to some extent is beyond the control of the Forest Service. Continuing to study projected impacts and then taking into account changes in carbon stocks and impacts of global climate change to adapt planning efforts will be important.

Supporting Services**Sustaining biodiversity, intact ecosystems, and connectivity for global ecological processes***Description and geographic scale*

Biodiversity can be considered the underpinning of an ecosystem service's condition and function. As stated by Mace et al. (2005), "Direct benefits such as food crops, clean water, clean air, and aesthetic pleasures all depend on biodiversity, as does the persistence, stability, and productivity of natural systems." Biodiversity can also be valued for its intrinsic worth, or existence value, and may provide potential future benefits that are yet unknown or unrecognized (Tilman, 1997). Loss of biodiversity impacts well-being unevenly across communities, affecting those who depend most on natural resources, such as those that practice subsistence and the rural poor (Diaz, Fargione, Chaplin III, & Tilman, 2006).

Conditions and trends

Details on the conditions and trends of wildlife, fish, and plants can be found in the Aquatic Ecosystems—Watersheds, Aquatic Ecosystems—Fish, Riparian Areas and Wetlands, and Terrestrial Ecosystem sections.

The Chugach National Forest is relatively new in a geological sense, and the patterns of biodiversity are still developing. A majority of these changes would be expected based on evaluation of the trajectory of the systems as they develop following the last glacial maximum. Successional change occurs as vegetation grows taller and understory vegetation is shaded out by taller trees or shrubs. Natural disturbances, such as flooding, windfall, herbivory, disease pockets, and fire, influence the trajectory of vegetation and habitat. Human management, such as thinning to improve moose browse or selective harvest to improve nesting habitat for marbled murrelets or harlequins, can also alter natural succession.

Climate change is influencing the entire planning area as noted in the various sections of this report; however, the consequences of human-induced climate change are poorly understood for this region (a vulnerability assessment will soon provide more insight). Key ecosystem characteristics of terrestrial vegetation and wildlife are functioning in a way that continues to contribute strongly to ecosystem integrity and sustainability within the plan area.

Drivers

The many ecosystem drivers that influence the biodiversity in the Chugach National Forest are discussed in chapter 2 in the following sections: Aquatic Ecosystems—Watersheds, Drivers and Stressors, Aquatic

Ecosystems—Fish, Riparian Areas and Wetlands, and Terrestrial Ecosystem sections. Drivers of biodiversity within the Chugach National Forest are related to the geographic locale at the interface of marine and terrestrial systems and at the transition from coastal rainforest to boreal forest; varied topography; varied disturbance processes (both at broad and fine scales); and available sources of biota.

Ecosystem characteristics

Ecosystem characteristics that support biodiversity within the Chugach National Forest are described in the Aquatic Ecosystems—Watersheds, Aquatic Ecosystems—Fish, Riparian Areas and Wetlands, and Terrestrial Ecosystem sections of chapter 2.

Influence beyond Forest Service authority

Managing for biodiversity, habitat, and intact ecological processes necessitates an all-lands approach and coordination with other agencies, land owners, and industry. Many of the initiatives the Chugach National Forest is currently involved in require collaboration and coordination with others.

Recreational experiences

Description and geographic scale

Outdoor recreation is an essential part of the culture and economy of Alaska. Alaska's glaciers, mountains, lakes, fish and wildlife, peat bogs, muskegs, spruce/birch forests, intact landscapes, and river systems have a unique mystique to residents, tourists, and people around the world. The lives of Alaskans are intimately interwoven with their natural surroundings. Wildlife, fish, plants, and the recreational opportunities in Alaska are reflected in the lifestyles, businesses, food, art, film, drama, dances, books, advertising, and other products throughout the state and abroad. Local residents as well as non-local or non-Alaskan visitors engage in all types of recreational activities during all seasons within the Chugach National Forest.

Conditions and trends

For information about the conditions and trends of recreational opportunities, activities, and provisions within the Chugach National Forest, see the Recreation and Scenic Character section of this assessment. This information will not be repeated here. Tourism sector businesses, including outfitters and guides, benefit from spending by visitors. Additionally, the Social, Cultural, and Economic Conditions section of this assessment includes a detailed discussion of jobs and income supported by visitors to the Chugach National Forest.

Drivers

There are a number of drivers potentially affecting recreation on the Chugach National Forest. These are described in detail in the Recreation and Scenic Character section.

Ecosystem characteristics

See the Recreation and Scenic Character section in this chapter, as well as other sections within chapter 2 for details about threats to ecosystem components and conditions that could affect the resilience of recreational services.

Influence beyond Forest Service authority

Nearly 25 percent of the lands within the boundary of the Chugach National Forest are owned by other individuals or entities. Ownership of nearly 12,000 acres of land within the Chugach National Forest boundary has changed since 2002, due in part to conveyances authorized by the Alaska Statehood Act and

the Alaska Native Claims Settlement Act. These conveyances can impact public access to recreation opportunities, but can also create new opportunities where the lands are managed or developed for recreation purposes.

For more information on recreation opportunities occurring on non-National Forest System lands, please see the Recreation and Scenic Character section of this assessment.

Education and research

Description and geographic scale

Local communities and schools, students, youth crews, and local and non-local visitors all derive cultural, social, and historical benefits from the many opportunities to engage with natural, cultural, and historical resources of the Chugach National Forest through the educational and interpretive programs. Local populations and communities are strengthened by cultural and historical awareness. Non-local visitors transfer and apply their experiences and awareness to their home communities in other areas of the Nation, thereby extending the public benefits beyond the region.

The benefits of education and research include connecting people with nature and culture, increasing place-based-awareness, expanding opportunities for community members to interact in natural settings, spiritual opportunities and experience, increasing and improving the body of scientific knowledge about ecosystem processes, fish and wildlife populations, and social and cultural resources, and reinforcing long-standing traditions and knowledge of resources, including Alaskan Native culture and traditions. Experience with National Forest System lands and resources can be an inspiration for art, literature, and music. Education and outreach efforts clarify the link between underlying supporting services and the more direct human benefits of the national forest that are reflected more commonly in provisioning and cultural services (Asah, Blahna, & Ryan, 2012).

Conditions and trends

The capacity for visitors to benefit from educational and interpretive opportunities, as well as community events and festivals remains good and may be increasing in some cases. In addition to natural environmental and cultural amenities, landscapes, and resources, the Chugach National Forest provides educational programs, visitor centers and information sites, interpretive trails, children's programs, assistance (as partners) with organizing and facilitating community events and festivals, and maintenance/protection of historical and cultural sites.

In May 2013, the Forest Service and the University of Alaska Anchorage co-hosted Classrooms for Climate: A Symposium on the Changing Chugach, Northern Ecosystems, and the Implications for Science and Society. More than 250 participants gathered, bringing together partners in climate inquiry, education, and management. One project that developed from the symposium engages stakeholder communities in a dialogue on their perspectives on the roles and contributions the Chugach National Forest offers in terms of economic, social, and cultural services. The second project evaluates ecosystem services most at risk to changes predicted in the region's climate, relative to the key economic sectors and socio-cultural systems.

The Pacific Northwest Research Station, in collaboration with Loyola, Michigan State, Notre Dame, and Oregon State universities, was recently awarded a two-year National Fish and Wildlife Federation Grant to investigate the effects of climate change on the Copper River Delta. Several other long-term research studies of national and international importance are taking place within the Chugach National Forest, including dusky Canada goose studies for the Copper River Delta and glaciology research at Columbia and Wolverine Glaciers in Prince William Sound. Research station temperature studies are collecting consistent data across the three geographic areas of the Chugach National Forest (Kenai Peninsula, Prince

William Sound, and Copper River Delta); last year temperature sites were expanded to the Yakutat Forelands on the Tongass National Forest. The intent is to also establish temperature sites on the Stikine River Flats. Once all three areas (Copper River Delta, Yakutat Forelands, Stikine River Flats) have temperature sites installed, it will allow for the comparison of habitat conditions and effects of climate change across all three of Alaska's Key Coastal Wetlands. Five RNAs totaling 21,500 acres have been designated within the Chugach National Forest, providing non-manipulative research and monitoring opportunities in a variety of areas (see the Designated Areas section).

Research permits, youth programs, and community events have all either been sustained or are increasing in the plan area.

More detailed information on opportunities for connecting people and nature can be found in the Recreation and Scenic Quality section of this assessment. In addition, information on research natural areas and climate change can be found in the Designated Areas and Climate Change sections of this assessment, respectively.

Drivers

Risks or drivers include concerns about fluctuations in the Chugach National Forest budget that could affect support for programs and events along with changes in demographics (people moving out of the area) and a corresponding decrease or loss in awareness about traditional culture and knowledge. Shifts in education and classroom instruction have been observed.

Ecosystem characteristics

Like recreation opportunities, education and research benefits are supported by the diversity of natural and culture resources within Chugach National Forest. The proximity of Portage Valley to Anchorage makes it a destination for elementary and university students alike to learn more about the natural world. The importance of the Copper River Delta for millions of migratory birds makes it a perfect setting to research and learn about the importance of wetlands to many different species. Climate change and other processes may alter these ecosystems, which may lead to new research opportunities.

National forest management can impact delivery of education and research services through its interpretation and conservation education programs as well as its special use permit process. Both of these programs have evolved over the past decade. The Forest Service has been working with partners to expand educational opportunities through the hands of others and continues to be responsive to research requests.

Influence beyond Forest Service authority

Local businesses and communities also provide support or contribute education and research services.

Subsistence

Subsistence hunting and fishing is both a livelihood and a way of life for many rural residents of Alaska and is protected by the 1980 Alaska National Interest Lands Conservation Act (ANILCA). ANILCA Section 803 defines subsistence uses 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...” (e.g., harvest of fish, wildlife, berries, firewood, logs, plant materials, etc.). Federal jurisdiction for subsistence hunting and fishing extends to 60 percent of the state’s land base, including the Chugach National Forest and the Tongass National Forest in southeast Alaska.

The Alaska Region Subsistence Program represents a unique Forest Service role in wildlife and fisheries management. Normally, the Forest Service role is confined to habitat management, with the State focusing on population management. In Alaska, the Forest Service has a role and workload in developing harvest regulations for subsistence wildlife and fish on Federal lands and waters within the State of Alaska and in enforcing subsistence regulations on National Forest System lands.

Relevant Information

- Subsistence management is a Forest Service program unique to the Alaska Region and is an important part of the Forest Service mission within the region.

Importance of Subsistence

Although not generally thought of in economic terms, subsistence resources play an integral role in the lives of many Alaskans when the replacement value of harvested resources is considered. These resources are also bartered and traded for goods, such as gasoline and boats that are needed to harvest these resources. Additionally, Federal regulations allow limited amounts of harvested resources to be sold.

Wild renewable resources play an important role in ceremonies and long-standing social and religious traditions of Alaska Natives, as well as in the sustenance of rural Alaska residents. Human survival, the economy, and the means of establishing prestige and of maintaining peace have all involved the consumption, transfer, and exchange of fish and game and of products made thereof, since time immemorial (Brown & Burch Jr., 1992).

Hunting and fishing are important activities for Alaska Natives as well as non-natives. Surveys suggest that the continued existence of wildlife and fish and the opportunity to hunt and fish are indispensable to the maintenance of what might be called the pioneer Alaskan lifestyle, particularly in rural communities (Brown & Burch Jr., 1992).

The Chugach National Forest plays several important roles in implementing ANILCA Title VIII Section 804 that mandates “the taking on public lands of fish and wildlife for non-wasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes.”

The Federal Subsistence Board has determined that for purposes of the Federal Subsistence Program, the only non-rural community within the boundary of the Chugach National Forest is Moose Pass. Therefore, the rural communities on the Chugach National Forest are Cooper Landing, Hope, Whittier, Chenega Bay, Tatitlek, and Cordova. Households in these communities harvest an average of 550 pounds of edible wild renewable resources per year (ADF&G, 2013c), an average of 203 pounds per capita. When compared to the 264 pound average per capita purchase of meat in the United States (FAO, 2013), this indicates a high dependence on natural resources for food by people in these communities.

Alaska National Interest Lands Conservation Act Guidance

Harvest of subsistence resources in compliance with ADF&G sport, personal use, and subsistence regulations plays an important role in the lives of both rural and non-rural Alaska residents. Alaskans living in non-rural communities within the boundary of or near the Chugach National Forest also harvest significant amounts fish and wildlife under state sport or personnel regulations. The populations of Valdez, Seward, Moose Pass, Kenai, Soldotna, Girdwood, and Anchorage fall into this category.

Virtually all of the Chugach National Forest is open to the harvest of subsistence resources except for small areas that are restricted due to safety concerns, such as active mines or developed recreation sites. Additionally, a portion of the Power Creek drainage north of Cordova is closed to motor vehicles, including subsistence activities. The Power Creek area has a low capacity for motor vehicle use for subsistence due to safety and environmental concerns and a determination was made that the closure would not significantly restrict subsistence uses.

Section 810 requires that the effects of land use decisions on subsistence uses will be evaluated. Any projects proposed to take place in the Chugach National Forest are analyzed in terms of their impacts to subsistence uses and resources. Analyses of Chugach National Forest projects related to Section 810 of ANILCA have ensured that no significant impacts to subsistence uses and resources have occurred. In addition, all special use permit applications are evaluated for the potential to impact subsistence uses and resources. Special use permits are frequently modified to mitigate their potential impacts to fish or wildlife resources important to subsistence users on National Forest System lands.

Section 811 of ANILCA states that “rural residents engaged in subsistence uses shall have reasonable access to subsistence resources on the public lands.” This means that most areas in the Chugach National Forest that are closed to motor vehicles remain open to motor vehicle use by rural residents engaged in subsistence activities.

Although lands are open to motor vehicle use for subsistence purposes, it does not mean that vehicle use cannot be restricted due to safety concerns or resource damage. For example, much of the Copper River Delta is accessed by airboats by Cordova residents hunting moose. Airboats are able to traverse wetlands without damaging vegetation whereas wheeled motor vehicles leave long-lasting trenches on these same habitats. For this reason, the use of wheeled motor vehicles on much of the west Copper River Delta has been discouraged.

Wild Renewable Resources

Wild renewable resources used by rural residents for subsistence are varied and include animals, plants, timber, and other special forest products, such as fungi and berries. The most important single resource used for food by rural communities within the Chugach National Forest is salmon. Households in these communities harvest an average of 230 pounds of salmon per year (ADF&G 2013f). Other fish species, both fresh and salt water, mammals, birds, and marine invertebrates (e.g., crabs, clams, and shrimp) are also among the important subsistence resources used as food. Berries constitute an important food resource with households in Chugach National Forest rural communities harvesting at least nine pounds per year (ADF&G, 2013c). With high energy costs in Alaska, for rural communities the most important non-food wild renewable resource is fuelwood.

The Forest Service monitors fish and wildlife with partners to help ensure conservation of populations and subsistence use opportunity. Since 1999, the Forest Service has annually cooperated with ADF&G on Sitka black-tailed deer pellet counts, mountain goat and moose surveys. From 2000 to 2010, the Forest Service funded the Native Village of Eyak to help assess salmon run size in the Copper River. Due to a reduction in appropriations, the Department of the Interior now funds this effort. Knowledge of

community uses and needs also contribute to the subsistence management structure. The Forest Service funded projects examining traditional ecological knowledge about the use of black bears and mountain goats in Prince William Sound in 2006 and a study of household subsistence harvest areas in Prince William Sound as part of the Prince William Sound Framework in 2009 (Poe, Gimblett, & Burcham, 2010; Simeone, 2008).

Fish

All Chugach National Forest rural communities reported harvesting fish, with salmon ranking as the most important group of species. Within the Chugach National Forest, much of the harvest of fish for food takes place under various sets of State and Federal regulations. In fresh water, salmon, trout, and char are harvested in accordance with both State sport regulations (all Alaska residents) and Federal subsistence fishing regulations (only rural residents with a customary and traditional use determination). The two most important Federal subsistence fisheries that take place in the Chugach National Forest are the dip net fishery at the Russian River Falls and a freshwater fishery on the Copper River Delta. In 2012, 120 residents of Hope and Cooper Landing harvested 1,339 sockeye salmon on the Russian River fishery. The number of Cordova residents participating in the Federal subsistence salmon fishery in fresh water streams on the Copper River Delta has doubled in recent years to more than 60 permits issued annually. The harvest from this fishery has recently exceeded 500 coho and sockeye salmon.

Currently, fish populations are at levels that fully support available subsistence fisheries. Salmon runs at weirs located on the Copper River Delta, Kenai Peninsula, and Prince William Sound (ADF&G, 2013c) indicate most fish populations, with the exception of chinook salmon in the Kenai River, are within their natural range of variation and harvestable surpluses are more than needed to sustain subsistence fisheries.

Wildlife

Rural communities within the Chugach National Forest reported harvesting large mammals for food but the species of importance varied with locality. All but one community (Tatitlek) reported harvesting moose, with an average of 60 pounds (27.2 kilograms) harvested per household annually (ADF&G, 2013c). Deer were similarly important to the Prince William Sound communities of Cordova, Tatitlek, Chenega Bay, and Whittier, where harvest averaged 58 pounds (26.3 kilograms) per household annually (ADF&G, 2013c). To a lesser degree than deer or moose, caribou are harvested by rural residents of the Kenai Peninsula, and mountain goats are harvested by residents of the Kenai Peninsula and Prince William Sound. Some, but not all of this harvest occurs under Federal subsistence regulations.

Moose rank as one of the most important subsistence foods throughout Alaska, including within the communities near the Chugach National Forest. Moose can be harvested by all State residents under State harvest regulations and by rural residents under Federal subsistence harvest regulations. As of 2014, the communities of Hope, Cooper Landing, Chenega Bay, and Tatitlek have a Federal customary and traditional (CT) use determination for moose in all of Unit 7 (ADF&G refers to these same geographic units as Game Management Units or GMUs) on the Kenai Peninsula. Cordova has a CT use determination for moose in Unit 6C on the Copper River Delta (36 CFR 242.24 and 36 CFR 242.26). The population status of moose in these areas varies considerably.

On the Kenai Peninsula, the Unit 7 moose population increased rapidly during the 1960s after wildland fires in adjacent Unit 15A created large areas of early succession vegetation. Wolf numbers were simultaneously reduced to low levels as a result of predator control efforts. A rapid moose population decline followed in the early 1970s after three severe winters in four years. The moose population has fluctuated at low levels since then as predator populations have stabilized and habitat succession has progressed into later seral stages (Del Frate, 2002). The Unit 7 moose population is considered stable at low densities and is expected to remain at these levels unless significant habitat alteration occurs

(McDonough, Unit 7 Moose Management Report, 2010). As a result, residents of Cooper Landing and Hope, who have had CT use determinations for Unit 7 moose since 2008 and 2010, respectively, have harvested zero to two moose annually under Federal subsistence regulations.

Similarly, in Prince William Sound, the moose population in Kings Bay, a disjointed segment of the Unit 7 moose population, has not been capable of sustaining subsistence needs for the two communities, Tatitlek and Chenega Bay, which have CT use determinations for moose and would be permitted to hunt moose if populations were sufficient (36 CFR 242.26(n)(7)). The amount of moose habitat in the Kings Bay area is very small and consists of narrow riparian areas along the Kings River and Nellie Juan River. Productivity and viability of this small population of moose is marginal. Moose surveys in 1997, 2001, and 2005 counted 20, 9, and 5 moose, respectively (Spraker, 2001; OSM, 2005). As a result of these low numbers, the Federal Subsistence Board kept the moose season closed for conservation concerns as recently as 2012. Due to low moose densities, abundant forested habitats that make surveys difficult, and budgetary constraints, very little moose monitoring has been conducted by ADF&G in Unit 7. Additional survey efforts could improve the management of the small moose population in Kings Bay and help identify management opportunities.

Habitat conditions are currently good for moose on the Copper River Delta. The 1964 earthquake uplifted the tidal wetland and initiated plant succession, which has led to abundant browse for moose. In the western Copper River Delta (Unit 6C), all of the allowable antlerless moose harvest and 75 percent of the bull moose harvest takes place under Federal subsistence regulations. The remainder of the bull moose harvest in Units 6C and the harvest of moose in Units 6A and 6B takes place in compliance with State harvest regulations. The Federal subsistence harvest in Unit 6C is extremely popular among the qualifying Cordova residents with as many as 900 applications submitted annually for the random drawing. The number of permits issued has varied from 26 to 105 between 2007 and 2011, and harvest success is almost 100 percent. Habitat models have predicted a decline in willow browse for moose in the future and the Cordova Ranger District has begun a program to mechanically treat patches of alder and spruce to favor early successional browse species, such as willow.

Sitka black-tailed deer are an important resource to the communities of Prince William Sound. Although residents of Prince William Sound have a positive CT use determination for deer in Unit 6, most harvest has taken place under State regulation. Deer populations remained relatively stable during the last decade until the winter of 2011-12. Near record snows across Prince William Sound reduced the deer population by 50 to 70 percent. As a result, the State season for deer and the Federal season for does closed 3 weeks early in 2012. Deer, especially at the northern end of their range, depend on old growth timber as winter habitat. Most of the deer winter habitat on the islands of Prince William Sound is in good condition with the exception of areas where logging has occurred on private lands on southern Montague Island.

A variety of other species are important to subsistence users in the Chugach National Forest for both food and other values. Caribou, mountain goats, and a variety of small game animals are used as food. Marine invertebrates, such as clams, crabs, and shrimp, are also important foods for many households. The furs and other parts of many species are also important for the making of clothing and handicrafts. Populations of these species are generally considered stable and are managed for sustainable yields.

Plants

Plants are used in a variety of ways by rural and non-rural residents of Alaska. While not the primary source for heating in southcentral Alaska, fuelwood is important to many residents, especially those in areas with high heating fuel costs, such as many of the rural communities within and near the Chugach National Forest (Nicholls, Brackley, & Barber, 2010). Currently, opportunities to harvest fuelwood are available on National Forest System lands and other ownerships on the Kenai Peninsula and on State

lands on the Copper River Delta. As mentioned in the Plants resource management section, berries are another plant material heavily used by all rural communities of the Chugach National Forest. They are abundant in the Chugach National Forest but subject to natural variations in production.

Future of Subsistence Uses

Wild, renewable resources produced within the Chugach National Forest will likely remain an indispensable part of the livelihood and lifestyles of both rural and non-rural Alaska residents. The Chugach National Forest will remain integral to providing the opportunity and resources to pursue Federal subsistence and state sport and personal use activities. Changes in use patterns and levels of use, however, will likely occur. Surveys of Prince William Sound households conducted as part of the Chugach National Forest's Prince William Sound Framework (Poe, Gimblett, & Burcham, 2010) identified areas important to subsistence harvest, trends in use of these areas, and reasons for changes in use patterns. These surveys measured the household use of 24 wild resources, and found that households reported they intended to harvest only 6 of these resources at similar levels in the future. Reasons for decreased use of resources included lifestyle changes, lingering effects of the Exxon Valdez oil spill, general changes in resource availability, and competition with others, including recreational users (Poe, Gimblett, & Burcham, 2010). Competition from other users likely affects subsistence users on the Kenai Peninsula as well. These and other factors have the potential to modify subsistence use patterns in the Chugach National Forest over time. Consistent with ANILCA, subsistence will remain a priority for the harvest of wild renewable resources across the national forest.

Fish

The use of fish that originate from the Chugach National Forest is largely associated with commercial and sport fisheries for salmon, trout, and char. Subsistence and personal use fisheries also rely on Chugach National Forest raised fish. Not all fishery use is consumptive. For example, 99 percent of the Dolly Varden char caught in the upper Kenai River recreational fishery are released back into the wild and not kept for food (Begich & Pawluk, 2011). Other popular, non-consumptive public uses of Chugach National Forest fish include fish viewing, science education, photography, and climate change monitoring.

Of the 600 to 635 million salmon estimated to occupy the North Pacific Ocean in an average year, 93 to 100 million of them return to southcentral Alaska waters (Rodgers D. E., 2001; Ruggerone, Peterman, Dorner, & Myers, 2010). Since the Chugach National Forest is the primary salmon production area in southcentral Alaska, this means that up to one-seventh of the salmon in the Pacific Ocean begin life within the Chugach National Forest.

Relevant Information

- Up to one-seventh of the salmon in the Pacific Ocean originate from Chugach National Forest watersheds.
- In Alaska, the largest freshwater fisheries for Chinook salmon, Coho salmon, sockeye salmon, and rainbow trout all occur in Chugach National Forest watersheds.
- More than 70 percent of the estimated 2.5 million days spent by anglers in Alaska occurred in southcentral Alaska, on the Chugach National Forest.
- The annual economic impact of salmon produced within the national forest in commercial fisheries is approximately 232 million dollars per year. This generates an estimated 3,141 jobs. The economic impact of recreational fisheries is more difficult to assess, but it is substantial considering it is estimated to support 1,062 jobs (see discussion in the Social and Economic Conditions section of this chapter).

Species Commonly Enjoyed and Used by the Public

In terms of numbers, economic value, cultural significance, and ecological importance, the five species of Pacific salmon that occur within the Chugach National Forest are the primary resource (see table 66). The Chugach National Forest provides the freshwater habitat for these fish, without which they could not exist. In addition to salmon, several other anadromous species rely on National Forest System lands, including steelhead trout, sea-run cutthroat trout, sea-run Dolly Varden char, and eulachon. Resident fishes are also a key part of the Chugach National Forest. The most commonly used by humans are Dolly Varden char, rainbow trout, and cutthroat trout.

Table 66. Common name, scientific name, and general distribution of fish produced within the Chugach National Forest having high public use and commercial value

Common Name	Scientific Name	Distribution
Chinook (king) salmon	<i>Oncorhynchus tshawytscha</i>	Throughout the national forest
Coho (silver) salmon	<i>Oncorhynchus kisutch</i>	Throughout the national forest
Sockeye (red) salmon	<i>Oncorhynchus nerka</i>	Throughout the national forest
Chum (dog) salmon	<i>Oncorhynchus keta</i>	Throughout the national forest
Pink (humpy) salmon	<i>Oncorhynchus gorbuscha</i>	Throughout the national forest
Steelhead trout	<i>Oncorhynchus mykiss</i>	Copper River Delta and perhaps the Kenai Peninsula
Cutthroat trout	<i>Oncorhynchus clarki</i>	Prince William Sound and Copper River Delta
Rainbow trout	<i>Oncorhynchus mykiss</i>	Kenai Peninsula and Copper River Delta
Dolly Varden char	<i>Salvelinus malma</i>	Throughout the national forest
Eulachon (hooligan)	<i>Thaleichthys pacificus</i>	Twentymile River (Kenai Peninsula) and Copper River Delta

Conditions and Trends

The information presented here on the relative condition and trends of selected fish is also discussed in the Aquatic Ecosystems—Fish section of chapter 2. However, the focus of chapter 2 is ecosystems, which makes for a different presentation than the summary provided here. In this section, the focus is the condition and trend of single fish species for each of the three geographic areas.

Copper River Delta

Pink and chum salmon are not common in the Copper River Delta geographic area. The primary species are coho salmon and sockeye salmon. The trend for freshwater catch of coho salmon in this area is upward, while comparable information for sockeye salmon does not show any trend. Information on the other species is limited; however as reported in chapter 2, the trend for Chinook salmon appears downward, while no trend was evident for Dolly Varden char. Catch data for cutthroat trout (Hochhalter et al. 2011) also show a range of variation but no clear indication of a trend.

Kenai Peninsula

Fish produced within the Kenai River watershed dominate fisheries in the Kenai Peninsula. The largest freshwater fisheries in Alaska for Chinook salmon, sockeye salmon, coho salmon, and rainbow trout all occur within the Kenai River watershed (Begich & Pawluk, 2011). It is notable these fisheries are sustained entirely without supplementation from hatchery produced fish. The trends for these species range from noticeably downward for Chinook salmon to upward for other primary species. The increasing trend in catch of rainbow trout and Dolly Varden char has been particularly dramatic. A more detailed discussion of the trends and condition of these species and associated ecosystem is provided in the Aquatic Ecosystem—Fish section in chapter 2.

Sockeye salmon produced from the Kenai River watershed are the most important salmon species in this area for commercial fisheries. The estimated harvest of sockeye in commercial fisheries has ranged from 1.7 million to 13.6 million fish (Shields & Dupuis, 2012).

The singular eulachon fishery on the Kenai Peninsula is located in the Twentymile River and the nearby upper Turnagain Arm. The harvest from 1995 to 2004 averaged 34,460 fish (Bosch, 2010). Harvest

decreased to 9,000 fish in 2005. Harvest has been increasing in recent years with approximately 29,000 fish harvested in 2009. The spawning levels of this species are not monitored, and the biology of the species is not well understood. Eulachon are an important food source of the beluga whale, which is currently listed in compliance with the Endangered Species Act (Hobbs, Shelden, Rugh, & Norman, 2008).

Prince William Sound

Pink and chum salmon are the primary species of importance in Prince William Sound. As described in chapter 2, the wild pink salmon population has averaged around 10 million fish since 1960, and the chum salmon population has averaged 1 million fish since 1970. There is no indication that either species is increasing or decreasing. However, a large hatchery program for both species was established in the early 1990s. Hatchery fish from these programs now dominate the catch of salmon in Prince William Sound. Commercial fishery catches have ranged up to 71.7 million fish during the last 20 years (Botz, Sheridan, Weise, Scannell, Brenner, & Moffitt, 2013). Not all hatchery fish are caught or return to hatchery facilities. Stray hatchery fish on spawning grounds also used by wild fish may pose a risk to the continued sustainability of the wild salmon production in certain areas of Prince William Sound.

