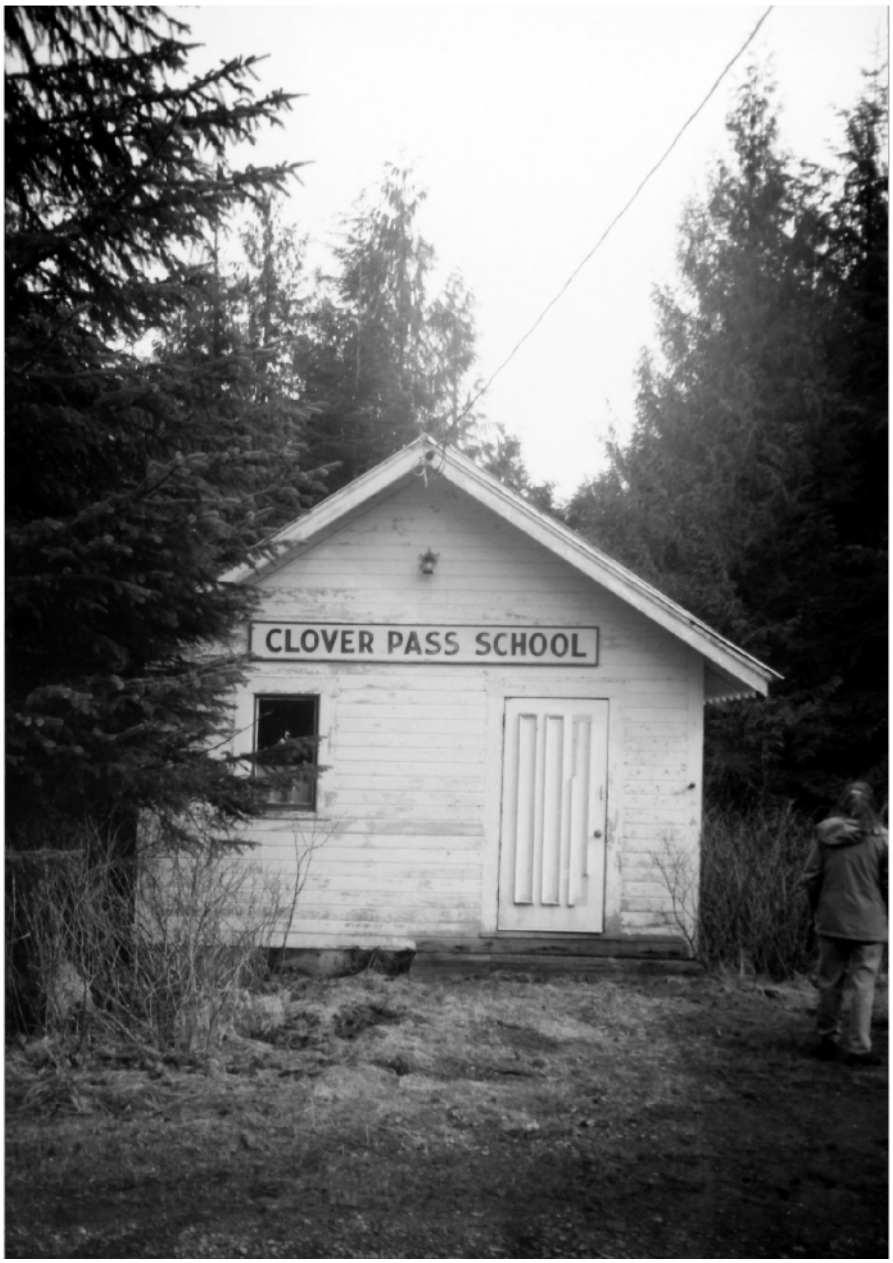
Chapter 3:

Affected Environment



3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the physical, biological, and socioeconomic resources of the Bureau of Land Management (BLM) Ring of Fire planning area. These descriptions present the relevant background information about the resources, resource uses, current status/trends of the resources, and existing programs on this portion of BLM lands managed by the Anchorage Field Office (AFO). This information is intended to establish the environmental baseline that will serve as the basis for the direct, indirect, and cumulative effects analyses presented in Chapter 4.

3.1.1 Approach

3.1.1.1 Scoping

BLM's approach to resource management is through the Resource Management Plan (RMP) process. An RMP is a land use decision-making document that guides future management direction for a planning area and site-specific implementation planning. Under the Federal Land Policy and Management Act (FLPMA) (1976), an RMP must be prepared before taking specific resource management actions and pursuing additional planning. The land use planning process is a key tool used by BLM to manage resources and designate uses on lands they manage. Under BLM guidelines, the RMP planning process is integrated within the requirements of the National Environmental Policy Act (NEPA). The Environmental Impact Statement (EIS) process requires an agency to identify potential effects that implementation of the RMP may have on the environment.

The first step in the EIS process is scoping. The Council on Environmental Quality (CEQ) defines scoping as an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 Code of Federal Regulations [CFR] 1501.7). The scoping process provides persons affected by the project an opportunity to express their views and concerns. The results of the scoping process are presented in the *Scoping Summary Report,*available in the project's administrative record.

The following steps have been taken to organize the issues and actions defined during the scoping process and subsequently presented in Chapter 3:

- Identify the relevant physical, biological, and socioeconomic resources.
- Review the literature, personal communications with resource specialists, and documentation of available information on identified resources.
- Conduct a past/present effects analysis.
- Define an environmental baseline for identified resources.

3.1.1.2 Geographic Scope

The Ring of Fire planning area, described in Section 1.2, consists of 61.4 million acres, of which 1.3 million acres are administered by BLM, including scattered tracts of BLM unencumbered and State- and Native-selected lands (Figures 1.2-2 through 1.2-4 in Appendix A). These selected lands are generally referred to as interim managed lands. BLM will continue to manage these lands until they are conveyed, scheduled to occur by the year 2009. The 1.3 million acres

of BLM-managed lands located in the Ring of Fire planning area is just a portion of the 16 million acres of public land and federal mineral estate that the AFO administers. BLM is responsible for managing the surface and subsurface resources and uses of certain public lands. For most resources, the geographic focus of this discussion is the BLM-managed lands occurring within the Ring of Fire planning area, although information on conditions adjacent to the BLM-managed lands within the Ring of Fire planning area is provided when the context is pertinent to the effects analysis. For ease of discussion, the Ring of Fire planning area has been divided into four separate regions: Alaska Peninsula/Aleutian Chain, Kodiak, Southcentral, and Southeast regions. The boundaries of these four regions are described below and are depicted on Figure 1.2-1. Refer to Table 3.1-1 for a breakdown of BLM-managed unencumbered and selected acreages within the Ring of Fire planning area by region.

Table 3.1-1. Acres within the Ring of Fire Planning Area by Region

Planning Region	All Ownerships*	BLM-managed Lands		BLM-managed Land as % of Region
		Unencumbered	Selected	
Alaska Peninsula/Aleutian Chain	15,500,000	28,100	83,587	<1%
Kodiak	3,200,000	2,729	13,796	<1%
Southcentral	21,200,000	453,140	382,614	4%
Southeast	21,500,000	1,933	318,430	1%
Total	61,400,000	485,902	798,427	2%

Notes: * All acres in this column rounded to nearest 100,000.

1) Acres summarized are based on geometrically-calculated areas in the general land status GIS dataset, as subsetted by geoprocessing methods to the Ring of Fire planning area boundary. GIS datasets provided by BLM.

Alaska Peninsula/Aleutian Chain Region

The eastern boundary of the Alaska Peninsula/Aleutian Chain region stretches from the Kenai Peninsula Borough (KPB)/Kodiak Island Borough (KIB) boundary at Cape Douglas, along the Alaska Peninsula Coast to Attu Island. The western boundary travels southwest from Cape Douglas along the Lake and Peninsula Borough (LPB)/KIB division until meandering west along the division between the Naknek and Egegik/Becharof subdrainages. At the Bristol Bay Coast, this region boundary then continues southwest along the Alaska Peninsula and Aleutian Chain to Attu Island. As land transfer has progressed during the RMP/EIS process, it is clear that BLM will manage very little land in this planning region, less than thought at the time that the Ring of Fire planning effort was initiated.

Kodiak Region

The Kodiak region covers approximately 5,000 square miles (Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004) and consists of all the land within the Kodiak Archipelago. Kodiak Island is the largest island in the archipelago, which also includes the Afognak, Shuyak, Sitkalidak, Sitkinak, Barren, and Tugidak islands, as well as many other smaller islands. This region lies within the Gulf of Alaska, southeast of the Alaska Peninsula.

Southcentral Region

The Southcentral region stretches from the western boundary of the BLM Glennallen Field Office and follows the Ring of Fire planning area boundary in the north and west. The region

terminates at the LPB and KIB boundaries in the southwest. This region encompasses lands from the Matanuska-Susitna Borough (MSB), Municipality of Anchorage (MOA), KPB, and the Chugach National Forest (CNF).

Southeast Region

The Southeast region covers over 42,000 square miles (Selkregg 1974-1976c). This region is bordered by Canada to the south and east, the Gulf of Alaska to the west, and the BLM Glennallen Field Office Boundary (east Yakutat Bay) to the north.

3.1.1.3 Temporal Scope

The temporal scope for these analyses may vary for resources, but generally begins with the original sustainable condition of the resource and extends through the time of analysis, 2006.

3.1.2 Methods

A thorough description of the current status of any resource describes both the natural and human actions that have influenced the resource over time. In accordance with CEQ guidance, an analysis of the cumulative effects on a resource begins by identifying the past and on-going events and/or actions that have affected the resource. In an effort to provide the starting point for the direct, indirect, and cumulative effects analyses presented in Chapter 4 of this document, Chapter 3 presents the relevant background literature, historical and current trends, and past/present effects analysis of the actions and events that have altered the resource from its original sustainable condition. These descriptions form a baseline that represents the current condition of the resource and environment on BLM-managed lands within the Ring of Fire planning area.

Prior to the implementation of the RMP/EIS process, the BLM AFO prepared Analyses of Management Situations for each BLM resource and management program. The Analyses of Management Situations provide essential background information on resources, assess the demand on resources, and present the current management practices, BLM goals, objectives, and policy regulations for resources found on BLM-managed lands within the Ring of Fire planning area. In addition, environmental baseline information was summarized from several BLM documents, field studies, published (peer-reviewed) sources, and personal communication with BLM and other agencies' resource specialists that are part of this project's Administrative Record. A complete bibliography of the references cited within the text appears in Chapter 7 of this document.

3.2 Resources

3.2.1 Climate

Three major climatic zones are found within the Ring of Fire planning area: maritime, continental, and transition. The maritime climatic zone exhibits heavy precipitation, persistently strong surface winds, cool summers, and warm winters. This zone includes southeast Alaska, a narrow band along the north coast of the Gulf of Alaska, the southern side of the Alaska Peninsula and Aleutian Islands, and all the islands in the Gulf of Alaska and along the Pacific side of the Alaska Peninsula. Interior Alaska, south of the central Brooks Range, and inland from the maritime zone, makes up the continental zone. In this zone, summer and winter temperatures are extreme, and surface winds are mostly light. The transition zone is a zone of varying width located between the maritime and continental regions. In this area weather is variable, with temperatures, precipitation levels, and winds fluctuating between maritime and continental.

Throughout the Ring of Fire planning area, the terrain creates numerous microclimates that have different temperature and precipitation averages from the larger climatic zone they fall within. The climate zones within the planning area are presented on Figure 3.2-1. Major ecosystems within the planning area are presented on Figure 3.2-2.

Global Climate Change

Carbon dioxide (CO2) is a greenhouse gas, as are other gases such as methane. Greenhouse gases are vital because they maintain global ambient temperatures within ranges suitable for life on earth. However, excess greenhouse gas emissions increase the concentration of these gases in the atmosphere, and contribute to overall global climatic changes, typically referred to as global warming. Carbon dioxide emissions are a product of fossil fuel combustion and tropical forest destruction, both human activities that contribute to global climatic changes. Large quantities of greenhouse gas emissions may decrease the amount of infrared or heat energy radiated by the earth back to space and upset the global temperature balance. Global warming may ultimately contribute to a rise in sea level, destruction of estuaries and coastal wetlands, and changes in regional temperature and rainfall patterns, with major implications to agricultural and coastal communities (ACIA 2004).

Increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change. Scientists speculate that the average global surface temperature could rise 1 to 4.5 degrees Fahrenheit (°F) in the next 50 years, with significant regional variation. Computer models indicate that such increases in temperature will not be equally distributed globally, but are likely to be accentuated at higher latitudes, such as in the Arctic, where the temperature increase may be more than double the global average (BLM and MMS 1998).

Evidence is emerging that climate warming in Alaska can be linked to changes occurring in the structure and function of terrestrial ecosystems throughout the State. Since the 1950s, Alaska has warmed by an average of 4°F (USEPA 2005). Changes include warming of permafrost throughout Alaska, the decrease in area of closed basin lakes in southcentral Alaska, and the altering of the ranges of some bird species. Climate change has also been linked to changes in disturbance regimes like fire and insect outbreaks in southcentral Alaska (McGuire 2003).

BLM recognizes the importance of climate change and the potential effects it may have on the natural environment. BLM land use management practices are based on goals and objectives that are established for different geographical areas. These established land uses are based on numerous criteria, including land cover and historical land uses. If climate change continues to have an effect on BLM-managed resources and programs, or use changes in a management area, BLM will re-evaluate the land management status for that given area and adjust management accordingly.

Alaska Peninsula/Aleutian Chain Region

The maritime zone includes the coastal areas and islands along the Pacific side of the peninsula. Average annual precipitation in this zone ranges from 1.66 to 5.83 feet (20 to 70 inches), but may be as little as 1.08 feet (13 inches) at the leeward coastal locations, which include the north side of the Alaska Peninsula and Aleutian Islands. At the leeward sites, precipitation-producing winds that tend to come from the south are blocked by the Aleutian Range. Maximum summer temperatures are approximately 60°F (DCCED 2004a) and drop to lows in the mid- to low 20s°F in winter. Surface winds in the maritime portion of this region average between 10 and 20 knots, but extreme speeds approach 100 knots. The western and central portions of the Aleutian Islands have historically recorded the strongest winds in the State. High winds are common along the coast, and in mountain passes and valleys (Selkregg 1974-1976b).

A small portion of the continental climatic zone is located in this region, inland, near the boundary between the Alaska Peninsula/Aleutian Chain region and the Southeastern Alaska region. Average annual precipitation amounts are usually less than 1.66 feet (20 inches). Average maximum temperatures are in the upper 60s°F, with average winter minimums between -20°F and 6°F. Surface winds in this area are lighter than coastal areas (Selkregg 1974-1976b).

The transition zone stretches along the leeward, or Bristol Bay side of the Alaska Peninsula, out to Unimak Island. Temperature extremes here most resemble those of the continental zone, while precipitation amounts reflect both the continental and the maritime zones. Surface winds also range between the two climate zones.