Only partial information is available for the other primary fish species in this region. As reported in chapter 2, limited information indicates the trend for Prince William Sound Chinook salmon may be upward, neutral for coho salmon, and downward for sockeye salmon and Dolly Varden char. Based on data presented by Hochhalter et al. (2011), the catch of cutthroat trout in the Prince William Sound appears to be neutral.

Contribution to Social and Economic Sustainability

In Alaska, recreational and commercial fishing plays a central economic and cultural role. For example, Southwick Associates, Inc. et al. (2008) estimated that in 2007, resident and non-resident recreational anglers fished 2.5 million days in Alaska, with 72 percent of those days taking place in southcentral Alaska. Bowker (2001) found that Alaskans devoted more trips per capita with fishing as the primary purpose than any other outdoor activity. In addition to the recreational and commercial importance of fishing, the unique existence of subsistence and personal use fisheries in Alaska is evidence that fish play a fundamental cultural and renewable local food supply role for many that live in this state.

In terms of economic impact, fisheries are an extremely important component to Alaska's economy. The commercial seafood industry has about a 5.8 billion dollar effect on the economy of Alaska (Northern Economics, Inc, 2009). About 25 percent or 1.5 billion dollars of this effect is associated with salmon fishing. The sport fishing industry, which is heavily dependent on salmon, trout, and char, contributes about 1.4 billion dollars to the economy of Alaska (Southwick Associates, Inc, 2008).

In terms of jobs, Southwick Associates et al. (2008) estimates that the Alaskan sport fishing industry contributes 15,879 jobs to the state of Alaska. Of the 78,519 jobs associated with the seafood industry, approximately 25 percent (19,630) are associated with the salmon fisheries (Northern Economics, Inc, 2009).

Converting statewide estimates of use, economic value, and jobs to the portion that is attributable to fish production that occurs or originates within the Chugach National Forest is difficult. From a sport fishery perspective, Southwick and Associates (2008) estimate the total economic output of sport fishing by non-residents for southcentral Alaska was 631 million dollars (supporting 6,365 jobs), demonstrating the economic (and social) significance of sport fishing in the region. Further, assumptions about visitor spending in Southwick and Associates (2008) include expenditures (e.g., boat purchases) that may not be impacted by changes in Chugach National Forest conditions.

The Chugach National Forest is a major production area for salmon, is heavily used by anglers, and therefore accounts for a large percentage (e.g., 50 percent or greater) of total fish pursued by anglers for the southcentral Alaska region. Fish produced within Chugach National Forest watersheds (and corresponding fish populations and catch rates) play a critical role in supporting the economic output and regional employment linked to sport fishing. It is difficult to estimate the percentage of output and employment attributable to the Chugach National Forest because recreational fishing visits and spending are a complex function of many factors. The evidence still demonstrates that Chugach National Forest produced fish account for a substantial portion of economic output and employment associated with sport fishing in the region and the state. See the Social, Economic, and Cultural Conditions section in this chapter for more discussion about economic impacts from recreation.

Estimates for the economic impact of commercial fisheries are based upon ADF&G's annual fishery statistics by region as summarized by R. Medel, Forest Service fish biologist, Tongass National Forest. The average direct value of commercial landings for Prince William Sound fisheries from 1994 to 2012 was 62 million dollars. Although, fish produced within the Chugach National Forest are caught in other fisheries and particularly in Cook Inlet, it is not known what fraction they represent of the total catch. This is not the case with Prince William Sound fisheries, where salmon caught are almost all from Chugach National Forest watersheds. The value of the Prince William Sound commercial fishery was used as a rough approximation for the Chugach National Forest. The direct value of this fishery was expanded to a total economic impact using the ex-vessel value to total economic impact ratio from information presented by Northern Economics, Inc. (2009). They reported a value of 1.55 billion dollars for Alaskan fisheries and a total economic impact of these fisheries of 5.8 billion dollars to the state's economy, a 3.7-fold increase over the ex-vessel value. Based on this ratio, watersheds within the Chugach National Forest produced salmon that contributed to fish harvests and could be valued at 232 million dollars in total output to Alaska's economy. Economic output, as used here, includes direct harvesting and processing impacts, as well as indirect and induced impacts.

Based on information provided by Northern Economics, Inc. (2009), each 73,867 dollars added to the economy could be associated with one job for the industry. Using this relationship, it was estimated that the Chugach National Forest produced salmon help support 3,141 seafood industry-related jobs. This estimation is based on extrapolations from existing state-wide economic impact models, i.e., IMPLAN models derived by Northern Economics, Inc. (2009); estimates may differ and could be higher if models and/or multipliers were derived specific for salmon, the southcentral region of Alaska, and data representing other years of harvest and ex-vessel prices.

Fish habitat and productivity within the Chugach National Forest contributes hundreds of millions of dollars in economic output and thousands of jobs in the commercial and sport fishing industries. Chugach National Forest fish resources play a substantial role to the economic, social, and cultural well-being of Alaska.

Wildlife

Humans use many of the wildlife (and invertebrate) species occurring within the national forest for the meat, eggs, other food, fur, feathers, skins, shells, trophy products, bait, and recreational opportunities they provide. The wildlife species within the national forest have been interwoven into human culture, survival, economic development, and lifestyle since the last ice age. Hunting, trapping, viewing, and subsistence uses remain extremely important to the livelihood of those who live here. Additionally, wildlife species play an important role in local, state, and national economies. In some areas of Alaska, wild game represents nearly all of the non-fish protein consumed by a household. Even in some urban households, moose, caribou, or deer are the primary meat consumed. Titus et al. (2009) noted that in 1991 Alaska ranked highest (93 percent) for the proportion of its population that participated in fish and wildlife related recreation. Selections of the many species that occur within the national forest that are commonly used and valued by people are highlighted in this section.

The following three questions about wildlife resources are addressed:

1. Which species are commonly used by the public for hunting, trapping, and wildlife viewing?
2. What is the status and trend associated with each species used by public for hunting, trapping, and viewing?
3. What is the social and economic importance of these species?

The general status and trend of wildlife species within the national forest, where known, are provided from research and survey information conducted by the USFWS, ADF&G, and others. Skalski et al. (2005) summarize that accurate and precise estimates of wildlife population demographics are crucial to successful conservation and management, but they also highlight the many challenges in gathering this information, including funding (Doak, Gross, & Morris, 2005; Hegel T. M., Cushman, Evans, & Heuttman, 2010; MacKenzie, 2005; Murray & Patterson, 2006; Waits & Paetkau, 2005). Rigorous population estimates of most wildlife species in Alaska are not available.

Alaskan species are described by status in the Wildlife Conservation Strategy (ADF&G, 2006). The strategy focuses on species with the greatest conservation need and includes special status species reports prepared by the Alaskan Natural Heritage Program. It addresses the economic value of game species but also stresses the values of non-game species:

“Nongame species are an integral part of every Alaskan ecosystem and many are important for traditional subsistence purposes: Along with plants, nongame species form the foundation of the food chain that produces Alaskans wealth of harvestable resources.”

The Wildlife Conservation Strategy identified the Kenai Peninsula as one of the few areas in Alaska that is experiencing urbanization and development that affect the connectivity of wildlife habitat. It points out that:

“...we’ve barely scratched the surface in terms of recording the diversity, abundance, distribution, and habitat relationships in the state...for the hundreds of species for which information is unknown, we are unable to provide an accurate assessment of populations or their habitats.”

ADF&G manages game species by game management units (GMUs) divided into smaller hunt units (HUs) also known as subunits. These units are used to manage hunting and report hunting statistics. For the location of the game management units located in whole or in part within the national forest, see the GMU map in the map package appendix. The western portion of HU 6A; most of HUs 6B, 6C, and 6D;

and the north half of GMU 7 are within the national forest. GMU 11 and HUs 13D and 14C overlap a much smaller portion of the national forest. Mountain goats and Dall's sheep are managed by even smaller herd/count units within HUs.

The Federal Subsistence Program also manages wildlife on Federal public lands (see the Subsistence section). The Federal program uses the term unit in place of game management unit since game implies sport use and the Federal program is for subsistence only. In this section, state terminology is used while in the subsistence section, Federal terminology is used, but both represent the same geographic units.

Harvest management is a significant driver of hunted and trapped wildlife management on National Forest System lands. Annual regulations of harvest seasons, bag limits, sex ratios, age classes, and harvest thresholds vary by species and administered harvest area (GMU, HU, or herd unit) such that descriptions of trends for each of these would be too extensive for this Assessment. Further, administered hunt areas do not coincide with the national forest boundary. Using population trends from ADF&G or USFWS data could therefore be misleading.

The following section of this assessment focuses on the aspects related to status and trends most influenced by Forest Service management. Hunter numbers and access were averaged for the major game species (summarized from ADF&G management reports) to provide use and access information not readily captured in the NVUM recreational information.

The latest published ADF&G management report (ADF&G, 2014b) provides data up through 2010 or 2011 depending on specific data type. The reader is encouraged to view the ADF&G Web site and USFWS migratory bird hunting Web sites for the most current information about the hunting/trapping for their species of interest.

The most influential Forest Service management activities affecting wildlife populations, hunting, trends, and behavior involve access, permits for special uses (including outfitter and guides), vegetation manipulation, resource extraction (e.g., wood, special forest products, and minerals), infrastructure development for Forest Service or requested actions, and disturbances associated with these actions or use of the national forest (see chapter 2).

Hunters, trappers, and wildlife watchers contribute to the economics of the area. Locals may buy goods and services, including planes, boats, OHVs, and fuel and many will use hunted animals for food, skins, trophies, or cultural uses. Non-residents will have higher expenses to access an area and may rent equipment in addition to purchasing lodging, food, and fuel. Non-Alaskans are required to use outfitters or guides for hunting some sheep, goats, and brown bear in Alaska. Non-residents often have their game skinned and mounted by local taxidermy businesses and may pay to process and ship meat out of state.

Relevant Information

- Understanding of Kenai Peninsula brown bear and management of that population has changed significantly since development of the 2002 Forest Plan. An interagency study estimated brown bear population size on the Kenai Peninsula using local field data gathered in 2010 resulting in an estimate of 582 individuals (95 percent CI 469-719). Results indicate there may be twice as many brown bear than estimated when the 2002 Forest Plan was published. Brown bear populations may be more secure than assumed when specific management areas were developed to conserve brown bear (e.g., the Brown Bear Core Area Management Area (USDA, 2002a)). However, high hunter harvest in 2013 and 2014 has resulted in renewed uncertainty regarding brown bear status.
- Black bear harvest in GMU 6 currently exceeds ADF&G's harvest objective by 2 to 3 times.
- Introduced, non-native, and feral animals (including mammals, birds, invertebrates, reptiles, amphibians, and mollusks) have the potential to expose native wildlife to diseases and pathogens for

which they have no resistance. Climate change may increase the chance of contact with infected organisms. Warming temperatures can also increase pathogen development and survival rates, disease transmission, and host susceptibility (Harvell, et al., 2002). Preventing contact may be the best defense.

- Domestic goats and sheep and their close relatives can harbor diseases that severely impact Dall's sheep (Schommer & Woolever, 2008) and mountain goats (Patton, Bildfell, Anderson, Cebra, & Valentine, 2012). ADF&G has restricted the use of domestic goats and sheep during hunting season. The Forest Service could implement similar restrictions for all uses to conserve native wildlife by restricting the use of domestic goats, sheep, llamas, and other related animals as pack animals and by not allowing contact between native sheep and goats with their domestic relatives in any habitat.
- The Forest Service could consider implementing preventative measures to limit the potential exposure of specific animals to pathogens, such as the chytrid fungus (which affects amphibians) and white nose syndrome fungus (which affects bats).
- Human use, including hunting, trapping, motor vehicle and non-motorized recreation, and facilities development within and adjacent to the national forest are increasing in many areas, but no analysis has been done to identify thresholds where such increased use will begin to threaten essential wildlife functions for some species.
- Climate change is expected to alter habitat conditions and change the feeding, sheltering, and migratory patterns of some wildlife.
- The national forest retains the full component of wildlife and ecological process that have been relatively uncompromised by species or habitat loss, development, or road construction. The national forest provides a unique landscape in which to study and evaluate natural processes.
- Recreational users have the potential to impact wildlife habitat, behavior, and sustainability. Landscape level evaluations of crucial wildlife habitat and recreational use, special use permits, and commercial permits may better incorporate mitigations to avoid or reduce impacts to wildlife populations and habitat than project scale evaluations.
- Most of the development, vegetation treatments, mining, special use permits, recreational use, trails, roads, and facilities occur on a narrow band of the national forest adjacent to the ocean or on the flatter, more-accessible vegetated portions. These areas are also the most productive and valuable to wildlife.
- Data on wildlife distribution, occurrence, and habitat associations are poorly known in Alaska, with some exceptions. The lack of this information makes it difficult to accurately assess impacts of projects on wildlife and the ecosystem, to assess species that may be declining, or to identify habitat issues that need management actions to meet Forest Service objectives and policy.

Species commonly enjoyed and used by the public

The species displayed in table 67 identify some of the most valuable wildlife resources to residents and non-residents in terms of numbers, economic value, cultural significance, and ecological contribution that can be influenced by Forest Service management decisions. The national forest provides important habitat for big game species, which are hunted for meat and trophy by residents and non-residents, and furbearers, which provide furs and significant recreational and economic contributions to resident trappers.

Watching, studying, and photographing wildlife is one of the biggest draws to users of the national forest. The viewing of big animals, such as brown bear, wolves, moose, Dall's sheep, and mountain goats, are a particular prize for wildlife watchers who visit and live in Alaska. The rare glimpse of a wolverine, lynx, or river otter are particularly prized because these species are less common in the contiguous 48 states. People from around the world enjoy bird watching from tour boats, ferries, cruise ships, and kayaks. At 30 percent, Alaska is one of the top five states in terms of residents participating in birding (USFWS, 2011a). The overriding trend in outdoor recreation indicates nature-based recreation is growing,

particularly viewing and photographing nature (Cordell, 2011). Alaska's Wildlife Conservation Strategy (ADF&G, 2006) also stresses the importance of wildlife viewing to the state. Tourists to Alaska rate viewing wildlife as one of the highest priorities during their visit.

The game and non-game wildlife within the national forest include millions of resident and migratory birds. The national forest provides the primary breeding ground of dusky Canada geese (see At Risk Species—Potential Species of Conservation Concern) and provides thousands of acres of wetlands for nesting waterfowl and shorebirds and a variety of habitats for migratory birds. The national forest also supports waterfowl and upland game birds popular with hunters. One of the most notable contributions from the national forest is the essential migratory bird habitat for millions of western sandpipers, dunlins, and other migratory shorebirds who stop for a few weeks in the Copper River Delta and estuaries of Prince William Sound to double or quadruple their weight during their cross continental migration.

Birds, bees, and other pollinators contribute to the development of flowers and fruits essential to many other species and highly prized by people (see chapter 2). These species are gaining more attention as watchable wildlife. The Forest Service has partnered with international partners to highlight bats, pollinators (National Fish and Wildlife Foundation), and migratory birds (Partners in Flight and many others) for their appreciation as viewable species and also their essential contributions to ecological processes (see chapter 2). Guidebooks are available for native bumblebees, birds of all kinds, and bats. These species are increasing in interest to nature-watchers everywhere, including Alaska. All of these species also contribute to the ecological function of the national forest.

Table 67. Common and scientific names of game species and furbearers that occur within the national forest and have high public use and commercial value

Common Name		Scientific Name
Black bear		<i>Ursus americanus</i>
Brown bear		<i>Ursus arctos</i>
Caribou		<i>Rangifer tarandus</i>
Moose		<i>Alces alces</i>
Mountain goat		<i>Oreamnos americanus</i>
Dall's sheep		<i>Ovis dalli</i>
Sitka black-tailed deer		<i>Odocoileus hemionus sitkensis</i>
Furbearers	Wolf	<i>Canis lupus</i>
	Coyote	<i>Canis latrans</i>
	Wolverine	<i>Gulo gulo</i>
	Lynx	<i>Lynx canadensis</i>
	Marten i.e., sable	<i>Martes Americana</i>
	Mink	<i>Neovison vison</i>
	River Otter	<i>Lutra canadensis</i>
	Beaver	<i>Castor canadensis</i>
	Red Fox	<i>Vulpes vulpes</i>
	Marmot	<i>Marmota spp.</i>
	Weasels	<i>Mustela spp.</i>
	Muskrat	<i>Ondatra zibethicus</i>
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	

Black bear

Black bears are common throughout the forested habitat of the national forest with the exception of Hawkins, Hinchinbrook, Montague, Kayak, and Middleton islands along with other, smaller islands in Prince William Sound. Like brown bears, they have an important cultural link to native people (see Brown bears). Black bears utilize a wide variety of forested habitats, have large home ranges and are a prized specimen for hunting, trophies, and viewing. A good proportion of hunters are non-Alaskans or non-local residents.

Habitat for black bears has not been quantified for the national forest. The forested riparian habitat and succulent vegetation the national forest provides is particularly important to black bears, especially in springtime. Similarly, salmonberry, and other vegetation are essential throughout the summer. Black bears eat vegetation, seeds, and the nearly four dozen types of Alaskan berries, many of which are adapted to sprout after passing through a bird or animal's digestive system. The amount and distribution of blueberries, salmon berries, crow berries and others are partially due to the services of bears. Black bears recycle nutrients, scarify and distribute seeds, and move marine-derived nutrients to terrestrial habitats, fertilizing terrestrial vegetation. Their activities create important microhabitats for other animals and plants. They are important scavengers of dead animals and provide an important component in predator-prey relationships with young ungulates.

Black bear status and trends

There is no rigorous estimate of the black bear population within the national forest or within most ADF&G GMUs. ADF&G estimates population from harvest reports, hunter returns, and population parameters. ADF&G collects data regarding the population status of black bears from sealing certificates, harvest ticket reports, conversations with stakeholders, and opportunistic observations of black bears during other wildlife surveys (Westing, personal communication, 2014). Legally-hunted black bears taken in GMUs 6, 7, and 14 require seals (reports to ADF&G), but those taken in GMUs 11 and 13 do not (ADF&G, 2014a). Hunting over bait is permitted, consistent with ADF&G regulations (ADF&G, 2014a) in all GMUs that occur within the national forest.

Data from reported bear harvest records help ADF&G evaluate if their management objectives are being met. Garshelis and Hristienko (2006) point out the risks of incorrect interpretation of population numbers and trends using harvest data. ADF&G does not report total hunters; only successful legal hunters who have their animals sealed. Information on black bears comes from the most recent published ADF&G Management Report (Harper, 2011) which includes data from 2005 to 2009.

ADF&G black bear management reports (as of July 2014) provide harvest numbers for several years prior to the year of the management report, usually the period from 2005 to 2010. The annual harvest varied by HU and ranged from a low of 5 to 14 bears in HU 6B to 469 to 638 in HU 6D. The annual bear harvest for all of GMU 6 ranged from 569 to 758 bears during that time period (Crowley, 2011a). The annual bear harvest for GMU 7 ranged from 198 to 262 bears (Selinger, 2011a).

The management objective for GMU 6 is to maintain a black bear population that will sustain a 3-year average annual harvest of 200 bears composed of at least 75 percent males with a minimum average skull size of 17 inches (Crowley, 2011a). According to Crowley (2011a), hunting in HU 6D has "increased substantially during the last half of the 1990s as evidenced by anecdotal reports and increased harvest." Harvest also became more widely dispersed, a statistic that Crowley (2011a) attributes in part to increasing number of transporters, fuel-efficient four-stroke engines, and inexpensive GPS units. Bait stations in HU 6D have more than doubled in the last 20 years. The average skull size of black bears in HU 6C and Prince William Sound (HU 6D) has decreased since the 1960s, suggesting an increased harvest of younger bears (Crowley, 2011a). This may be due to improvements in backcountry access

related to the Anton Anderson Memorial Tunnel on the Whittier Road that opened in 2000 and improved boat/snow machine access and technology. ADF&G has increased hunting restrictions in HU 6D, but harvest continued to rise. Reported female harvest climbed until 2007 (Crowley 2011a). A large harvest of females in a low reproductive species (e.g., black bears) may lead to population declines (Schwartz & Franzmann, 1992). Preliminary reports indicate that this trend has continued through 2013 (Westing personal communication, 2014).

Most hunters reported using a plane or boat in GMU 6 or 7 to access their hunting areas. Because of their availability, roads were used more in GMU 7 than 6. OHVs, dogs, and horses were also mentioned as means of access. Access is a factor that is influenced, in part, by Forest Service policy and land use classifications. Out-of-state black bear hunters contract the services of outfitters and guides (see Brown bear). Forest Service policy requires the permitting of commercial outfitters and guides conducting business within the national forest. Outfitters and guides contribute considerable revenues to Alaska's economy. The number of outfitter and guide permits also influences hunting pressure and harvest levels, although the harvest thresholds are set by the Alaska Board of Game (BOG).

ADF&G reports often estimate the unknown and illegal kills, which are thought to approach or exceed 10 percent of the legal harvest. Poaching bears for gall bladders has been a significant issue for all bear species throughout their range, including Alaska (Servheen, 1998). In 2004, seven people were indicted for poaching black bears for their gall bladders on the Kenai Peninsula and in Prince William Sound, the largest bear poaching case in Alaska to that date. The inaccessibility of much of the national forest makes it difficult to accurately quantify the degree of illegal kill of bears or other animals (see Brown bear).

The American black bear is listed as an Appendix II species of the Convention on International Trade in Endangered Species (CITES), not because it is endangered but because its gallbladder cannot be easily distinguished from that of the threatened Asian bear (Garshelis S. L., 2006). CITES Appendix II permits trade if the take is sustainable and legal (see Brown bear).

The Forest Service has partnered with other agencies and communities to reduce the availability of human foods, waste, and other attractants to bears and to reduce problems resulting from food-conditioning and human-habituated bears (see Brown bear).

Brown bear

The national forest is one of a few that supports functional and huntable brown bear populations. Alaska has more than 98 percent of the United States population of brown bears and more than 70 percent of the North American population (ADF&G, 2010). Alaskan brown bears are prized trophy species for resident and non-resident hunters. The United States is the third largest exporter of brown bear trophies to the European Union, only after Canada and Russia (Knapp, 2006), and it is likely most of those trophies came from Alaska, because harvest in the contiguous 48 states is prohibited or highly restricted. Like black bears, they are important in native cultural practices, sought for wildlife viewing, and are one of the more charismatic native wildlife species in art, music, and legend. Alaskan myths abound with stories of bears who behave very much like people, and even bears that can transform into people. Native Alaskan myths portray bears as highly social beings. In stories they are not necessarily savage creatures, even though they are frightening for their great size and strength. The Chugach Alaska Corporation website posts cultural stories, including a historic story: Why brown bears are hostile towards men (CAC, 2014).

Brown bears occur in all three geographic areas of the Chugach National Forest. Brown bears are symbols of functioning ecosystems with a high degree of integrity and are often considered umbrella species because habitat that supports healthy bear populations will also support a diverse set of other species. They eat a protein-rich diet of salmon; ungulates when they can get them, particularly during the spring

when moose and caribou are having their young; ground squirrels and other small mammals; insects; and a large quantity of grass and forbs, roots and berries. They play a role in the dynamics of ungulate populations, the spread and planting of fruiting shrubs and plants, and as a nutrient recycler depositing nutrients from nitrogen-rich salmon throughout terrestrial uplands. In localized areas, their digging can create important microhabitats, and some have considered them ecological engineers on the same vein as beavers in terms of influencing habitat. Their propensity to take young moose calves has contributed to development of predator control programs in some areas outside the national forest; conclusions regarding the effectiveness of predator control on bears to enhance ungulate populations vary (Zager & Beecham, 2006). Brown bears, like all bears, have been instrumental in the study of diabetes and kidney function due to their unique winter estivation period and how they are able to use protein without building up toxic byproducts. Brown bears are poached for gallbladders (see Black bear section), and are also a CITES Appendix II species because gallbladders are a significant reason for endangerment of other bears worldwide and Alaskan brown bear gallbladders cannot be easily differentiated from other protected bear species.

Defense of life and property

Like black bears, brown bears are motivated by the need to intake thousands of calories a day to survive. Also like black bears, they are easily attracted to fish and fish waste, gut piles, berries, human foods, garbage, and odiferous attractants. Even non-food items such as scented lotions, soaps and toothpaste, petroleum products and grease can be attractants. Bears that obtain food associated with humans are behaviorally rewarded and can become food-conditioned and habituated to being around humans (see Disturbance section in chapter 2). Bears that lose their natural avoidance of humans or take food from human sources are often killed in defense of life and property (DLP) situations. Enforcing food storage guidelines and education programs to reduce attractants can reduce impacts.

Concerns about high brown bear mortality, primarily related to DLP incidents in the Kenai Peninsula, led to several studies and management guidelines related to brown bears. ADF&G classified the Kenai brown bear as a population of conservation concern from 1998 to 2010. The Forest Service partnered with other agencies and organizations to manage and understand this species and its habitat on the Kenai Peninsula. As a result of population concerns, the 2002 Forest Plan delineated a special management area for brown bears, and identified standards and guidelines for management within those allocated Bear Core Areas (USDA, 2002a).

The 2002 Forest Plan initiated projects to evaluate populations and monitor DLP incidents related to bear habituation and depredation. Criteria for cataloguing and recording DLPs have varied across agencies and the Forest Service generally relies on ADF&G for this information. No DLPs were reported on National Forest System lands in fiscal year 2012, but 13 bear deaths were reported as DLP-related in GMU 7. One female bear was killed at the Russian River for DLP reasons in 2013.

The Forest Service has partnered with other agencies and organizations to teach national forest users and local residents about the importance of keeping human foods, waste, and other attractants away from bears. Precautions include not using bird feeders or compost near bear habitat, use of bear-resistant garbage facilities, not raising chickens in bear habitat or using appropriate electric fences to deter bears, and implementing food storage requirements in campgrounds. These precautions have reduced DLPs on National Forest System lands since the 2002 Forest Plan was approved. The Forest Service has participated in a particularly effective public involvement campaign with the Anchorage Bear Committee and ITREC teachers in Girdwood. The results are improved food storage, safety for humans, and fewer bear incidents in Girdwood. Cordova also collaborates with the Forest Service to educate residents on how to cohabitate safely with bears.

The Forest Service partners with the other land managers of the popular salmon fishing area at Russian River: the Kenai National Wildlife Refuge, Alaska Department of Fish and Game, Cook Inlet Region Inc., the Kenaitze Indian Tribe, and Alaska Department of Natural Resources. The Russian River is a road-accessible intensely-popular fishing destination that has resulted in habituation of brown and black bears. Negligent storage and handling of human-generated attractants, including fish waste, is a primary management concern. The Russian River Interagency Coordination Group recently completed the Managing Human-Bear Conflicts, Kenai-Russian River Area, Five-Year Action Plan, 2013-2017, (USDA, USFWS and ADF&G, 2013). This action plan aims to “minimize human-bear conflicts and related public/employee safety concerns, while continuing to provide recreation opportunities and conserve fish and wildlife resources at the Kenai-Russian River area.” The plan focuses on approaches to reduce availability of fish waste as a potential food source for bears and to reduce access to other human generated food sources and attractants. National forest resources dedicated to addressing bear conflicts related to fishing and recreational use at the Russian River has been growing. The current level of support may be unsustainable under predicted budgets.

Brown bear status and trends

Alaskan-wide brown bear populations were considered stable at 25,000 to 39,100 when the estimation was made using field-based density estimates from several populations to predict state-wide abundance (Miller, 1993). Brown bears are classified as big game and as such may be legally killed by resident, non-resident, and subsistence hunters with the appropriate licenses and tags during specified seasons (Alaska Administrative Code 5AAC 92.990). Knapp (2006) reports that the greatest source of adult brown bear mortality is legal and illegal killing by humans for sport or subsistence harvest and the killing of nuisance bears. Miller and Schoen (1999) identified trophy hunting as the most common source of mortality. Hunting is monitored through mandatory sealing. ADF&G adjusts seasons, harvest limits, and quotas to meet management objectives, which vary by GMU. As of 2006, CITES did not consider intensive management to be a serious threat to brown bear numbers.

Knapp (2006) summarized some recommended annual sustainable harvest levels: McCullough (1981) recommended a maximum sustainable harvest on brown bears in the Yellowstone ecosystem at 5 to 8 percent. Harris (1986) suggested the sustainable human-caused mortality level in Montana should be no more than 5 percent. Brown bears in Europe usually sustain a slightly higher annual mortality rate approaching 10 percent but they are more productive than brown bears in North America (Swenson, 2004). The estimated maximum sustainable harvest for Alaskan brown bears was estimated by Miller (1990) at 5.7 percent of the total population (based on a model that did not include density-dependent effects). British Columbia received scrutiny of its management of brown bears and developed guidelines to keep female harvest to less than 30 percent of harvest annually (Knapp, 2006). Implementing harvest guidelines based on limiting the proportion of the population harvested is constrained by significant challenges to estimate population abundance of brown bears.

Most brown bear studies within the national forest have focused on the Kenai Peninsula. Morton et al. (2013) conducted a rigorous mark-recapture study of brown bears on the Kenai Peninsula in 2010 which resulted in an estimate of approximately 624 brown bears (95 percent CI 504-772). An August 2014 re-evaluation of that data revised the estimate to 582 bears (95 percent CI 469-719) due to the availability of habitat.