Kodiak Region

Kodiak Island is located in the maritime climatic zone, which is characterized as having cool summers and warm winters. There is also frequent cloud cover and fog over the island due to the strong marine influence on the climate. January temperatures average 14°F to 46°F, and July temperatures vary from 39°F to 76°F. The actual range from lowest to highest recorded temperatures is nearly 100°F. The highest maximum daily temperatures occur with northwest winds in the summer. Precipitation is normally abundant throughout the year, with all months having a wide variation in the amount of precipitation. In Kodiak, annual rainfall is 5.58 feet (67 inches), and snowfall averages 6.5 feet (78 inches). Small amounts of snow may fall as late as May or as early as September, with persistent cover anticipated by November. Precipitation measurement is often difficult due to strong, gusty surface winds that frequently accompany precipitation. The prevailing wind direction is northwesterly every month except May, June, and July, and the average speed is about 10 knots. Maximum gusts of over 90 knots have been recorded in Womens Bay. Severe storms are common from December through February.

Annual precipitation is 5 feet (60 inches) on the windward side of the Island, and 3.3 feet (40 inches) on the leeward side (Selkregg 1974-1976b).

Southcentral Region

All three climatic zones are represented in the Southcentral region: maritime, continental, and transition. The Gulf of Alaska coast and islands falls into the maritime zone. Annual precipitation in this zone typically amounts to around 5 feet (60 inches), including snow. However, in some areas, the same air can be pushed up mountainsides and result in more than 16.67 feet (200 inches) of moisture. Temperatures usually reach the upper 50s°F for mean maximums during summer, and drop into the low 20s°F for mean lows during winter. The strongest surface winds in this zone occur along the coast. Wind speeds offshore can average between 12 and 18 knots; winds are slightly less onshore due to surface friction. Extreme winds of 50 to 75 knots are common in winter, and have been known to exceed 100 knots when channeled (Selkregg 1974-1976a).

The continental zone can be found in the interior portions of the Kenai Peninsula, and in the northern portion of this region around Talkeetna. Precipitation amounts tend to range between .83 to 1.25 feet (10 to 15 inches). Heavier amounts, possibly exceeding 1.66 feet (20 inches), usually occur at higher elevations. Surface winds are light compared to the coastal areas. Channeling through mountain valleys can result in narrow bands of strong winds in some areas.

Southeast Region

The maritime climatic zone dominates the Southeast region. Temperatures range from the 40s°F to mid-60s°F during the summer months, and from the high teens to low 40s°F in winter. In the summer, cooler temperatures occur on or near the coasts, and warmer temperatures occur farther inland. The reverse is true during winter months. Moderate temperatures along the coasts reflect the strong maritime influence.

Storms and rain showers occur throughout the year, however precipitation is heavier and more frequent from November to January. The north end of Lynn Canal around Haines and Skagway lies within the transition climatic zone that receives less precipitation than Juneau. Klukwan, located 20 miles north of Haines, has colder temperatures in winter, warmer temperatures in the summer, and less precipitation than Haines. It is not unusual for simultaneous temperatures in the two towns to differ by as much as 10°F (City of Haines 2000). Snow occurs frequently in all areas during the winter, but it usually melts fairly quickly at low elevations in the southern section of the region. Ketchikan and Lake Carlanna, both located in the southern portion of this region, lie within the maritime climate zone noted for its warm winters, cool summers, and heavy precipitation. Ketchikan averages 13.5 feet (162 inches) of precipitation annually, including 2.66 feet (32 inches) of snowfall (Selkregg 1974-1976c).

Surface winds are moderate to strong throughout the entire region. Prevailing winds are typically south or southeasterly, except where local terrain alters the pattern, which can produce isolated areas with strong winds. Wind channeling resulting from topographic features is common along the Taku River and Inlet, and the Mendenhall Glacier near Juneau, where winds funneled through narrow valleys and mountain passes may increase adversely in speed (Selkregg 1974-1976c). Wind channeling and other extreme wind conditions can also occur in the northern portion of the Lynn Canal (City of Haines 2000).

3.2.2 Air Resources

Air resources are simply the gaseous atmosphere. Air resources within the planning area are constantly changing as winds and climatic systems move air masses across the globe. Pollution of air resources can come from a variety of natural and anthropogenic sources, including on- and off-road vehicles, industrial or construction equipment, smoke from fires, and windblown dust. Air resources within the planning area are generally considered pristine or of very good quality.

In Alaska, air quality is monitored within one of four regions: Cook Inlet Intrastate Air Quality Control Region, Northern Alaska Intrastate Air Quality Control Region, South Central Intrastate Air Quality Control Region, and Southeastern Air Quality Control Region. The Ring of Fire planning area has also been divided into four regions; these regions and their relationships to Alaska air quality control regions are described below.

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula/Aleutian Chain region is located within the South Central Intrastate Air Quality Control Region. This BLM planning region is comprised of remote islands and small, isolated fishing villages. Existing air quality can be considered pristine or of very good quality throughout this region.

Kodiak Region

The Kodiak region is located within the South Central Intrastate Air Quality Control Region. This region also has relatively low population densities. Existing air quality can be considered pristine or of very good quality for the region. Simeonof Island southwest of Kodiak is designated as a Class I area (see Section 3.2.2.2).

Southcentral Region

The southcentral region is located within the Cook Inlet Intrastate Air Quality Control Region and the South Central Intrastate Air Quality Control Region. The Cook Inlet air quality region includes the MOA, KPB, and MSB. The remaining Southcentral region is included in the South Central Air Quality Contract Region. This Southcentral region is the most populated area in Alaska, containing 60 to 70 percent of the State's population. Anchorage, the State's largest city located within this region, contains over 250,000 people. Air quality in the region is affected by both anthropogenic and natural (volcanoes, glacial silt) sources. There is one non-attainment area (Anchorage) located within this region. Tuxedni Island of lower Cook Inlet is designated as a Class I area.

Southeast Region

The Southeast region is located in the Southeastern Alaska Intrastate Air Quality Control Region. This region is comprised of mountainous islands and protected marine waterways. Most communities are small, with fewer than 5,000 people. The State's capital, Juneau, is the largest city in the region, containing approximately 30,000 people. There is one non-attainment area (the Medenhall Valley in Juneau) located within this region.

3.2.2.1 Air Quality Standards and Relevant Pollutants

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual pollutants degrade the atmosphere by reducing visibility, damaging property, reducing vegetation productivity, or adversely affecting human and animal health. Air quality is regulated at the federal level under the Clean Air Act (CAA) of 1970. The CAA authorizes the USEPA to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that pose a risk to public health. These primary standards represent air quality levels, with an adequate safety margin, that are required to protect public health. USEPA has established standards for seven criteria pollutants: carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and airborne lead (40 CFR 50). Secondary standards represent air quality levels necessary to protect public welfare. Both the primary and secondary standards must be met outside a facility's property boundary.

Federal standards require each state to submit a State Improvement Plan (SIP) detailing strategies for attaining the standards. Air quality is regulated at the State level under the Alaska Ambient Air Quality Standards promulgated in Title 18, Chapter 50, of the Alaska Administrative Code (AAC). The Alaska Ambient Air Quality Standards mirror federal standards for most of the pollutants. Table 3.2-1 shows the federal and State air quality standards for selected pollutants.

In addition to the NAAQS, USEPA has developed Prevention of Significant Deterioration (PSD) standards that limit the incremental increase in air pollutant concentrations above the specified PSD standards. PSD standards for Alaska are listed in 18 AAC 50.

The State of Alaska air toxics inventory identified hazardous air pollutants (HAPs) for Anchorage, Fairbanks, and Juneau in 1999 (Alaska Department of Environmental Conservation [ADEC] 2001b). Although HAPs do not have federal standards, they are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive or birth defects, or adverse environmental effects. Some of the HAPs in Alaska include benzene, toluene, xylenes, and formaldehyde. HAPs are generated by on- and off-road mobile sources (vehicles, aircraft, marine vessels, recreational vehicles, logging equipment, and construction equipment) and industrial activities (paint shops, dry cleaners, and refineries).

Table 3.2-1. National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary	Secondary
CO	1 hour	35 ppm (40,000 µg/m^3)	Not Applicable
	8 hours	9 ppm (10,000 µg/m^3)	
Pb	3 months	1.5 µg/m^3	Same as Primary Standard
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as Primary Standard
O_3	1 hour	0.12 ppm (235 µg/m^3)	Same as Primary Standard
	8 hours [1]	0.08 ppm (157 µg/m^3)	
PM_{10}	24 hours	150 µg/m^3	Same as Primary Standard
	Annual	50 µg/m^3	
$PM_{2.5}$[1]	24 hours	65 µg/m^3	Same as Primary Standard
	Annual	15 µg/m^3	
SO_2	3 hours	Not Applicable	0.5 ppm (1,300 µg/m^3)
	24 hours	0.14 ppm (365 µg/m^3)	Not Applicable
	Annual	0.03 ppm (80 µg/m^3)	

Notes: Standards from 40 CFR 50.8 and 18 AAC 50.010. Alaska standard for ammonia is not included in this table.
[1]No corresponding Alaska standard exists for $PM_{2.5}$ or 8-hour ozone (Register 168, 18 AAC 50.010).
CO – carbon monoxide
µg/m^3 – micrograms per cubic meter
NO_2 – nitrogen dioxide
O_3 – ozone
Pb – airborne lead
PM_{10} – particulate matter less than 10 microns
$PM_{2.5}$ – particulate matter less than 2.5 microns
ppm – parts per million
SO_2 – sulfur dioxide

3.2.2.2 Attainment Status of the Planning Area

A region may be categorized as being in attainment or non-attainment of the NAAQS for each pollutant, or, when insufficient information exists, unclassifiable. Regions where monitored values of any pollutant exceed the NAAQS are formally designated by USEPA as non-attainment areas. Both federal and State regulations require the preparation of strategies by which non-attainment areas can meet attainment for each pollutant where the NAAQS are exceeded.

Most of the Ring of Fire planning area is designated as an air quality attainment area or is unclassifiable; however, there are two areas that are designated as non-attainment within the planning area: the Eagle River area within the MOA and the Mendenhall Valley near Juneau are both non-attainment for PM_{10}. On August 13, 1993, USEPA approved the Eagle River PM_{10} attainment plan, which focuses on reduction of fugitive dust by implementing road surfacing and paving projects. On March 24, 1994, USEPA approved the Mendenhall Valley PM_{10} attainment

plan, which focuses on control of wood smoke emissions and fugitive dust sources (e.g., glacial silt, dust from unpaved roads, agriculture/timber harvesting) during the winter months. Air quality in the Mendenhall Valley is impaired primarily during the winter when stable air masses and low winds trap particulate matter in the valley. Formerly the Anchorage area was designated as non-attainment for CO; however, on July 23, 2004, Anchorage was redesignated as in attainment for CO (USEPA 2004a).

In 1999, USEPA announced the final version of the Regional Haze Rule. Regional haze refers to haze that impairs visibility in all directions over a large area. Haze-causing pollutants are directly emitted to the atmosphere by a number of activities (e.g., various industrial and manufacturing processes; truck, auto, and vessel emissions; burning related to forestry and agriculture; and construction activities). Class I wilderness areas have important visual characteristics that must be protected under the Regional Haze Rule to preserve the natural condition of the area.

Alaska has four Class I areas: Denali National Park, Tuxedni Wilderness Area, Simeonof Wilderness Area, and Bering Sea Wilderness Area (ADEC 2001a). The Tuxedni Wilderness Area is located within the Southcentral Alaska region, and the Simeonof Wilderness Area is located within the Alaska Peninsula/Aleutian Chain region. Denali National Park and the Bering Sea Wilderness Area are not located near the Ring of Fire planning area.

3.2.2.3 Ambient Air Quality in the Ring of Fire Planning Area

With the exception of Anchorage and Juneau, Alaska does not have a statewide air toxics emission inventory. An emission inventory of village areas is planned by ADEC but has not yet been completed (ADEC 2004). A listing of the top 10 HAPs and emissions sources can be found in the ADEC's *1999 Air Toxics Emission Inventory – for Anchorage, Fairbanks, and Juneau, Alaska, Final Report*, (June 2001b). Toluene, xylene, and benzene were the top three HAPs for Anchorage and Juneau areas. The top five emissions sources within those two cities include:

Anchorage

- Surface Coating Area Sources
- Consumer Products Area Sources
- Light Duty Gasoline Vehicles
- Aircraft Off-Road Mobile Sources
- Dry Cleaners Area Sources

Juneau

- Outboard Engines (two stroke)
- Logging Equipment
- Personal Water Craft (two stroke)
- Surface Coating Area Sources
- Light Duty Gasoline Vehicles

Except for the non-attainment areas and the major metropolitan areas of Juneau and Anchorage, air quality within the Ring of Fire planning area is generally considered pristine or of very good quality. Natural conditions can temporarily degrade air quality. Volcanic eruptions

(ash and gases), wind blown glacial flour, or wildland fires can all degrade air quality. Most of the Ring of Fire planning area is very sparsely populated, and so human effects are localized and usually temporary.

Activities on BLM administered lands are analyzed as required by NEPA. As part of this analysis, effects on air resources are evaluated. Activities that would adversely effect air resources or not comply with federal laws, regulations, and policies, would not be approved, and/or must be altered. According to the CAA, a “conformity applicability” process is used to evaluate if a proposed action is subject to the air conformity regulations. If the conformity regulations are applicable to the proposed action, a “conformity determination” may be incorporated into a concurrent NEPA document. Air quality data may be necessary to evaluate proposed actions in this planning area. The specific data types necessary would depend on the action being analyzed.

3.2.3 Physiography

Topographic maps of each region of the Ring of Fire planning area can be found in the *Mineral Potential Report* (Figures G-2 through G-5), in Appendix G. A map of the physiography of the planning area is included as Figure 3.2-3 in Appendix A.

Alaska Peninsula/Aleutian Chain Region

This region encompasses the extreme southwest portion of the State. Bounded by the North Pacific Ocean to the south and the Bering Sea to the north, the Aleutian Chain extends in an east-west arc for over 1,000 miles from the Alaska Peninsula. The Aleutian Chain is comprised of many islands ranging from 20 to 60 miles wide, which represent volcanic summits of a submarine ridge. The topography features glaciated and rubble-strewn volcanic cones, indented with fjords and bordered by sea cliffs or wave-beaten platforms (Selkregg 1974-1976b; U.S. Fish and Wildlife Service [USFWS] 1988; Nowacki, Spencer et al. 2002). The Aleutian Chain contains 57 volcanoes which rise to elevations between 2,000 and 9,400 ft above sea level (Alaska Volcano Observatory [AVO] 2004a).

The Alaska Peninsula divides Bristol Bay from the North Pacific Ocean, and extends for approximately 400 miles from Bechevin Bay at the east end of the Aleutian Islands arc to the northeast base of the peninsula near Mount Katmai (USFWS 1985b). The Alaska Peninsula is about 100 miles wide at its base, and narrows progressively toward the southwest. Rugged mountain terrain, volcanoes, lake-dotted tundra, and many rivers characterize the peninsula. Glaciation has produced landforms that range from smooth glacial moraines on the north side of the peninsula, to deeply cut fjords on the south side (Selkregg 1974-1976b; Nowacki, Spencer et al. 2002). The Aleutian Range, which forms the backbone of the Alaska Peninsula, reaches elevations of 4,500 to 8,500 ft, and is mantled on its northwest side by the Nushagak-Bristol Bay Lowland (Wahrhaftig 1965; Selkregg 1974-1976b).

Kodiak Region

The Kodiak region of the Ring of Fire planning area includes Kodiak Island and all surrounding islands, which lie across Shelikof Strait from the Alaska Peninsula. The Kodiak archipelago is approximately 180 miles long by 70 miles wide. Kodiak Island is mountainous and intensely scoured by repeated glaciations. High peaks with cirque glaciers characterize the island, and low rounded ridges surround glacially scoured valleys. The Kodiak Mountains reach elevations of 2,000 to 4,000 ft, and are generally drained by short swift streams. Rocky, glacially carved fjords characterize the northern part of Kodiak Island, while the southern coastline is relatively smooth with few indentations (Selkregg 1974-1976a; USFWS 1987a; Nowacki, Spencer et al. 2002).

Southcentral Region

The Southcentral region of the Ring of Fire planning area includes the Cook Inlet area, Matanuska-Susitna Valley, and Kenai Peninsula, but excludes the eastern Prince William Sound (PWS) area and the Wrangell Mountains to the east. It encompasses a wide variety of land types. Along the west side of Cook Inlet, the north end of the Aleutian Range merges imperceptibly with the southern end of the Alaska Range. There area several volcanoes in this range, including Augustine, Iliamna, Redoubt, and Mount Spurr, each reaching elevations of over 10,000 ft (AVO 2004a). The northwest corner of the region is comprised of foothills of the

central Alaska Range. The ice-carved Talkeetna Mountains in the northeast corner of the region rise to elevations of 6,000 to 7,000 ft (Wahrhaftig 1965; Selkregg 1974-1976a). The Cook Inlet-Susitna Lowland extends for over 200 miles through the center of this ring of mountains. Together with the Upper Matanuska Valley, these gently sloping lowlands have been buried by ice and flooded by lakes during repeated glaciations. Numerous lakes, ponds, and wetlands exist throughout the area. The lowlands are fed by multiple drainages that originate in the mountains of the Alaska Range and the Talkeetna and Chugach Mountains. Several of these, including the Yentna, Skwentna, Susitna, Matanuska, and Knik rivers, are large, glacially-fed streams that course down mountain ravines and braid across valley bottoms and coastal flats (Wahrhaftig 1965; Nowacki, Spencer et al. 2002).

The Chugach Mountains extend east of Anchorage and across the north side of PWS. Along the sound, these mountains form steep angular peaks with elevations in the range of 12,000 to 13,000 ft, and are surrounded by large icefields, snowfields and glaciers, some of which extend down to tidewater. Western PWS and the southern portion of Kenai Peninsula are characterized by a fjord coastline, which formed where glacier-carved terrain filled with seawater after deglaciation. Broad U-shaped valleys with deeply incised sidewalls lie at the heads of many of the fjords (Nowacki, Spencer et al. 2002). The Kenai Mountains form the central and eastern portions of the Kenai Peninsula. These moderately high, rugged mountains are covered with icefields, snowfields, and glaciers (Wahrhaftig 1965; Nowacki, Spencer et al. 2002).

Southeast Region

The Southeast region, extending from Yakutat Bay to the southeastern tip of Alaska, is an island-rich fjordland characterized by broad U-shaped valleys with steep sidewalls. High, steep-sided, angular mountains exist above the upper reaches of the glaciers. The St. Elias Mountains east of Yakutat Bay reach elevations of 14,000 to 19,000 ft. South of the St. Elias Mountains, the Boundary Range, which forms the eastern border with Canada, comprises a glacier-covered upland between 5,000 and 10,000 ft (Selkregg 1974-1976c; Nowacki, Spencer et al. 2002). Rounded mountains with rolling till plains occur where continental and piedmont glaciers overrode the land. A narrow coastal plain characterized by longitudinal beach ridges lies along the Gulf of Alaska coast between Yakutat Bay and Chichagof Island (Wahrhaftig 1965; Nowacki, Spencer et al. 2002).

3.2.4 Geology

The Ring of Fire planning area spans one of the most geologically complex areas of the world. Much of the area contains individual rock terranes that have been accreted to the North American continent through plate tectonic movements. The word “terrane” refers to an assemblage of related rocks that occupy a certain geographic area, are separated from other groups of rocks by faults, and have a history of formation that is different from neighboring terranes. This concept is useful in summarizing the complex geologic evolution and wide variety of rock types within the Ring of Fire planning area.

The following paragraphs provide a general summary of the rock types and surficial deposits found in each region of the Ring of Fire planning area. More detailed descriptions, geologic maps, and stratigraphic columns can be found in the *Mineral Potential Report* (Appendix G, Figures G-6 through G-14, and Table 1).

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula/Aleutian Chain region encompasses two different geologic segments that meet near Unimak Pass off the southwestern tip of the Alaska Peninsula. The Aleutian Ridge segment lies west of Unimak Pass and is geologically younger than the Alaska Peninsula (Vallier, Scholl et al. 1994). The Aleutian Ridge is a mostly submerged mountain range that was formed by the subduction of the Pacific Plate underneath the North American Plate along the Aleutian Megathrust. This major south-dipping fault system surfaces near the bottom of the Aleutian Trench in the Pacific Ocean about 100 miles south of the islands (Plafker, Gilpin et al. 1993). Twenty-seven volcanoes in the Aleutian Chain are reportedly active, having been built up of both lava flows and solid volcanic fragments (pyroclastics) (USFWS 1988; Wohletz and Heiken 1992; AVO 2004b). More gentle slopes and thin flows characterize the older volcanoes of the Aleutians. Many of the Aleutian volcanoes exhibit calderas of former volcanoes that have collapsed (USFWS 1988). Tertiary-aged marine sedimentary rocks are found interbedded with volcanic deposits on several islands, including Attu, Amchitka, and Unalaska.

Since early Tertiary time, the entire Aleutian arc, including the Alaska Peninsula, shared a similar geologic history. Prior to the early Tertiary, however, the evolution of the Alaska Peninsula was very different from the rest of the Aleutian arc, as parts of the Alaska Peninsula may have originated as an island arc far to the south of their present position, and were added onto the rest of Alaska as a result of plate convergences. Rock types on the Alaska Peninsula can be divided into two distinct parts that are separated by an extension of the Bruin Bay fault: (1) the lowland on the northwest half of the peninsula is underlain by Tertiary sedimentary rocks that thicken to the northwest under Bristol Bay; and (2) the mountainous southeast half of the peninsula contains older folded and deformed sedimentary rocks of the Peninsular Terrane, as well as younger volcanic rocks associated with active volcanoes.

Unconsolidated surficial deposits of the Aleutian Chain include volcanic ash, pumice, cinders, and alluvium, as well as deposits of glacial origin. Glaciation is responsible for the presence of till, meltwater outwash, and loess on the islands (USFWS 1988). Surficial deposits on the Alaska Peninsula are mostly of glacial, fluvial (stream-deposited), and volcanic origin. The eastern slopes of the Aleutian Range are generally free of surficial cover, while the gentler northwest slopes and lowlands contain a thick blanket of unconsolidated material, including volcanic ash, pumice, cinders, glacial till, morainal deposits, outwash, and alluvium. Sand, silt, and gravel are found on beds and terraces of modern floodplains and meltwater streams.

Kodiak Region

Like the Alaska Peninsula, Kodiak Island originated far south of its present position, having evolved along a zone of plate convergence since Mesozoic time. Geologically, the Kodiak area is an extension of Kenai Peninsula, as the areas share the same rocks and structures (Beikman 1980; USFWS 1987a). Most rocks on Kodiak belong to the Chugach Terrane, which is bounded to the southeast and northwest by major thrust fault systems, and is composed primarily of marine sedimentary and volcanic rocks intruded by granite.

Three main glaciations covered Kodiak during the Pleistocene, leaving behind discontinuous surficial deposits consisting of moraines, glacial till, and outwash. A small amount of alluvium occupies the short steep rivers of Kodiak. Volcanic ash from Aleutian Range eruptions forms a relatively continuous surficial layer throughout the Kodiak region (USFWS 1987a).

Southcentral Region

The structural geology of the Southcentral region is composed of a complex series of fault systems and intervening arcuate-shaped rock terranes and basins of various ages. Geologically, the Aleutian-Alaska Range along the west side of Cook Inlet is an extension of the Alaska Peninsula, characterized by Peninsular Terrane sedimentary rocks, granitic intrusive rocks, and Quaternary volcanoes. Complexly deformed and metamorphosed volcanic and sedimentary rocks, primarily of Mesozoic age, comprise the foothills of the northern Alaska Range and the Talkeetna Mountains in the northeast corner of the region (Nokleberg, Bundtzen et al. 1994a; Nokleberg, Plafker et al. 1994b).

The Cook Inlet-Susitna Basin is bordered to the west and north by the Aleutian-Alaska Range and Talkeetna Mountains, and to the southeast by the Chugach and Kenai Mountains. The basin contains up to 25,000 ft of Tertiary strata overlying a 30,000-ft thick sequence of Mesozoic sedimentary rocks belonging to the Peninsular Terrane (Selkregg 1974-1976a; Swenson 1997). These rocks form important oil and gas, coal, and coalbed natural gas (CBNG) resources in the Ring of Fire planning area. The Castle Mountain fault forms the approximate boundary between the Cook Inlet and Susitna basins. The mountains of eastern Kenai Peninsula and western PWS contain rocks of the Chugach and Prince William terranes: metamorphosed, deep water marine sedimentary rocks; mafic volcanic and igneous rocks, such as pillow basalts, greenstone, and gabbro; and ultramafic assemblages (Tysdal and Case 1979; Plafker, Moore et al. 1994; Silberling, Jones et al. 1994).

Unconsolidated surficial deposits of the Southcentral region consist chiefly of glacial tills, outwash deposits, and alluvium from the development of major drainage systems originating in large mountain ranges (Selkregg 1974-1976a; Reger and Pinney 1997).

Southeast Region

The Southeast region is dominated by a series of subparallel northwest-trending fault systems, which form boundaries between different rock terranes. Together, the Yakutat, Chugach, and Wrangellia terranes form the northwest margin of southeast Alaska from Yakutat Bay to the southern tip of Baranof Island. These contain a wide variety of rock types including highly deformed and metamorphosed upper Paleozoic- and Mesozoic-aged marine sedimentary, volcanic, and ultramafic rocks; nonmarine Tertiary sedimentary rocks; and isolated patches of intruded granite. The Alexander Terrane and Gravinia Belt rocks occupy the largest proportion of

southeast Alaska, and contain some of the oldest rocks in Alaska, including sedimentary, metamorphic, plutonic, and volcanic rocks of Late Precambrian to Mesozoic age. Taku Terrane rocks lie along the east side of the Alexander and Gravinia rocks, and consist mostly of Paleozoic- and Mesozoic-aged rocks characterized by strong deformation and high-grade metamorphism. The Coast Mountains batholith along the border with Canada consists of younger plutonic rocks (Beikman 1980).

Unconsolidated deposits of glacial origin laid down during multiple Pleistocene advances cover most of the lowlands of southeast Alaska, but are thin or absent in the uplands. Poorly-drained soils, compact glacial tills, and morainal terraces characterize these deposits. Deposits of silt, sand, and gravel are common along most streams (Selkregg 1974-1976c). Beach gravel deposits occur along many shorelines. A narrow coastal plain characterized by glacial outwash, beach ridges, and sand dunes lies along the coast in the Yakutat area (Wahrhaftig 1965; Nowacki, Spencer et al. 2002).

BLM manages approximately 12 miles of the 24-mile long Tsirku River uplands, valued for its scenery and geologic features (Figure 2.3-8). The highly braided river valley is surrounded by very steep, mountainous terrain covered in snow and glaciers. The geological values stem from the historical and current values of minerals in the area. Gold was discovered in 1898 in the Porcupine District south of the Klehini River and 30 miles northwest of Haines. Near the delta of the Tsirku and Chilkat Rivers, 750 ft of river sands and gravel fill this deep glacially scoured valley. Gold bearing gravel has also been found in the middle reaches of the Tsirku River. With all of these glacially derived sands and gravels in the area, and given that placer gold has been found in surrounding gravels, it is reasonable to assume that areas along/within the Tsirku River region would prove to be gold-bearing, as well. In addition, an exploration program of the Tsirku Group resulted in the discovery of copper, lead, zinc, and barite (Haines Borough 2004).

3.2.4.1 Geologic Hazards

Earthquakes

The Ring of Fire planning area spans one of the most seismically active areas of the world. Major fault systems along the southern edge of the Ring of Fire planning area form the boundary between the North American Plate to the north and east, and the Pacific Plate to the south. Active fault systems in the Ring of Fire planning area include the Aleutian Megathrust along the subduction zone between the two plates, the Bruin Bay fault in northeast Alaska Peninsula and west side of Cook Inlet, the Castle Mountain fault extending across Cook Inlet and Susitna basins, and the Fairweather fault in southeast Alaska. The depth of earthquakes along the Aleutian Megathrust ranges from about 20 to 100 miles (Plafker, Gilpin et al. 1993). Active folding and faulting of Cenozoic strata in Cook Inlet basin is thought to be the source of shallower earthquakes above the megathrust (Haeussler, Bruhn et al. 2000).

Much of the Southcentral region lies within the rupture zone of the 1964 Alaska earthquake (magnitude 9.2), which experienced subsidence and uplift ranging from -6 ft along the eastern Kenai Peninsula to +10 ft in southwestern PWS (Plafker and Berg 1994). Earthquakes greater than magnitude 7.0 occurred along the Fairweather fault in 1949, 1958, and 1972. Two short faults east of Yakutat are the suspected source of the Yakutat Bay earthquakes of 1899. The Chatham fault of southeast Alaska is continuous with the active Denali fault of interior Alaska, which was the epicenter of the magnitude 7.9 earthquake of 2002. However, it is unknown whether the Chatham segment of this fault system is active (Plafker, Gilpin et al. 1993).

Besides ground shaking, other earthquake-related hazards that can occur in the Ring of Fire planning area include liquefaction, tsunamis, landslides, land subsidence/uplift, avalanches, rockfalls, ground cracking, and lateral spreading near bluffs. Liquefaction can occur in areas of unconsolidated sand and silt deposits with a shallow water table, such as lowlands with saturated alluvium. The risk of tsunamis is expected to be high along coastlines exposed to the open ocean, and low to moderate in shallow protected waters. For example, based on modeling studies conducted by the U.S. Army Corps of Engineers (USACE), the 500-year combined tsunami and high tide event is anticipated to be as high as 55 to 60 ft along the southeast coasts of Kodiak Island and Kenai Peninsula, and in the range of 12 to 25 ft in upper Cook Inlet (Crawford 1987).

Volcanic Activity

The “Ring of Fire” name comes from the interconnected sequence of arcuate-shaped, highly active volcanic regions located along plate boundaries around the northern, western, and southeastern margins of the Pacific Ocean basin. There are about 30 active volcanoes in the Ring of Fire planning area, extending from the Aleutian Chain, through the Alaska Peninsula, and along the west side of Cook Inlet (AVO 2004a). Volcanoes pose hazards to people and property through eruption clouds, ash fall, gas emissions, lava/pyroclastic flows, lahar (mudflows), and volcanic landslides (Myers, Brauntley et al. 2004). Ash clouds from the eruptions of Redoubt and Mount Spurr in 1989 and 1992, respectively, caused interruptions of flight operations and near-crashes (Neal, Casadevall et al. 1997). The abrasive particles in ash falls can damage electronics and machinery, interrupt power generation and telecommunications, and present long-term health and economic hazards (Kenedi, Brauntley et al. 2000).