The estimate of 582 bears is more than double the assumption used during the development of the 2002 Forest Plan. While there is no direct evidence that brown bears increased (or decreased) during the period from 2002 to the present, the quantitative estimate from 2010 provides a different understanding of brown bear abundance than was available in 2002 before any field-based estimate was made.

A 2013 change in the State of Alaska brown bear hunting regulations for the Kenai Peninsula included an increase in the allowable harvest and authorized hunting brown bears with bait (starting in spring 2014) for the first time. During the calendar year 2014 (January to December), ADF&G is following a mortality cap of less than 70 brown bears of which no more than 17 females can be killed. The harvest cap includes all human-caused mortality: harvest, DLP, road mortality, and agency-related mortality. As of August 11, 2014, there have been 54 reported brown bears killed by any reason in GMUs 7 and 15 on the Kenai Peninsula (Selinger, personal communication, 2014).

Selinger (2011b) reported high female mortality in GMUs 7 and 15 and confirmed female mortality remained high through 2013 (Selinger, personal communication, 2014). Female mortality in 2014 has been considerably lower. There have been five human-caused female mortalities reported for calendar year 2014 to date (Selinger, personal communication, 2014). The literature suggests that high female mortality in species with low reproductive rates contribute to population declines (Miller, 1990).

The high mortality of brown bears in 2013 and 2014 has resulted in renewed uncertainty regarding brown bear status on the Kenai Peninsula. Assuming the population was approximately 582 bears, the deaths of 57 bears through August 11, 2014 is 9.8 percent. That level of harvest is above suggested sustainable harvest rates based on literature (Knapp, 2006; Miller, 1990; Swenson, 2004).

Although harvest rates have increased recently, the 2002 Forest Plan was developed when the bear population on the Kenai Peninsula was estimated to be much lower. As a result, management areas and standards and guidelines designed to conserve brown bears on the Chugach National Forest portion of the Kenai Peninsula, including the Brown Bear Core Areas, could be re-evaluated.

Rigorous brown bear estimates for Prince William Sound and the Copper River Delta have not been completed. Crowley (2011b) estimated the population of brown bears based on den and track surveys on Montague and Hinchinbrook islands. He estimated that there were approximately 100 brown bears on each island and thought the population on Montague might be increasing during the reporting period (2005 to 2010), but warned that these estimates were not based on a rigorous estimation procedure.

The most recent ADF&G brown bear management report is dated 2011 and covers the period from fall 2006 to spring 2010 (Harper, 2011). Annual brown bear mortality in GMU 6 for fall 2006 to spring 2010 from all causes ranged from 59 to 86 bears (Crowley, 2011b). Of these, reported hunter kills ranged from 47 to 70 bears. The remaining were non-hunting kills and estimated illegal kills. Illegal kills were estimated from 9 to 10 bears per year. Female annual mortality during the same period ranged from 11 to 34 bears (of the total hunter kills) and 13 to 35 of the total estimated kills (Crowley, 2011b).

GMUs 7 and 15 brown bear population data are combined (Selinger, 2011b). There was no hunt of brown bears from fall 2005 to spring 2007. Non-hunting mortality occurred, including DLPs, roadkill, illegal, and research-related. Non-hunting human-caused mortality from fall 2005 to spring 2006 was 17 bears (7 were females), and from fall 2006 to spring 2007 was 31 bears (15 were females) (Selinger, 2011b). Annual mortality levels from fall 2007 to spring 2010 ranged from 28 to 40, of which 1 to 6 were hunter kills (2011b). The remaining bears were other human-caused non-hunting mortality. More than half of the total bears killed were females: 16 of 28 bears in 2007-08; 23 of 40 in 2008-09; and 18 of 30 in 2009-10 (Selinger, 2011b).

Access for brown bear hunting was by boat, plane, and roads in patterns similar to those used by black bear hunters. Non-resident hunters made up the majority of brown bear hunters in GMUs 6, 7, and 15. Regulations require non-resident brown bear hunters to use outfitters and guides or a resident relative. Using outfitters and guides contributes to the local economy. The Forest Service requires commercial guides who use National Forest System lands to have permits.

Crowley (2011b) noted logging on state and private lands, primarily in HU 6A, impacts brown bears. Roads reduce habitat quality for bears due to noise, human avoidance, increased access for hunters and poachers, habitat fragmentation, and bear-vehicle collisions (Benn & Herrero, 2002; Clevenger, Chruszcz, & Gunson, 2001; Lewis, et al., 2011; McLellan, 1998; McLellan & Shackleton, 1988; Waller & Servheen, 2005). Forest Service management can influence hunting access and thereby populations through road management, trail management, and designated boat landings in brown bear habitat. Vegetation manipulations that change habitat conditions along roads can moderate (or increase) the effects of roads, depending on how those projects are designed and implemented.

ADF&G biologists track annual number of hunters. From 2005 to 2009, successful hunters ranged from 53 to 93 per year in GMU 6 (Crowley, 2011b).

Caribou

The Kenai Mountains Caribou Herd occurs primarily on National Forest System lands in the Kenai Peninsula geographic area (see chapter 2 Terrestrial Ecosystems—Wildlife). The Chugach National Forest is one of the last national forests in the United States with a viable caribou herd. The Kenai Mountains caribou herd is one of four caribou herds currently occurring on the Kenai Peninsula (ADF&G, USDA, USFWS, 2003). Caribou are prized by people for viewing, food, and fur. Their fur is well adapted to arctic climates, and clothing made from it is used to protect people from harsh winter conditions. ADF&G manages caribou by herds. Caribou movement patterns are not easily predictable. Constraints on herd size are not well known. The Kenai Peninsula caribou herds don't exhibit the large migrations of caribou in some areas of inland Alaska. Caribou range over large areas, particularly when food is limited. They eat a large proportion of lichens in summer as well as in winter, supplemented by grasses, forbs, and deciduous shrubs. Any management activity that would reduce lichens could impact wintering caribou if it occurs in important habitat or over too large an area at a time. Caribou within the national forest calve in early summer, a time when they are particularly sensitive to disturbance.

Caribou were extirpated from the Kenai Peninsula in the early 1900s due to market hunting, predation, and possibly habitat loss from human-caused wildfires (ADF&G, USDA, USFWS, 2003; Bangs, Spraker, Bailey, & Berns, 1982) (see chapter 2 Terrestrial Ecosystems—Wildlife). A series of reintroductions occurred from 1965 through 1986. There is limited data on the historic range of caribou before their extirpation and reintroduction.

Caribou status and trends

Lutz (1959) reported that the last caribou observation on the Kenai Peninsula prior to extirpation was in 1912. They were reintroduced via several transplants from the Nelchina Herd. Forty-four caribou were reintroduced into the Kenai Peninsula in 1965 and 1966. These transplants ultimately established two herds on or near the national forest: the Kenai Mountains herd in GMU 7 and the Kenai Lowlands herd primarily in HU 15A, west of the national forest. The Kenai Mountains herd is primarily within the national forest south of Hope (ADF&G, USDA, USFWS, 2003). A small population was once known to be present near Seward, but the status of this herd is currently unknown. There are two additional herds created with 1985 and 1986 reintroductions: the Fox River herd which is well outside the national forest boundary and the Killey River herd that occurs primarily in the upper drainages of the Funny and Killey rivers in HU 15B, mostly on the Kenai National Wildlife Refuge. There is no rigorous estimate of caribou populations or habitat trends within the national forest. The Forest Service relies on population estimates from ADF&G, which estimates caribou populations by capturing and radioing a sample of each herd and using radio located animals to count herd numbers on fall flights when funding is available. The state's drawing permit hunt and the Federal Subsistence Board's subsistence hunt require mandatory reporting that provides additional information leading to population estimates.

The Kenai Mountains herd initially exhibited excellent production and recruitment, both of which declined sharply during the mid-1970s as the herd appeared to reach carrying capacity. Sport hunting of these caribou was initiated in 1972 to maintain the herd within the estimated carrying capacity of the area. Caribou calf weights were considered an indicator of habitat and were assessed each year from 1996 to 2002. Kenai Mountain caribou had declining calf weights during that period, but causes were unknown.

The 2003 Kenai Peninsula Caribou Management Plan (ADF&G, USDA, USFWS, 2003) stated that the population of the Kenai Mountains herd was increasing or stable. No herd composition counts of the Kenai Mountain herd occurred during that reporting period.

The Kenai Mountain herd was estimated at approximately 300 animals (as of 2009-10). The herd inhabits a limited alpine area of public land (McDonough, 2011a). In 2010, the Federal Subsistence Board determined customary and traditional use of the Kenai Mountain herd and established a Federal season with a quota of five animals. Less than 500 caribou are estimated to occur in the two Kenai Peninsula herds (McDonough, 2011a), and those two herds support approximately 150 hunters a year, with a harvest success rate of 20 to 30 percent. The Kenai Mountain herd, located primarily within the national forest, is the most hunted and is managed to maintain a caribou population of 300 to 400 animals (Selinger, 2009).

Less than half of the average annual 250 Kenai Mountain herd permit holders actually hunted during the 2005 to 2010 reporting period. The success rate for those who hunted was approximately 20 percent per year. Success rate including all permittees was less than 10 percent. Highway vehicles to trailheads were the predominate access reported by hunters for caribou in the Kenai Mountains herd.

Dall's sheep

Dall's sheep occur in the Kenai and Chugach mountains, which is the southernmost range of the species. They are a highly-desired for trophy hunting and wildlife viewing. Dall's sheep are often observed by drivers along the Seward Highway and are occasionally seen in the Kenai Mountains from the Russian River Campground. The national forest is one of the few places where both Dall's sheep and mountain goats can be observed in close proximity to each other. They are one of the most publicly accessible Dall's sheep herds. Dall's sheep are one of two thin-horned sheep species found in North America. They forage predominantly on sedges but will utilize bunch grasses when sedges are depleted and will move along the elevation gradient to find fresh forage as snow melts. Like many animals in winter, they are nutrient deficient, and long winters of deep snow can lead to malnutrition. Exposed vegetation on steep alpine winter ranges blown free of snow is important to provide food and refuge from predators or disturbances.

Dall's sheep status and trends

There are no reliable estimates of the number of Dall's sheep within the national forest. The Forest Service relies on ADF&G flights and hunter reports. The only extensive surveys to estimate populations in the Kenai Peninsula were in 1968 and 1992 (McDonough, 2011b). Dall's sheep surveys in the Kenai Mountains indicated population increases from 1949 to the late 1960s, followed by declines beginning in 1970. The most recent population survey, conducted in 1997, estimated a Kenai Peninsula population of 1,600 animals, down from the 1968 survey which counted more than 2,000 (McDonough, 2011b). Dall's sheep occur within the national forest in GMUs 7 and 14 and possibly in GMUs 11 and 13. Dall's sheep and mountain goats are difficult to discern from the air, and consistent, thorough flights have not been conducted for the national forest. McDonough (2011b), using discontinuous and variable survey areas among years, estimated populations in GMUs 7 and 15. He reported population estimates that ranged between 1,000 and 1,700 until 2007. From 2007 to 2009, the estimate ranged from 800 to 1,200.

In 2007, 916 Dall's sheep were harvested Alaska-wide, which is very close to the five-year average. An average of 118 hunters per year on the Kenai Peninsula harvested an average of 12 rams per year from 2008 to 2010 (McDonough, 2011b). The drawing permit units (Round Mountain and Crescent Lake) occur within the national forest. The number of permits authorized in the two permit areas has been low. There have been some years when ADF&G has not issued permits. Hunters who responded reported using a variety of methods for access: boat, highway, airplane, ATV/OHV, and horse. ADF&G 2014 Dall's sheep regulations are restricted to full curl or larger rams (ADF&G, 2014a). There is no Federal Subsistence Board hunting season. ADF&G began capturing and collaring Dall's sheep with VHF radios north of Anchorage, just outside of the national forest in 2009 (Woodford, 2009). From data obtained, preliminary results suggest low pregnancy rates when compared to Dall's sheep in other places and evidence of malnutrition, as shown by bone marrow condition. The reasons for these conditions are unknown to date. Weather and habitat conditions are thought to be factors. Disease was not indicated in preliminary evaluations. It is unknown whether Dall's sheep and habitat within the national forest exhibit similar conditions.

Sheep numbers typically fluctuate irregularly in response to a number of environmental factors, including deep snow, dry summers, and severe winter weather (Whitten, 1997). Sheep populations tend to increase during periods of mild weather. Disease is an important concern with Dall's sheep. Bacteria and viruses cause respiratory illnesses, typically pneumonia, and these illnesses have profoundly affected some populations in the contiguous 48 states. Mountain sheep, in general, are extremely susceptible to disease introduced by domestic livestock. The use of domestic goats or other hooved mammals as pack animals increases the exposure risk. The Forest Service has reviewed disease-related risks among domestic sheep and goats and bighorn sheep (Schommer & Woolever, 2008). Stone sheep are a thin-horned sheep similar to Dall's sheep and disease risks are similar (Schommer & Woolever, 2008). Garde et al. (2005) did a similar evaluation for Dall's sheep.

The Schommer et al. (2008) risk assessment indicated "that contact between domestic sheep or goats and wild Dall's sheep or mountain goats would likely result in significant disease in the wild species with substantial negative and long term effects on population dynamics and sustainability." They strongly advised that domestic goats not be used as pack animals and that domestic sheep and goats not be pastured anywhere in the vicinity of wild sheep population. ADF&G prohibits the use of domestic sheep and goats as pack animals to hunt sheep or mountain goats. ADF&G regulations for hunting apply to National Forest System lands, but the Forest Service currently has no restrictions on the use of pack animals for other reasons, such as recreational hiking/packing. The forest plan revision could address this issue.

Inadvertent hunting of females has been established as a factor in low populations in areas outside of Alaska, and there has been some female harvest from the national forest populations in past years. Habitat for Dall's sheep follow glacial outwash habitats, which are exhibiting successional change to less favorable shrub/tree habitats as glaciers melt. Sheep tend to follow the older ewes in the herd across historic ranges. Losses of older animals from a population can curtail historic migration tendencies. Increasing human population and more human use of alpine areas may affect Dall's sheep. Dall's sheep are sensitive to disturbances, such as low-elevation flights, skiing near habitat, and machinery noise during winter when they are in poor nutritional condition and food and cover are limited. They are particularly vulnerable to predators and other disturbance during the lambing period from mid-May to mid- or late-June (Valdez & Krausman, 1999). Such activities may cause animals to move away from important habitat. They are also susceptible to avalanches and falls.

The 2002 Forest Plan (USDA, 2002a) includes two guidelines intended to minimize human activities near important Dall's sheep wintering and lambing habitat: "Locate concentrated human activities away from

important wintering, kidding and lambing habitat... a minimum one mile avoidance distance is recommended.” Permitted aerial activities are also restricted near sheep: “Maintain a minimum landing distance of 0.5 mile from observed goats and sheep... and a 1,500 foot vertical distance while flying.” The Forest Service requires outfitters and guides to monitor heli-ski activity in mountain goat habitats to evaluate impacts to both sheep and goats within the national forest (mountain goats are a management indicator species (MIS) in the 2002 Forest Plan and serve as an indicator species for alpine ungulates; see Mountain goat subsection). Outfitters and guides have complied with the monitoring but the Forest Service has not yet evaluated if the mitigations have met their intent. Other winter recreational activities may impact Dall’s sheep, although these uses are not restricted or monitored. It may be difficult for recreationists to avoid sheep because sheep are notoriously difficult to see against snow. A person could be well within the restricted distance before they are aware of the presence of any sheep.

Snowmobile technology has increased the range, distance, and slopes accessible by snowmachines since 2002. Snowmachines also provide additional access to skiers and snowboarders who use them to access high elevation winter recreation areas. The Forest Service doesn’t monitor general recreational use by snowmachines, but public demands for more parking and more winter recreation areas during public meetings indicate use has increased substantially and areas are more crowded since 2002. Identification and buffering of priority sheep habitats may be a more manageable approach to conserving sustainable sheep populations. Further evaluation of sheep and human interactions may trigger a need for change in the 2002 Forest Plan.

Moose

Moose are a highly prized meat and trophy animal, important to many Alaskan residents for subsistence and sport hunting and are a popular viewing species within the national forest. Many non-residents prize moose as a destination guided-hunt species, although guides are not required for moose hunters. Moose have an important ecological role in vegetation development and predator-prey balances in the ecosystem. Many public comments at the assessment phase public meetings indicated the public wanted more moose, a request that may be difficult to meet under current conditions.

Moose are wide-ranging browsers that eat leaves of trees and shrubs. Within the national forest, they prefer willow, sweet gale (in the Copper River Delta) and birch over other woody species, but due to high tannins in their preferred browse species, they need diverse plants over a wide area. Depending on the density, diversity, and condition of shrub and tree species, moose can influence the morphology and production of browse plants and can also increase biomass production through the deposits of their dung and urine (Persson, Pastor, Dannell, & Bergstrom, 2005).

Moose have a strong place in native culture and are highlighted in art, music and legend and are enjoyed by wildlife viewers. Moose antlers and bones are frequently used in local craft and art industries. Moose were identified as an important species during the initial public involvement process for this assessment.

Moose habitat is widespread within the national forest. The availability of habitat for moose in winter is severely curtailed by snow. Moose restrict their movements when snow is more than 30 inches deep, and experience a starvation diet in severe winters. Winter habitat availability is significantly curtailed when snow depths are more than 36 inches. Dussault et al. (2005) modeled moose habitat selection in terms of three limiting factors, limited in priority order: predator avoidance, food availability, and snow. They found that responses followed these general trends, but varied by scale (i.e., home range for an individual versus landscape scale). Females with young also differed in their habitat selection trade-offs. Moose make habitat selections to balance food availability vs. predator avoidance.

The best quality moose habitat in the Kenai Peninsula is located on the Kenai National Wildlife Refuge. National forest habitat is less suitable and productive. Current vegetation maps and imagery on the Kenai Peninsula do not differentiate willow and other moose browse from less-palatable hardwoods, so a complete habitat distribution for the national forest hasn't been completed. Moose habitat on the Copper River Delta occurs primarily in wetlands. Habitat in the wetlands has experienced drying and successional development due to the 1964 earthquake-caused uplift. The Forest Service has partnered with others to model moose habitat within the national forest and has developed habitat improvement projects to enhance early seral species, particularly willow.

Moose have differential tolerances of people. Moose can be deterred from important habitat by recreational use yet alternatively will use the compacted roads and trails to access habitat that would otherwise be unavailable in winter. Access paths created by humans can help provide moose travel routes in winter but, depending on the type, timing, and duration of human activity on the road or snowmobile trail, can also deter moose from important winter habitat (Harris, Nielson, Rinaldi, & Lohuis, 2012). Cows may seek areas close to homes for giving birth and rearing young because these areas are more protected from predators.

Moose status and trends

Moose can be cryptic to observe in forested conditions; ADF&G has developed methods to correct for sightability (Christ, 2011). Moose are easier to survey in the Copper River Delta geographic area than elsewhere within the national forest. Statewide, an estimated 175,000 to 200,000 moose are widely distributed. ADF&G, in partnership with the Chugach National Forest's Federal subsistence program, conducts aerial surveys to obtain moose population estimates and related demographic factors, such as twinning rates, cow/calf and bull/cow ratios, and habitat delineation. Titus et al. 2009 reported that from 1987 to 2007, an annual mean of 29,000 moose hunters harvested 7,260 animals annually in Alaska.

Moose are found in all the GMUs that overlap the national forest: GMUs 6 and 7 and portions of 11, 13, and 14 (see the GMU map in the map package appendix), but the majority of moose are in GMUs 6 and 7. Moose populations normally experience large fluctuations over time driven by habitat, predation, density, weather, and harvest rates. The Subsistence section in chapter 3 provides additional information on moose hunting specific to that program. The majority of moose in GMU 6 originated from transplants. In the 1950s, Cordova residents raised 24 moose calves and released them on the western Copper River Delta. This population grew to a high of about 1,600 in 1988 and declined to about 1,200 as part of a planned reduction. The only moose endemic to the Prince William Sound geographic area are two small populations in the Lowe River Drainage and Kings Bay. Recent surveys indicate the population is stable in most of GMU 6 and is increasing in HU 6C near Cordova. The total moose population was estimated at 1,250 in the GMU, determined by combining survey counts from each of the GMU HUs (Crowley, 2010a). A recent survey in Kings Bay (DeFrate, personal communication, 2014) resulted in no moose seen.

Moose density in GMU 7 on the Kenai Peninsula is consistently low. Less than 10 percent of the moose harvest on the Kenai Peninsula has come from GMU 7 during the last 20 years (McDonough, 2010). Habitat within the national forest is limited when compared to other areas of the Kenai Peninsula. Severe winters with deep snow contribute to high mortality rates. Human-caused wildfires in the 1950s and 1960s on the Kenai Peninsula caused moose populations to increase. Extensive predator control during that time also facilitated artificially high population numbers, and vegetative damage and die-offs occurred. The historic human-caused wildfires in Kenai Peninsula that supported the high moose populations may not be currently feasible due to safety, increased human residents and developments, summer smoke concerns, and economics.

Populations of moose in GMU 13 have fluctuated widely in the past 5 to 7 years but have been generally increasing since 2001. Only a small portion of the southern end of GMU 13 occurs within the national forest and supports a low density of moose. The ADF&G goal for GMU 13 is to increase the moose population to about 25,000 moose GMU-wide; in GMU 13 ADF&G has implemented wolf-control regulations under intensive management protocols (ADF&G, 2011).

Moose can cause safety and property concerns for motorists and homeowners. Moose-vehicle collisions have led to moose mortality and human injury along the Seward and Sterling highways. The Kenai Wildlife Refuge reported that an average of 225 moose were killed annually during the last decade by vehicles on the Kenai Peninsula (USFWS, 2014b). Moose can also be aggressive if encountered too closely, especially when accompanied by calves. More people in Alaska are injured by moose than bears, partially an artifact of their numbers (Conger, 2008).

Moose are susceptible to several diseases and parasites. Interspecies transfers of parasites, particularly species that haven't evolved together, can cause increased mortality to the native host. Transplants of off-site animals and changing climate could increase the chance of parasites.

Habitat treatments, such as thinning on the Kenai Peninsula, have been of too small a scale to be effective in terms of increasing moose numbers. Hydroax treatments on the Copper River Delta to reverse succession in an effort to create more moose browse (primarily willow) have focused on those areas with alder and spruce encroachment in the core winter range. Ongoing monitoring in these areas is currently in analysis. Small scale treatments can improve the availability of winter range for moose if principles of scale and landscape trade-offs are implemented (Dussault et al. 2005). The Forest Service may not be able to treat enough habitat to support the public demands for more huntable moose within the national forest.

Mountain goat

Mountain goats are endemic to all three geographic areas of the national forest and are highly valued by wildlife viewers and hunters. They are endemic but were extirpated on Bainbridge, Culross, and Knight islands (Crowley, 2010b). The mountain goat population in the Heney Range south of Cordova is depleted (Burcham, personal communication, 2014). Most mountain goats harvested in Alaska are mounted for trophies. Southcentral Alaska is one of the few areas where mountain goats and thin-horned sheep (see Dall's sheep) coexist in similar habitat. The Chugach Mountains are the northernmost limit of mountain goat range.

Mountain goats utilize steep, rocky, inaccessible habitat to avoid predators and disturbance. Mountain goats utilize forested habitat for cover and wind-swept snow-free areas above the tree line during winter. Even minor impacts to the availability of their winter habitat can be consequential because snow-free protected winter range is very limited (Fox, Smith, & Schoen, 1989).

Salt is often limited in alpine habitats and goats will travel long distances to reach mineral licks; mineral licks influence habitat range and distribution. Animals can concentrate at limited mineral licks with a corresponding increase in aggressive intraspecific encounters (Cote & Festa-Bianchet, 2003).

They are most susceptible to disturbance when activities occur during their resting periods where they are conserving energy. They are most active in early morning and late afternoon. They are particularly vulnerable to predators and other disturbance (including recreational activity) during the primary kidding period from mid-May to early June, during the winter when quality food is inaccessible, and around concentration areas (such as mineral licks). Starvation is a high risk in late winter and spring.

Mountain goat status and trends

The Forest Service relies on ADF&G flights and population estimates of mountain goats within the national forest. The Forest Service subsistence program helps support surveys in GMU 6, and flights are more regular as a result of that financial support. Mountain goats are a management indicator species in the 2002 Forest Plan for alpine habitats. Habitat and accurate mountain goat kidding/wintering areas are not well defined. The Forest Service partnered with ADF&G to develop a habitat model with the University of Mexico using data collected on a subset of radioed mountain goats in the Kenai Peninsula (Bohara, Thacher, & Nepal, 2011). The majority of the collars deployed for this effort failed, and only five adult females were used to develop a model (Herreman, 2014) that prioritizes some of the occupied mountain goat habitat, although they are known to occur within other areas of the national forest (Bohara, Thacher, & Nepal, 2011).

In 1952, 4,350 mountain goats were documented in an area that makes up most of GMU 6 (Crowley, 2010b). Since then the population in GMU 6 is thought to have decreased and is now estimated at near 4,000 animals. Survey coverage and survey years have been inconsistent and hampered by poor survey conditions (i.e., weather). HU 6D had the highest number of goats within GMU 6. ADF&G established a minimum population goal of 2,400 goats in GMU 6, and the population was thought to be stable for the reporting period (2006 to 2010) (Crowley, 2010b).

In GMU 7, where goats coexist with Dall's sheep, goats are thought to have decreased 30 percent since the early 1990s (McDonough, 2012). GMUs 7 and 15 are combined by ADF&G into the Kenai Peninsula mountain goat range, excluding Kenai Fjords National Park. GMUs 7 and 15 are managed as 28 hunt areas that have had hunts at some point from 2007 to 2011. Populations are monitored by aerial survey. ADF&G tries to survey each hunt area every 3 years, but surveys have been inconsistent and many years have been missed. The trend counts indicate a 30 to 50 percent decrease from the 1990s to 2006, and harvest led ADF&G to close hunts or reduce permits. Not all hunt areas indicate declines; some show stable or increasing trends (McDonough, 2012). A major factor in goat populations is the risk of overharvest and a low billy to nanny ratio (Cote & Festa-Bianchet, 2003; Hamel, Cote, Smith, & Festa-Bianchet, 2006). Harvest recommendations suggest acceptable harvest may be as low as 1 to 4 percent of a native population with a minimum size of 50 animals (Hamel, Cote, Smith, & Festa-Bianchet, 2006). Such parameters may be quite different in larger populations as are found within the national forest. A mountain goat population can maintain population levels better if females are not (or rarely) harvested. Rice and Gay (2010) developed a model for a small mountain goat population in Washington that supported results from Hamel et al. (2006).

There has been consistent harvest of females in both GMU 6 and the combined GMUs 7 and 15 hunt areas. Female harvest in GMU 6 met the ADF&G less than 30 percent harvest stipulation. Female harvest in GMUs 7 and 15 often exceeded 30 percent during the 2007 to 2011 reporting period and may be a concern. The management objective for GMUs 7 and 15 does not provide numerical goals, but states, "...maintain a low proportion of nannies in the harvest, and restrict or liberalize hunting permits and allowable harvest based on conservative assessments of minimum population trends" (McDonough, 2012).

ADF&G has recognized the sensitivity of mountain goat populations and has developed educational information for hunters to properly identify the sex of mountain goats. ADF&G imposed a point system that helps regulate the number of females harvested each year. Mountain goats can also be vulnerable to disturbance from aircraft, snowmachines, and human winter recreational activities similar to Dall's sheep (Cadsand, 2005). The nannies and kids are particularly vulnerable to predators and disturbance during the kidding season from mid-May through mid-June. After mid-June the kids are more mobile and food is

more abundant, so they are not as constrained. Mountain goats are nutritionally-deprived in winter like many ungulates in the northern hemisphere. They must build up adequate fat storage during the summer.

A particular concern is winter recreation when it occurs in or near limited winter habitat or near sensitive kidding grounds when kids are very small and unable to move far. Disturbance can cause displacement from important habitat, startled fleeing (causing accidents or misstep), but can also result in less obvious responses, such as elevated heart rate, disrupted feeding and rumination, increased stress hormones and increased utilization of nutritional reserves. Short bursts of elevated stress hormones are normal in prey animals when they run from predators, but long term elevated stress levels or repeated stress can lead to physiological breakdown and reduced fitness, lowered reproductive rate, or less resistance to disease or low nutrition.

Goldstein et al. (2005) observed the visible response of mountain goat groups to helicopter flights in 2001 and 2002 and noted that 25.1 percent of goats displayed overt behavioral changes to helicopters with 66 percent of those responsive goats displaying alert or vigilant behavior and 34 percent fleeing. Cote' (1996) in Alberta and Foster and Rahe (1983) in British Columbia noted fleeing or hiding responses at helicopter to goat distances less than 500 meters; maintenance behavior was altered at 500 to 1,500 meters and altered head tilts occurred at distances greater than 1,500 meters. Goldstein et al. (2005) reported that Alaskan goats displayed more muted behavior. Habituation, topography, and other habitat differences were offered as potential explanations for the difference between the Alaskan study and those in Canada.