Volcanic landslides or debris avalanches are giant landslides formed by the collapse of upper parts of volcanoes. Such flows can travel at speeds of 20 to 90 miles per hour, burying surrounding landscapes up to 10 to 15 miles away. Volcanic debris avalanches may occur both during eruptions or during non-eruptive periods, if triggered by large earthquakes (Beget, Nye et al. 2000). The AVO has published volcano hazard assessments of active volcanoes in the Ring of Fire planning area that evaluate risks of volcanic landslides to life and property (AVO 2004b).

Debris flows, rockslides, or landslides generally occur in areas of steep slopes and erodable soils. Such flows can be initiated by extensive precipitation or seismic activity. The stability of slopes depends on a number of factors such as slope steepness; strength of substrate; degree of water saturation; dip of bedding, jointing, and foliation relative to slope; vegetation cover; climate; undercutting (often man-made), and seismicity (Marshak 2004). Based on studies of forested slopes in southeast Alaska, potential unstable slope gradients were found to be in the range of 28 to 36˚, and slopes greater than 36˚ were considered highly unstable. Fine-grained, poorly-drained soils (for example, volcanic ash and glaciomarine clays) tend to have lower frictional resistance to sliding (Swanston 1998). Steep mountainous topography that could be subject to debris flows occurs throughout the Ring of Fire planning area. The 1964 Alaska earthquake caused major landslide damage to the southcentral cities of Anchorage, Whittier, and Seward (U.S. Geological Survey [USGS] 2002b). A landslide occurred near Skagway in 2002 when a 700-ft high moraine fell into a glacial lake, triggering a flood that forced the evacuation of at least 25 people (The Associated Press 2002).

Avalanches

Different types of avalanches include snow slides, slab avalanches, cornice collapses, and ice avalanches. Backcountry travelers are especially subject to slab avalanches, which involve snow that fails catastrophically across a large area. The angle of repose for slab avalanches ranges from 25° to 55°, with two-thirds of slab avalanches occurring between angles of 30° and 45° (McClung and Schaerer 1993). Two avalanche centers exist in the Ring of Fire planning area, in southeast Alaska and in the CNF, each providing current advisories and weather information. From 1985 to 1998, there were 54 deaths from avalanches in Alaska, most of which occurred within the Ring of Fire planning area (UAF 2005). In one of the largest incidents, a major slab avalanche broke loose in the Turnagain Pass area of Kenai Peninsula in 1999, killing six snowmachiners (Fesler and Fredston 1999).

3.2.5 Soils

In addition to the FLPMA and the Clean Water Act (CWA), the federal legislative acts that BLM must consider in addressing the management and protection of soils and prime farmland include the Farmland Protection Policy Act (1984), Executive Order (EO) 11752 (1973), EO 11988 (1973), and Soil and Water Resources Conservation Act (1977).

Information regarding general surface soil conditions throughout the Ring of Fire planning area was obtained through the Natural Resource Conservation Service (NRCS) (formerly the Soil Conservation Service) State Soil Geographic (STATSGO) Database. The soil types and associations listed in the STATSGO Database were initially developed as part of the Exploratory Soil Survey of Alaska (Reiger, Schoephorster et al. 1979), which was completed in 1973. Each map unit in the survey is an association of soils arranged in a consistent pattern. Individual soil boundaries, however, were not mapped (Reiger, Schoephorster et al. 1979). Polygons representing the approximate area of the soil types and associations provided in the STATSGO database are presented on Figures 3.2-4 through 3.2-7 in Appendix A. The legend for the soil types displayed on these figures is located on Table 3.2-2, which precedes the figures in Appendix A.

Detailed soil surveys and investigations have been conducted at various locations throughout the Ring of Fire planning area. The surveys and investigations provide more site-specific information on the properties and composition of soil profiles within the area studied. Soil surveys provide detailed descriptions of the soils, while soil investigations are not complete soil surveys in that they do not provide all the data or interpretations provided by a soil survey.

Soil limitations for selected land uses were evaluated as part of the Exploratory Soil Survey of Alaska (Reiger, Schoephorster et al. 1979). The evaluations were based largely on soil properties and related factors and were designed to assist land resource managers with land use planning decisions. The soil limitations are designated as slight, moderate, severe, and very severe, and are used to indicate limitations regarding road location and building construction. These same designations are used to indicate limitations for recreation and off-road traffic. In general, the limitations are interpretations that, combined with information in the descriptions of the soils and map units, can be applied in broad land use planning in estimating the effects of a specific use or alternative uses on soils and the overall environment. Soils with the highest potential for a specific use can be identified, as well as soils with unfavorable properties can often be avoided. The evaluations are also useful in planning and implementing conservation measures that may be required to prevent environmental damage (Reiger, Schoephorster et al. 1979).

Desired ecological conditions and goals for soil resources are contained in the BLM Statewide Land Health Standards (BLM 2004u). Management objectives of soil resources include maintaining productivity, minimizing erosion, and stabilizing the resources. Management activities in areas of high erosion potential should be designed to minimize surface disturbance to the extent possible. In addition, areas of soil disturbance should be reclaimed. Management of soil resources on BLM-managed lands within the planning area should also include coordination with related programs State, local, and other federal agencies.

Section 404 of the CWA directs protection of soils when the upper soil layers are saturated with water during the growing season, causing soil organisms to consume the oxygen in the soil and resulting in conditions that are unsuitable for most plants. Such conditions also cause the

development of soil characteristics (such as color and texture) of hydric soils. For more information on hydric soils in relation to the identification of wetlands, refer to Section 3.2.11.

Alaska Peninsula/Aleutian Chain Region

The northeastern part of the Alaska Peninsula is a coastal plain that borders Bristol Bay and the Bering Sea. The coastal plain contains many rivers and large and small lakes. Typical soils that have developed on the coastal plain are deep, very poorly-drained organic soils. These soils typically have a thin mat of mosses and sedges on the surface. Layers of dark brown sedge peat, moss peat and thin layers of sandy volcanic ash occur below the mat to a depth of several feet. The water table is at or near the surface. There are areas on the coastal plain that have well-drained soils. These are found on low rolling dunes and stream terraces throughout the coastal plain. The well-drained soils are formed in layers of volcanic ash and cinders (Reiger, Schoephorster et al. 1979).

Soils that have developed along the foot slopes and foothills of the Aleutian Range are typically well-drained and are formed in stratified sandy, silty, and cindery volcanic ash. Typical soils found further upslope on the hilly to mountainous portions of the Aleutian Range, including the Aleutian Islands and the Shumagin Islands, are formed in a blanket of volcanic ash and cinders over basaltic bedrock. The ash deposits in most places can be many feet thick, depending on the slope of the land. In general, the coarser volcanic material is closer to active volcanoes and the finer ash material is more distant. Nearly all of the ashy soils are black or brown and are high in organic matter.

Soil Limitations

The poorly-drained soils (Map Unit AK023 on Figure 3.2-5, Appendix A) that occur on the coastal plain in the northeastern part of the Alaska Peninsula are generally not suitable for construction of roads or buildings due to the high organic content and high soil moisture conditions. Soils that occur on the foot slopes and mountain slopes of the Aleutian Range and Islands (Map Units AK046 and AK220 on Figure 3.2-4, Appendix A) are considered to have severe to very severe limitations for construction of roads and buildings due to steep slopes. Limitations inherent to the soils in this region typically result from layers of volcanic ash deposited throughout the region. The small particle size and non-cohesive nature of the volcanic ash deposits increases the instability when disturbed, especially on steeper slopes.

Kodiak Region

General soil descriptions of the Kodiak region were obtained from the NRCS STATSGO database. Soils that occupy the steep hills and foot slopes on islands in the Kodiak region are generally deep or moderately deep volcanic ash over glacial till or volcanic cinders, deposited from nearby Aleutian Range volcanoes. These soils are typically well-drained ash-rich soils. Soils that have developed in low-lying areas and depressions are typically fibrous peat soils that are generally poorly-drained. Soils that occupy the steep mountainous slopes on islands in the region are typically well-drained loamy soils that develop in strongly acid, fine volcanic ash, and are mostly underlain by gravelly glacial till (Reiger, Schoephorster et al. 1979).

Soil Limitations

The ashy, well-drained soils that occur on steep hills and foot slopes (Map Unit AK056 on Figure 3.2-5, Appendix A) are considered to have moderate limitations for road or building construction. The moderate limitation rating for these soils reflects the low load supporting capacity of the

fine-grained volcanic ash. Further upslope, the well-drained loamy soils (Map Unit AK060, Figure 3.2-5, Appendix A) are considered to have very severe limitations for road and building construction due to the fine volcanic ash, steep slopes, and shallow depth to bedrock.

Southcentral Region

General soil descriptions of the Southcentral region were obtained from the NRCS STATSGO database. The Southcentral region encompasses a wide variety of landscapes and land types, ranging from mountainous slopes of the Alaska, Talkeetna and Chugach Mountain Ranges to the coastal flats of the Matanuska-Susitna valley. Therefore, soil development throughout this region varies based on elevation, precipitation and the over all climate regime.

Typical soils along the foothills and foot slopes of the Alaska Range in the western portion of the Southcentral region are formed in volcanic ash and cinders deposited on moraine and glacial till (Map Unit AK052, Figure 3.2-6, Appendix A). These are well-drained soils that occur on landscapes such as dissected mountain foot slopes and valley sides. Typical soils that occupy the benches and foot slopes of the Alaska Range in the northern portion of this region are well-drained and without permafrost (Map Unit AK255, Figure 3.2-6, Appendix A). These soils are formed in a thin mantle of silty volcanic ash over very gravelly and stony parent material (Reiger, Schoephorster et al. 1979).

The Cook Inlet-Susitna Lowland portion of this region lies between the Chugach and Talkeetna mountains to the east and the Aleutian and Alaska ranges to the west. A majority of the northern half of the Lowland is drained by the Susitna River and its tributaries. The Matanuska Valley is an eastern extension of the Lowland from the head of Cook Inlet. Sediments of the Tertiary Age underlie the entire Cook Inlet-Susitna Lowland. The surface consists principally of glacial deposits, including low moraines interspersed with many lakes, bogs, and broad outwash plains. Most of the uplands in this area are covered with well-drained soils that are formed in a mantle of silty loess, or loess and volcanic ash, over very gravelly glacial drift (Map Unit AK233, Figure 3.2-6, Appendix A). Soils that occur in depressions and low-lying areas between the moraine hills and terraces are typically deep, very poorly-drained peat in muskegs, or peat bogs (Reiger, Schoephorster et al. 1979).

Soils that occupy broad terraces and moraines in parts of the Matanuska Valley are well-drained, loamy soils formed over loose coarse sand, gravel and cobblestones (Map Unit AK017, Figure 3.2-6, Appendix A). Many of these soils have been cleared for cultivation or other uses, and they make up the most highly developed farming area in Alaska.

The Kenai Peninsula makes up the southern portion of the Southcentral region. The western portion of the Kenai Peninsula consists of hilly moraines interspersed with many lakes and poorly-drained muskegs. Small stream terraces and a few outwash plains are also included. Most of the uplands in this area are covered with well-drained soils that are formed in a mantle of silty loess, or loess and volcanic ash, over very gravelly glacial drift (Map Unit AK233, Figure 3.2-6, Appendix A). Soils that occur in depressions and low-lying areas between the moraine hills and terraces are typically deep, very poorly-drained peat in muskegs. Soils that occur along the central portion of the Kenai Peninsula are those typically associated with rough mountainous land, which is made up of steep rocky slopes, icefields, and glaciers. These are thin soils over bedrock or bouldery deposits (Reiger, Schoephorster et al. 1979).

The eastern portion of the Kenai Peninsula borders the coast of the Gulf of Alaska and PWS. Typical soils that occupy mountain foot slopes, moraine hills, and deep glaciated valleys are formed in very gravelly and stony silt loam or loam glacial till (Map Unit AK253, Figure 3.2-6, Appendix A). Areas with very poorly-drained soils occur on gentle to steep slopes affected by seepage. The soils are mainly partially decomposed dark brown sedge peat over firm glacial till (Reiger, Schoephorster et al. 1979).

Soil Limitations

The areas with poorly-drained soils that occur throughout the Southcentral region are generally considered to have limitations for construction of roads or buildings due to the high organic content and high soil moisture conditions. The soils that occur on the foot slopes and mountain slopes throughout the region are considered to have severe limitations for construction of roads and buildings due to steep slopes. In general, well-drained soils on low rolling hills and gently sloped land (Map Unit AK017, Figure 3.2-6, Appendix A) are suitable for construction of roads and buildings, and for cultivation and harvest of various crops.

Southeast Region

General soil descriptions of the Southeast region of the Ring of Fire planning area were obtained from the NRCS STATSGO database. Typical soils that occur on steep hill slopes and mountain slopes on islands throughout the Southeast region are well-drained gravelly silty loam formed on moraine deposits (Map Unit AK267, Figure 3.2-7, Appendix A). These soils support a forest of Sitka Spruce, Western Hemlock, and Cedar. These soils are typically shallow to moderately shallow, and in many areas are formed over thin deposits of glacial till that covers consolidated bedrock. Outcrops of bedrock are common throughout the region. In some areas, a thick fragipan underlies the soil. Another dominant soil that occurs throughout the region is associated with rough mountainous land that occurs on upper mountain slopes (Map Units AK 217 and AK218, Figure 3.2-7, Appendix A). These are generally thin soils over bedrock or gravelly deposits.

On lower hill slopes, typical soils that occur are subject to seepage and are somewhat poorly draining, underlain by a very firm gravelly fragipan. These soils support cedar and western Hemlock forests. Typical soils that occur on nearly level to rolling areas are very poorly-drained sphagnum moss peat with layers of fibrous sedge peat. The thickness of the peat ranges from 5 to as much as 50 ft. The substratum of these areas is usually glacial till.

Soil Limitations

The areas with poorly-drained soils that occur throughout the Southeast region are generally considered to have limitations for construction of roads or buildings due to the high organic content and high soil moisture conditions. The soils that occur on the steeper slopes throughout the region that are underlain by a fragipan layer increases the likelihood of soil slippage, and are susceptible to landslides. In general, the main limitations for construction of roads and buildings are steep slopes and wetness.

3.2.6 Water Resources

3.2.6.1 Methodology

Major watersheds in each region of the planning area were identified using USGS hydrologic unit codes (HUCs). HUCs are eight digit numbers representing four levels of classification including Regions, Sub-Regions, Basin, and Sub-Basin, which are used to delineate river basins having drainage areas usually greater than 700 square miles (448,000 acres). Each hydrologic unit, or watershed, identified by a HUC is assigned a name corresponding to a major hydrologic feature(s), cultural or political feature within the unit (USGS 2004c; USEPA 2005b). A watershed district is a land use district designated for the purpose of guaranteeing water sources and supplies by preserving and protecting water resources.

The following sections provide a description of the major watersheds and freshwater environments based on the available data; however, groundwater, stream flow, and water quality data are limited. An overview of the regulatory background for water resources can be found in Appendix C.

3.2.6.2 Major Watersheds and Major Surface Water Resources

Alaska Peninsula/Aleutian Chain Region

Alaska Peninsula

The Alaska Peninsula is located between the Bering Sea and the Pacific Ocean in the southwestern portion of Alaska, and is composed of mountainous terrain and many rivers. The peninsula is divided into five district watersheds (Figure 3.2-9), which are predominately fed by melting glaciers and snow and ice fields in the Aleutian Range. Rivers in the region tend to flow down the western slopes of these mountains into Bristol Bay or the eastern slopes into the Pacific Ocean. The rivers flowing on the eastern side are generally short and steep with few tributaries, whereas those on the western side are longer, meandering, with frequent natural impoundments, and terminate with glacial outwash fans (USFWS 1985b). Generally, the larger streams have heavier sediment loads and wide, braided channels (Selkregg 1974-1976b).

The region is also characterized by lake dotted lowlands along the Bristol Bay coast. The largest lakes lie in the northern portion of the peninsula. Becharof Lake for example, is located in this area and is Alaska's second largest lake. The lake ranges 37 miles long, 15 miles wide, and encompasses approximately 468.75 square miles (300,000 acres) (Selkregg 1974-1976b; USFWS 1985b). A description of the region's major watersheds and their major surface water resources is shown in Table 3.2-3, although not all of these fall within or are adjacent to BLM lands.

Barbara and Reindeer Creeks are found on BLM-managed lands within this region, and are part of the Shelikof Strait Watershed (HUC 19020702).

Table 3.2-3. Major Watersheds and Surface Water Resources in the Alaska Peninsula Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Egegik Bay Watershed (HUC 19030203)	• Located in the northern portion of the peninsula • Includes the Bristol Bay coastal lowlands • Characterized by large lakes, many small pothole lakes, ponds, and marshlands	• Becharof Lake	• Egegik River • King Salmon River • Kejulik River • Featherly Creek • Becharof Creek • Big Kashvik Creek • Angle Creek • Contact Creek • Gertrude Creek • Granite Creek
Ugashik Bay Watershed (HUC 19030202)	• Includes rivers that drain the western slopes of the Aleutian Range and lowland areas along the Bristol Bay Coast • Characterized by large lakes, many pothole lakes, ponds, and marshlands	• Upper Ugashik Lake • Lower Ugashik Lake • Mother Goose Lake	• Ugashik River • Dog Salmon River • King Salmon River • Ugashik Creek • Crooked Creek • Deer Creek • Black Creek • Old Creek • Pumic Creek • Cinder River • Mud Creek
Shelikof Strait Watershed (HUC 19020702)	• Includes rivers that drain the eastern/southern slopes of the Aleutian Range • Characterized by steep drainages, and short glacially fed rivers and streams	• Dakavak Lake • Surprise Lake • Black Lake • Chignik Lake	• Swikshak River • Shelikof River • Big River • Ninagiak River • Katmai River • Aniakchak River • Chignik River • Kametolook River • Cinder River • Kametolook River • Soluka Creek • Kialagvick Creek • Yantarni Creek • Main Creek
Port Heiden Watershed (HUC 19030201)	• Includes rivers that drain the northern slopes of the Aleutian Range, and lowland areas along the Bristol Bay Coast	• Sandy Lake • Bear Lake	• Meshik River • Muddy River • Sandy River • Bear River • Fracture Creek • Blueberry Creek
Cold Bay Watershed (HUC 19030101)	• Includes rivers that drain into Bristol Bay and the Pacific Ocean • Characterized by high mountain areas, and lowland areas with many pothole lakes	• Sapsuk Lake	• Big River • Cathedral River • Canoe Bay River • Caribou River • Joshua Green River • Beaver River • Davis River • Lefthead River

Aleutian Chain

The Aleutian Islands are partially submerged continuations of the Aleutian Range located west of the Alaska Peninsula between the Bering Sea and Pacific Ocean. The islands span roughly 1,000 miles and range from 20 to 60 miles in width, and many host active volcanoes. The islands are divided into two major watersheds: the Fox Islands Watershed (HUC 19030102) and the Western Aleutian Islands Watershed (HUC 19030103) (Figure 3.2-8). The Fox Islands Watershed consists of Unimak, Unalaska, Umnak, and Akutan Islands. The Western Aleutian Islands Watershed consists of the Andreanof Islands, including Amlia, Atka, Adak, Kanaga, and Tanaga; the Rat Islands, including Amchitka and Kiska; and the Near Islands, including Agattu, Attu, and the Semichi Islands.

Generally the streams on the islands are short, swift, and steep. Several lakes and streams are found on Unimak and Amchitka Islands, and small ponds are found on the islands of Kanaga and Agattu (USFWS 1988). Some of the islands contain glaciers, ice fields, small high mountain lakes; however, others have little to no fresh water, including the rocky islands of Chagulak and Amak (USFWS 1988). The two watersheds and their major surface water resources are described in Table 3.2-4, although they may not fall entirely within or adjacent to BLM lands.

Table 3.2-4. Major Watersheds and Surface Water Resources in the Aleutian Chain

Major Watersheds	Description	Major Surface Water Resources
Fox Islands Watershed (HUC 19030102)	• Consists of Unimak, Unalaska, Umnak, and Akutan Islands • Characterized by short, swift, and steep streams, and many lakes.	• Lazaref River • Sandy River • Big River • Pogromni River
Western Aleutian Islands Watershed (HUC 19030103)	• Consists of the Andreanof Islands, the Rat Islands, the Near Islands, and the Semichi Islands • Characterized by short, swift, and steep streams, and small ponds.	• Limpet Creek • Falls Creek • Clevengu Creek • Bridge Creek • White Alin Creek • Spring Creek

Kodiak Region

The entire Kodiak Archipelago is grouped into the Kodiak-Afognak Islands Watershed (HUC 19020701) (Figure 3.2-9). The Kodiak Mountain Range extends through most of Kodiak Island, and boasts many glaciers and ice fields that drain into the Pacific Ocean to the south and Shelikof Strait to the north. Overall, the streams on the islands are swift, clear and less than 10 miles long (Selkregg 1974-1976b). The streams that drain in the northwest toward Shelikof Strait tend to be larger with considerable flow; whereas, those that drain to southeast toward the Pacific Ocean are often short and steep (USFWS 1987a). Numerous ponds and elongated lakes are scattered throughout Kodiak and Afognak Islands. High mountain cirque and pothole lakes are also common. The smaller islands of Shuyak and Tugidak contain several important salmon streams. Pothole lakes are also common on Shuyak Island. Elbow Creek, located on BLM-managed lands within this region, is located within the Kodiak-Afognak Islands Watershed (HUC 19020701). The watershed and major surface water resources are outlined in Table 3.2-5, although not all of these fall within or are adjacent to BLM lands.

Table 3.2-5. Major Watersheds and Surface Water Resources in the Kodiak Region

Major Watershed	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Kodiak-Afognak Islands Watershed (HUC 19020701)	• Consists of Kodiak Island, Afognak Island, Barren Islands, Trinity, and Semidi Islands • Composed of several wide river valleys, steep river valleys, and mountainous terrain with many lakes and streams	Kodiak Island: • Karluk Lake • Frazer Lake • Red Lake • Akalura Lake • South Olga Lakes • Spiridon Lake • Little River Lake • Uganik Lake • Terror Lake • Buskin Lake • Lake Rose Tead Lakes • Afognak Lake • Selief Lake • Big Kitoi Lake • Little Kitoi Lake • Pauls Lake • Laura Lake • Gretchen Lake • Portage Lake • Little Waterfall Lake • Hidden Lake • Upper Melina Lake • Lower Melina Lake	• Karluk • Ayakulik • Red River • Sturgeon River • Dog Salmon River • Buskin River • Monashka Creek • Afognak River • Pauls River • Malina River • Portage River

Southcentral Region

The Southcentral region stretches from the western boundary of the BLM Glennallen Field Office and follows the Ring of Fire planning area boundary in the north and west. The region terminates at the LPB/KIB boundary in the southwest. This region encompasses lands from the MSB, MOA, KPB, and the CNF.

The Southcentral region is divided into eleven district watersheds (Figure 3.2-10), all of which drain major mountain ranges. The major mountain ranges include the Kenai Mountains on the Kenai Peninsula, the Chugach Mountains in the east-southeast, Talkeetna Mountains in the east-northeast, Alaska Range in the north-northwest, and the Chigmit, Neacola, and Tordillo Mountains in the west. Many volcanoes are also in this region, including Iliamna, Redoubt, and Mount Douglas. Extensive glaciers and icefields, glacially fed streams, and numerous valley and high mountain lakes, characterize the mountains. The south-southeastern portion of the region, along PWS and the Kenai Peninsula, is composed of many fjords and inlets, and short, flashy streams. The coast along the western portion of the region is characterized by wetlands, floodplains, and estuarine salt marshes formed from glacial outwash and tidal fluctuations.

The region is also composed of vast lowland areas with numerous pothole lakes, wetlands, and large meandering rivers. The Cook Inlet-Susitna Lowland for example, is a broad basin over 200 miles long and averages 60 miles in width. The lowland is characterized by ground moraine, drumlin fields, outwash plains, kettles, numerous lakes and several large riverine systems including the Susitna River and Matanuska River (Selkregg 1974-1976a). The coastal area of the Cook Inlet-Susitna Lowland is dotted with salt marshes and pothole lakes. Another significant lowland area in the Southcentral region is located in the northwest portion of the Kenai Peninsula. The Kenai Lowlands are characterized by wetlands, floodplains, and estuarine salt marshes formed from glacial outwash and tidal fluctuations. The major watersheds and major surface water resources of the Southcentral region are outlined in Table 3.2-6, although not all of these fall within or are adjacent to BLM lands.

The Knik River; Hunter, Friday, and Jim Creeks; and Finger, Jim, and Swan Lakes are located within the Matanuska Watershed (HUC 19020402) within the proposed Knik River Special Recreation Mangement Area (SRMA). Portions of the Skwenta River; Emerald and Crystal Creeks; and Max Lake are located within the Yentna River Watershed (HUC 19020504), within the proposed Neacola Mountains Area of Critical Environmental Concern (ACEC). Farther south in within the proposed ACEC, the McArthur, Chilligan, and Nagishlamina Rivers are located within the Redoubt-Trading Bays Watershed (HUC 19020601).

Table 3.2-6. Major Watersheds and Surface Water Resources in the Southcentral Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Anchorage Watershed (HUC 19020401)	• Streams drain the glaciers and snowfields in the Chugach Mountains toward Cook Inlet • The cities of Anchorage, Eagle River, and Girdwood are included in this watershed • The watershed is largely urban	• Harlequin Lake • Redfield Lake • Situk Lake • Akwe Lake • Ustay Lake • Tanis Lake	• Ship Creek • Campbell Creek • Chester Creek • North Fork Creek • South Fork Creek • Glacier Creek • Peters Creek • Rabbit Creek • Bird Creek • Eagle River • Penguin Creek • Twentymile River
Eastern PWS Watershed (HUC 19020201)	• Characterized by extensive glacial coverage, as well as many fjords and lakes • Short, steep streams drain glaciers directly into the inlets and fjords	• Coghill Lake • Boreas Lake • Kadin Lake • Terentiev Lake	• Coghill River
Lower Kenai Peninsula Watershed (HUC 19020301)	• Characterized by one large lake and many rivers that drain the west slopes of the Kenai Mountains • The Harding Icefield is included in this watershed • The City of Homer is located in this watershed	• Tustumena Lake • Caribou Lake • Bradley Lake • Seldovia Lake	• Ninilchik River • Anchor River • Fox River • Deep Creek • Seldovia River • Bridge Creek • Twitter Creek • Stariski Creek • Wosnesenski River • Sheep Creek

Table 3.2-6 (continued). Major Watersheds and Surface Water Resources in the Southcentral Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Upper Kenai Peninsula Watershed (HUC 19020302)	• Characterized by several large rivers, and many lakes and wetland areas in the northwestern portion of the peninsula • The City of Kenai is included in this watershed	• Kenai Lake • Skilak Lake	• Kenai River • Snow River • Trail River • Russian River • Skilak River • Canyon Creek • Summit Creek • Resurrection Creek • Chickaloon River • Big Indian Creek • Little Indian Creek • Turnagain Creek • Mystery Creek • Moose River • Funny River • Killey River • Placer River • Slikok Creek • Beaver Creek
Western PWS Watershed (HUC 19020202)	• Characterized by steep, swift streams that drain the eastern slopes of the Kenai Mountains into the Gulf of Alaska and PWS • The Sargent Icefield is included in this watershed • The City of Seward is located in this watershed	• Nellie Juan Lake	• Nellie Juan River • Kings River • Snow River • Resurrection River • Nuka River • Rocky River • Lowell Creek • Jap Creek • Spruce Creek • Tonsina Creek • Salmon Creek • Fourth of July Creek
Matanuska Watershed (HUC 19020402)	• Characterized by wide river valleys dotted with lakes and wetland areas • The cities of Wasilla and Palmer are included in this watershed	• Finger Lake • Swan Lake • Jim Lake • Eklutna Lake • George Lake	• Matanuska River • Knik River • Chickaloon River • Eklutna River • Hicks Creek • Boulder Creek • Kings River • Granite Creek • Moose Creek • Glacier Creek • Gravel Creek • Monument Creek • Coal Creek • Carpenter Creek • Wolverine Creek

Table 3.2-6 (continued). Major Watersheds and Surface Water Resources in the Southcentral Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Lower Susitna River Watershed (HUC 19020505)	• Characterized by a wide river valley with extensive wetlands, lakes, and small tributary streams • The coastal area of the valley is dotted with pothole lakes and salt marshes	• Big Lake • Horseshoe Lake • Stephan Lake • Butterfly Lake • East Butterfly Lake • Nancy Lake • Red Shirt Lake • Rainbow Lake • Shirley Lake • Trapper Lake • Long Lake • Florence Lake • Flat Horn Lake • Figure Eight Lake	• Susitna River • Chulitna River • Talkeetna River • Tyone River • Kashwitna River • Deshka River • Little Susitna River • Willow Creek • Little Willow Creek • Iron Creek • Deception Creek
Talkeetna Watershed (HUC 19020503)	• Composed of several large rivers that drain the Talkeetna Mountains, as well as wetlands, many pothole lakes, and numerous small tributaries	• Rainbow Lake • Larsen Lake • Diana Lakes	• Talkeetna River • Sheep River • Sheep Creek • Iron Creek • Disappointment Creek
Yentna River Watershed (HUC 19020504)	• Characterized by large rivers that drain the Alaska Range • Also composed of extensive wetlands, small lakes, and tributary streams	• Chelatna Lake • Alexander Lake • Shell Lake • Hewitt Lake	• Yentna River • Kichatna River • Johnson Creek • Red Creek • Skwentna River • Hayes River • Trimble River • Kahiltna River
Redoubt-Trading Bays Watershed (HUC 19020601)	• Composed of large lakes and rivers that drain the glaciers and icefields in the Alaska Range, Chigmit, Neacola, and Tordillo Mountains • The coastal area is characterized by wetlands, floodplains, and estuarine salt marshes formed from glacial outwash and tidal fluctuations	• Chakachamna Lake • Kenibuna Lake • Beluga Lake • Lower Beluga Lake • Summit Lake • Blockade Lake	• Drift River • Tlikakila River • Big River • McArthur River • Theodore River • Middle River • Chackachatna River • Chilligan River • Nagishlamina River • Beluga River • Neacola River • Igitna River • Another River

Table 3.2-6 (continued). Major Watersheds and Surface Water Resources in the Southcentral Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Tuxedni-Kamishak Bays Watershed (HUC 19020602)	• Characterized by volcanoes, large glaciers, wetlands, and many lakes, inlets, and glacially fed rivers that drain into Cook Inlet	• Hickerson Lake • Crescent Lake	• Douglas River • Chinitna River • Paint River • McNeil River • Kamishak River • Strike Creek • Little Kamishak River • Iniskin River • West Glacier Creek • Middle Glacier Creek • East Glacier Creek • Red River • Crescent River • Redoubt Creek • Johnson River • Iliamna River • Tuxedni River

Notes: PWS – Prince William Sound

Southeast Region

Southeast Alaska covers over 42,000 square miles and is bordered by the Dixon Entrance to the south, Canada to the east, the Gulf of Alaska to the west, and the BLM Glennallen Field Office Boundary (east Yakutat Bay) to the north (Selkregg 1974-1976c). The region also includes the Alexander Archipelago and many mountain ranges, including the Coast Range in the east-northeast and extending through the archipelago; the St. Elias Range in the north; the Fairweather Range in the northwest; the Chilkat-Baranof Range in the west; and the Prince of Wales Range in the southwest. The Coast and St. Elias Ranges contain extensive glaciers and ice fields that feed the drainage basins on the mainland (Selkregg 1974-1976c).