The 2002 Forest Plan (USDA, 2002a) includes two guidelines intended to minimize human activities near important mountain goat wintering and kidding habitat. "Locate concentrated human activities away from important wintering, kidding and lambing habitat... a minimum one mile avoidance distance is recommended," and "Maintain a minimum landing distance of 0.5 mile from observed goats and sheep... and a 1,500 foot vertical distance while flying." The Forest Service began monitoring commercial heli-ski activity in mountain goat habitat in 1997 to evaluate impacts to both sheep and goats within the national forest (Goldstein, Poe, Cooper, Youkey, Brown, & McDonald, 2005). Permittees have complied with the terms of their permit, but the data hasn't been analyzed in depth for effectiveness in avoiding impacts to mountain goats. The permittees are required to avoid areas where goats are observed, but goats are notoriously difficult to see from the air and may flee to avoid aircraft or other disturbance. The Forest Service has flown and mapped alpine winter goat habitat in all of the heli-ski areas (Burcham, personal communication, 2014). Those areas are delineated on maps and permit requirements do not allow skiing or close aerial approach in those areas.

The 2002 Forest Plan (USDA, 2002a) has no standard or guideline restrictions to protect wildlife for the non-commercial national forest users (including private snowmachines, boat, and aircraft operators). Snowmachines have become more powerful than those evaluated by Goldstein et al. (2005) and are now able to access more goat habitat throughout the winter. The more powerful snowmachines also provide access for winter skiers and snowboarders who may alter goat use of preferred habitat or cause excessive energetic demands.

Sitka black-tailed deer

The Cordova Chamber of Commerce introduced Sitka black-tailed deer to Hawkins and Hinchinbrook islands between 1916 and 1923 (Crowley, 2011c). Since then, Sitka black-tailed deer have been seen occasionally in all three geographic areas of the national forest. They are found primarily in HU 6D, but deer have been observed on the Kenai Peninsula and as far west as Anchorage. They swim well and are expanding in forested areas, moving inland from the coast. They are an important sport hunting, meat, and subsistence species (see Subsistence section) in the Prince William Sound geographic area.

Sitka black-tailed deer status and trends

The ADF&G population objective under the Intensive Management Law (AS 16.05.255) for Sitka deer in GMU 6 (for 2010) was 24,000 to 28,000 deer, which is capable of a sustainable annual harvest of 2,200 to 3,000 deer. ADF&G estimated harvest in GMU 6 at 1,900 deer in 2008-09 and 1,600 deer in 2010 (Crowley, 2011c). The highest deer densities in HU 6D occurred on Hinchinbrook, Hawkins, and Montague islands. Lower densities occurred on the smaller islands and mainland areas around Prince William Sound.

ADF&G collected harvest information for Sitka deer via hunter surveys through 2010. More recent data is being collected similar to other game species with harvest reports. The Forest Service subsistence program assists ADF&G with annual deer pellet group surveys in HU 6D to provide an index of pellet density in sample areas from year to year but does not provide population estimates. No estimates have been made in the other GMUs within the national forest. Hunting for Sitka deer in GMU 7 is currently prohibited.

Snow depth and duration are the primary limiting factors in Sitka black-tailed deer populations within the national forest. Sitka deer were introduced to the Queen Charlotte Islands of British Columbia more than 50 years ago. Those islands lacked predators. Sitka deer were found to significantly simplify vegetation patterns in the Queen Charlotte Islands to the detriment of the plants and fauna dependent upon lower-canopy vegetation (Stockton, Allombert, Gaston, & Martin, 2005). Martin et al. (2011) evaluated 18 NW Archipelago islands inhabited by deer and found that "...deer regulate both the cover and architecture of understory vegetation which in turn profoundly affects island bird assemblages." There has been no equivalent evaluation of impacts of introduced Sitka deer on island vegetation within the national forest. Sitka deer populations within the national forest may be controlled by hunting and deep winter snow before they have similar impacts on biodiversity. Deer populations remained relatively stable in GMU 6 during the last decade until the winter of 2011-12, when near record snows across Prince William Sound reduced the population by 50 to 70 percent (see Subsistence section).

Furbearers

All of the important furbearers identified by trappers in Alaska occur within all three geographic regions of the national forest (see table 67). Furbearers are an important resource for trappers. The average trapper in southcentral Alaska spends more than 9 weeks trapping per year. Nearly 40 percent of trappers are accompanied by a young person (ADF&G, 2013b). Selling furs can make a significant contribution to a trapper's income. The average marten pelt in 2012-13 sold for 143 dollars; the average otter for 100 dollars (ADF&G, 2013b).

Wolves, wolverine, and lynx, in particular, are rarely seen within the national forest but are highly prized by wildlife viewers. Many of these species have been extirpated across large portions of their range, are listed as threatened or endangered, or are otherwise severely depleted or out-of-balance in the contiguous 48 states. In the contiguous 48 states, the loss of segments of the furbearer population (such as wolves) has led to increases in other species, such as coyotes. The national forest provides a unique opportunity to evaluate ecological communities where native communities remain intact.

Wolverines are a management indicator species in the 2002 Forest Plan. They are wilderness creatures that utilize areas with persistent winter snow, often mountainous areas that are also favored by heli-skiers and winter sports enthusiasts. Much of their diet is scavenging ungulates, although they have been documented to kill their prey in certain circumstances. Both male and female ranges correspond with moose and caribou habitat and some with mountain goats and sheep (Krebs, Lofroth, & Parfitt, 2007). Krebs et al. 2007 noted that both male and female wolverines were negatively associated with heli-skiing and back country skiing in British Columbia. Females, in particular, used remote high elevation habitats

while giving birth and raising young to avoid predatory wolves. Both sexes were negatively associated with human activities in the winter (Krebs, Lofroth, & Parfitt, 2007). Wolverines have low reproductive rates and require large areas of undeveloped habitat. If their habitat is unavailable due to human activity, it could affect population parameters and sustainability. The Forest Service has partnered with ADF&G to conduct inventories on wolverines within and near the national forest. They are not easy animals to count. ADF&G uses a sample unit probability estimator (SUPE) technique (Becker, Golden, & Gardner, 2004). Monitoring is ongoing and results will be evaluated in terms of Forest Service management, although preliminary data indicates national forest wolverines fit the published models and results of other areas and continued restrictions of human use in their winter habitat is warranted.

Each furbearer also provides important ecological contributions to sustainability to ecosystems and other populations. For example, wolves influence big game populations and help maintain habitat from overgrazing/browsing. Beavers build dams and create ponds important for fish rearing, help slow water to help protect riparian areas and reduce downstream flooding, and cut trees to add diversity to riparian vegetation.

Furbearer status and trends

There are no population estimates for furbearers within the national forest. The Forest Service relies on information from ADF&G. Eight thousand trapping permits for furbearers are sold each year statewide. ADF&G depends on trapper survey results and reported harvest of furbearer seals for population trend data for many furbearers. Only lynx, river otter, wolf, and wolverine are required to be sealed across their range. Furbearers can be cyclic depending on their prey levels. Lynx, for instance, experience periodic boom/bust cycles when snowshoe hares, their primary prey, vary. Marten and beaver also require seals in most of the national forest GMUs. Population trends are described for furbearers in periodic furbearer reports by ADF&G and vary by species and by GMU. Annual trapper reports are posted on the ADF&G Web site. The most recent trapper questionnaire is the 2013 report, covering July 2012 to June 2013 (ADF&G, 2013b). The most recent ADF&G furbearer report is 2010, reporting on 2006 to 2009.

Russian explorers and early settlers established fox farms and introduced a wide variety of non-native furbearers across Alaska. From the late 1800s through the early 1900s, native and non-native furs were the second largest economic driver in Alaska. Many Russian foxes and other fur bearers were dropped on islands to be harvested the next season. Occasionally prey species, such as rabbits, were also introduced to provide food for the introduced fur bearers. Most of the introduced furbearers died off from disease or starvation. The last fur farm within the national forest was permitted in the 1930s. Impacts from the oversaturation of introduced predators probably still remain on some islands. The current impacts of non-native furbearers on native furbearers are not known, but rabies and disease was a factor during the fur farm era (Isto, 2012). An Exxon Valdez oil spill Trustee Council funded project was initiated in 2014 by USFWS to reduce the number of Naked Island mink in order to accelerate the restoration of pigeon guillemots and other island-nesting shorebirds susceptible to fur bearer predation. DNA analysis of mink on Naked Island in Prince William Sound indicates the mink there have mixed genetics showing they developed from a variety of source populations.

Birds

The national forest provides millions of acres of bird habitat used by people for hunting, bird watching, and subsistence. The national forest provides extensive acres of undeveloped shoreline habitats and islands important to nesting birds and upland areas provide millions of acres of songbird habitat. The Copper River Delta is one of the world's largest staging areas for migratory shorebirds (Myers, 1983). Bird meat and eggs have been important protein sources for native peoples for generations and eggs are still collected by some subsistence users. Bird feathers and bones are also used for clothing, crafts,

cultural practices, and tools. Nearly all activities within the national forest (by management and users) have the potential to affect one or more bird species or their habitat.

Management designations

The many islands and shorelines in Prince William Sound are also recognized worldwide for their shorebird and seabird habitats (Suring & Poe, 2010). Prince William Sound cliffs provide habitat for kittiwakes and puffins, and Prince William Sound beaches provide cryptic nesting habitat for black oystercatchers. Much of Prince William Sound was within the impact zone of the Exxon Valdez oil spill and several species of birds were impacted, and some species have not yet recovered (see table 35) (EVOS Trustee Council, 2010).

The Copper River Delta is the largest shorebird staging area known in North America (Isleib P. , 1979; Senner, 1979). The Copper River Delta contains 700,000 acres of wetlands plus associated uplands. The entire land base encompasses a 2 million-acre management area. Federal recognition was formalized for a portion of this important resource through ANILCA when Congress specified management direction for the Copper River Delta, stating that the area would be managed for the conservation of fish and wildlife resources and their habitats. It is a site in the Western Hemisphere Shorebird Reserve Network, is a State of Alaska Critical Habitat Area, and is an emphasis area in the North American Waterfowl Management Plan. Other special management actions include the Copper River Delta: the Key Coastal Wetland plan and the Copper River International Migratory Bird Initiative (CRIMBI).

Many of the birds within the national forest are identified on various status lists maintained by ADF&G, AKNHP, Audubon, Partners in Flight, and Pacific Joint Venture as species of concern. Since many of these birds are migrants, descriptions of their status and trends are too extensive and dynamic to summarize for this Assessment. The Forest Service partners with other agencies to contribute to data on bird populations and trends and to work on ways to sustain them across all of their range, not just Alaska. The Forest Service complies with the memorandum of understanding with USFWS and others (Forest Service Agreement 08-MU-1113-2400-264, 2008) regarding implementation of the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and other bird regulations.

Of particular mention to the national forest, black oystercatchers are a in the 2002 Forest Plan. Dusky Canada geese are also a current management indicator species and have been evaluated as a potential species of conservation concern. During a 2012 status review, Kittlitz's murrelets were delisted from candidate species status by USFWS (77 FR 69993 70060). Many other species have special designations due to their status or ecological importance.

Hunting

The national forest provides nesting and migratory habitat for dozens of waterfowl species hunted in Alaska and elsewhere. The USFWS manages migratory waterfowl hunting in North America. Alaska supports 20 percent of the nesting habitat for America's waterfowl. Alaska supports at least 36 species of waterfowl, many of which breed within or migrate through the national forest and are hunted in Canada and the western United States along the Pacific flyway. The status of waterfowl vary by species and population estimates are difficult to obtain, particularly for migratory sea ducks and geese (Sea Duck Joint Venture Management Board, 2008), and are difficult to obtain for waterfowl/shorebirds that nest in crevices, inland forests, or cavities (Piatt & Ford, 1993). The USFWS also analyzes hunter information through the Harvest Information Program and joins with Canada to conduct surveys, analyze bird band returns, and do winter bird counts on winter habitat. Alaska/Yukon-wide waterfowl surveys are conducted annually (USFWS, 2012b) and species results vary widely. The USFWS (2012) publishes a detailed waterfowl population status report periodically. Alaska is combined with the Yukon Territory and Old Crow Flats, so determining the national forest's contribution is difficult, with the exception of dusky

Canada goose and trumpeter swan surveys on the Copper River Delta. The 2012 dusky Canada goose survey indicated the total population was the highest recorded since 2005 (see also At Risk Species—Potential Species of Conservation Concern).

ADF&G administers harvest of upland game birds. ADF&G has limited data on game birds. Merizon (2013) summarized information on grouse and ptarmigan based on road surveys and hunter wing returns. Ruffed grouse are native to parts of southcentral Alaska and were translocated to the Kenai Peninsula in the mid-1990s. Population densities in the Kenai Peninsula are considered low for ruffed grouse, an introduced species, and moderate for spruce grouse.

Viewing and cultural significance

The national forest does not have a large diversity of land bird species as compared to other national forests in the United States, but many of the species that do occur here have special significance to bird watchers. Bald eagles are extremely common and provide a thrill to visitors to Alaska. A bald eagle sighting is usually announced on ferries, cruise ships, and tour buses. Several national forest species are do not occur in the contiguous 48 states and help birders add new species to their life list. A view of the Arctic tern is particularly prized by birders, partially because their migration can exceed 25,000 miles each spring and fall, or 50,000 miles annually. Alaska supports the majority of breeding habitat for the trumpeter swan and sandhill cranes, some migrating from Siberia. Ptarmigan, which do not migrate and turn white during the nonbreeding season, hold particular fascination to bird watchers in winter.

Spruce grouse, ptarmigan, and ruffed grouse provide cultural contributions to native peoples, food for humans and wildlife, and sport hunting and bird watching opportunities. The common raven is a year-long Alaska resident and is common throughout the national forest. The spiritual importance of the raven to Alaska's Native people is still recognized. The Tlingit, Haida, Tsimshian, Bella Bella, and Kwakiutl all view the raven as the creator of the world and bringer of daylight. The raven is also important in the creation of myths by the Eskimo. The myths of the raven remain a significant social and religious component of Alaska culture. This very intelligent bird can provide hours of entertainment to the discerning observer, and its distinctive calls are one of the most commonly heard sounds during winter.

Since 1990, The Forest Service has partnered with the Cordova Chamber of Commerce to host the annual Copper River Delta Shorebird Festival. The event attracts people from around the world to experience the spectacular migratory shorebird concentrations.

Hunting status and trends

Most population and trend data on seabirds and shorebirds were conducted following the Exxon Valdez oil spill. Populations of one species of seabird, the pigeon guillemot, have not yet recovered (EVOS Trustee Council, 2010). Irons et al. (2013) looked at 29 populations (15 taxa in winter and 14 taxa in summer) and found that Alaska supports nearly 50 percent of pigeon guillemot's nests. Populations in Prince William Sound were estimated at 2,300 (USFWS, 2006b) and their populations are experiencing 6.7 percent declines (from 1972 to 2006), attributed to gill net bycatch, oil pollution, and predation. Incidental subsistence collection is authorized. In 2013, the Exxon Valdez Oil Spill Trustee Council funded a project to help restore pigeon guillemots at the Naked Islands group within the national forest by reducing mink (see Furbearers subsection).

Other Exxon Valdez oil spill impacted species that have not fully recovered and which have habitats on or adjacent to National Forest System lands include: marbled murrelets, Kittlitz's murrelets (both status unknown); and Barrow's goldeneye, harlequin ducks, and black oystercatchers (status recovering) (EVOS Trustee Council, 2010). The Forest Service is designing projects to restore habitat for harlequin ducks and marbled murrelets on lands and easements acquired under the Exxon Valdez oil spill settlement.

Seabird populations often fluctuate in response to habitat quality (i.e., fish), and ocean conditions (Suryan & Irons, 2001). Surveys of Arctic terns in Prince William Sound indicate large recent declines of more than 90 percent, including the complete disappearance of 14 historical colonies on Kodiak Island (Aglar, Kendall, Irons, & Klosiewski, 1999; Lance, Irons, Kendall, & McDonald, 2001; Stephensen, Irons, Kendall, Lance, & McDonald, 2001; Stephensen, Zwiefelhofer, & Howard, 2002; Stephensen, Zwiefelhofer, & Slater, 2003). Reasons are unknown, but food, ocean conditions and disturbance to nesting areas could contribute. People encountering Arctic terns have caused terns to abandon nests if those birds are not habituated to human activity. Humans with dogs are a particular concern. They also have the ability to adapt to disturbance in areas of regular high human use. They are listed as a species of High Conservation Concern in Alaska (Hatch, 2002; USFWS, 2006b) and are protected under the federal Migratory Bird Treaty Act (MBTA 1918). In Alaska, reported subsistence harvest was estimated at 80 adults and 2,500 eggs per year between 1995 and 2000 (AMBCC, 2007).

In Prince William Sound, marine bird surveys indicated that there was an 84 percent decline in Kittlitz's murrelets from approximately 6,400 birds in 1989 to 1,000 birds in 2000. Seventy-eight percent of the population occurred in two Fjords in the northwest corner, and 20 percent in three other Fjords. Recreational activity on newly exposed rock below glaciers may be a factor in Kittlitz's murrelet nesting success, but this has not been tested.

Kittiwake populations increased in north Prince William Sound and those in south Prince William Sound declined from 1985 to 1997, such that 70 percent of the kittiwake population nested in the north during the latter years of the study (Lance, Irons, Kendall, & McDonald, 2001). The mid-1980s population was distributed equally between north and south. The trend was reversed in 1972 when most of the kittiwake population (70 percent) occurred in the southern Prince William Sound.

The Boreal Partners in Flight report (2004) evaluated and prioritized international and statewide population trends for Alaskan landbirds in 2004. Two of the four priority groups occur in the national forest and have the potential to be influenced by Forest Service management activities: landbirds sensitive to forest management; and landbirds with long-term declines in population size. The olive-sided flycatcher, blackpoll warbler, and rusty blackbird were noteworthy species within the declining group. Olive-sided flycatchers have experienced a 70 percent decline in the last 40 years, possibly related to food (bees, dragonflies, and yellow jackets) (see Information Needs).

Bird declines have been correlated with changes in habitat and food availability. Climate change may also affect competition and predation, factors that may be irreversible. Forest Service activities that influence the type and number of fish and invertebrates, introduced species, or nutrients transfer may contribute to these changes.

Causes of migratory bird declines or changes are difficult to determine. Changes can benefit some species at the detriment of others. The loss or change of breeding habitat, climate change, impacts to the seeds or insects, disturbance, successional change, disease, invasive species, loss of important migratory habitat here or in the southern hemisphere, and activities that upset the natural balance of predators and competitors all can be factors, and can interact with each other in unpredictable ways. Impacts can differ between the short and long terms.

Management impacts

Activities within the national forest can impact birds and habitats in many ways. Habitat change and disturbance from activities, including recreation, can impact bird populations. Habitat losses can be reduced by maintaining important habitat components during activities and permitted projects. Habitat improvements can be significant and effective at maintaining or increasing bird populations with little

impact to other programs if wildlife considerations are designed into the project. The designation of important birding areas of the national forest as special management areas has been important in maintaining healthy bird habitats. The Forest Service has instituted habitat enhancements for dusky Canada geese (see At Risk Species—Potential Species of Conservation Concern) and incorporated actions during project planning to enhance bird habitat when possible or to mitigate impacts when actions cannot be totally positive. Recommended mitigations include seasonal protections during the nesting season and capping open pipes that can entrap curious cavity nesting species. Actions that reduce garbage, fish waste, and other and human-associated food sources can reduce the unnaturally high concentrations of gulls, eagles, and corvids that prey on other birds. All animals, including birds, are particularly sensitive to plastic and chemical pollution. The Forest Service has initiated and partnered with others to reduce marine and Tsunami debris that harm birds and other wildlife (see marine pollution). Regulations to discourage pollution or abandoned materials, such as fish line or plastics, and projects that clean up debris can be effective at reducing wildlife mortality associated with these materials.

Nearly all birds are susceptible to introduced mammalian predators such as Norway rats, and feral cats, and dogs. They are susceptible to parasites and diseases from other areas, a problem that is increasing with global warming. Maintaining and protecting winter habitat for migrating birds in South and Central America is essential for birds that nest in or migrate through the national forest. Forest Service programs, such as the Key Coastal Wetlands, and CRIMBI, and participation in national/international programs, such as Partners in Flight, can help reduce habitat losses in other places.

Recent Forest Service activities do not cause large scale vegetation changes within the national forest, but small changes occur resulting from access, firewood harvest, berry picking, the presence of dogs in sensitive areas, human recreational disturbance to nesting locations, developed sites in riparian areas, activities that change the abundance or timing of insects or seeds, or the introduction of non-native species could cumulatively influence landbird populations and trends. The predominant habitat changes within the national forest are tied to climate change and successional development of forest/shrub habitat. The national forest is geologically young, glaciers are melting, and succession is progressing. Baseline distribution, occurrence, and habitat relationship data for Alaska is incomplete. Determining ideal habitat successional patterns, distributions, and patch sizes cannot be tied to historic patterns, which is the goal of much bird management in more developed areas in the contiguous 48 states.

Contribution to Social and Economic Sustainability

The uses of the species summarized here contribute significantly to Alaskan economy. Non-commercial fish and wildlife license revenues brought in 24.6 million dollars to Alaska in 2012 (ADF&G, 2013c). Big game tags contributed 3.9 million dollars to Alaska in 2012 (ADF&G, 2013c). Commercial licenses, including fishing licenses, produced 24.6 million dollars of revenue statewide (ADF&G, 2013c). Additional economic value is multiplied many times over when transportation, lodging, GPS, cameras, scopes, supplies and ammunition, guide fees, meat packaging, fur/trophy processing, and shipping are included.

Nonresidents of Alaska must be personally accompanied by a licensed guide or a qualified resident relative over 19 years of age to hunt brown bears, Dall's sheep, and mountain goats. ADF&G (2013c) states that hunters can expect to pay 6,000 to 15,000 dollars for a brown/grizzly bear hunt, 4,000 to 6,000 dollars for a Dall's sheep hunt, and 1,500 to 4,000 dollars for a goat hunt. Reported fur exports from Alaska were worth nearly 2.3 million dollars/year. Trappers reportedly sold/exported about 50 percent of the animals they harvested (ADF&G, 2013c).

The economic value of wildlife viewing is also a major financial contributor to Alaska and the nation. Nationally, fish and wildlife-related recreation is an important leisure and economic activity. Nationwide,

hunters, anglers, and wildlife watchers spend 145 billion dollars/year on wildlife related recreation (USFWS, 2011a). Wildlife viewing is one of the significant reasons tourists visit Alaska, but since viewing is incorporated into other activities, calculations specific to wildlife viewing in Alaska are harder to make. Alaskan wildlife is rated as one of the reasons visitors and residents appreciate Alaska (ADF&G, 2006). Wildlife enriches the experience of local Alaskan hikers, boaters, and recreationists. There is also the intrinsic value that many people around the world assign to an area that still has free-ranging brown bears, wolves, and millions of birds—even if they may never visit.

Information Needs

Detailed information on numbers, trends, distributions, range, age class, and habitat use of many species within the national forest is either lacking or dated. Baseline wildlife population and habitat data is a challenge to all wildlife and land managers in Alaska.

Humans influence wildlife distribution, productivity, and survival. The impact of that influence on wildlife is determined by the location, intensity, season, and duration of human activities and the location, breeding status, vulnerability, and extent of wildlife exposed. Good population numbers or distributions of wildlife within the national forest are currently lacking. Essential breeding, feeding, and wintering habitats for most of these species have not been determined to an adequate degree to fully evaluate the effects of human activities within the national forest.

Habitat associations identify which characteristics of habitat are important to wildlife for necessary life functions. These associations require information that describes the important characteristics, patterns, and extent of habitat for each species. Information on habitat associations and habitat quality, quantity and extent within the national forest is often lacking the detail necessary to meaningfully evaluate project level effects on a species. Other factors, such as invasive species; roads and railroad barriers; mortality sinks; and garbage, pollution, and marine debris, have not been quantitatively evaluated to determine if they have significant effects on national forest wildlife.

Wildlife habitat associations, i.e., the description of the mix of vegetative, topographic, biological, and landscape conditions that support the needs of a species or population of wildlife, have been well-studied for many species in the contiguous 48 states, but studies of some species suggest that patterns of habitat use in Alaska may differ from what is observed in these studies. The differences are due in part to higher latitude, shorter seasons, more predators, more recent geological development, and the different community ecosystems in Alaska (Duffy, Boggs, Hagenstein, Lipkin, & Michaelson, 1999).

Less than one percent of Alaska has been permanently altered by human activity (Duffy, Boggs, Hagenstein, Lipkin, & Michaelson, 1999). Baseline data, habitat relationships, distributions, and population parameters are poorly known for Alaskan wildlife (ADF&G, 2006). The lack of this information makes it difficult to accurately assess impacts of projects on wildlife and the ecosystem, to assess species that may be declining, or identify habitat issues that need management actions to meet Forest Service objectives and policy. Most species in Alaska still appear to have intact ecological communities and functional habitat and can provide a relatively undisturbed study canvas to evaluate the function and patterns of intact ecosystems. These intact functional systems are difficult to find in the contiguous 48 states.

Plants

Chugach National Forest plant species commonly enjoyed and used by the public for gathering, observing, or sustenance are summarized, and the conditions and trends for these species along with the contribution of these species to social and economic sustainability are discussed.

Relevant Information

- In general, the condition of Chugach National Forest plant populations enjoyed and used by the public is good.
- Harvesting fern fiddleheads and mushrooms from within the national forest appears to be increasing. There is a need to evaluate special forest products management to ensure sustainability.
- The spread of non-native and invasive plant species does pose some risk in specific areas of high human use (e.g., trails and roads).

Species Commonly Enjoyed and Used by the Public

Native people of southcentral Alaska have used a variety of plants for thousands of years for food, shelter, fuel, medicine, crafts, and spiritual purposes (Russell, 2011). Some present day uses of these plants include Christmas trees, transplants (for landscaping), cuttings (for restoration), burls, boughs, and medicines along with edible leaves, berries, fruits, stems, and roots. Some trees found within the national forest are used for wood products, such as house logs or fuelwood.

More than 560 vascular plant species have been recorded within the Chugach National Forest, equating to about one-third of the total flora of Alaska (DeVelice, et al., 1999). Of these, the 284 most common are described in DeVelice et al. (2001). All of these species contribute to the aesthetic character of the national forest landscape. A selection of plants found within the national forest and their known uses by people is listed in table 68.