The Southeast region is divided into eleven district watersheds (Figure 3.2-11). In general, the watersheds on the mainland areas are characterized by mountainous terrain, glaciers, many glacially fed streams, numerous fjords and inlets, several large rivers, and many elongated lakes. Coastal lowlands are often dotted with pothole lakes. The characteristic heavy precipitation of the region can result in nearly continuous flow in small ephemeral streams. Descriptions of each watershed on the mainland areas and the major surface water resources are outlined in Table 3.2-7.

The Alexander Archipelago, located to west of the mainland, is composed of hundreds of islands including Prince of Wales, Chichagof, Baranof, Admiralty, Revillagigedo, Mitkof, Wrangell, and Kupreanof. The island rivers are generally low gradient and short in length. Lakes are also numerous in the archipelago, especially on the islands of Etolin and Revillagigedo; parts of some islands are nearly 50 percent lake surface (Alaska Department of Natural Resources (ADNR) 2000a). The Chilkat, Chilkoot, Ferebee, Nourse, Kesall, and Raiya Rivers; and Goat Hollow, Nataga, Rosaunt, and West Creeks, located in the proposed Haines Block SRMA, are within the Chilkat-Skagway Rivers Watershed (HUC 19010303). The major watersheds and water resources on the islands are described in Table 3.2-7, although not all of these fall within or are adjacent to BLM lands.

Table 3.2-7. Major Watersheds and Surface Water Resources in the Southeast Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Yakutat Bay Watershed (HUC 19010401)	• Includes mountainous terrain with large glaciers and fjords, several large lakes and rivers, and an extensive coastal plain along the Gulf of Alaska coast	• Harlequin Lake • Redfield Lake • Situk Lake • Akwe Lake • Ustay Lake • Tanis Lake	• Dangerous River • Alsek River
Chilkat-Skagway Rivers Watershed (HUC 19010303)	• Includes mountainous terrain with glaciers and inlets, several large rivers, and glacially fed streams • The cities of Haines and Skagway are located in this watershed	• Chilkat Lake • Chilkoot Lake • Lily Lake • Rutzebeck Lake	• Chilkat River • Klehini River • Tsirku River • Kelsall River • Takhin River • Kicking Horse River • Chilkoot River • Ferebee River • Katzehin River • Glacier River • Tahini River • Sawmill Creek • Johnson Creek • Mink Creek
Glacier Bay Watershed (HUC 19010302)	• Includes Glacier Bay National Park and Preserve • Characterized by massive glaciers, many short, steep glacially fed streams, and inlets • Pothole lakes can be found in the lowland areas	• Abyss Lake • Crillon Lake • Wood Lake • Seclusion Lake • Bartlett Lake	• Dundas River • Dixon River • Excursion River • Bartlett River • Beartrack River • Berg Creek
Lynn Canal Watershed (HUC 19010301)	• Characterized by massive glaciers, numerous glacially fed streams, several large rivers, and inlets • The City of Juneau is included in this watershed	• Mendenhall Lake • Annex Lake • Glory Lake • Auke Lake • Twin Glacier Lake	• Lace River • Antler River • Gilkey River • Berners River • Taku River • Wright River
Mainland Watershed (HUC 19010201)	• Characterized by massive glaciers, elongated lakes, glacially fed streams, several large rivers, and inlets	• Long Lake • Crater Lake • Turner Lake • Farragut Lake • Scenery Lake	• Speel River • Whitting River • Farragut River • Scenery Creek • Stikine River

Table 3.2-7 (continued). Major Watersheds and Surface Water Resources in the Southeast Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Southeast Mainland Watershed (HUC 19010101)	• Includes the Misty Fjords National Monument Wilderness • Characterized by glaciers, elongated lakes, glacially fed streams, several large rivers, and fjords • Pothole lakes can be found in the lowland areas along the Behm Canal	• Virginia Lake • Marten Lake • Tyee Lake • Reflection Lake • Eagle Lake • Boulder Lake • Anan Lake • Ledue Lake • Walker Lake • Wilson Lake • Punchbowl Lake • Big Goat Lake • Upper Checat Lake • Winstanley Lake • Humpback Lake	• Harding • North Fork Bradfield River • East Fork Bradfield River • Eagle River • Unuk River • Chickamin • South Fork River • Blossom River • Keta River • Marten River
Admiralty Island Watershed (HUC 19010204)	• Composed of large elongated lakes, and numerous fjords, inlets, and streams that drain the higher elevations	• Hasselborg Lake • Thayer Lake • Distin Lake • Davidson Lake • Lake Kathleen • Florence Lake	• Hasselborg River • Ward Creek • Fishery Creek
Baranof-Chichagof Island Watershed (HUC 19010203)	• Composed of glaciers, many fjords, inlets, elongated lakes, and glacially fed streams	• Surge Lake • Goulding Lake • Kook Lake • Sitkoh Lake • Eva Lake • Blue Lake • Baranof Lake • Redoubt Lake • Benzeman Lake • Plotnikof Lake • Rezanof Lake	• Neha River • Lisianski River • Baranof River • Medvetcha River • Maksoutof River
Kuiu-Kupreanof-Mitkof-Etolin Watershed (HUC 19010202)	• Composed of streams that drain higher elevations, several lakes, and numerous inlets • The cities of Wrangell and Petersburg are included in this watershed	• Towers Lake • Irish Lake • Kushneahin Lake • Petersburg Lake • Crystal Lake	• Big Creek • Falls Creek • Bear Creek • Ohmer Creek • Kadake Creek
Ketchikan Watershed (HUC 19010102)	• Characterized by many lakes, and streams that drain the higher elevations • The City of Ketchikan is located in this watershed	• Orchard Lake • Swan Lake • Grace Lake • Manzanita Lake • Ella Lake • Patching Lake • Connell Lake • Ketchikan Lake • Lake Carlanna	• Naha River • Orchard Creek • Carroll Creek • White River

Table 3.2-7 (continued). Major Watersheds and Surface Water Resources in the Southeast Region

Major Watersheds	Description	Major Surface Water Resources	
		Lakes	Rivers/Creeks
Prince of Wales Watershed (HUC 19010103)	• Characterized by many lakes, streams that drain the higher elevations, and numerous fjords and inlets	• Red Lake • Shipley Lake • Salmon Bay Lake • Neck Lake • Sweetwater Lake • Luck Lake • Thorne Lake • Lake Galea • Salmon Lake • Klawock Lake • Kegan Lake • Essowah Lakes	• Logjam Creek • Thorne River • Harris River

3.2.6.3 Groundwater

Alaska Peninsula/Aleutian Chain Region

Groundwater aquifers have been found around the major rivers and streams on the peninsula. In the Aleutian Islands, groundwater is limited to the flatter areas of lower elevation that are comprised of alluvial or glacial deposits. The island of Amchitka contains a large spring, averaging 26.74 cubic feet per minute (cfm) (200 gallons per minute [gpm]), which is used for water supplies (Selkregg 1974-1976b). Thermal springs and hydrothermal convection systems are associated with volcanoes, and are common along the peninsula and islands. Permafrost is generally absent along the Aleutian Islands and major drainages of the peninsula, but small occurrences can be found around low slopes and the gravel soils of north-facing slopes (USFWS 1985b).

Kodiak Region

Permafrost is generally absent in the Kodiak region and limited yields of groundwater can be found in the bedrock and alluvial deposits (ADNR 2003a). Groundwater found in bedrock or near coastal areas may experience salt water intrusion (Selkregg 1974-1976b). Areas of development in the region typically depend upon surface water as the predominant source of water; however, there are groundwater wells in operation within the city of Kodiak. Groundwater wells installed in villages on Kodiak Island also have been successful in providing an adequate source of drinking water (USFWS 1987a).

Southcentral Region

Isolated areas within the Southcentral region, typically in lowland areas, contain shallow but productive aquifers that occur in unconsolidated deposits, outwash gravel-fans, and terraces. The central portion of the Kenai Peninsula, for example, contains artesian aquifers that are recharged by precipitation (KPB 1989). Groundwater yields in this area range from 1.34 to 133.68 cfm (10 to 1,000 gpm) (Selkregg 1974-1976a). The Susitna River Valley also has a large potential for groundwater. Wells near major streams in the Susitna River Valley have high yields of approximately 133.68 cfm (1,000 gpm), whereas wells away from the major streams typically yield less. In the Anchorage lowlands, two principal groundwater aquifers lay within unconsolidated sediments (Selkregg 1974-1976a). Groundwater also exists in bedrock aquifers

in the region, and springs have occurred along the flanks of the Kenai, Chugach, and Alaska Ranges. Spring flows are generally less than 13.37 cfm (100 gpm) (Selkregg 1974-1976a). Permafrost is not prevalent in the area, but does occur in isolated areas (Weeks 2003).

Southeast Region

Groundwater is generally found in the moraine and outwash deposits that contain a mixture of sand, gravel, silt, and clay (Selkregg 1974-1976c). Wells have been identified in the Haines, Skagway, and Juneau areas. Groundwater wells have also been developed in bedrock, but at lower elevations, and the wells are generally of low yield and susceptible to saline intrusion (Selkregg 1974-1976c). Springs have been found along bedrock fractures and within glacial or outwash deposits in lowland areas of the region. Hot springs exist along the Stikine River and Behm Canal, central Baranof Island near Sitka, and near Hoonah on Chichagof Island (Selkregg 1974-1976c). Permafrost is absent in the Southeast region.

3.2.6.4 Hydrology

Alaska Peninsula/Aleutian Chain Region

Streamflow is largely dependent on glacial melt and snowmelt during the spring and early summer months, and precipitation during the summer and fall months. Average annual precipitation ranges from 3.33 to 8.33 feet (40 to 100 inches) along the Pacific side of the Aleutian Range, and 3.33 to 6.67 feet (40 to 80 inches) along the north-northwestern slopes of the Aleutian Range. Average annual precipitation along the Bristol Bay coastal plain is generally less than 1.67 feet (20 inches). In the Aleutian Islands, average annual precipitation is typically more than 8.3 feet (100 inches) (USFWS 1985b; USFWS 1988). Temperatures in the region generally range from -15°F to 75°F.

The topography ranges from rugged mountain terrain, U-shaped valleys, sea cliffs and fjords, glacial lakes, and moraines, to wet tundra and salt marshes (USFWS 1985b). The coastal plains in the west and northwest are relatively flat with clays and silts along the shores, and poorly drained organic soils along the inland tundra. The eastern Aleutian slopes are covered with volcanic ash, pumice, sand, glacial till, outwash, and occasional glacial moraines. Many areas are generally free of surficial soil cover, which provide preferential flow paths for precipitation and meltwater drainage (USFWS 1985b).

Runoff rates vary with season and geographic location. Flooding in the region is generally caused by snowmelt and spring break-up, which occurs around March and April. Flooding is more likely to affect the smaller drainages that are more susceptible to rapid fluctuations in streamflow. High mountain streams are susceptible to flooding due to less permeable bedrock and shallow soils. The mean annual runoff rate ranges from two cubic feet per second (cfs) per square mile in the Bristol Bay coastal plain located in the northern portion of the peninsula, 4 cfs per square mile in the Pacific side of the peninsula, and 3 to 4 cfs per square mile in the southern portion of the peninsula (USFWS 1985a; USFWS 1985b). The mean annual peak runoff rate ranges from 10 cfs per square mile within the Bristol Bay coastal plain to over 50 cfs per square mile in the steeper mountains along the Pacific coast (USFWS 1985a; USFWS 1985b).

Kodiak Region

The climate of the Kodiak region is characterized as maritime with high annual precipitation. Annual temperatures generally range from 0°F to 75°F in the lower elevations, with little seasonal and daily temperature variation and frequent cloud cover and wind. The average annual rainfall on Kodiak Island is 6.25 ft (75 inches); however, the eastern side of Kodiak Island generally receives twice that of the western side due to rain shadow effect of the mountains. Total annual snow accumulation averages 5.91 ft (71 inches) (ADNR 2003a).

The region is composed of rocky, mountainous terrain, steep drainages, wet tundra, and rolling mountains. Three main glaciations that covered Kodiak during the Pleistocene left behind discontinuous surficial deposits consisting of moraines, glacial till, and outwash. Volcanic ash from Aleutian Range eruptions forms a relatively continuous surficial layer throughout the Kodiak region (USFWS 1987a). The southwestern region of Kodiak Island remained ice-free during the last glaciation and is now composed of wet tundra with rolling mountains, and surrounded by moraines of the last two glaciations (USFWS 1987a). The islands to the north including Shuyak and the Barren Islands are rocky with little vegetation. Tugidak Island to the south is flat, with wet and moist tundra. Surficial deposits on Tugidak are composed of glacial moraine and drift deposits (Selkregg 1974-1976b; Alaska Department of Fish and Game (ADF&G) 1994a).

High runoff rates are characteristic of the region due to steep, exposed and impermeable bedrock in the mountains, thin soil cover, and a lack of aquifers (Selkregg 1974-1976b). Thick vegetation, wetlands, and pothole lakes common in the lower elevations of watersheds reduce the runoff and provide storage. Annual runoff ranges from 0.9 to over 400 cfs per square mile, with a mean of approximately 8 cfs per square mile (USFWS 1987a). High flows coincide with glacier and snowmelt in the summer, mid-winter thaw, or heavy fall rains. Of the major river systems, Dog Salmon Creek, Uganik, and Terror Rivers exhibit the highest degrees of storage from lakes and groundwater (USFWS 1987a).

Southcentral Region

The watersheds in this region are largely dependent upon the glacier and snowmelt that occurs in the high mountains. Precipitation generally ranges from 1.25 to 2.92 ft (15 to 35 inches) in lower elevations of the region to 3.33 to 6.67 ft (40 to 80 inches) in the upper elevations. Portions of the Kenai Peninsula, northern Aleutian Range, and eastern PWS often receive twice the precipitation received in the Cook Inlet-Susitna Basin. Temperatures in the Southcentral region are generally moderate, ranging from mean summer temperatures of 50°F to mean winter temperatures of 20°F (Selkregg 1974-1976a). The interior areas are less influenced by the coast and tend to have higher temperatures in the summer and lower temperatures in the winter.