Table 68. A selection of plant species found within the Chugach National Forest that are known to be used by people (based in part on Russell 2011)

Scientific Name	Common Name	Known Uses	Geographic Area
Trees			
<i>Betula kenaica</i>	Kenai paper birch	E T U W	Kenai Peninsula
<i>Picea glauca</i>	white spruce	O U T W X	Kenai Peninsula
<i>Picea X lutzii</i>	Lutz spruce	O U T W X	Kenai Peninsula
<i>Picea mariana</i>	black spruce	U	Kenai Peninsula
<i>Picea sitchensis</i>	Sitka spruce	E M O T U W X	Forestwide
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	U W	Kenai Peninsula and Copper River Delta
<i>Populus tremuloides</i>	quaking aspen	T U W	Kenai Peninsula
<i>Salix scouleriana</i>	Scouler willow	C	Kenai Peninsula
<i>Tsuga heterophylla</i>	western hemlock	U W	Prince William Sound and Copper River Delta
<i>Tsuga mertensiana</i>	mountain hemlock	U and W	Forestwide
Tall Shrubs			
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder	T	Kenai Peninsula
<i>Alnus viridis</i> ssp. <i>sinuata</i>	Sitka alder	T	Forestwide
<i>Amelanchier</i> spp.	serviceberry	B	Kenai Peninsula
<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>	shrubby cinquefoil	M and T	Kenai Peninsula

Scientific Name	Common Name	Known Uses	Geographic Area
Tall Shrubs (continued)			
<i>Malus fusca</i>	Oregon crab apple	B	Prince William Sound
<i>Myrica gale</i>	sweetgale	M	Forestwide
<i>Oplopanax horridus</i>	devil's club	M and T	Forestwide
<i>Ribes hudsonianum</i>	northern black currant	B	Kenai Peninsula
<i>Ribes lacustre</i>	bristly black currant	B	Kenai Peninsula
<i>Ribes laxiflorum</i>	trailing black currant	B	Kenai Peninsula and Prince William Sound
<i>Ribes triste</i>	northern red currant	B	Kenai Peninsula
<i>Rosa acicularis</i>	prickly rose	B and M	Kenai Peninsula
<i>Rubus idaeus</i>	raspberry	B	Kenai Peninsula
<i>Rubus spectabilis</i>	salmonberry	B	Forestwide
<i>Salix</i> sp.	willow	C	Forestwide
<i>Salix alaxensis</i>	feltleaf willow	C	Forestwide
<i>Salix barclayi</i>	Barclay willow	C	Forestwide
<i>Salix commutata</i>	undergreen willow	C	Forestwide
<i>Salix hookeriana</i>	Hooker willow	C	Copper River Delta
<i>Salix pulchra</i>	diamond-leaf willow	C	Kenai Peninsula
<i>Salix sitchensis</i>	Sitka willow	C	Forestwide
<i>Sambucus racemosa</i>	elderberry	M	Forestwide
<i>Sorbus scopulina</i>	western mountain-ash	M	Kenai Peninsula and Prince William Sound
<i>Sorbus sitchensis</i>	Sitka mountain-ash	M	Forestwide
<i>Vaccinium ovalifolium</i>	early blueberry	B and T	Forestwide
<i>Viburnum edule</i>	highbush cranberry	B and M	Forestwide
Low and Dwarf Shrubs			
<i>Arctostaphylos alpina</i>	alpine bearberry	B	Kenai Peninsula
<i>Arctostaphylos uva-ursi</i>	kinnikinnick	B	Kenai Peninsula
<i>Empetrum nigrum</i>	crowberry	B	Forestwide
<i>Ledum palustre</i> ssp. <i>decumbens</i>	narrow-leaf Labrador-tea	E	Forestwide
<i>Ledum palustre</i> ssp. <i>groenlandicum</i>	Greenland Labrador-tea	E	Kenai Peninsula
<i>Linnaea borealis</i>	twinline	T	Kenai Peninsula
<i>Oxycoccus microcarpus</i>	bog cranberry	B	Forestwide
<i>Spiraea beauverdiana</i>	Beauverd spiraea	T	Kenai Peninsula and Prince William Sound
<i>Vaccinium caespitosum</i>	dwarf blueberry	B	Kenai Peninsula and Prince William Sound
<i>Vaccinium uliginosum</i>	bog blueberry	B and T	Forestwide
<i>Vaccinium vitis-idaea</i>	lowbush cranberry	B	Forestwide
Herbs			
<i>Achillea borealis</i>	yarrow	M	Forestwide
<i>Aconitum delphinifolium</i>	monkshood	T	Kenai Peninsula and Prince William Sound
<i>Aquilegia Formosa</i>	western columbine	T	Kenai Peninsula and Prince William Sound
<i>Arnica latifolia</i>	broadleaf arnica	M	Kenai Peninsula and Prince William Sound

Scientific Name	Common Name	Known Uses	Geographic Area
Herbs (continued)			
<i>Artemisia tilesii</i>	<i>Aleutian mugwort</i>	M	Forestwide
<i>Aruncus Sylvester</i>	goatsbeard	T	Forestwide
<i>Boschniakia rossica</i>	ground-cone	M	Forestwide
<i>Chamerion angustifolium</i>	tall fireweed	M and T	Forestwide
<i>Chamerion latifolium</i>	dwarf fireweed	T	Forestwide
<i>Conioselinum chinense</i>	western hemlock-parsley	E and M	Forestwide
<i>Cornus Canadensis</i>	bunchberry	B	Forestwide
<i>Dodecatheon pulchellum</i>	pretty shooting star	T	Forestwide
<i>Erigeron peregrinus</i>	subalpine fleabane	M and T	Forestwide
<i>Fragaria chiloensis</i>	beach strawberry	B and T	Copper River Delta
<i>Fritillaria camschatcensis</i>	chocolate lily	E and T	Forestwide
<i>Geranium erianthum</i>	northern geranium	M and T	Kenai Peninsula and Prince William Sound
<i>Heracleum maximum</i>	cow parsnip	E and M	Forestwide
<i>Honckenya peploides</i>	seaside sandplant	E	Prince William Sound and Copper River Delta
<i>Iris setosa</i>	wild iris	T	Forestwide
<i>Lathyrus maritimus</i>	beach pea	E	Forestwide
<i>Leymus mollis</i>	beach rye	C	Forestwide
<i>Ligusticum scoticum</i>	beach lovage	E and M	Prince William Sound and Copper River Delta
<i>Lupinus nootkatensis</i>	Nootka lupine	E and T	Forestwide
<i>Moneses uniflora</i>	single delight	M	Forestwide
<i>Myosotis alpestris</i>	forget-me-not	T	Kenai Peninsula
<i>Petasites hyperboreus</i>	arctic sweet coltsfoot	M	Kenai Peninsula and Prince William Sound
<i>Polygonum viviparum</i>	alpine bistort	M	Forestwide
<i>Prenanthes alata</i>	rattlesnake root	M	Forestwide
<i>Rubus arcticus</i>	nagoonberry	B	Forestwide
<i>Rubus chamaemorus</i>	cloudberry	B	Kenai Peninsula and Prince William Sound
<i>Rubus pedatus</i>	fiveleaf bramble	B	Forestwide
<i>Rumex fenestratus</i>	western dock	E	Prince William Sound and Copper River Delta
<i>Sedum rosea</i>	roseroot stonecrop	T	Kenai Peninsula
<i>Solidago multiradiata</i>	northern goldenrod	T	Kenai Peninsula
<i>Streptopus amplexifolius</i>	twistedstalk	B	Forestwide
<i>Thalictrum sparsiflorum</i>	fewflower meadowrue	M	Kenai Peninsula and Prince William Sound
Ferns			
<i>Athyrium filix-femina</i>	lady fern	E and T	Forestwide
<i>Dryopteris expansa</i>	wood fern	E and T	Forestwide
<i>Equisetum arvense</i>	common horsetail	E and M	Forestwide

Note: Codes for known uses are B: berries/fruits, C: cuttings, E: edible (leaves, stems, or roots), M: medicinal, O: boughs, T: transplants, U: burls, W: wood products, and X: Christmas trees

Although not technically plants, mushrooms are discussed in this section. Mushrooms are a highly sought after special forest product within the Chugach National Forest as a source of food, pigments for dyes, and for aesthetic enjoyment. There are more than 300 species of mushroom producing fungi documented within the Chugach National Forest and many more species are likely to occur. Mohatt et al. (2013) provides descriptions of 51 common and interesting species of southern Alaska, 50 of which occur within the Chugach National Forest. The species most often collected for consumption include: angel wings (*Pleurocybella porrigens*), gypsy (*Cortinarius caperatus*), shaggy mane (*Coprinus comatus*), winter chanterelle or yellow foot (*Craterellus tubaeformis*), blue or black chanterelle (*Polyozellus multiplex*, rare), king bolete (*Boletus edulis*), sulfur shelf or chicke of the woods (*Laetiporus conifericola*), hedgehog or sweet tooth (*Hydnum repandum*), bear's head (*Hericium coralliodes*), gray fire morel (*Morchella tomentosa*) and other morels (*Morcella* spp.). The most common commercially harvested species are king bolete and hedgehog.

Conditions and Trends

National Forest System lands are available for the personal use gathering of special forest products, such as berries, mushrooms, greenery, and Christmas trees. No permits are required for these activities and no data are available to evaluate this use. Permits are required for commercial harvest of special forest products (USDA, 2000). People collecting special forest products are expected to exercise reasonable care to protect resources from damage. In addition, a special forest products decision memo specifies limits on permits by watershed on the Kenai Peninsula to prevent overharvesting within heavily used areas, highly public areas, and within specific watersheds (USDA, 2002a).

The demand for some special forest products is increasing; this is evidenced by overharvest of fern fiddleheads and mushrooms. Based on public reports and Forest Service site visits, lady fern (*Athyrium filix-femina*) is being overharvested in the Girdwood area. Monitoring plots have been established to quantify harvesting effects on the fern population. Results of this monitoring are not yet available.

The demand for edible mushrooms/fungi appears to be increasing based on public interest in informational presentations. The Girdwood Fungus Fair has consistently drawn more than 1,000 people each of the last 6 years. There has not been an increase in requests for commercial harvest of species, yet several restaurants and shops sell or serve locally harvested species. Complaints have been made about commercial harvests occurring on National Forest System lands (Mohatt, personal communication, 2013). There is a need to review special forest product management for the Chugach National Forest.

In general, the condition of Chugach National Forest plant populations enjoyed and used by the public is good. This is primarily due to the generally low level of intensive human-caused disturbance across the largely unroaded national forest. The spread of non-native and invasive plant species does pose some risk in specific areas of high human use (e.g., trails and roads).

Contribution to Social and Economic Sustainability

The Forest Plan Review 2002-2012 (USDA, 2012b) noted that demand for commercial special forest products from the national forest was low in 2002 and has remained low. Twelve special forest products permits have been issued since 2002, all on the Kenai Peninsula. These permits allowed collection of 100 pounds of mushrooms, more than 350 spruce transplant trees, 200 alder transplants, 5,800 hardwood transplant trees, burls, willow cuttings, spruce boughs, blueberry transplants, and miscellaneous landscaping plants. In addition, an average of two permits are issued each year to collect botanical specimens for scientific research (not directed toward development of a commercial product).

Personal use gathering of special forest products, such as berries, mushrooms, and Christmas trees, is a popular activity within the national forest. A 1997 survey found berry picking to be among the most

popular activities among Alaska adults (61 percent participation), and that participation is expected to grow (Bowker, 2001). Additionally, interest among agencies, tribal governments, traditional users, landholders, businesses, and scientists in sustainable special forest products in Alaska is documented by the Alaska Boreal Forest Council. Nature enthusiasts using the national forest often include plants as subjects of interest in photography and observation.

Timber

This section is a summary of information on timber resources within the Chugach National Forest, including the current level of timber harvest and production; the ability of timber harvest to affect forest resistance and resilience to stressors; the ability of timber harvest to maintain or restore key ecosystem characteristics; the current capacity and trend of logging and restoration services; key trends that drive the supply and demand for timber; and the contribution of timber harvest and production to ecological, social, and economic sustainability. General characteristics of forest vegetation of the Chugach National Forest are summarized in the Terrestrial Ecosystems section in chapter 2.

Relevant Information

- Less than one percent of the Chugach National Forest is tentatively suitable for timber production.
- Supply and demand for forest products are not in balance. The decrease in supply (especially fuelwood) and increase in demand suggest it may be desirable to identify opportunities for supplying wood products. This could include designated small timber sales and free use fuelwood collection areas.

Suitable Timberland

The 2002 Forest Plan does not include an allowable sale quantity for a sustained output of volume for commercial timber sales. Although the land suitability analysis identified 282,610 acres of tentatively suitable forestland, those lands are allocated for resource uses other than commercial timber production. To meet National Forest Management Act requirements, an analysis of changes in timber suitability was completed in 2012 (DeVelice R. L., 2012b). Based on the 2012 process, 156,380 acres of tentatively suitable timberland were estimated across the national forest (table 69). The main difference between this estimate and the 282,610 acre estimate from 2002 is the exclusion of productive forest acreage in the Nellie Juan-College Fiord WSA and in research natural areas. In 2014, all remaining acreage designated as part of an inventoried roadless area was further excluded since timber production is prohibited. Presently, 3,260 acres of tentatively suitable timberland are estimated for the national forest.

Table 69. Acreage of tentatively suitable timberlands within the Chugach National Forest by geographic area as identified in the 2002 Forest Plan and in a 2012 analysis (DeVelice R. L., 2012b) and at present (with IRAs excluded)

Geographic Area	2002	2012	Present (excluding IRAs)
	acres		
Copper River Delta	88,514	71,280	2,730
Kenai Peninsula	25,397	17,180	0
Prince William Sound	168,699	67,920	530
Totals	282,610	156,380	3,260

Condition and Trend

Current level of timber harvest and production

Although the overall percentage of tentatively suitable timberland is low (less than one percent of the almost 5.4 million acre Chugach National Forest), there is still considerable social and some economic demand for such things as personal use fuelwood, lumber and house logs, commercial fuelwood, and special forest products.

The 2002 Forest Plan FEIS noted that from 1910 to 2000, the average amount of timber harvested from the Chugach National Forest was 3,800 thousand board feet (MBF) per year, and from 1995 to 2000, the average was 1,500 MBF per year. The FEIS also noted personal use permitting ranged from 100 to 500 MBF per year from the late 1980s to 2000.

According to the Forest Plan Review 2002-2012 and annual accomplishment reports, from 2002 to 2006, the average timber volume harvest for personal use was about 410 MBF per year while the average harvest from sales was 70 MBF per year. From 2007 through 2011, the average harvest for personal use was about 350 MBF per year with an additional harvest of 1,110 MBF per year from sales.

From 2006 to 2011, personal use fuelwood harvested from the Kenai Peninsula geographic area of the Chugach National Forest averaged 1,125 cords per year, and 650 cords per year were sold to fuelwood businesses. The Forest Service also coordinates with the state of Alaska to provide personal use fuelwood in the Cordova area.

Ability of timber harvest to affect forest resistance and resilience to stressors

The largest disturbance (stressor) that has affected forest ecosystems in the Chugach National Forest in recent decades has been spruce bark beetle activity. From 1980 to 2003, spruce bark beetle outbreaks occurred on about 2.25 million acres in the broader Kenai Peninsula-Cook Inlet region (Werner, Holsten, Matsuoka, & Burnside, 2006). The spruce tree mortality associated with this outbreak has resulted in extensive hazardous fuels accumulations. In response to the fuels situation on the Kenai Peninsula, an interagency committee of Federal, state, local, and Alaska Native land managers developed an action plan for fire prevention and protection, hazardous fuels reduction, ecosystem restoration, and community assistance (Kenai Peninsula Borough, 2004). As part of this action plan, mechanical and prescribed fire fuel reduction is occurring on about 100,000 acres on the entire Kenai Peninsula (about 875 acres per year within the Chugach National Forest), with a focus on the wildland-urban interface. Much of the beetle-killed spruce reduction work has been completed within the wildland-urban interface and accessible roaded areas. These treatments are expected to reduce the supply of fuelwood in the future. There is potential to use more preventative treatments, such as green tree thinning, to increase resistance to future insect infestations and to meet current demands for timber. The potential influence of climate change on forest vegetation is discussed in the Terrestrial Ecosystems section.

Ability of timber harvest to maintain or restore key ecosystem characteristics

In 2008, an integrated five-year plan for vegetation treatment was developed for the Kenai Peninsula geographic area. The purpose of this plan is to assist with out-year planning and budget development for projects that reduce hazardous fuels, improve wildlife habitat, improve forest vegetation, and provide a reliable supply of wood products to the public. National forest vegetation and wildlife habitat is managed through thinning and patch cuts that favor early seral hardwoods and maintain aspen stands. Dead and down hazardous fuels are removed or piled. The resulting forest stands are potentially more resistant and resilient to wildland fire and future stressors, such as insects and diseases and precipitation changes, which may result from a changing climate.

Current capacity and trend of logging and restoration services

The Forest Service is providing for personal and commercial uses of timber and special forest products but harvest has decreased. This reduction may be due to a depleted supply of easily accessible wood on the Kenai Peninsula.

Key trends that drive the supply and demand for timber

The price of fuelwood has increased from 180 to 200 dollars per cord to 275 to 300 dollars per cord during the past five years, an increase of about 50 percent. This is likely due to increased fuel oil prices and the decline in accessible fuelwood. Much of the beetle-killed spruce that was close to roads has been gathered or is no longer sound enough to use as fuel. The decrease in fuelwood supply and increase in fuelwood (demand) suggest it may be necessary to consider planning for more designated small timber sale and free use fuelwood collection areas in the future.

Contribution of Timber Harvest and Production to Social and Economic Sustainability

The 1,125 cords of personal use fuel wood collected from the Kenai Peninsula geographic area of the national forest is enough to heat 225 households for the year, saving each approximately 1,250 dollars per year in heating costs, not including the cost to collect fuelwood. Fuel wood businesses (commercial collection) generate approximately 163,000 dollars in revenue from 650 cords per year. See the timber and wood products discussion in the Social, Cultural, and Economic Conditions section for additional information.

Fire Management

Owing to the generally cool, moist climate and low incidence of lightning, natural fires are infrequent within the Chugach National Forest, especially in the Prince William Sound and Copper River Delta geographic areas. Low frequency (about 600 year interval) natural fire has been important in the Kenai Peninsula geographic area of the national forest (Potkin, 1997). Charcoal has been reported as present in most soil pits within the Kenai Peninsula forested zone (Davidson, personal communication, 2013) suggesting the occurrence of widespread, yet infrequent, fires in prehistoric times.

While natural fire has been infrequent, human caused fire on the Kenai Peninsula geographic area has been common over the last 100 years. From 1914 to 1997, approximately 1,400 fires burned a total of 75,000 acres within the national forest (Potkin, 1997) (see figure 19), an average of about 17 fires per year. Based on the Chugach National Forest GIS database, about 85 percent of the fires within the national forest were smaller than one-quarter acre, 10 fires were larger than 1,000 acres, and more than 99 percent of all the acres burned were in the Kenai Peninsula geographic area. Humans have caused more than 99 percent of these fires.

The majority of wildland fires within the Chugach National Forest result from human activities and occur near communities, public concentration areas (e.g., campgrounds), along roads, trails, and waterways. With an increasing number of people using the national forest, human-caused fire is expected to increase. Climate change may alter the frequency and intensity of fire by affecting lightning occurrence and fuel moisture.

One 2002 Forest Plan goal is to “protect human life, property and facilities from wildland fire hazards” (USDA, 2002a). Fire and fuels management for the national forest include wildland fire response, hazardous fuels reduction, and wildlife habitat improvement. The focus is on the Kenai Peninsula geographic area where people and communities are in close proximity to hazardous fuels. Management of vegetation near communities, public concentration areas, and transportation routes is used to help reduce the threat of fire to life and property.

Relevant Information

- There are about 119,000 acres of wildland-urban interface in the Kenai Peninsula geographic area.
- Since 1914, approximately 1,400 fires burned a total of 75,000 acres on the Chugach National Forest.
- More than 99 percent of the acres burned were in the Kenai Peninsula geographic area.
- Humans caused more than 99 percent of the fires.
- With an increase in the number of people using the national forest, the likelihood of human-caused fire is expected to increase.
- Effects of climate change on lightning occurrence and fuel moisture may alter the frequency and intensity of fire.
- The 2002 Forest Plan includes direction allowing broadcast burning as a fire management tool. Plan objectives could be included to emphasize using broadcast burning as a fire management tool where reducing hazardous fuels or improving wildlife habitat is part of the desired condition.

Fire Use by Alaska Natives

Alaska Natives have been present in southcentral Alaska for thousands of years. There is no evidence that they used fire as a land management tool (Berg, personal communication, 2013).

Wildland Fire Response

Protection of life and property from the threat of wildland fire is one of the Forest Service’s most critical missions (USDA, 2002c). Fire suppression activities within the national forest are prioritized by the four

protection levels (critical, full, modified, and limited) defined in the Alaska Interagency Wildland Fire Management Plan (2010).

The distribution of these four protection levels across the national forest and by geographic area is shown in map 11 and the acreage is displayed in table 70. About 14 percent of the Kenai Peninsula geographic area (where wildland fires are most prevalent within the national forest) is classified either Critical or Full protection level. Even though the probability of fire is low in the rain forests of Prince William Sound and the Copper River Delta, populated areas, property, and structures are present that need to be protected in the unlikely event of wildland fire. The intent of the options follows.

Critical protection level

These are the highest priority areas/sites for suppression actions and assignment of available firefighting resources. Lands in the wildland-urban interface and other populated areas where there is an immediate threat to human life, primary residences, inhabited property, community-dependent infrastructure, and structural resources designated as National Historic Landmarks qualify to be considered for this designation.

Full protection level

This option provides for the protection of cultural and paleontological sites, developed recreational facilities, physical developments, administrative sites and cabins, uninhabited structures, high-value natural resources, and other high-value areas that do not involve the protection of human life and inhabited property. Structures on or eligible for inclusion and non-structural sites on the National Register of Historic Places are placed within this category.

Modified protection level

This option provides a protection level between Full and Limited. Unlike Full protection level areas, the intent is not to minimize burned acres, but to balance acres burned with suppression costs and, similar to the Limited protection level, to accomplish land and resource management objectives when conditions are favorable.

Management actions should:

- Under suitable fire and environmental conditions, accomplish fire-related land-use and resource objectives in a cost effective manner while providing appropriate levels of protection to identified sites.
- Maintain the flexibility to respond to fire conditions and tailor the initial action to those conditions.

Limited protection level

The Limited protection level is designed for broad, landscape-scale areas where the low density and wide distribution of values to be protected best allows for fire to function in its ecological role. Sites that warrant higher levels of protection may occur within the boundaries of Limited protection level areas, and actions to protect these sites will be taken when warranted without compromising the intent of this management option. Limited protection level is also assigned to areas where the cost of suppression may exceed the value of the resources to be protected or the environmental impacts of fire suppression activities may have more negative impacts on the resources than the effects of the fire.

Hazardous Fuels Reduction

The hazardous fuels reduction program strives to minimize the potential for large, destructive wildland fires by reducing the volume of hazardous fuel within the national forest. The highest priority is reduction

of fuels in the wildland-urban interface. Coordination occurs with state and private land owners to maximize benefits across the landscape (using the Interagency All Lands/All Hands action plan, i.e., Kenai Peninsula Borough 2004). In general, priorities for treatment follow the fire protection levels described previously (i.e., focusing management actions in Critical protection level areas first).

The wildland-urban interface and Community Wildfire Protection Plan (CWPP) areas of the national forest are displayed in map 12. CWPP areas occurring at least in part within the national forest boundary are: Hope/Sunrise/Summit; Moose Pass/Crown Point/Primrose; Cooper Landing; and Bear Creek/Seward/Lowell Point. There are about 119,000 acres of wildland-urban interface in the Kenai Peninsula geographic area of the national forest. Most areas of the high hazard fuels and high fire risk border the Sterling and Seward highways.

As noted in the Forest Plan Review 2002-2012, a spruce bark beetle (*Dendroctonus rufipennis*) infestation killed a majority of mature spruce trees across at least 40,000 acres of the Chugach National Forest in the Kenai Peninsula geographic area since the 1950s (peaking in the 1990s). The spruce bark beetle infestation has resulted in extensive hazardous fuels accumulation and increased potential for large wildland fires. Reducing these accumulations has been the focus of the hazardous fuels program.

The 2002 Forest Plan proposed completing 400 acres of hazardous fuel reduction annually. About 600 acres of treatment are actually accomplished each year. Treatments consist of removal, thinning, pruning, piling, and burning, especially in the wildland-urban interface, high use areas, and along transportation routes. Since the Kenai Lake Fire of 2001, which was planned for 1,250 acres but burned 3,260 acres, broadcast burning has not been used within the national forest. Reestablishing broadcast burning as a fire management tool would expand treatment options (and possibly reduce costs) for hazardous fuel reduction and wildlife habitat improvement.

Wildlife Habitat Improvement

The 2002 Forest Plan proposes about 2,248 acres of wildlife habitat improvement burns annually. However, since broadcast burns are not currently being used within the national forest, habitat improvement burns are not taking place.

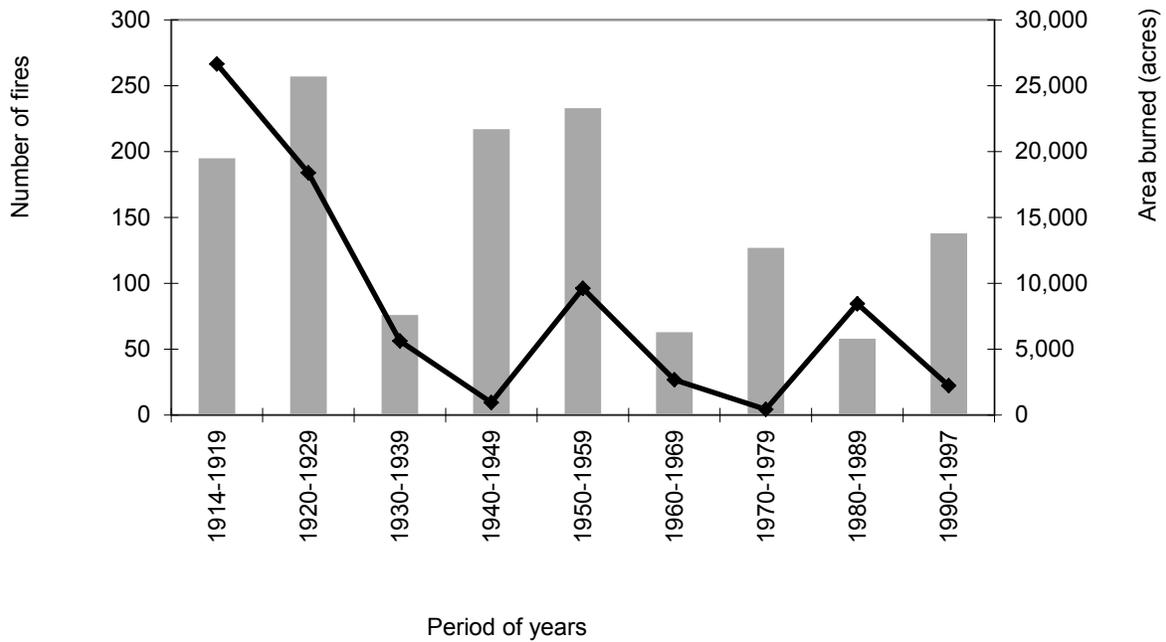
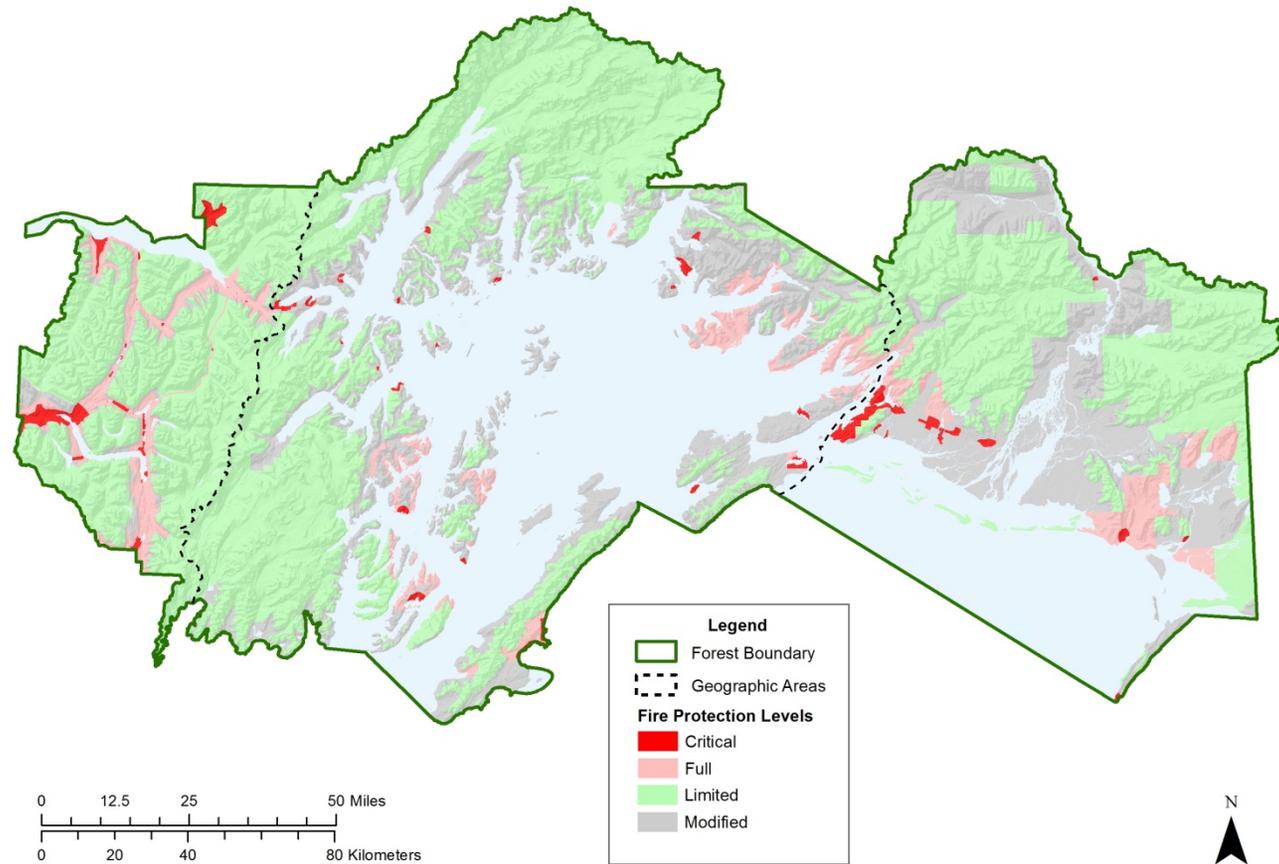


Figure 19. Number of fires (bars) and acres burned (line) by decade in the Kenai Peninsula geographic area from 1914 to 1997 (Potkin 1997 and USFS 2002b)

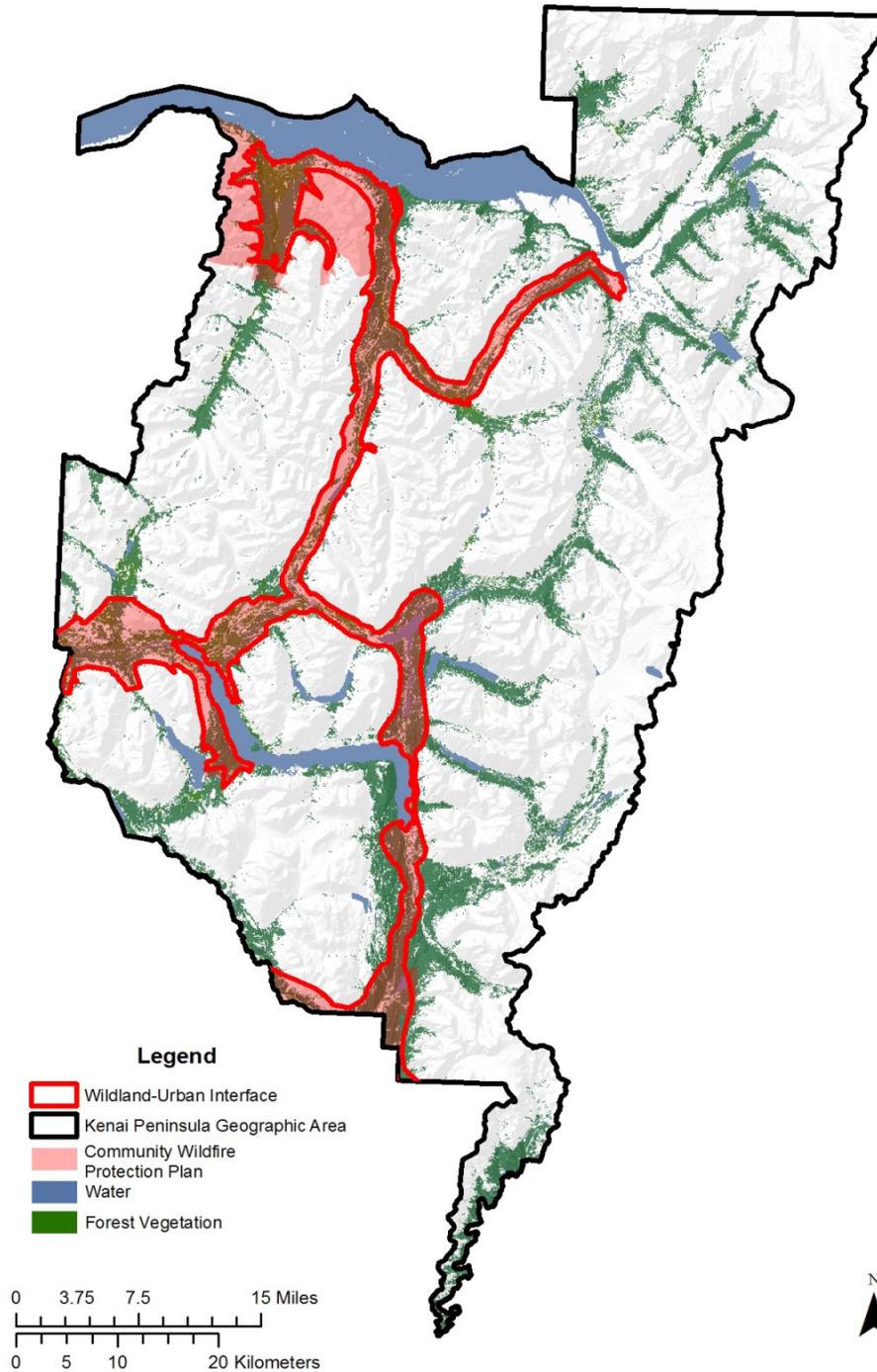
Table 70. Acreage by fire protection level within the outer boundary of the Chugach National Forest (see map 11)

Geographic Area	Protection Level					Totals
	Critical	Full	Modified	Limited	Water	
	acres (percentage)					
Kenai Peninsula	33,152 (2.6)	146,213 (11.6)	74,271 (5.9)	981,689 (77.9)	24,582 (2.0)	1,259,907
Prince William Sound	21,166 (0.7)	161,458 (5.3)	920,456 (30.3)	1,925,382 (63.4)	7,601 (0.3)	3,036,063
Copper River Delta	27,635 (1.4)	139,248 (6.9)	735,205 (36.0)	1,080,091 (53.8)	37,647 (1.9)	2,007,826
Forestwide	81,953 (1.3)	446,920 (7.1)	1,717,932 (27.3)	3,987,162 (63.3)	69,829 (1.1)	6,303,796

Definitions of the four protection levels are provided in the text.



Map 11. Fire protection levels across the Chugach National Forest. The boundaries of the Kenai Peninsula, Prince William Sound, and Copper River Delta geographic areas are also shown (left to right, respectively). Definitions of the four protection levels are provided in the text. Source: Chugach National Forest GIS database.



Map 12. Wildland-urban interface (within the red line) and CWPP (in red shading) areas of the Chugach National Forest. The boundary of the Kenai Peninsula geographic area is in black. Areas of forest vegetation are shown in green and open water in blue.

Sources: Kenai Peninsula Borough GIS (wildland-urban interface and CWPP), Chugach National Forest GIS (Kenai Peninsula geographic area boundary), and the National Land Cover Database (<http://www.mrlc.gov/>).

Watershed and Water Resources

This section represents a rapid evaluation of existing information on the trends and sustainability of the contribution of watersheds and water resources to social, economic, and ecological sustainability. Specific items to be evaluated for the plan area include: water rights and instream flows, consumptive water uses, non-consumptive water uses, condition and trends for water uses in the plan area and broader landscape, and the contribution of watersheds and water resources to social and economic sustainability.

Water resources within the national forest are extremely valuable to the public. These resources are both consumptive and non-consumptive. The main consumptive water uses include drinking water, water use for Forest Service facilities (i.e., campgrounds, maintenance, fire, and management activities), hydropower generation, fish hatcheries, mining operations, highway construction, dust abatement, and special use permits. National Forest System lands provide water for more than 150 public water systems and one designated municipal water source (city of Cordova). Non-consumptive water uses include recreation (i.e., rafting, fishing, boating), wildlife and aquatic habitat, subsistence, and the aesthetic quality of the resource. A substantial part of recreational use within the national forest revolves around water bodies and glaciers.

Relevant Information

- Water uses within the national forest will likely increase in the future with increased demands for hydroelectricity, mining operations, gravel extraction, development, and recreation.
- Nearly 500 water rights exist within the national forest. Seven include instream flow reservations for fish and wildlife habitat. The majority of these are within the Kenai Peninsula geographic area. The Forest Service has not applied for any water rights for in-stream flow reservations within the national forest. With trends for increased demands, filings of water rights, the influence of lands of other ownership, and climate change projections on water resources, the Forest Service could include management direction to pursue applications for securing in-stream flows reservations within priority watersheds.
- Direction could be added to acquire water rights associated with new and existing administrative and recreational facilities.
- Impacts from climate change to non-consumptive national forest water resources include affects to timing, locations, and use of recreational activities, such as whitewater rafting, skiing, fishing, and glacial viewing. Impacts from climate change to consumptive national forest water resources include changes in the timing and amounts of water available for water storage and hydropower generation.

Water Resources Used by the Public

Water rights and instream flows

The 2002 Forest Plan does not use the phrase water rights at all and the phrase instream flows is mentioned only once (USDA, 2002a). Instream flows are identified as a goal for Water, Wetland, and Riparian Areas, specifically: “Provide instream flows to maintain and support aquatic life and habitat, recreation and aesthetics, the natural conveyance of water and sediment, and other resources that depend on such flows on National Forest System lands.” The corresponding objective states: “Establish instream flow requirements or suitable mitigation measures for all water impoundments or diversions” (USDA, 2002a).

Guidance on acquiring water rights and reservation of instream flows is outlined in FSM 2540.

A water right is a legal right to use surface or groundwater. It allows a specific amount of water from a particular water source to be diverted, impounded, or withdrawn for a specific use. Water rights in Alaska are regulated under the Alaska Water Use Act (AS 46.15).

A reservation of water for instream use is a specific type of water right that protects certain instream water uses, such as fish spawning or recreation. It sets aside the water flow necessary for these activities and keeps later water users from appropriating water that may affect instream activity.

Federal reserved water rights are different from state appropriated water rights. Federal reserved rights:

- May apply to both instream and out-of-stream water uses
- May be created without actual diversion or beneficial use
- Are not lost by non-use
- Have priority dates established as the date the land was withdrawn
- Are for the minimum amount of water reasonably necessary to satisfy both existing and foreseeable future uses of water for the primary purposes for which the land is withdrawn

Additionally, Federal subsistence use has a reserved water right in navigable waters within and adjacent to the exterior boundary of the national forest to provide for the harvest of fish (36 CFR 242.3(c)(6)). The reserved water right applies to all waters, within public and private ownership excluding marine waters (see the Subsistence section).

Water rights for all other Federal purposes must be obtained in compliance with AS 46.15.

Water rights within the Chugach National Forest

State-issued water rights are administered and maintained by the Water Resources Program of Alaska DNR Division of Mining, Land, and Water. Table 71 displays the number of surface and subsurface temporary water use permits and state water rights held within any 6th-level HUC watershed that is entirely or partially within the Chugach National Forest. Figure 20 illustrates that the majority of these lie within the Kenai Peninsula geographic area where most of the population resides. The Forest Service holds 15 percent of the surface water rights and 12 percent of the subsurface water rights displayed in these charts.

Table 71. All surface and subsurface temporary water use permits and state water rights permits held within any 6th-level HUC located within the Chugach National Forest boundary; permits listed include all certificates issued, permits issued, certificates pending action, permits pending action, and applications received (ADNR, 2013)

Type	Temporary Water Use Permits (TWUP)	Water Rights	
		Forest Service	Total
Surface	34	36	244
Subsurface (groundwater)	2	28	232

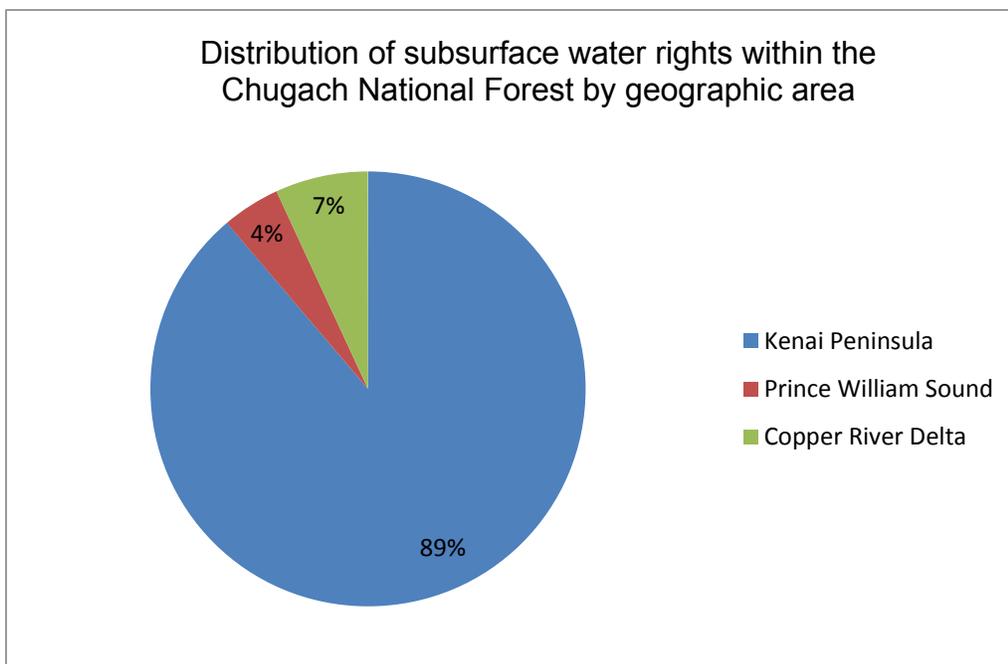
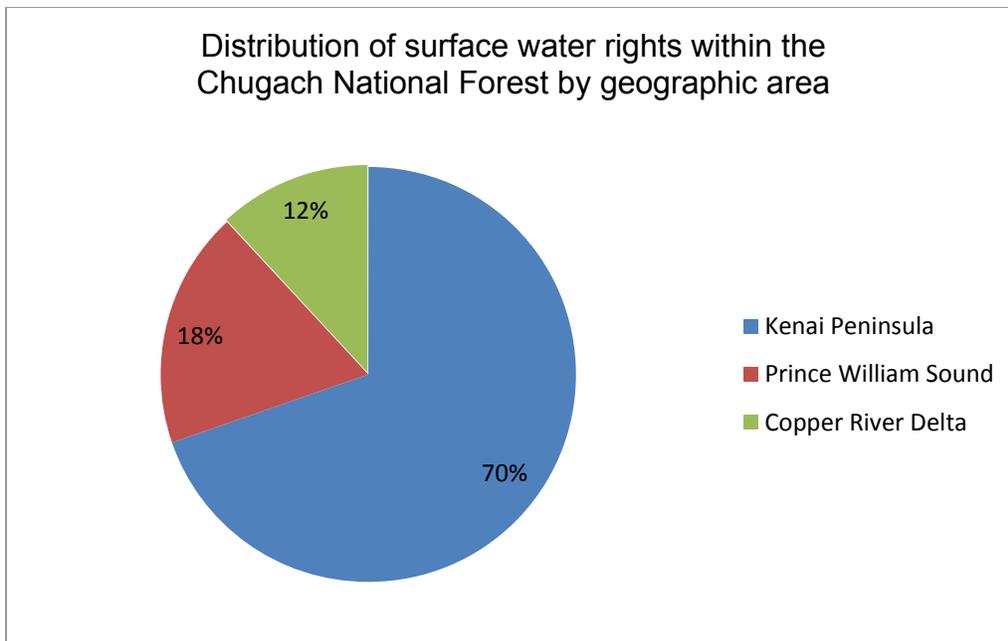


Figure 20. The distribution by geographic zone of surface and subsurface water use permits held within any 6th-level HUC located within the Chugach National Forest boundary. Permits listed include all certificates issued, permits issued, certificates pending action, permits pending action, and applications received (ADNR, 2013).

The Forest Service currently holds no water rights granted by the state of Alaska for in-stream flow reservations. Table 72 contains instream flow reservations by other owners that are on waters within or adjacent to the Chugach National Forest.

Table 72. Instream flow reservations held within or adjacent to the Chugach National Forest (ADNR, 2013)

Instream Flow Reservations			
Stream	Geographic Area	LAS	Comments
Kenai River	Kenai Peninsula	12676	ADF&G certificates issued
Kenai River	Kenai Peninsula	12677	ADF&G certificates issued
Glacier Creek	Kenai Peninsula	20895	ADF&G certificates issued
Copper River	Copper River Delta	22407	ADF&G certificates issued
Copper River	Copper River Delta	22405	ADF&G certificates issued
Grouse Creek	Kenai Peninsula	28418	ADF&G applications received
Twentymile River	Kenai Peninsula	28750	ADF&G certificates issued
Russian River	Kenai Peninsula	28751	ADF&G certificates issued

Contribution of Water Resources: Consumptive Use

Consumptive water use is defined as the amount of water taken from the system during the application of water to a beneficial use that is not returned to the system. The consumptive use of water reduces the overall amount of water in the system, making less water available for environmental purposes or downstream uses. Overall, consumptive water uses are fairly limited within the Chugach National Forest. There are limited water withdrawals and diversions for agricultural, municipal, and commercial uses. The main consumptive water uses include drinking water, water use for Forest Service facilities (i.e., campgrounds, maintenance, firefighting, and management activities), hydropower generation, fish hatcheries, mining operations, highway construction, dust abatement, and special use permits.

Municipal and public water supplies

There currently is one municipal watershed within the national forest. This municipal watershed encompasses Heney Creek, with water diverted into Meals Reservoir, and Murcheson Falls that drains into Eyak Lake and provides the drinking water source for the City of Cordova. Municipal watersheds are managed to protect the municipal water supply of communities adjacent to national forests. Activities on lands managed as municipal watersheds are generally limited to protect and maintain resources in a natural condition. These watersheds meet the provisions of the Safe Drinking Water Act and the State of Alaska Drinking Water Regulations and Water Quality Standards in accordance with Forest Service Manual (FSM 2545 and 36 CFR 251.9).

Municipal Supply Watersheds are defined (FSM 2545.05) as a watershed that serves a public water system as defined in the Safe Drinking Water Act of 1974, as amended, or watersheds that contain Source Water Protection Areas, as defined in Federal or state safe drinking water statutes or regulations. Source Water Protection Areas are delineated by the state for a public water system or include numerous public water systems, whether the source is ground water or surface water or both, as part of the State Water Assessment Program (SWAP) approved by EPA under section 1453 of the Safe Drinking Water Act. Figure 21 displays a list of the number and type of public water systems directly affected by National Forest System lands. These public water systems are entirely within the Chugach National Forest boundary or are adjacent and within a watershed that is partially within the boundary. Eighty-six percent

of these public water systems are within the Kenai Peninsula geographic area with 9 percent in Prince William Sound and 5 percent on the Copper River Delta.

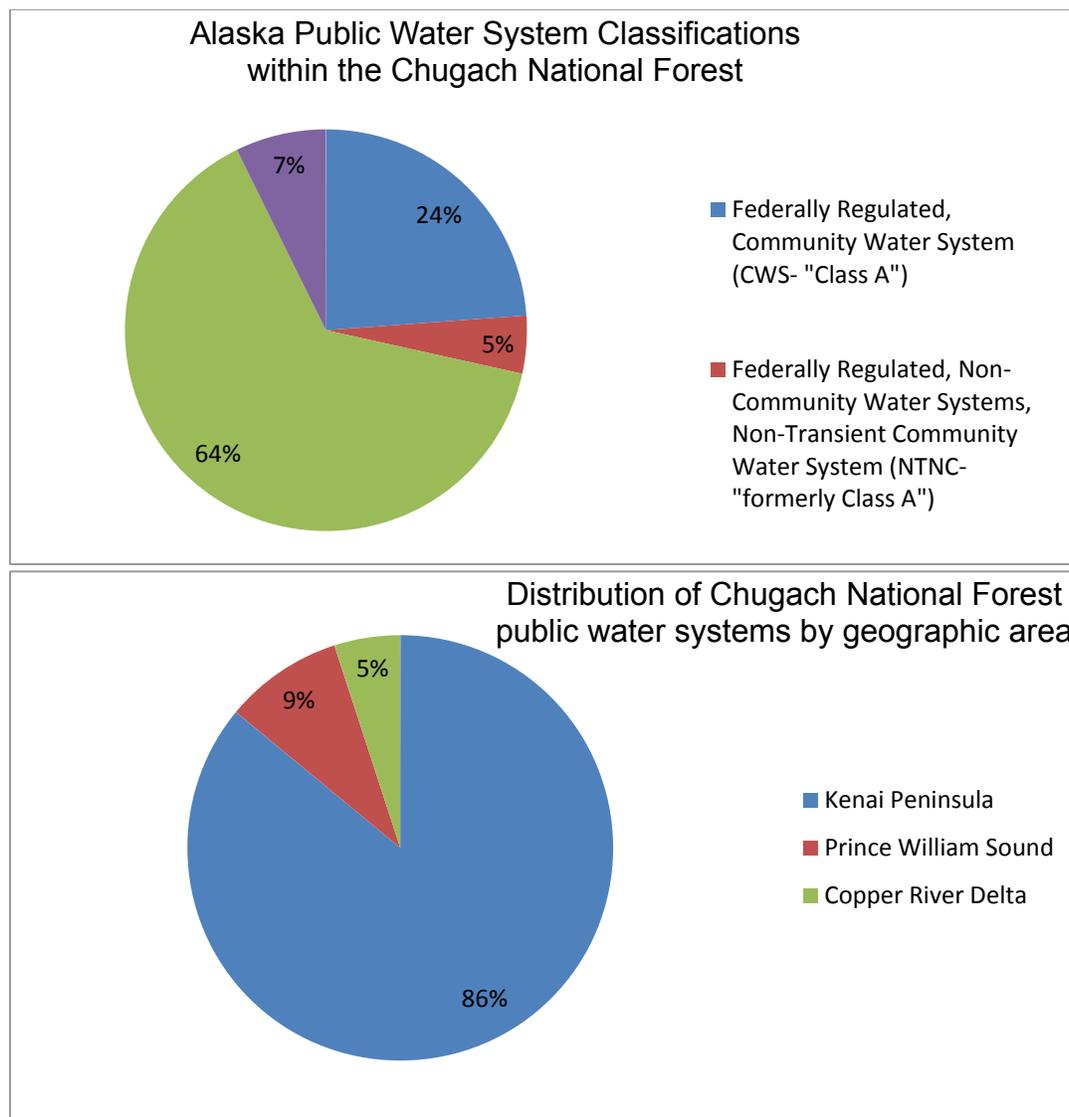


Figure 21. Percentages and types of public water systems within or adjacent to the Chugach National Forest. Data include any public water system that is within a 6th-level HUC that is entirely or partially within the Chugach National Forest. Public water system information has been provided by the Drinking Water Program of the ADEC. The information provided is a data snapshot as of March 12, 2013. There may be errors in source location information as well as other information provided.

A public water system is a system that provides water for human consumption through pipes or other constructed conveyances to one or more multi-family dwellings, two or more duplexes or single-family residences, a factory, office building, restaurant, school, or similar facility. If such a system has a least 15 service connections or regularly serves at least 25 individuals, it must comply with Federal regulations. A public water system is further broken down into classifications as either a community water system; a non-community water system; or Class C water system, which must comply with state regulations. A Community Water System (CWS) is a public water system that, year round, regularly serves 25 people or has 15 service connections. Examples include a municipal water system serving a town or village or a

mobile home park. A Non-Community Water System is a public water system that does not serve a permanent resident population. This category is further divided into two types. A Non-Transient Non-Community Water System (NTNC) is a public water system that serves at least 25 of the same people at least 6 months a year, such as a church, school, or office building. A Transient Non-Community Water System (TNC) is a public water system that serves a transient population at least 60 days per year, such as a campground, hotel, or restaurant. A Class C Water System is a public water system that is not a CWS, a NTNC, a TNC, or a private water system. Examples include an assisted living facility or daycare. A Private Water System is a potable water system serving one single-residence or duplex.

Groundwater is of beneficial use both within and outside the national forest in the form of water supply wells. Groundwater provides 92 percent of the public water system water in the geographic area of the national forest (see figure 22). Several communities use wells that are recharged by surface water from National Forest System lands. Most notable are the City of Seward that uses wells recharged by the Resurrection River and the City of Whittier that uses a well recharged by Whittier Creek, which originates within the national forest. The community of Valdez uses groundwater as their public water system as well. The communities of Moose Pass, Hope, and Cooper Landing do not have a city well/water source; however, drinking water for the majority of the households is individual groundwater well sources. Other consumptive use of groundwater within the national forest includes special-use permittees and Forest Service campgrounds and administrative sites with domestic wells. Although located entirely outside the national forest, the Alyeska Ski Area uses water from Glacier Creek for snow making. The Glacier Creek watershed originates on National Forest System lands.

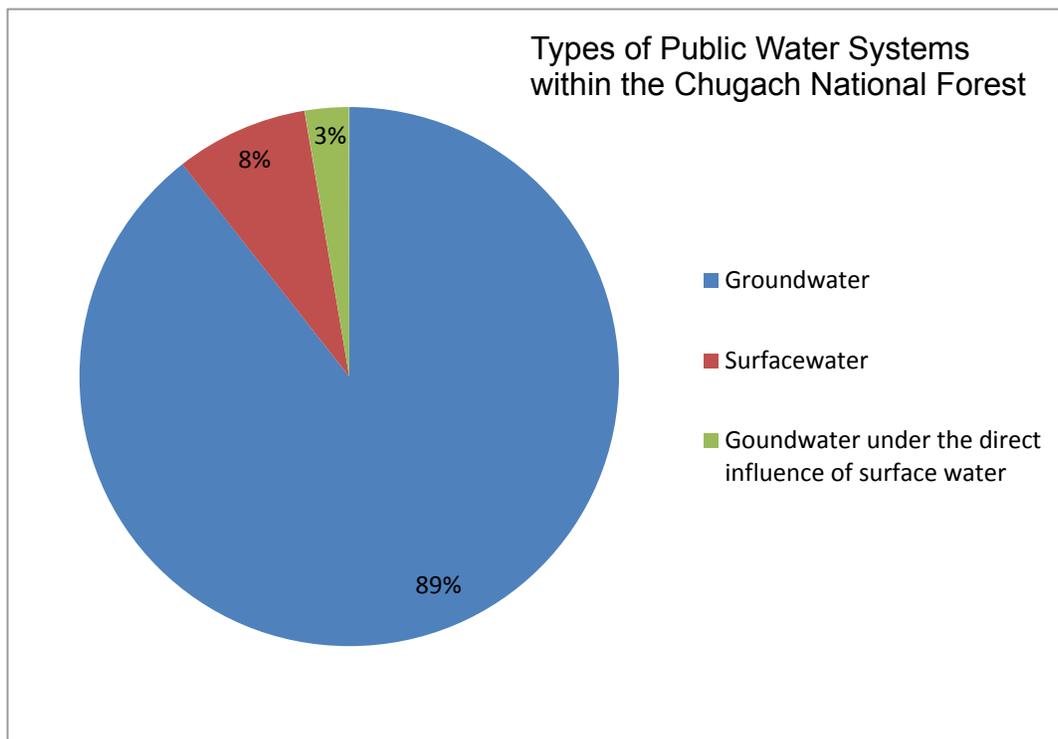


Figure 22. Percentage and type of public water systems within or adjacent to the Chugach National Forest. Data include any public water system that is within a 6th-level HUC that is entirely or partially within the Chugach National Forest. Public water system information has been provided by the Drinking Water Program of the ADEC. The information provided is a data snapshot as of March 12, 2013. There may be errors in source location information as well as other information provided.

Special use permits

The agency's special uses program authorizes uses on National Forest System lands that provide a benefit to the general public and protect public and natural resource values. There are a number of special use permits currently granted by the Forest Service that include water rights or water diversions.

Four hydroelectric power projects draw water from watersheds lying in part on National Forest System lands. These include the Cooper Lake Project near Cooper Landing, Humpback Creek and Power Creek near Cordova, and Salomon Gulch near Valdez. The Cooper Lake project stores inflow from Cooper Lake and diverts it out of the watershed down to Kenai Lake for power production. Currently the Cooper Lake Hydroelectric Project is being modified with the construction of the Stetson Creek diversion. When this project is complete, some flow from Stetson Creek, a tributary to Cooper Creek, will discharge directly into Cooper Lake. The project is slated for completion in fall 2014. The two Cordova projects are run of the river with minimal storage and no water diversion from the watersheds. Solomon Gulch has only a small portion of its upper watershed within the Chugach National Forest. Several additional sites on or adjacent to the national forest are currently being considered for hydropower development. Refer to the Hydroelectric section in this chapter for additional information.

Five fish hatcheries are located within or near the Chugach National Forest and draw water wholly or in part from national forest watersheds. The Main Bay and Cannery Creek hatcheries use watersheds entirely on National Forest System lands. The Main Bay hatchery diverts water from Main Lake and dewater a stream at the head of the bay while the Cannery Creek Fish Hatchery diverts water from Cannery Lake. The Esther Creek watershed that lies primarily within the Chugach National Forest feeds the Esther hatchery. The San Juan Bay hatchery has a small portion of its watershed (about 40 acres) on National Forest System lands, while the Trail Lakes hatchery uses wells that are recharged by Moose Creek, portions of which are within the national forest.

Several additional permits authorize the diversion of water on National Forest System lands for flood control. The Kenai Peninsula Borough, Seward-Bear Creek Flood Control Area (SBCFSA) maintains a levee on Box Canyon Creek and the Alaska Railroad channels and maintains several dikes on an unnamed intermittent stream at railroad miles 16.6 and 36. Failure of the Box Canyon Creek infrastructure occurred during the September 2012 floods, causing significant damage to private and public property.

Mining

Mining within the national forest includes lode and placer operations, sand and gravel, and rock extraction. The majority of placer mining is small-scale operations with a couple mechanical operations. Processing equipment (suction dredges, washplants, etc.) for gold bearing gravels all require water for gravity separation. Some of these operations are larger (i.e., Hope Mining Company on Resurrection Creek). Lode operations and sand and gravel extraction currently utilize minimal water; however, there is potential for more utilization in the future. See the Locatable Minerals Section for additional information.

Contribution of Water Resources: Non-Consumptive Use

The largest contributions of water resources in the Chugach National Forest are non-consumptive. Non-consumptive water use is defined as water taken for a use that is not consumed or removed from the water system. Non-consumptive water uses include recreation (i.e., rafting, fishing, and boating), wildlife and aquatic habitat, subsistence, and the aesthetic quality of the resource. A substantial part of recreational use within the national forest revolves around water bodies and glaciers. These water bodies provide opportunities for sight-seeing, camping, fishing, motor boating, and non-motorized boating, whitewater activities, skiing, fish and wildlife viewing, hunting, swimming, mountaineering, and educational opportunities (i.e., Kid's Fishing Day and Project Wet). Non-consumptive water storage include weirs and

numerous trickle lake dams located on the western part of the national forest that are annually stocked by ADF&G for sport fishing enhancement and fish passes. Prince William Sound has two fish passes, three weirs, and an old dam built by the West Gable Cannery in 1932. The Kenai Peninsula has nine trickle lake dams, two small pond dams, and a weir.

Current Condition and Trends

Watershed and water resources stressors and drivers

The primary system driver to the Chugach National Forest watershed and water resources is climate change with additional limited stressors of spruce bark beetle infestation, spread of aquatic and terrestrial invasive species, and increased human population and/or Forest Service use. Projected impacts to water resources from climate change within the national forest include increased flood frequency and magnitude, glacial recession, changes in the timing of peak and low flows, increased air and stream temperatures, increase in fire potential on the Kenai Peninsula, and conversion of watersheds from glacial and snow-melt dominated to snow-melt dominated and rain dominated. All of these will affect recreational activities, such as whitewater rafting, skiing, fishing, and glacial viewing, as well as water storage and hydropower.

Increases in instream flows and decreased water quality have been associated with changes in vegetation as a result of spruce bark beetle infestations and severe wildland fire (Pugh & Small, 2011; Schnorbus, 2011; Winkler, 2011). These changes could impact both surface water consumptive and non-consumptive water resources, such as recreation.