The region's topography and geology allow for a wide variety of drainage systems, characterized by rugged mountain terrain, exposed bedrock, alpine tundra, poorly-drained lowlands, glaciers, permanent snow, and ice. Repeated Pleistocene glaciations carved troughs, U-shaped valleys and valley floors, and left behind broad outwash plains of unconsolidated material and moraines throughout the region (Selkregg 1974-1976a). Unconsolidated surficial deposits consist primarily of glaciofluvial sediments related to the glaciations, and the development of drainage systems from several large mountain ranges (Selkregg 1974-1976a; Reger and Pinney 1997). Fluvial deposits consisting of modified glacial outwash, alluvial fans,

floodplain, and terrace deposits are present throughout the river systems. Wind-blown silt and sand deposits occur in the Susitna delta area. Coastal beaches and spit deposits are common around Cook Inlet, particularly on the west side of Upper Cook Inlet (Selkregg 1974-1976a).

The amount of surface runoff depends on the specific location; generally runoff rates increase with increasing elevation. Snowmelt runoff peaks around late May through June. The major rivers in the region, including the Susitna, Matanuska, and Kenai rivers, generally have mean annual flows of around 5,000 cfs or greater. Rivers along the eastern side of the Aleutian and Alaska Range, such as the Tlikakila River, also reach flows of 5,000 cfs (Weeks 2003). The Kenai River, however, has recently experienced reduced water levels due to glacial retreat and changing climate (ADNR 1997a).

Southeast Region

The climate of the Southeast region is characterized as maritime, with high humidity and precipitation, frequent cloud cover, moderate temperatures, and little temperature variations. The average precipitation ranges from 3.33 to over 16.67 ft (40 to over 200 inches) a year, which is either stored as snowpack or transported through drainage systems into the inlets and fjords of the area. The annual average temperature of the region is around 40°F (Selkregg 1974-1976c). The coldest month is January, with a mean temperature of 21°F, and the warmest month is July, with a mean temperature of 58°F (National Park Service [NPS] 2003b). Small variances in temperature and precipitation occur throughout the region. For example, Haines consistently receives more precipitation and warmer temperatures than Klukwan, which is 20 miles away (Nanney Jr. 1993).

The highest runoff rates in Alaska occur in the Southeast region, where periods of high precipitation can continue for months (Meyer, Hess et al. 2001). The peak river runoff rates range from 50 to 200 cfs per square mile, with a mean peak runoff rate of 100 cfs per square mile (Selkregg 1974-1976c). Peak runoff rates typically occur in the spring when the seasonal snowpack melts. Peak runoff rates can also occur in the fall, a period when rainfall is typically higher than that received during summer months (Meyer, Hess et al. 2001).

3.2.6.5 Water Quality

Alaska Peninsula/Aleutian Chain Region

The water quality in this region is characterized by low concentrations of dissolved solids, ranging from 25 to 75 milligrams per liter (mg/L); however, concentrations can increase during spring breakup. Suspended sediment loads carrying glacial silts and volcanic ash can reach up to 2,000 mg/L in the high mountain and glacier-fed streams (USFWS 1985a; USFWS 1985b). The streams draining lower elevation catchment basins that do not contain glaciers or significant deposits of ash tend to carry less suspended sediment. Water temperatures in the region range from 32°F to 60°F (USFWS 1985a; USFWS 1985b).

In general, degradation of the region's water quality occurs as suspended sediments increase following spring break up or a storm event. In populated areas, human activities that can affect water quality of fresh waterbodies include sewage effluent, mineral development, canneries, roads and OHVs, and military installations (USFWS 1985a; USFWS 1985b). For example, a one-acre portion of the Egegik River is listed on the Section 303(d) list of impaired waters, due to leaking gasoline and diesel fuel storage tanks (USEPA 2003b).

Reindeer and Barbara Creeks, located on BLM-managed lands within this region, do not appear on the USEPA Section 303(d) list of impaired waterbodies (USEPA 2003b).

Kodiak Region

The major streams and lakes in the Kodiak region exhibit dissolved solids of less than 60 mg/L (USFWS 1987a). The dissolved oxygen concentrations in 22 lakes around the city of Kodiak range from 12 to 6 milligrams of dissolved oxygen per liter (DO/L), with a pH ranging from 5.8 to 6.5 (USFWS 1987a). Red Lake and Anton Road Ponds, near the city of Kodiak, are on the Section 303(d) list of impaired waters for metals as a result of urban runoff (USEPA 2003b). In general, degradation of the water quality occurs when dead salmon and vegetation decompose, as suspended sediments increase following spring break up or storm event, or as a result of human activities such as urban runoff or military installations. Elbow Creek, located on BLM-managed lands within this region, does not appear on the Section 303(d) list of impaired waterbodies (USEPA 2003b).

Southcentral Region

Rivers and streams within the urban areas of MOA and the MSB often have poor water quality due to urban runoff. The lakes and creeks that run through the City of Anchorage are on the Section 303(d) list of impaired waters for fecal coliform (USEPA 2003b). One-half acre of the Matanuska River is on the 303(d) list of impaired waters for landfill debris (USEPA 2003b). Eagle River and the Eagle River Flats are listed as impaired waters because of high concentrations of ammonia and metals from a wastewater treatment facility (USEPA 2003b). Several lakes and creeks in the Wasilla area are also on the Section 303(d) list of impaired waters (USEPA 2003b). Large amounts of solid waste were removed from the Knik River access area in 2000 by BLM, Alaska Department of Transportation and Public Facilities (ADOT&PF), ADNR, and ADF&G; as well as numerous community volunteers (BLM 2004f). The access area was also contaminated with high levels of lead-shot. In 2003, the contaminated soils were removed or capped from the Knik River Access Area (BLM 2004f). Neither the Knik River, or Hunter, Friday, or Jim Creeks, located within the proposed Knik River SRMA, appear on the USEPA Section 303(d) list of impaired waterbodies (USEPA 2003b).

Most of the larger, glacially fed streams have higher suspended sediment concentrations. The Knik River is recorded as having the highest sediment yield per square mile in the region, and the second highest in Alaska (Selkregg 1974-1976a). The sediment yield at the Palmer station is 6,600 tons per square mile, with a drainage area of 1,180 square miles making the discharge equivalent to 7.84 tons per year (Selkregg 1974-1976a). Dissolved solids are generally low, and lowland areas typically have higher iron content. Surface water temperatures generally range from 32°F to 53°F, although shallow lakes can reach up to 65°F (Selkregg 1974-1976a). Overall, degradation of the region's water quality occurs as suspended sediments increase following spring break up or storm event, or as a result of human activities such as urban runoff, sewage effluent, mineral development, petrochemical refining and storage, or military installations.

Within the proposed Neacola Mountains ACEC, the following rivers and creeks do not appear on the USEPA list of Section 303(d) impaired waterbodies: Chilligan River, North Fork Bachatna Creek, Emerald Creek, Kustatan River, McArthur River, Nagishlamina River, and Skwentna River.

Southeast Region

The Southeast region is an extension of the rain-belt forest of the Pacific Northwest. Water temperatures generally range from 37°F to 52°F and concentrations of dissolved solids range from 10 to 100 mg/L (Selkregg 1974-1976c). Poor water quality in the region is generally due to suspended sediments and debris carried from glacial meltwater. The rivers in the mainland generally have a suspended sediments concentration of less than 500 mg/L, and those in the islands have less than 50 mg/L (Selkregg 1974-1976c). Suspended sediments are higher in glacially fed streams, and higher during the summer months. Suspended sediments in non-glacial streams generally are due to erosion.

Overall, degradation of the region's water quality occurs as suspended sediments increase following spring break up or storm events, or as a result of human activities such as urban runoff, sewage effluent, or mineral development. For example, the water quality of rivers in the Haines/Skagway area, including the Tsirku and Chilkoot Rivers, tend to be poor due to high sediment loads (Nanney Jr. 1993). Several smaller creeks in the Juneau area are on the Section 303(d) list of impaired waters for fecal coliform and suspended sediments/debris (USEPA 2003b).

Lake Carlanna is part of the Carlanna Creek watershed, and an important source of water for the Ketchikan water system (Ketchikan Gateway Borough [KGB] 2000). It does not appear on the USEPA list of Section 303(d) impaired waterbodies (USEPA 2003b).

Lake Carlanna was withdrawn for use as a watershed, to provide potable water for the community of Ketchikan. Over time, the community has developed larger more reliable sources for its water supply and the Lake Carlanna area has become the backup source for the community.

Lake Carlanna, near Ketchikan, AK.

Within the proposed Haines Block SRMA, the Chilkat River appears as a Category C on the USEPA list of Section 303(d) impaired waterbodies (USEPA 2003b). The Category C designation refers to waterbodies with limited information, and attainment or impairment can not be determined. The following rivers and creeks do not appear on the list: Chilkoot River, Ferebee River, Goat Hollow Creek, Kelsall River, Nourse River, Nataga Creek, Rosaunt Creek, Taiya River, and West Creek.

3.2.7 Floodplains

The uses of floodplains is regulated by EO 11988 (as amended May 24, 1977), Floodplain Management, in furtherance of the National Flood Insurance Act of 1968, as amended (42 United States Code [U.S.C.] 4001 et seq.) and the Flood Disaster Protection Act of 1973 (Public Law 930234, 87 Statue 975), which provides for the restoration and preservation of natural and beneficial floodplain values. The objective is to avoid to the extent possible the long- and short-term adverse effects associated with occupancy and modification of the floodplains.

Specific flood hazard boundaries can be mapped by determining the base flood elevation of a stream channel or other waterbody and comparing it to local topographic elevations. Flood hazard areas have the potential for inundation that involves risk to life, health, property and natural floodplain values; and the Federal Emergency Management Agency (FEMA) maps flood hazard boundaries by identifying areas that have a one percent or greater chance of being flooded in a given year. FEMA has mapped flood zones primarily in populated areas in the Ring of Fire planning area. Flood zones are flood insurance rate zones that correspond to the 100-year floodplain as determined generally by a flood insurance study. Flood zones designations correspond to types of flood hazards in a floodplain. Flood hazard boundaries, flood elevations and flood zones for communities that participate in the National Flood Insurance Program (NFIP) are published on Flood Insurance Rate Maps (FIRMs).

In the past, the U.S. Soil Conservation Service (now known as the NRCS) mapped floodplain boundaries and flood elevations in the planning area, and is still involved in floodplain studies (Soil Conservation Service 1982). The USACE performs flood control studies that include flood elevations. Smaller communities, sparsely populated areas, and uninhabited areas are not included in the studies (USACE 2004c). USACE community studies are currently being updated and are often incomplete. Flood hazard data by community can be obtained from the USACE Civil Works Branch, Floodplain Management Service website (USACE 2004c). The USACE defines a floodplain as the lowlands that adjoin the channel of a river, stream or watercourse, ocean, lake, or other standing waterbody, which may have been or may be inundated by floodwater. The channel of a watercourse is part of the floodplain. Natural functions of floodplains include moderation of floods; provision of habitat for fish, wildlife, and plant resources; opportunities for groundwater recharge; and a natural system for water quality maintenance. The presence of freshwater lakes, rivers, glaciers, and the marine coastline in the Ring of Fire planning area provides many opportunities for flooding. Any river, stream, channelized flow, or other waterbody has flood potential (Miller 2004). Channels obstructed by ice jams, sediment deposition associated with stream glaciation, and log or debris obstructions can be common occurrences and can contribute substantially to flooding in Alaska (Soil Conservation Service 1982).

For the most part, the floodplains in the Ring of Fire planning area have not been mapped. However, the *Alaska Regional Profile* series has interpreted flood zones for most of the area based on topographic elevation data (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c). The flood zone information contained in the *Alaska Regional Profile* series was used to described the extent of floodplains by region.

Alaska Peninsula/Aleutian Chain Region

Several river systems present flood hazards in the region. Flooding can be caused by spring snowmelt, breakup, river ice jams, and runoff from locally heavy rainfall. Impermeable bedrock near the land surface limits storage of substantial amounts of groundwater; therefore, flash floods are common. Tsunamis have occurred in the region (National Oceanic and Atmospheric Administration [NOAA] 2005).

Flooding in coastal areas could be initiated by wind and tide-driven storm surges or tsunamis. General areas of coastline in the Aleutian Chain susceptible to flooding hazards include the western shore of Unimak Island, Unimak Bight, Cape Lazaref, Otter Cove, and Ikatan Bay on Unimak Island, and Big Lagoon in Morzhovoi Bay, Inpoint Cove, Cold Bay, Kinzarof Lagoon, and Long John Lagoon on the Alaska Peninsula (Aleutians East Coastal Resource Service Area 1984). Storm surges are most likely to occur along the northern coastline of the Alaska Peninsula and Aleutians Islands adjoining the Bering Sea in the vicinity of Urilia Bay, Bechevin Bay, Kudiakof Islands, Izembek Lagoon, Nelson Lagoon, Kudobin Islands, and Port Moller. Hazardous wave conditions generally occur during winter and fall with the greatest occurrence west of Unimak Island, south of Sanak Island, and in the Shumagin Islands (Aleutians East Coastal Resource Service Area 1984). All rivers, streams, channelized flows, or other waterbodies have flood potential (Miller 2004).

At Izembek National Wildlife Refuge (NWR) (Figure 1.2-2), moderate flooding is common along the Joshua Green River in August when heavy rains cause rapid glacial melt. Floods also occur in winter when ice forms on the river freezing shallow sections that create a dam and spread water over the floodplain freezing in successive ice sheets (USFWS 1985a).

Information contained in the *Alaska Regional Profiles Southcentral Region* was used to determine the extent of the floodplains (Selkregg 1974-1976a). There are a few small lakes dammed by glaciers that are widely scattered on the Alaska Peninsula and in the Aleutian Islands (Post and Mayo 1971). The glaciers, lakes, and associated streams were not mentioned by name in the report.

Flood zones in the Alaska Peninsula/Aleutian Chain region can be interpreted based on topographic maps. Based on topography, it is probable that flooding has or could occur in the floodplains associated with Reindeer and Barbara Creeks, and several other waterbodies in the region that do not cross BLM-managed lands.

Kodiak Region

Tsunamis are the predominant flood hazard associated with the region. However, all rivers, streams, channelized flows, or other waterbodies have flood potential (Miller 2004). Information contained in the *Alaska Regional Profiles Southcentral Region* was used to determine the extent of the floodplains in the Kodiak region (Selkregg 1974-1976a). No flood zones were identified in the Kodiak region based on topographic map interpretations (Selkregg 1974-1976a). There are a few small lakes dammed by glaciers that are widely scattered on Kodiak Island. The glaciers, lakes, and streams were not named in the report (Post and Mayo 1971).

Southcentral Region

Flooding in the Southcentral region is caused mostly by spring snowmelt, river ice jams, locally heavy rainfall, and glacial outbursts. Floods can occur on nearly any stream in the Cook Inlet region, and streams with small drainage basins often reach flood stage rapidly during periods of above average runoff. A potential threat to development situated in floodplains is glaciation or winter flooding.