Impacts to water resources from increased population and/or Forest Service use include increased needs for future water withdrawals, diversions, storage and associated infrastructure, municipal watershed and sole source aquifer needs, increased placer mining, gravel extraction and development, increased recreational use, and the potential for increased introduction of invasive species (both terrestrial and aquatic).

There are several proposed and unconstructed hydroelectric projects within the national forest. These projects affect water quantity by diverting and/or impounding water. Within the last 10 years numerous hydroelectric projects within or near the Chugach National Forest have been proposed. The water resources of the national forest are receiving regional, national, and international attention for potential for producing renewable energy. Within the last seven years, there has been a growth in proposals, and the trend is expected to continue for the foreseeable future. See the Hydroelectric section for more detail. Given this trend, it can be anticipated that water quantity within the national forest has the potential to be negatively affected.

The Forest Service has not applied for any water rights for in-stream flow reservations within the national forest. With trends for increased demands, filings of water rights, the influence of lands of other ownership, and climate change projections on water resources, the Forest Service may want to be proactive in gaining these.

Watershed/water resources resilience

Properly functioning watersheds provide many important ecosystem services. Functioning watersheds generally provide high quality water, recharge of streams and aquifers, moderation of climate variability, and long-term soil productivity. Additionally, healthy watersheds generally create and sustain resilient terrestrial, riparian, aquatic and wetland habitats that support diverse populations of plants and animals capable of rapid recovery from natural and human disturbances.

There is minimal intensive vegetation management activity within the majority of the Chugach National Forest watersheds by the Forest Service. Overall, most of the watersheds are healthy, properly functioning, and generally exhibit strong integrity. Strong integrity enhances resilience to stressors and aids in recovery to the desired conditions when large natural disturbances or land management activities occur. Because more than 90 percent of the Chugach National Forest watersheds are in good condition, it is anticipated that watershed resilience and integrity will continue to remain strong. However, stressors from increased water needs (i.e., hydropower) coupled with climate change and changes in salmon populations contributing to nutrient cycling have the potential to affect watershed resilience. Warming air and stream temperatures, loss of glaciers, reduced snowpack, and changes in magnitude and frequency of flows will affect both consumptive and non-consumptive water uses. Water storage facilities will need to balance storage timing. Recreational opportunities, such as skiing and whitewater rafting, may also have shifts in their seasons. Increased stream temperatures will affect aquatic organism life cycles and change habitats. A number of watershed restoration projects have occurred within the national forest within the last decade. These projects have improved the functions of streams and riparian areas associated with impacts from past or historic land management and current activities. Continuing to conserve complex and diverse habitats and to restore these watersheds will help to maintain and improve integrity and resilience in the face of these stressors.

Influence of lands of other ownership

Upstream water users securing water rights on streams and rivers with headwaters located outside the national forest threaten instream flows within the national forest in the long-term. One of these areas of concern is the Copper River, where water rights to support development in the Copper River basin may reduce instream flows for fish and wildlife and affect geomorphic processes. Private groundwater wells and extraction also located adjacent to National Forest System lands have the ability to affect national forest surface and groundwater resources. Future development and water resource needs may affect water resources within the national forest unless the Forest Service takes an active role in assessing vulnerable areas and needs for requesting future water rights or instream flow reservations.

Contribution to Social, Cultural, and Economic Sustainability

Watersheds and water resources, both consumptive and non-consumptive use, within the Chugach National Forest provide a substantial contribution to social and economic sustainability in southcentral Alaska. Water from the national forest provides drinking water for communities, private residences, businesses and lodges, and visitors at campgrounds. Hydroelectric facilities within the national forest provide electricity to communities throughout southcentral Alaska. Much recreation use within the national forest revolves around water bodies and glaciers, including sight-seeing, camping, fishing, and boating. Most campgrounds within the national forest are located near lakes and streams. The Forest Service issues large numbers of outfitter/guide permits each year to companies that utilize national forest watersheds and water resources. The 2011 Commercial Recreation Monitoring Report showed that water based activities made up a very significant part of guided use across the national forest (Clark, personal communication, 2013). These activities included, but were not limited to, rafting, fishing, motorboat tours, kayak trips, canoeing, fishing, flight seeing and glacial tours, skiing, snow machining, and canoeing. Watersheds and water resources also provide a large local economic off-set for food through fishing and hunting and are culturally important for subsistence. Mining operations within the national forest utilize water resources for wash plants and camp facilities.

Chugach National Forest water resources not only provide a significant contribution to regional social, cultural, and economic sustainability but also to the state, nation, and world. Watersheds within the national forest provide spawning grounds for salmon populations that feed people in the national and

global markets. Although it is not anticipated in the short term, Chugach National Forest fresh water resources may be in more demand in the future to meet the long term needs of the rest of the nation.

A number of watershed restoration projects have occurred within the Chugach National Forest (Resurrection Creek, Daves Creek, Ibeck Creek, and numerous smaller scale bank and riparian stabilization projects) in the last decade that have also provided economic income to local contractors. It is anticipated that the trend for watershed use and enjoyment of water resources to social and economic sustainability will continue to remain high and likely increase in the future.

Information Needs

With potential temperature increase due to climate change impacts and as glaciers recede and thin, glacial runoff may gradually decrease. In addition, flow regimes are changing as a result of snowmelt runoff occurring earlier in the year. This can cause increased magnitude of peak flows, lower flows during dry periods, and increased variability in stream flows.

Availability of long term reliable data on stream flow is scarce or lacking. It is difficult to establish instream flow requirements when there are no data available to use in determining historic average and peak stream flows. Since 2007, the number of USGS stream gages within the Chugach National Forest supported by the Forest Service has decreased from 3 to 1. It is difficult to achieve the 2002 Forest Plan objective, “Establish instream flow requirements or suitable mitigation measures for all water impoundments or diversions” without knowledge of stream flows across the national forest.

Forest Service data for well heads in a few of the campgrounds on the Kenai Peninsula do not match the State of Alaska’s water rights data. It appears that a few wells have been constructed that have not been filed for water rights and that there are a few wells no longer in use that remain in the state’s database.

The Forest Service lacks an adequate way to track locations and information on fish passes, diversions, dams, etc. It is recommended these be incorporated into a GIS database as part of the southcentral Alaska National Hydrography Database. Most of the knowledge of these sites is in paper files and acquired by word of mouth from ranger district personnel.

Air

The current conditions and trends of air resources and airshed management in the Chugach National Forest are described in this section. The Chugach National Forest has relatively good air quality overall, but there are some concerns. (Good air quality is defined as satisfactory and air pollution poses little or no risk.) Chugach National Forest air quality related issues are mainly due to dust, woodsmoke, and vehicle and marine vessel emissions.

Airsheds

An airshed is defined as a geographic area that, because of topography, meteorology, and/or climate, is frequently affected by the same air mass. It is difficult to describe airsheds in the planning area. Many of the Forest Service's local airsheds are constrained by topography, especially in some of the fjord and mountainous areas. The mountains channel flow, create winds, cause upslope and downslope flow, initiate drainage winds, produce wind shear and extreme mechanical turbulence. Some areas are also characterized by local inversions and stagnant air flow during parts of the year.

Alaska's Department of Environmental Conservation (ADEC) has divided the state into four Intrastate Air Quality Control Regions (ADEC, 1972). The Chugach National Forest is within two of these regions: Cook Inlet and southcentral Alaska. The Cook Inlet Intrastate Air Quality Control Region comprises all watersheds flowing into Cook Inlet (for the Chugach National Forest, this means anything flowing into the Kenai River or Turnagain and Knik Arms). The rest of the national forest lies within the Southcentral Intrastate Air Quality Control Region.

Class I and Sensitive Air Quality Areas

The Clean Air Act provides the Forest Service with specific responsibilities for protection of air quality in Class I areas. Only wilderness areas designated before August 7, 1977, are classified as Class 1 areas by the Clean Air Act. There are no Class 1 areas within the Chugach National Forest. The Chugach National Forest does have one wilderness study area (WSA). Per 2002 Forest Plan direction, the Nellie Juan-College Fiord WSA is to be managed to maintain the presently existing wilderness character and the potential for inclusion in the National Wilderness Preservation System.

Condition and Trends of Air

There is limited air resource data for the Chugach National Forest. Some recent deposition and haze monitoring have been completed for the national forest. There are also quite a few state air quality monitors in the vicinity, as well as IMPROVE sites for Tuxedni Wilderness Area and Denali National Park.

The 2002 Forest Plan did not include an air quality monitoring question. However, due to the Chief's decision regarding an appeal, the 2002 Forest Plan was amended to include a monitoring question concerning the impact of snow machine use on air quality where winter motor vehicle use is greatest. An air quality monitoring pilot study was conducted for the national forest during the winter of 2006-07 to quantify the levels of air pollutants in areas with high levels of winter motor vehicle use. The carbon monoxide and fine particulate data collected on the eight sample days indicated no violations of the EPA 24 hour standards, though there were some issues identified with the carbon monoxide sampling tool.

While the study was limited in its temporal and spatial scope, it provided an initial look at the potential that these uses are violating EPA air quality standards. It was recommended that this type of sampling be repeated every three to five years to determine trends and to determine whether violations of air quality standards are occurring.

The second round of air quality monitoring was conducted during the winter of 2011-12, using a different carbon monoxide detector rated for extreme cold. Results from 2011-12 monitoring indicate motor vehicle use at Turnagain Pass resulted in increased levels of carbon monoxide and fine particulates at sites measured near the parking lot. However, the carbon monoxide and fine particulate data collected on the sample days indicated no violations of the EPA state air quality standards. The present motor vehicle use trends at Turnagain Pass make the likelihood of exceeding the standards relatively low.

Due to the increase in interest of air quality in this area, one air quality biomonitoring plot was established in a forested area on Turnagain Pass in 2012. It was surveyed for epiphytic lichens and several species were collected for elemental analysis, such as nitrogen and sulphur levels. Elements associated with airborne deposition detected in lichens will be compared to background ranges for forested sites.

Growing air quality concerns in the Nellie Juan-College Fiord WSA point towards diminished visibility and possible ecological impacts from air pollution. Understanding and protecting WSA air quality is a key approach to monitoring and maintaining wilderness character and is used as an indicator in the Chugach National Forest WSA Character Monitoring Protocol.

In 2012, the Forest Service began a pilot project to monitor cruise ship visual emissions in College Fiord. The work responded to a history of questions and complaints from visitors, outfitter, guides, and other tour operators about the impact of cruise ship visual emissions on the area's wilderness character. The public feedback was substantiated by recent research showing that ship emissions reduce visibility in Prince William Sound by up to 30 percent and may have associated ecological impacts on local marine and terrestrial environments (Molders, Porter, Cahill, & Grell, 2010). In spring 2012, the Forest Service partnered with ADEC to become certified in EPA Method Nine Visual Emissions Monitoring Protocol. Between May and September, Forest Service employees used EPA Method Nine to successfully monitor visual emissions from 10 percent of cruise ships visiting College Fiord. Preliminary reports suggest cruise ship visual emissions may have exceeded allowable state standards in College Fiord.

Also in 2012, Chugach National Forest ecology and wilderness specialists revisited lichen biomonitoring plots established in 1993 and 1994 in the Nellie Juan-College Fiord WSA. The work was part of a planned two-year effort to re-survey lichen communities and collect lichens for elemental analysis at 21 existing plots and create up to eight new plots in the WSA. Re-visiting existing plots enables the Forest Service to: (1) determine if baseline air quality conditions have changed; (2) establish thresholds for 27 contaminants in lichens for the Chugach National Forest (Dillman, Geiser, & Brenner, 2007); and (3) track changes in air quality over time indicated by shifts in lichen community composition or contaminant levels. Establishing new plots in specific areas helps the Forest Service address air quality concerns that have arisen since establishing the 1993 and 1994 plots. The community identification element of the work is also a cost-effective way to monitor forest vegetation community changes related to air quality and climate change. Results of this monitoring are included in a multi-regional (Alaska, Oregon, and Washington) lichen monitoring database. These data have been used to suggest critical loads for nutrient nitrogen (N) and to develop better understanding of lichen and forest community dynamics in response to acidifying and fertilizing nitrogen and sulfur-based air pollutants.

Implementation plans for regional haze, non-attainment, or maintenance areas

Haze is caused by particulate matter suspended in the air or atmosphere. Haze can be both naturally occurring and manmade. Some natural sources of particulate matter include windblown dust, wildland fires, bioorganic emissions from trees (i.e., pollen), and coastal emissions from the ocean (i.e., salt spray). Manmade sources include emissions from gas and diesel engines, electric utility and industrial fuel burning, manufacturing operations, prescribed burns, and dust from unpaved roads, construction, and

agriculture. Particulate matter can remain suspended in the air for a long period of time and can travel to areas hundreds or even thousands of miles away from the pollution sources.

The Regional Haze Rule, adopted by the EPA in 1999, calls for state and Federal agencies to work together to improve visibility in 156 national parks and wilderness areas. The rule requires the states, in coordination with the EPA, NPS, USFWS, Forest Service, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. The Regional Haze Rule establishes specific state implementation plan requirements (SIPs) and strategies to adopt when implementing a plan. States must develop long-term plans for reducing pollutant emissions that contribute to visibility degradation and within the plans establish goals aimed at improving visibility in Class 1 areas. The SIP must address haze caused by all sources of pollutants that impair visibility, including haze caused from smoke, vehicles, electric utility and industrial fuel burning, and other activities that generate pollution. Alaska has four Class 1 areas:

- Denali National Park
- Tuxedni Wilderness Area
- Simeonof Wilderness Area
- Bering Sea Wilderness Area

Denali National Park and the Tuxedni Wilderness Area are the two closest to the Chugach National Forest and could possibly be affected by emissions generated within the national forest. It is not known to what extent the Forest Service emission estimates have been included in the Regional Haze SIPs, though emissions and the risk of emissions from the Chugach National Forest are probably low.

No communities within or directly adjacent to the national forest are classified by the EPA as non-attainment areas or maintenance areas. However, there are multiple rural communities within or adjacent to the Chugach National Forest that have been identified as reporting problems with PM₁₀ (dust) and/or PM_{2.5} (woodsmoke). Also, Anchorage is identified as being a maintenance area for carbon monoxide (CO) and Eagle River is classified as a non-attainment area and is currently working to apply for re-designation to a limited-maintenance area for PM₁₀ (dust) (ADEC, 2011).

Critical loads

A critical load is defined as “a quantitative estimate of the exposure to one or more pollutants below which significant harmful effects on specific sensitive elements of the environment do not occur according to present knowledge.” A target load is set based on policy and management direction and, depending on whether or not current critical loads values have been exceeded, can be above or below the critical load. In general, the critical load is based on modeled or measured dose-response data, while a target load can be based on political, economic, spatial, or temporal considerations in addition to scientific information. Defining the critical and target loads for areas within the national forest helps resource managers communicate the effects of air pollution on resources to Forest Service decisionmakers as well as to air regulators. At this time there are no known target loads set for this area.

There has been limited data collected for the Chugach National Forest. However, lichen community data from the Tongass National Forest collected by the regional air program and Forest Inventory and Analysis shows that species overlap with western Oregon and Washington (Region 6) is probably sufficient to apply those nutrient N critical loads to Region 10 until region-specific critical loads can be established (Pardo, Robin-Abbot, & Driscoll, 2011). Based on existing literature (Geiser, Jovan, Glavich, & Porter, 2010) and a recent study to calibrate dry weight lichen nitrogen concentrations with nitrogen deposition in Alaska, Oregon, Washington, and California (Root, et al., 2013), a conservative nutrient N critical load for the Chugach National Forest would be between 2.7 and 4 kg per hectare per year.

A recent study by Shirokauer et al. (2013) suggests that acidic deposition from local sources of nitrogen and sulfur oxides is likely to be more important than local or long distance transport of nutrient nitrogen as ammonium nitrates and sulfates. This is especially true in areas with frequent inversions and docking ports where ships are continuously running their generators.

Renewable Energy and Mineral Resources

Renewable energy sources, including biomass, hydroelectric, hydrokinetic, solar, and wind, are discussed in this section. Power site classification withdrawals and utility corridors are also included. Geothermal energy is included under leasable minerals in the Nonrenewable Energy and Mineral Resources section, in addition to coal, oil, and gas. Discussions of locatable minerals, leasable minerals, mineral materials, and mining activities are in the Nonrenewable Energy and Mineral Resources section.

Renewable Energy

Alaska is one of 37 states with renewable portfolio standards or policies that require or encourage increased production and reliance upon renewable energy sources. In 2012, Alaska adopted the goal of generating 50 percent of the state's electricity from renewable sources by 2025 (solar, wind, biomass, hydropower, wave, tidal, and geothermal sources). Alaska is already generating more than 24 percent of its electric power from renewable sources (mostly hydroelectric power). The state legislature and the Alaska Energy Authority (AEA), a state agency, fund a variety of grant and loan programs to incentivize renewable energy production and energy conservation in Alaska.

Relevant Information

- Alaska has adopted the goal of generating 50 percent of the state's electricity from renewable sources by 2025 (solar, wind, biomass, hydropower, wave, tidal, and geothermal sources).
- The Chugach National Forest will continue to have an increase in the number of new energy project proposals, due, in part, to the availability of Federal and state grants, high fossil fuel costs, and tax breaks for renewable energy projects.
- The location of previously-proposed, current, and planned energy projects and potential utility corridors should be considered when making land use allocation decisions so as to not preclude future energy development.

Biomass Energy

Specific items to be evaluated for biomass include: the current type, extent, and general location of biomass energy activity and biomass energy facilities; the potential for biomass energy activity; trends that affect biomass energy activity; and the contribution of biomass energy activity to social, economic, and ecological sustainability.

The 2002 Forest Plan did not directly address biomass energy except by referencing the Energy Security Act of 1980 that authorizes making timber resources available from National Forest System lands for use by biomass energy projects. The 2002 Forest Plan references providing timber for fuelwood for personal and commercial uses.

Relevant Information

- There are currently no biomass energy facilities within the boundary of the Chugach National Forest, but the interest and demand may increase. Parties in Cordova, Valdez, and Seward have expressed interest in biomass projects. Cordova has completed a feasibility study considering state and corporation land.
- The pervading roadless character of the Chugach National Forest limits the capacity for biomass utilization.
- Most of the easily accessible tree biomass within the national forest is in the Kenai Peninsula geographic area.

Biomass energy activities and facilities

In Alaska, 19 non-industrial wood biomass energy plants have been installed from the southeast to the interior, and many others are planned or in development (Parrent, personal communication, 2013). There are currently no biomass energy facilities within the Chugach National Forest, but the interest and demand may increase (see the Timber section). Parties in Cordova, Valdez, and Seward have expressed interest in biomass projects. Cordova has completed a feasibility study considering state and corporation land. The projects in Seward and Valdez and are still in the early stages.

Potential for biomass energy

A report on aboveground carbon in trees across the Chugach National Forest (Barrett T. , 2014) can be used to provide estimates of potential biomass energy opportunity from trees in the plan area. Excluding the WSA, the carbon pool reported by Barrett (2014) is 88.3 thousand pounds per acre of forest vegetation. The pool is split as 84 percent live trees, 6 percent snags, and 10 percent downed logs. Since carbon mass is approximately one-half dry biomass, the biomass estimate is 176.6 thousand pounds per acre (i.e., 88.3 thousand pounds per acre times two). Barrett (2014) estimates that forest vegetation covers approximately 596,000 acres within the Chugach National Forest (excluding the WSA) (see the Carbon Stocks section for belowground and non-tree aboveground biomass estimates).

Interest in biomass energy in Alaska is expanding (Parrent, 2012). Commercial demand to tap biomass supplies within the Chugach National Forest may increase. The roadless character within the national forest limits the capacity for biomass utilization. About 99 percent of the Chugach National Forest is farther than one-quarter mile from existing road network. Most of the easily accessible tree biomass within the national forest is in the Kenai Peninsula geographic area.

Trends that affect biomass energy

A report on woody biomass energy in Alaska (Parrent, 2012) listed the following opportunities:

- *For the forest manager*: biomass utilization can provide opportunities to mitigate the costs associated with pre-commercial thinning, hazardous fuels reduction, forest restoration, and habitat enhancement.
- *For the forest products industry*: biomass markets can mean new, or more profitable, local opportunities to utilize processing by-products, such as sawdust and bark.
- *For communities*: biomass fuels can save facility operators money, create and sustain local jobs, and keep energy dollars in the community.

Contribution of biomass energy to social, economic, and ecological sustainability

See the Timber section.

Hydroelectric Energy

Specific items to be evaluated include the current type, extent, and general location of hydroelectric resources; hydroelectric potential of the plan area; trends that affect hydroelectric activity in the plan area; and the contribution of hydroelectric energy activity to social, economic, and ecological sustainability.

The 2002 Forest Plan provides direction for Federal Energy Regulatory Commission (FERC) hydroelectric projects and includes a management area prescription for major transportation and utility systems (USDA, 2002a). In addition to transportation facilities, this direction is applicable to the following energy-related facilities: hydroelectric dams, reservoirs, power generation sites, powerlines, and pipelines 10 inches or greater in diameter.

Hydroelectric power and Alaska

Hydroelectric power is the generation of electric power from the movement of flowing water to a lower elevation. It supplies about 21 percent of the state's electrical energy in an average year and is the largest renewable energy source in the state, producing more energy than every other renewable resource combined. Hydroelectric projects are found throughout the state but primarily in the Aleutian Islands, southcentral, and southeast Alaska.

The FERC evaluates proposed non-federal (those proposed by other than Federal government) hydropower projects and determines if they should be issued a preliminary permit and perhaps eventually, a FERC license. The Forest Service works closely with FERC and the applicant to ensure that impacts to National Forest System lands and resources are considered and balanced with the need for power.

Hydroelectric resources and facilities

Existing and operating FERC projects located within the Chugach National Forest include:

- Cooper Lake: Chugach Electric Association owns and operates this 19.4 MW facility on Cooper Lake, Cooper Creek, and Kenai Lake near the community of Cooper Landing in the Kenai Peninsula. It was originally licensed in 1960 and was relicensed by FERC in 2007. The project occupies 3,012 acres of land on the Seward Ranger District and is within the Kenai Lake Inventoried Roadless Area (IRA).
- Solomon Gulch: The Solomon Gulch Hydroelectric Project is owned by the Copper Valley Electric Association and supplies power to Valdez. This 12 MW project has been operating since 1982. The project facilities and structures are located off National Forest System lands; however, the upper reaches of the watershed are within National Forest System lands in Prince William Sound.
- Power Creek: The Power Creek hydroelectric plant is located 7 miles east of Cordova and has a total installed generating capacity of 6 MW. It is owned by the Cordova Electric Cooperative and provides about 50 percent of the electrical power to the town of Cordova and surrounding areas. It was licensed in 1997. Project structures are on private land but much of the watershed lies within National Forest System lands in the Copper River Delta.
- Humpback Creek: This is a 1.25 MW run-of-the-river (water is taken directly from the stream) project roughly 7 miles north of the Cordova boat harbor. It is owned and operated by Cordova Electric Cooperative and was licensed by FERC in 1990. The project facilities are located off National Forest System lands; however, much of the Humpback Creek watershed is within National Forest System lands in the Copper River Delta.

There are no operating non-FERC projects within the Chugach National Forest.

Potential of the plan area for hydroelectric energy

Proposed and unconstructed FERC projects (active) within the national forest include:

- Cooper Lake/Stetson Creek Diversion, P-2170: This project is located on Cooper Lake, Cooper Creek, and Kenai Lake, near the community of Cooper Landing in the Kenai Peninsula. The project occupies National Forest System lands within the Kenai Lake IRA. The new 2007 FERC license included a new diversion structure, pipeline and outlet works to divert flows from Stetson Creek into Cooper Lake. The Stetson Creek Diversion, including 2.13 miles of pipeline and access road, will be constructed on National Forest System lands within the IRA. The Forest Service issued the special use permits and approved the final construction plans.
- Grant Lake, P-13212: Kenai Hydro LLC is evaluating this 5 MW project about 26 miles north of Seward. The constructed facilities would be located outside National Forest System lands, but Grant

Lake, most of which is on National Forest System lands, would be used for water storage. The project is within the Kenai Mountains IRA in the Kenai Peninsula.

- Allison Creek, P-13124: The Copper Valley Electrical Association is determining the feasibility of this 4 MW project on Allison Creek near Valdez. The project structures would be located on state land; however, the very upper reaches of the watershed are on National Forest System lands in Prince William Sound. The project is not expected to affect National Forest System lands or resources.

Only one proposed and unconstructed non-FERC project (active) occurs within the Chugach National Forest.

- Chenega Bay: Located on Evans Island and proposed by the Chenega Corporation, this 90 kilowatt (kW) run-of-the river project on Anderson Creek was funded by AEA and is currently in the design phase. The project is on private land and is not expected to affect National Forest System lands or resources.

During the last 10 years, other hydroelectric projects have been proposed that were located within or near the Chugach National Forest. The projects are inactive primarily due to funding issues, significant environmental effects, and unfavorable cost-benefit ratios. While these projects are currently inactive, it is important to note that these projects may become viable in the future. The Forest Service may want to track these projects and consider their location and any associated transmission line corridor needs when making land use allocation decisions. Previously proposed projects include:

- Falls Creek: Kenai Hydro LLC decided to not pursue this 5 MW project about 26 miles north of Seward. The constructed facilities would have been outside National Forest System lands but much of the watershed is on National Forest System lands and within the Kenai Mountains IRA in the Kenai Peninsula. This project was associated with the Grant Lake project (see above).
- Victor Creek: This 5 MW project was proposed by Kenai Hydro, LLC and would be located near Lawing, just south of Moose Pass in the Kenai Peninsula.
- Fourth of July Creek: Proposed by Independence Power, LLC, this 5.4 MW project across Resurrection Bay from Seward was thought to be capable of supplying one-third of Seward's annual electrical needs. AEA funded the feasibility work but chose to not fund the permitting and design phase.
- Colorado Creek: In September 2012, an individual representing the Summit Lake Lodge (in the Kenai Peninsula) contacted the Forest Service to inquire about a potential hydroelectric project on Colorado Creek. He was referred to FERC and also given an application for an investigative studies permit. There has been no further contact.
- Silver Lake: The Copper Valley Electric Association considered this 15 MW project about 15 miles southwest of Valdez. The proposed project would have been located on private lands with a dam and water storage reservoir at Silver Lake. The project would supply power to Valdez and to Tatitlek, a diesel-dependent community. Proposed transmission lines would have likely crossed National Forest System lands in Prince William Sound.
- Whittier Creek Hydroelectric Project: In 2009, the City of Whittier received funding from the AEA to examine the viability of hydropower on Whittier Creek. Proposed structures included a dam, intake, and powerhouse. All structures would have been on land owned by the city of Whittier.
- Snyder Falls Creek: This 3 MW project was near Nelson Bay, about 7.5 miles north of Cordova, and was proposed by the Cordova Electric Cooperative, Inc. The proposed project included a dam, reservoir, and penstock on National Forest System lands in the Copper River Delta. The other constructed facilities would have been on private land. The National Forest System lands portion of the project area would have been within the Fidalgo-Gravina IRA. While this project is considered inactive, and the FERC Preliminary Permit for the project has been relinquished, the Cordova Electric

Cooperative continues to hold a Forest Service special use permit for investigative studies. Recent reports indicate that field studies and data gathering are underway and that the project may be formally re-activated in the future with an application to FERC.

Trends that affect hydroelectric energy

Water is everywhere in Alaska's national forests, originating as rainfall and melting snow and ice. Increasingly, it is this plentiful water that is the focus of communities, utility companies, consultants, and developers. These water resources are receiving local, regional, national, and international attention as potential sources of reliable and relatively inexpensive renewable energy. Within the past seven years, the Chugach National Forest has had growth in the number of new energy project proposals, due in part to the availability of Federal and state grants, high fossil fuel costs, and tax breaks for renewable energy projects. This trend is expected to continue for the foreseeable future. Alaska is thought to have numerous suitable sites that are undeveloped and is estimated to contain 40 percent of the untapped hydropower potential in the United States.

Contribution of hydroelectric energy to social, economic, and ecological sustainability

More than 35 hydroelectric projects, with a total capacity of approximately 423 MW, generate 21 percent of the electricity used throughout Alaska. Several of these projects have been operating for more than 95 years. Hydropower has been proven to be a reliable source of renewable energy in Alaska.

Hydrokinetic Energy

Hydrokinetic energy is considered in this assessment since it is a potentially feasible energy source in much of Alaska. Hydrokinetic projects generate electricity from waves or directly from the flow of water in ocean currents, tides, or inland waterways and rivers.

The 2002 Forest Plan makes no mention of hydrokinetic energy resources or facilities. Hydrokinetic projects are typically located in marine waters or on state tidelands and submerged lands; however, these projects have the potential to affect National Forest System lands and resources due to the need for upland facilities and transmission lines.

Specific items to be evaluated include the current type, extent, and general location of hydrokinetic resources; potential for hydrokinetic resources in the plan area; trends that affect hydrokinetic activity in the plan area; and the contribution of hydrokinetic energy activity to social, economic, and ecological sustainability.

Hydrokinetic energy and Alaska

Hydrokinetic power projects are similar to traditional hydropower projects but rather than storing, controlling, or diverting the flow of water to take advantage of hydraulic head (potential energy), hydrokinetic projects use the density of water and harness kinetic energy from its motion. This motion includes waves, flowing rivers, and tides. The kinetic energy harnessed is dependent upon the kinetic energy available during tide cycles, wave periods, and river flows.

With more than 44,000 miles of shoreline and many miles of rivers, Alaska has vast unrealized potential for hydrokinetic energy development using river in-stream and wave and tidal energy technologies. Alaska is thought to have more than half the nation's potential wave energy.

River in-stream hydrokinetic devices are placed directly in the river current and are powered by the energy of the moving water. The speed of the water current determines the available power. The best river

locations provide significant flow year-round with no major flood events, little turbulence and debris, and no lengthy periods of low water.

Tidal energy devices generate power from the ebb and flow of ocean tides. Designs range from the underwater wind turbine-style, to vertical- or horizontal-axis cross-flow turbines.

Wave energy is derived from the motion of ocean waves. Alaska has one of the best wave resources in the world but the best sites are typically far away from population centers where the power is needed. Many different designs that attempt to convert wave energy into electricity are being tested around the world. Designs include oscillating water columns and single buoys riding the waves in the open ocean.

All hydrokinetic projects in Alaska are currently at the pilot project or demonstration level and the available technology is considered to be pre-commercial.

Hydrokinetic energy resources and facilities

Currently, there are no operating utility-scale hydrokinetic generation projects within the plan area or within the entire State of Alaska. In addition, there appear to be no proposed projects within or adjacent to the Chugach National Forest.

Within the last 10 years, several tidal power projects have been proposed within Cook Inlet and elsewhere in southcentral Alaska. FERC has issued preliminary permits for pilot projects in Cook Inlet, Turnagain Arm, and Kachemak Bay. These projects are still undergoing feasibility determinations and environmental analysis and if developed, are not expected to affect National Forest System lands or resources. The project sites are not located adjacent to National Forest System lands.

Several in-river hydrokinetic devices have been and/or are being tested in locations around Alaska, including the Yukon, Tanana, and Kvichak rivers. None of these sites are within or adjacent to the plan area.

Potential of the plan area for hydrokinetic energy

AEA compiled tidal, wave, and in-stream energy information from several reports and inventories and displayed the information in the 2011 Renewable Energy Atlas of Alaska. Three potential sites or areas are within or adjacent to the Chugach National Forest: (1) Bainbridge Passage near Bainbridge Island is identified as having significant tidal power potential; (2) The Million Dollar Bridge site northeast of Cordova is identified as having significant potential for in-river power; and (3), the entire outside shoreline along the Chugach National Forest is identified as having wave power potential.

Trends that affect hydrokinetic energy

Hydrokinetic power generation technologies suitable for use in Alaska are still considered to be pre-commercial and somewhat experimental. However, as these devices are tested in pilot projects and the technology continues to improve, there will likely be a rapid increase in the number of new project proposals statewide, including the greater Anchorage area.

With reportedly the second highest tidal fluctuation in North America and the fourth highest tidal fluctuation in the world, the Cook Inlet area is considered to be one of the premier world sites for hydrokinetic power generation and is receiving interest from both international and domestic developers. To date, none of the permitted and funded projects are likely to affect National Forest System lands or resources, but it is possible that additional projects may be proposed in the area that would require upland facilities or transmission lines within the Chugach National Forest.

Contribution of hydrokinetic energy to social, economic, and ecological sustainability

It is generally agreed that Alaska has great potential for hydrokinetic power development and that this has the potential to displace some fossil fuels used for power generation. However, the current hydrokinetic projects are small-scale pilot or demonstration projects and very few are actually operational and generating power. The various technologies are not fully developed or tested and have received no utility-scale testing in Alaska. It is much too soon to make any conclusions about the contribution of hydrokinetic power to social, economic, and ecological sustainability in Alaska.

Solar Energy

The current type, extent, and general location of solar resources; solar energy potential of the plan area; trends that affect solar activity in the plan area; and the contribution of solar energy activity to social, economic, and ecological sustainability are discussed in this section.

The 2002 Forest Plan makes no mention of solar energy resources or facilities.

Solar energy and Alaska

Solar energy or solar radiation can be captured in specially designed solar panels that concentrate the rays and convert the energy for use. Generally, solar energy projects in Alaska are small-scale solar thermal or solar electric projects for home use. Solar thermal projects involve the use of solar energy to heat a building through the use of heated water and other methods. Solar electric projects convert the energy into electricity to power the building unit or the grid to which it is connected, typically through the use of photovoltaic panels.

While there are numerous examples of both private and public small-scale solar energy projects in Alaska, there are no utility-scale solar generation projects. The use of photovoltaic panels to generate power for Alaskan communities is generally not practicable at this time due to the high cost of solar panels and the low levels of year-round solar radiation received throughout the state.

Solar energy resources and facilities

Currently, there are no utility-scale solar generation projects within the plan area or within the entire State of Alaska. There are numerous private and public solar energy projects that heat or provide power to individual buildings or small developments. An example is the Anchorage Solar Building in downtown Anchorage.

Potential of the plan area for solar energy

The U.S. Department of Energy's National Renewable Energy Laboratory has compiled solar radiation maps for the United States. Within the Chugach National Forest, most areas average less than 3.5 kWh/m²/day of solar insolation annually. Insolation is a measure of the amount of solar radiation received on a given surface area and represents the amount of solar radiation available to a flat plate collector, such as a solar panel. Insolation is measured in kilowatt-hours per square meter per day kWh/m²/day. A small area on the Kenai Peninsula averages between 3.5 to 4.0 kWh/m²/day on an annual basis. These figures are very low when compared to the average value for southern Arizona of greater than 7.5 kWh/m²/day. Based on these maps, it appears that there is very low potential for utility-scale solar generation facilities within the Chugach National Forest.

Solar energy was not included as a viable renewable energy source in the Railbelt Integrated Resource Plan, contracted by AEA or in the report from the Chugach Regional Renewable Energy Conference sponsored by AEA, held in Cordova in July 2009.

There have been no solar energy proposals submitted to AEA for 2009 to 2014 funding, and solar energy is not included as a viable utility-scale renewable energy resource in AEA's Energy Pathway.

It appears that the use of solar energy will likely remain small-scale and will continue to be used to heat or provide power to homes, individual buildings, or small developments.

Key trends that affect solar energy

As previously noted, Alaska is one of 37 states with renewable portfolio standards or policies that require or encourage increased production and reliance upon renewable energy sources. Solar energy is an integral component of renewable energy strategies in the southwestern United States, but its use for utility-scale projects in Alaska is limited by the lack of solar radiation and the high cost of the technology. It is unlikely that solar energy generation will become a viable substitute for other types of renewable energy or will displace the use of fossil fuels in Alaska.

Contribution of solar energy to social, economic, and ecological sustainability

It appears impracticable to substitute solar energy for other renewable energy sources or fossil fuels in Alaska on a large scale. Solar energy will continue to be used to heat or provide power to homes, individual buildings, or small developments and will contribute locally or on an individual and family basis to social and economic sustainability.

Wind Energy

The current type, extent, and general location of wind resources; wind energy potential of the plan area; trends that affect wind energy activity in the plan area; and the contribution of wind energy activity to social, economic, and ecological sustainability are discussed in this section.

The 2002 Forest Plan makes no mention of wind energy resources or facilities.

Wind energy and Alaska

Alaska has abundant wind resources and the best resources are generally located in the western and coastal portions of the state. The quality of wind resource is very site specific and the windiest locations are not always suitable. In some areas, turbines may actually need to be sited away from the strongest winds to avoid strong gusts and turbulence.

Wind power technologies currently in use in Alaska include small off-grid systems for homes and remote camps to medium-sized machines displacing diesel fuel in village wind-diesel combination systems, to large industrial turbines generating energy on the railbelt and in towns, such as Kodiak. At least 17 Alaska towns and communities have operating wind generation projects. An additional 7 projects are under construction, 6 are in the design phase, and 30 wind projects are in the feasibility phase.

Wind resources and facilities

There are no operating utility-scale or community wind generation projects within the Chugach National Forest. Numerous small off-grid systems are likely present within the plan area, but the number of these systems is unknown.

The Fire Island Wind Project near Anchorage is the utility-scale or community project closest to the Chugach National Forest. Built by Cook Inlet Region Inc. (CIRI), the project began operating with 11 turbines in September 2012. The project has a 17.6 megawatt generation capacity and is expected to sell more than 50,000 MW-hours to Chugach Electric Association (CEA) annually. The project is expected to supply about four percent of CEA's energy needs (enough to power about 4,000 homes) and offset up to

0.5 billion cubic feet (bcf) of natural gas consumption each year. The project may be expanded in the future. The full project is permitted to include up to 33 turbines with a total generation capacity of 52.8 MW. The project is operated by CIRI and its subsidiary Fire Island Wind, LLC.

Potential of the plan area for wind energy

AEA has developed a high-resolution wind resource map of Alaska in coordination with the National Renewable Energy Laboratory and consultants at AWS Truepower. The map integrates historical weather data at various heights above ground level, vegetation cover, terrain effects, and atmospheric simulation models and can assist in determining the ideal location for a potential project. This map is included in the 2011 Renewable Energy Atlas of Alaska (REAP, 2011). Based on this map, the highest wind potential in the plan area occurs near Katalla in the Copper River Delta, both on the mainland and on several nearby islands in the Gulf of Alaska. These islands are rated as having outstanding wind power potential. The area near Cordova is rated as fair to good.

Four wind energy proposals were submitted to AEA for 2009 to 2014 funding through the Alaska Renewable Energy Fund. Proposed projects included a 60 kW project at Seldovia, a 9 MW wind farm at Nikiski, a 500 kW wind project at Tatitlek, and a wind project at Camp Hill near Cordova. Two of the projects that received funding are located near National Forest System lands within the plan area: Tatitlek and Camp Hill near Cordova.

- **Tatitlek High Penetration Wind Project:** This 500 kW project is about 30 miles south of Valdez on the eastern side of Tatitlek Narrows in Prince William Sound and is designed to serve the community of Tatitlek. Funding was requested and received in 2009 to conduct initial feasibility studies. If constructed, this project might provide 100 percent of the electrical needs and displace at least 50 percent of the heating fuel used in the community.
- **Camp Hill Wind Project:** The project is located at Camp Hill near Wireless Point, approximately seven miles south of Cordova in the Copper River Delta and would be designed to provide power to Eyak and Cordova. Funding was requested and received in 2009 to conduct initial feasibility studies. The project, if constructed, might provide approximately 3.4 million kWh per year to displace diesel generation.

In addition, the Forest Service was contacted in 2011 by the University of Alaska School of Engineering regarding a potential wind project in the Portage Valley. There has been no contact since the initial inquiry.

Trends that affect wind energy

Due to the high cost of diesel-generated electricity in rural Alaska, as much as 0.65 to 1.30 dollars per kWh in some locations, the use of wind energy has grown rapidly over the last several years. The number of utilities using wind to generate part of their electricity increased from 7 to 17 between 2008 and 2012. The electricity generated by wind increased 10 times, from about 2 megawatt-hours to more than 20 megawatt-hours. Nevertheless, that was less than 0.5 percent of statewide electricity in 2010.

As noted previously, at least 17 Alaska towns and communities have operating wind generation projects. An additional 7 projects are under construction, 6 are in the design phase, and 30 wind projects are in the feasibility phase. The use of Alaska's abundant wind resources to generate electricity is a proven and accepted technology that will continue to grow in use, both for small-scale off-grid home use and for utility-scale and community applications.

Contribution of wind energy to social, economic, and ecological sustainability

The increasing use of wind power in Alaska has the potential to displace modest amounts of fossil fuels, reduce carbon emissions, and may reduce the cost of electricity, especially for rural residents. Based on information from the Institute of Social and Economic Research at the University of Alaska, wind power replaced about 12,000 barrels or 500,000 gallons of fossil fuels in Alaska in 2010. Due to wind power and the use of natural gas, carbon dioxide emissions from power generation were about 3 percent lower in 2010. The Fire Island Wind Project is expected to offset up to 0.5 billion cubic feet of natural gas consumption in southcentral Alaska each year. The Kodiak Electric Association has operated the Pillar Mountain Wind Farm at Kodiak since July 2009 and estimates that it has saved an estimated 3,739,078 gallons of diesel through February 2013. While these and other operating wind projects can clearly offset the use of fossil fuels and decrease carbon emissions, data on the effects of these projects on local economies and utility rate payers appear to be unavailable.

Power Sites

Power sites are discussed as renewable energy infrastructure. The 2002 Forest Plan makes no mention of power site classifications and withdrawals. They are identified during this assessment due to potential conflicts with future management direction.

Power site classifications and withdrawals

There are two main categories of water power withdrawals in Alaska:

1. Withdrawals made to set aside and protect lands that have potential water power value until that potential can be realized or developed. In Alaska there are two types in this category:
 - a. Power Site Classification (PSC): these are administrative orders that are created under the authority of the Organic Act of 1879. (This is the USGS Organic Act; authority for these withdrawals was/has been given to the BLM.)
 - b. Power Site Reserve (PSR): these are administrative orders that were created under the authority of the Pickett Act of 1910.
2. Withdrawals made because water development is actually being planned:
 - a. Power Project: these are not created by an administrative order but the lands are withdrawn when an application for a hydroelectric project preliminary permit or license is filed with FERC under the Federal Power Act (FPA) of 1920, as amended.

Although these water power withdrawals are created under different authorities, they are all subject to the provisions of Section 24 of the FPA. This section provides that the lands that fall in these categories are reserved from entry, location, or other disposal under the public land laws until otherwise directed by FERC or by Congress.

The PSC withdrawal in Prince William Sound is the only one still active within the Chugach National Forest:

- Nellie Juan Lake and River, PSC 456. 12,319.5 acres were withdrawn in 1965 by Public Order No. 3665. BLM Case: AK 061270.

All other PSCs within the Chugach National Forest appear to have been revoked and are no longer in effect.

There are no PSRs within the Chugach National Forest.

Two power project withdrawals occur in the national forest, both on the Kenai Peninsula:

1. Cooper Lake, Kenai Lake, Stetson Creek, P-2170, existing power project. In 1956, 2,320 acres were withdrawn for FERC Project P-2170. The withdrawal has been amended several times and the FERC license was renewed in 2007. The current withdrawal consists of 41 acres. BLM Case: AA-39417.
2. Grant Lake/Creek, P-13212. In 2008, 6,460.483 acres were withdrawn for proposed FERC Project P-13212. BLM Case: AA-91091.

Additional power project withdrawals appear in the BLM records but are no longer in effect. These will be removed from the records when FERC issues an updated status plat.

Utility Corridors

The location and condition of utility corridors; the need for additional utility corridors; and the contribution of utility corridors to social, economic, and ecological sustainability are discussed in this section.

The 2002 Forest Plan includes a management area prescription for major transportation and utility systems. In addition to transportation facilities, this direction is applicable to the following energy-related facilities: hydroelectric dams, reservoirs, power generation sites, powerlines, and pipelines 10 inches or greater in diameter.

Location of utility corridors

There are six powerline corridors in the plan area on National Forest System lands.

1. Chugach Electric Association transmission line from the Quartz Creek substation to Anchorage. The entire powerline is 90.4 miles in length. Approximately 70 miles of this are on National Forest System lands in the Kenai Peninsula and are authorized by a Forest Service special use permit. This line transmits power from the Cooper Lake Hydroelectric Project to Anchorage; work is underway to upgrade the powerline from 115-kv to 230-kv.
2. Chugach Electric Association distribution line from the Hope substation on the Seward Highway to Hope (in the Kenai Peninsula). The entire powerline is 19.3 miles in length. About 12.7 miles are on National Forest System lands and are authorized by a Forest Service special use permit. Sections along the Hope Highway will be re-routed in the near future.
3. Chugach Electric Association distribution line from the Portage substation to Whittier. About 4.6 miles of this 11 mile powerline are on National Forest System lands (Kenai Peninsula and Prince William Sound) and are authorized by a Forest Service special use permit.
4. City of Seward distribution line in vicinity of Seward. About 15 miles of this powerline are on National Forest System lands (in the Kenai Peninsula) and are authorized by a Forest Service special use permit.
5. Homer Electric Association distribution line in the vicinity of Homer. Approximately 8.5 miles of this line are on National Forest System lands (in the Kenai Peninsula) and are authorized by a Forest Service special use permit.
6. Cordova Electric Cooperative buried distribution line along the highway from Cordova to past the airport (on the Copper River Delta). This powerline is approximately 12 miles long and is authorized by a Forest Service special use permit.

Need for additional utility corridors

It is unlikely that additional utility corridors would be needed on National Forest System lands for the Grant Lake and Allison Creek hydroelectric projects. The Grant Lake project is next to the Seward Highway and would likely connect to the existing distribution lines. The Allison Creek project is not on National Forest System lands and any powerlines would likely be located on State of Alaska land.

The Cordova Electric Association holds a Forest Service special use permit for investigative studies for a potential hydroelectric project at Snyder Creek Falls. If the project is developed, a utility corridor may be needed for the associated transmission line.

It is also possible that additional utility corridors will be needed in the future to support other types of planned renewable energy development, including wind and hydrokinetic. It is impossible to anticipate the locations at the present time.

Contribution of utility corridors to social, economic, and ecological sustainability

Utility corridors may contribute to social, economic, and ecological sustainability by transmitting power generated from renewable sources, such as hydropower, wind, and hydrokinetic.

Nonrenewable Energy Resources

Leasable Minerals

Leasable mineral authority is under the Secretary of the Interior. Various Acts provide authority for nonrenewable energy leasable minerals as outlined.

- Geothermal: The Geothermal Steam Act of 1970, as amended (84 Stat, 1566; 30 U.S.C. 1001-1025), provides the Secretary of the Interior with the authority to lease public lands, including National Forest System lands, for geothermal exploration and development in an environmentally sound manner.
- Oil and Gas: The Mineral Leasing Act of 1920 gives the BLM responsibility for oil and gas leasing on public lands, including National Forest System lands, and other Federal lands, as well as private lands where mineral rights have been retained by the Federal government.
- Coal: BLM has several primary authorities under which it leases, including the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Land of 1947; and the Federal Land Policy and Management Act of 1976.

Oil and gas

Oil was first discovered in 1901 at Katalla, and, by 1902, Alaska had its first producing oilfield. More than 150,000 barrels were produced. Production ceased when the onsite refinery burned in 1933. A settlement agreement (1982) gave the Chugach Alaska Corporation (CAC) rights to drill from a private portion of the mineral estate beneath the Chugach National Forest but rights would be extinguished if a producing well was not established by December 31, 2004. A producing well was not established and the rights have expired.

No encumbrances currently exist on the oil and gas estate at Katalla since the rights under the 1982 CNI Settlement Agreement have been extinguished. The process to establish a new oil and gas lease is as follows:

- An oil and gas operator must possess a Federal oil and gas lease in order to explore for and develop federally owned oil and gas. The operator may directionally drill from the adjacent non-Federal surface but still must have a Federal lease. The process to obtain a Federal lease is initiated by submission of a nomination of lands/expression of interest to the BLM State Office.
- Lands may be nominated to the BLM in either a letter identifying the legal description of the lands to be leased or in a completed offer to lease (Form 3100-11).
- BLM would request Forest Service consent to leasing.
- After the completion of a NEPA analysis and associated decision, BLM would offer the lands for competitive leasing. The notice of lease sale would be published a minimum of 45 days in advance of the lease sale date. Leases are issued to the highest bidder.
- The Forest Service would approve surface use based on the lessee submitted surface use plan of operations.

Coal

The Bering River Coal deposit is on privately held lands so Forest Service surface management regulations do not apply and the Forest Service has no authority. There is a road right-of-way to this deposit held by CAC.

Geothermal

There are no known geothermal resources within the Chugach National Forest.

Mineral Resources

This section addresses the current type, extent, and general location of mineral activity; potential of the plan area for mineral activity; mineral activity trends; and the contribution of mineral activity in the plan area to social, economic, and ecological sustainability.

Existing mineral activity

Almost the entire national forest, with the exception of areas that have been appropriated, withdrawn, or segregated, is open to location under the General Mining Law of 1872, as amended. Acquired lands are not open to mineral location but are available under leasable laws.

It is not possible to quantify the number of active mining operations within the national forest since many activities do not require an authorization. The national forest has about 50 surface disturbing mining operations that are authorized under an approved plan of operations and most have a performance-reclamation bond.

There are four frequently used sand and gravel community sites within the national forest. At least eight additional sites are used, but less frequently.

Hundreds of mining claims are located within the national forest. Mining claims are dynamic and are routinely staked, filed, and dropped. The Forest Service does not administer mining claims. All mining claims on public lands are administered by the BLM. The Forest Service only administers surface mining operations.

Locatable minerals

Locatable minerals are those minerals that may be located and removed from Federal lands under the authority of the General Mining Law of 1872, as amended. In general, locatable minerals are those hard rock minerals that are mined and processed for the recovery of metals. They may also include certain nonmetallic minerals and uncommon varieties of materials that possess valuable and distinctive properties, such as some deposits of limestone or silica. Lands open to mineral entry are in the public domain and have not been appropriated, withdrawn, or segregated from location and entry.

Placer gold deposits/operations

In the late 1840s when Alaska was still owned by Russia, placer gold was first discovered in Kenai Peninsula drainages, which would later become part of the Chugach National Forest. Thousands of ounces of placer gold have been mined from many of the creeks, primarily on the roaded portions of the Kenai Peninsula. Placer gold producing drainages include: Crow Creek, Canyon Creek, Resurrection/Palmer creeks, Lynx Creek, Bear Creek, Mills Creek, Gulch Creek, Sixmile Creek, Cooper/Stetson Creeks, and Quartz Creek. As of 2012, active plans of operations exist for small-scale operations on all but one of the above streams (most of Sixmile Creek is withdrawn from mineral entry). Mid-sized mechanical operations (Hope Mining Company) have been active on Resurrection Creek for the past 4 to 5 years.

Lode deposits/operations

The rigorous permitting requirement to establish a lode mine, the limited size of lode deposits in the area, and the small-scale miners that dominate mining within the national forest all serve to limit development of lode mines. Two or three lode operations do exist within the national forest but production is very limited. Operators work seasonally and use rudimentary hand tools.

Larger gold lode deposits exist in northern Prince William Sound. Both the Cliff and Granite mines have had significant historic gold production. Historic base metals, primarily copper, have also been produced from lode mines in Prince William Sound: Latouche and Knight islands, and Ellamar; however, the more significant identified deposits have been selected and conveyed to the Chugach Alaska Corporation, an Alaska Native regional corporation under Alaska Native Claims Settlement Act (ANCSA).

Leasable minerals

Leasable mineral administration is under the authority of the Secretary of Interior. Various Acts provide authority for leasable minerals as outlined below.

- Solid leasables: The BLM leases certain solid minerals, like phosphate, sodium, and potassium, on public and other Federal lands, including areas managed by the Forest Service.
- Hardrock leasables: Where the Federal government has acquired the land, the BLM leases hardrock minerals under leasable regulations.

Hardrock leasable: Copper River addition

Hardrock minerals, such as gold and other metals, are generally conveyed by discovery and location. However, when mineral lands are acquired by the Federal government, those minerals are only available under the laws and regulations for leasable minerals. The Copper River Addition was appended to the Chugach National Forest under provisions of ANILCA in 1980. Hardrock minerals within this addition are not available for mineral entry because the lands are acquired but may be made available under leasing laws.

Salable minerals (mineral materials)

Salable minerals are common variety minerals disposed under free use permit or sale contract as authorized under the Materials Act of 1947 and the Surface Resources Act of 1955. They include the following categories: agricultural supplies; building materials; abrasive materials; construction materials; and landscape materials. The regulations for salable minerals may be found at 36 CFR 228C.

Sand and gravel

Extensive deposits of sand and gravel occur as alluvial, bench, and glacial deposits and are ubiquitous to nearly every valley within the national forest. Suitability of sand and gravel deposits for construction purposes varies based on factors, such as particle hardness, durability, and silt content. Road or rail accessibility is necessary for development.

The most significant sand and gravel deposit is located along the Spencer Glacier outwash plain. A second important sand and gravel resource is the deposits in Portage Valley, which have supported infrastructure projects for many decades.

Quarry rock: shot rock, rip-rap, and armor stone

Quarry rock suitable for construction purposes is in short supply within the Chugach National Forest, especially near roaded areas where the demand is greatest for road and other construction projects. Extensive portions of the Valdez Group are the underlying rocks on the roaded corridor and are commonly low grade slates and other non-competent or highly fractured rock that is unsuitable for construction use. Rock that fractures either naturally or by controlled blasting into large blocks is even less common and in demand for many infrastructure projects. A rock knob along the north edge of Spencer Lake is one of the few sources armor stone in the state certified for use in COE (U.S. Army Corps of Engineers) projects. The blasted rock fractures in large blocks, is durable, has rail accessibility, and is a proven commodity.

Decorative stone

A small tonnage of stone is produced from the national forest each year for use as decorative stone. Slate is produced from two locations along the Hope Highway.

Salable agricultural minerals

Travertine deposits occur infrequently within the Chugach National Forest and potentially may be suitable for use as an agricultural soil conditioner or amendment and are disposed under salable mineral materials regulations at 36 CFR 228C. One or more deposits occur along the Russian River but are precluded from development due to provisions of the Roadless Area Conservation Rule.

Mineral potential

The mineral potential for locatable minerals varies across the national forest, but activity is heaviest in areas with ready road access. The most comprehensive report delineating the mineral potential of most lands of the national forest was provided by Nelson and Miller (2000). Nelson and Miller delineated 21 mineral tracts and classified tracts into one of four categories as follows:

1. Tracts containing identified mineral resources (mines and prospects) and considered highly favorable for future mineral development and production
2. Tracts containing identified mineral resources and considered moderately favorable for future mineral development and production
3. Tracts without identified resources but considered highly favorable for containing undiscovered mineral resources
4. Tracts considered under-evaluated as to their mineral resource potential because geologic data is lacking due to rugged topography and (or) glacial cover

Leasable mineral potential is low for the Chugach National Forest.

Salable mineral potential is high. Sand and gravel demand is moderate to high along roaded areas of the national forest. Larger deposits exist in valley floors and as bench deposits.

Trends affecting mineral activity

Mineral activity within the Chugach National Forest is often related to the market for specific mineral resources. The price of gold was about 300 dollars per ounce when the 2002 Forest Plan was implemented. Since then, the price of gold has exceeded 1,800 dollars per ounce, an increase of more than 500 percent. The huge increase in the price of gold has resurrected interest in gold prospecting and mining and by persons seeking recreational opportunities for gold recovery. The Forest Service can gauge interest in locatable minerals by anecdotal indicators, such as observed activity, mining claim filings with BLM, number and topics of phone calls from the public, and submitted plans of operations. There is no requirement that operators provide information to any agency on their mineral recovery, except for the state mining license tax to the Alaska Department of Revenue, and that information is considered confidential. Mineral materials demand is driven by immediate area construction projects.

Split estate

Certain acquired National Forest System lands, including lands purchased by the United States following the Exxon Valdez oil spill, have a split estate: the surface ownership is held by the Federal government but the subsurface estate remains the possession of CAC. In the event that CAC identifies a mineral deposit, they may choose to develop that deposit.

Wilderness areas, recommended wilderness areas, and wilderness study areas

A wilderness area is a congressionally designated area that is withdrawn from mineral entry by an act of Congress. Mining development may occur in a wilderness area if a pre-existing mining claim has been determined to possess valid existing rights. Recommended wilderness areas within the Chugach National Forest are not congressionally designated areas. All recommended wilderness areas within the Chugach National Forest are in the Nellie Juan-College Fiord WSA. Recommended wilderness areas and the WSA are not withdrawn from mineral entry and are open to location and mineral entry in compliance with U.S. Mining Laws, therefore mineral development may occur. Several areas of moderate and high mineral potential (Nelson & Miller, 2000) exist in recommended wilderness areas and the WSA. Management to retain wilderness character discourages locatable mineral exploration and development.

Recreational mineral recovery

Recreationists may remove mineral specimens from National Forest System lands, including withdrawn lands, using small hand tools and four inch or less suction dredges. Recreational users are afforded no rights under U.S. Mining Laws and the activity is not covered under 36 CFR 228A. The process of recreational mineral recovery does not consider the mineral recovery an economically gainful endeavor. Only one area within the national forest (Resurrection Creek restoration area) has a closure order as of 2012 to preclude the use of gold pans and other hand tools for recreational mineral recovery.

Social and economic contribution of mineral activity

Mining laws do not consider any social aspects beyond the economic production of minerals in support of the national economy and personal capitalistic principles. A large social contribution exists for salable minerals, which supports infrastructure and construction projects, safety (road traction sand and flood control), and personal use needs for area residents.

Anecdotal evidence suggests that economic considerations are not considered by the individuals that seek out placer gold and other locatable minerals within the national forest. Economic contributions, however, do exist through purchase of goods and service, including fuel, heavy equipment, suction dredges, gold pans, hand tools, diving gear, and ATVs.

Abandoned mine lands

Abandoned mine sites were inventoried in the mid-1990s and rated on criteria, including physical and chemical hazards (site reports are on file in the Chugach National Forest minerals library). Explosives and immediate chemical hazards have been addressed at abandoned mine land sites. Mitigation of physical hazards at abandoned mines continues to be addressed and often includes sealing mine adits, shafts, and other workings from entry by humans. Some sites were designated as superfund sites under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and pose longer term chemical risks due to contamination of soil and/or ground water.