Flood zones in southcentral Alaska, including the Knik River and Neacola Mountains, were interpreted based on the topographic maps, interviews, and drainage basin studies and are described below (Post and Mayo 1971; Selkregg 1974-1976a; Soil Conservation Service 1982). All rivers, streams, channelized flows, or other waterbodies have flood potential (Miller 2004). Based on topography, it is probable that flooding has or could occur in the floodplains associated with the following waterbodies associated with BLM-managed lands:

- Knik River associated with Knik Glacier
- Hunter Creek
- Jim Creek
- Friday Creek
- McArthur River associated with Blockade Glacier
- Chakachamna Lake and Chakachatna and Middle rivers associated with Mt. Spurr Volcano and Shamrock Glacier
- Chilligan River
- North Fork Bachatna Creek
- Emerald Creek
- Kustatan River
- Nagishlamina River
- Skwentna River
- Iniskin River

Southeast Region

Floods are infrequent in southeast Alaska and are usually the result of long duration, intense rainfall events that produce runoff flooding. Landslides are sometimes associated with runoff flooding. Landslides and glacial calving into large lakes can sometimes cause flash floods, which are rare, but can be devastating. Winter floods can be caused by ice jams or by rain on frozen watersheds. Flooding on small, steep streams is characterized by sharp rise and decline of floodwaters over short time frames. However, the volume of runoff is low and can be regulated by lakes if they occur in the stream course. Snow slides can block steep mountain streams and result in floods. Spring snowmelt increases runoff and can cause ice jam floods. Low-gradient braided channels that can cover a wide area often characterize floodplains in the broad valleys of the lower reaches of the larger drainage systems. Seasonal flooding often causes changes in the braided channel locations (Selkregg 1974-1976c).

Outburst floods are common to the region and occur in mid-summer through late fall. On glacial streams, ice dams can fail causing glacier-dammed lakes to be released. These events produce

large flood peaks and are often larger than maximum non-outburst floods (Selkregg 1974-1976c). The smaller, coastal streams have steep banks or channels that allow considerable overflows during floods. Most coastal communities are subject to floods by storm-driven waves and tsunamis. The coastal floodplains are affected by tidal fluctuation and stormwaves. Tides affect the velocity and flow dynamics. When peak stream flows occur simultaneously with high tides, streams can back up well above the normal intertidal zone and induce flooding at higher elevations (City and Borough of Juneau [CBJ] 2003). High winds combined with high tides create storm surges.

Flood zones in southeast Alaska, including areas around the Haines Block, were interpreted based on topographic maps, interviews, and drainage basin studies and are described below (Post and Mayo 1971; Selkregg 1974-1976c). Based on topography, it is probable that flooding has or could occur in the floodplains associated with the following waterbodies:

- Malaspina Lake associated with Malaspina Glacier
- Taku and Tulsequah rivers associated with Taku and Tulsequah glaciers
- Chilkat River
- Tsirku River
- Chilkoot River
- Ferebee River
- Goat Hollow Creek
- Kelsall River
- Nourse River
- Nataga Creek
- Rosaunt Creek
- Taiya River
- West Creek

The *Ketchikan 2020 Existing Conditions Report* states that FEMA has mapped the 100-year floodplain for populated portions of the KGB. It was determined that much of the City of Ketchikan, including Schoenbar, Hoadley, and Carlanna Creek areas are located within the 100-year floodplain (KGB 2000).

The Skagway River is subject to flooding events that usually occur in September, October, or the spring. The primary cause is runoff from rainstorm events. High temperatures in glacial areas or warm rain on snow or ice fields contribute to higher base flows during summer months (NPS 1996).

In the Juneau area, Montana Creek experiences flooding about every three years and flooding is usually associated with heavy rainfall events in late summer or fall (CBJ 2003). BLM hydrologists examined the Taiya River watershed near Skagway in 2004 to assess potential glacial outburst hazards. Additional examination for similar hazards will occur as potential hazard areas are identified.

3.2.8 Fisheries and Aquatic Habitat

The Ring of Fire planning area includes freshwater watersheds and marine intertidal areas (nearshore areas between the low and high tide marks) that support anadromous and resident freshwater fish species. BLM defines anadromous species as “species of fish that migrate upriver from the ocean to reproduce in freshwater”, and resident species as “any fish species naturally occurring, either presently or historically, in any ecosystem of the U.S.” (BLM 1996b). Unlike anadromous fish species, resident fish species remain in freshwater watersheds (e.g., streams, rivers, or lakes) throughout their lives. Aquatic habitats including salt and brackish water are crucial for a wide variety of wildlife. Most wildlife species are wholly or partially dependent upon aquatic habitats for water, food, space, and shelter requirements. Aquatic habitats are crucial to other wildlife for a wide variety of purposes, whether or not these habitats support fish. The complex relationships between riparian, wetland, aquatic, fish and wildlife habitats are crucial to maintaining the Ring of Fire planning area ecosystem.

Anadromous waters are protected by ADNR. The ADNR Office of Habitat Management and Permitting (OHMP) require that permits be obtained for activities (use or construction) that potentially affect anadromous waters. The OHMP is also concerned with protecting fish passage in both anadromous and resident fish streams. ADF&G continues to receive and process anadromous waterbody nominations and maintains the fish distribution database (ADF&G 2004d). The *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* and its associated atlas are the media used to accomplish this specification and are adopted as regulation under 11 AAC 195.010 (ADF&G 1991a). Stream numbers, locations, extent of cataloged habitat, and species utilization of a given stream may change from year to year. ADF&G protects and manages fish and aquatic resources throughout the State of Alaska.

Of the environmental and human-controlled variables that affect fish survival, BLM has primary influence over habitat that can affect the spawning and rearing of fish species. However, there has not been a recent inventory of fishery resources by BLM, due in part to the fact that most of the current demand for fish resources occurs outside of BLM-managed land. It is therefore not possible at this time to determine the contribution of resident and anadromous species to BLM land user groups and communities in the BLM management area. Refer to Section 3.3.4 for a discussion of BLM land ownership within the planning area.

3.2.8.1 Species Descriptions

Fish are an important resource in the Ring of Fire planning area. The common fish species of economic and social importance known to occur in the planning area are listed in Table 3.2-8. Subsistence, commercial, and sport user groups target both resident and anadromous fish species. Among the more subsistence and commercially important are five species of Pacific salmon. Resident species contribute primarily to the subsistence and sport fisheries.

Table 3.2-8. Common Subsistence, Commercial, and Sport Fish Species Found in the Ring of Fire Planning Area

Common Name	Scientific Name	Economic/Social Importance
White sturgeon	*Acipenser transmontanus*	Subsistence
Round whitefish	*Prosopium cylindraceum*	Subsistence and Forage Species
Cutthroat trout	*Salmo clarki*	Subsistence and Sport Fish
Rainbow/Steelhead trout	*Oncorhynchus mykiss*	Subsistence and Sport Fish
Lake trout	*Salvelinus namaycush*	Subsistence and Sport Fish
Arctic char	*Salvelinus alpinus*	Subsistence and Sport Fish
Dolly Varden	*Salvelinus malma Walbaum*	Subsistence and Sport Fish
Pink salmon	*Oncorhynchus gorbuscha*	Subsistence and Commercial Fish
Chinook salmon	*Oncorhynchus tshawytscha*	Subsistence and Commercial Fish
Chum salmon	*Oncorhynchus keta*	Subsistence and Commercial Fish
Coho salmon	*Oncorhynchus kisutch*	Subsistence and Commercial Fish
Sockeye salmon	*Oncorhynchus nerka*	Subsistence and Commercial Fish
Arctic grayling	*Thymallus arcticus*	Subsistence and Sport Fish
Eulachon	*Thaleichthys pacificus*	Subsistence and Prey Species
Alaskan blackfish	*Dallia pectoralis*	Subsistence
Northern pike	*Esox lucius*	Subsistence and Sport Fish

A majority of the fish species considered in this document belong to the family Salmonidae, and are therefore known as “salmonids”. Salmonidae is the dominant family of fishes in the northern regions of North America, consisting of both anadromous and freshwater resident species, which are medium- to large-sized in comparison to other freshwater fish species (Morrow 1980). Most of the species found in the Ring of Fire planning area belong to the Salmonidae family; the exceptions are the Alaska blackfish (Umbridae), white sturgeon (Acipenseridae), northern pike (Esocidae), and eulachon (Osmerididae).

3.2.8.2 Threatened and Endangered Fish Species

Although there are no Endangered Species Act (ESA)-listed salmonids, or other fish species in Alaska, there are several ESA-listed salmon evolutionary significant units (ESUs) that spawn in the Pacific Northwest states, and occur in Alaskan waters during the marine phase of their life cycle. There are six Chinook (*O. tshawytscha)* ESUs, one sockeye (*O. nerka*) ESU, and five steelhead (*O. mykiss*) ESUs that are listed under the ESA and occur in Alaskan waters (NOAA Fisheries 2005a). Some or all of these stocks may occur in waters near the Ring of Fire planning area at certain life history stages. However, because the Ring of Fire Proposed RMP (PRMP)/Final EIS (FEIS) deals with land-based management, only the nearshore marine environment that is used by Alaska salmonids, and not the offshore marine environment, is considered as part of the planning area.

3.2.8.3 Aquatic Habitats

Anadromous species (i.e., five species of Pacific salmon, steelhead trout, and Dolly Varden) depend on both marine and freshwater environments for survival. Spawning occurs in freshwater streams (usually in forested watersheds) and rearing can occur in the spawning streams or in the nearshore estuarine waters. Juvenile Chinook, chum, and pink salmon are most dependent on the nearshore habitat, as it provides ample and diverse prey during their acclimation to saltwater. Necessary characteristics of habitat required to support anadromous fish species include ample spawning and rearing habitat. Depending on the species, one or both of these habitat types can be the limiting factor in the successful reproduction of the species.

Resident fish habitat is found entirely within a watershed, such as lakes, tributaries, rivers, streams, and ponds, throughout which they migrate during their lifetimes. An example of specific habitat for both anadromous and resident fish species during spawning is shallow and swift riffle areas that provide a constant flow of oxygenated water for the eggs. Stream banks and the associated vegetation, referred to as "riparian" areas, offer habitat for the fish species. Overhanging banks and irregularly shaped shorelines offer fish protection from predators, especially during rearing, while organic debris (e.g., fallen logs) helps provide critical overwintering in-stream habitat (ADF&G 2004e). Refer to Section 3.2.11 for more information on riparian habitat.

A review of anadromous fish streams on BLM-managed lands within the Ring of Fire planning area has been conducted by BLM staff. Based on ADF&G automated anadromous fish data (ADF&G 2004d) and BLM's current land status for the planning area, it was estimated that less than one percent of the known statewide anadromous fish streams are on BLM-managed lands in the Ring of Fire planning area. More accurate information on anadromous fish streams on BLM lands will be available as land status data is refined. The ADF&G Divisions of Wildlife and Sport Fisheries have two regions that correspond with areas delineated in the Ring of Fire planning area: the Southeast and Southcentral regions. The ADF&G Division of Commercial Fisheries has three regions within the Ring of Fire planning area: the Southeast, Central, and Westward regions. A review of available anadromous stream information yielded estimates of the miles of anadromous streams on BLM lands, and is discussed below.

ADF&G does not catalog information on resident fish species as it does for anadromous fish; however, information is available regarding general life history for the species found in the Ring of Fire planning area. The information on watersheds and the species found within each of the regions in the planning area is discussed below.

Alaska Peninsula/Aleutian Chain Region

Current data for ADF&G's southwest region (which encompasses both BLM's Alaska Peninsula/Aleutian Chain and Kodiak regions) indicate that 11,390 miles of anadromous streams occur in this area. A visual estimate of these two regions by BLM suggests approximately 125 miles of the cataloged anadromous waters are located on BLM lands.

Peninsula-South Side — The Chignik River system (including Black Lake) includes the largest and most important river on the south side of the Alaska Peninsula. This river system is known for large sockeye salmon runs, and for its support of other anadromous fish (such as steelhead trout). There are two separate populations of sockeye salmon within this area: one that spawns in the vicinity of Chignik Lake, and another that spawns in Black Lake and its nearby drainage system (ADF&G 1978). Five species of Pacific salmon, steelhead trout and Dolly Varden are indigenous to these river systems (Selkregg 1974-1976b). Pink salmon are more abundant on the south side than on the north side of the peninsula, especially in Mino Creek, Settlement Point, and Southern Creek on Deer Island (ADF&G 1978). Arctic grayling are not present in streams on the south side of the peninsula (ADF&G 1985b). Alaska blackfish, lake trout, round whitefish, Arctic char, and northern pike are present in peninsula (both south and north sides) area lakes and streams (Morrow 1980; USFWS 2005j). Spawning eulachon are present in larger peninsula rivers (USFWS 2005j).

Peninsula-North Side — On the northern side of the Alaska Peninsula, major watersheds include the King Salmon River, Becharof Lake/Egegik River, Upper and Lower Ugashik lakes

and Ugashik River, and Meshik River near Port Heiden. All of these systems support major salmon runs, specifically sockeye salmon, and other species such as Dolly Varden and Arctic grayling. The King Salmon River is thought to be the southern limit for Arctic grayling on the northern side of the peninsula (ADF&G 1985b). Rainbow trout, native to the Bristol Bay area, are found in all the major drainages north of the Becharof Lake-Egegik River, but are not present in the Egegik or Ugashik rivers (ADF&G 1985b). Isolated populations of rainbow trout are found in Bear and Sapsuk lakes near Port Moller (ADF&G 1985b). Steelhead trout are found in small numbers in the King Salmon and Sandy rivers and Steelhead Creek (ADF&G 1985b). The Nelson Lagoon system (which includes the Sapsuk River) supports Chinook, sockeye, coho, and chum salmon (ADF&G 1985a).

Aleutian Islands — In the Aleutian Islands, most of the streams are short and are without headwater lakes, which reduce the occurrence of sockeye salmon in the area. Chum salmon, Arctic char, and Dolly Varden are commonly found, while coho, pink, and Chinook salmon are rare. Resident round whitefish, Alaska blackfish, and northern pike are found in suitable habitat throughout the Aleutians (Morrow 1980; USFWS 2005j). Rainbow trout do not naturally occur in the Aleutian Islands, but lakes on Adak Island have been stocked for sport fishing. Arctic grayling are not present on the Aleutian Islands (ADF&G 1985b).

Kodiak Region

No estimate for miles of anadromous fish streams separate from the Alaska Peninsula/Aleutian Chain region estimate is available for the Kodiak region.

On Kodiak and Afognak islands, ADF&G has identified 348 anadromous streams (USFWS 2005g). Seven major river drainages, including the Karluk Lake and River system, Red River, Frazer Lake, and the Dog Salmon River system, and about 100 smaller streams and tributaries provide critical freshwater habitat for five species of Pacific salmon, steelhead trout, rainbow trout, Arctic char, and Dolly Varden. Dolly Varden are the most widely distributed anadromous or freshwater fish species in the Kodiak-Afognak islands area, and overwinter in Karluk, Red, and Frazer lakes (ADF&G 1985b). Pink, chum, and sockeye salmon are most abundant in these systems, while Chinook and coho salmon are less common. (ADF&G 1978; USFWS 2005g). The production of steelhead trout in the Karluk and Red rivers is one of the highest in Alaska (USFWS). Rainbow trout, although present in many area streams, are relatively abundant in only the Karluk and Red rivers (ADF&G 1985b). The distribution of both steelhead and rainbow trout are closely associated with the presence of sockeye salmon, and all steelhead river systems also contain populations of resident rainbow trout (ADF&G 1985b).

Arctic char have been documented only in Karluk Lake (USFWS 2005g). Arctic grayling are not native to Kodiak, but a few selected lakes have been stocked (ADF&G 1985b).

Southcentral Region

The Southcentral region supports expansive watersheds that provide important fish habitat. Therefore, this discussion has been divided into four main areas, which are based on ADF&G's *Alaska Habitat Management Guide's* sportfish survey areas (ADF&G 1985a), but modified to the Ring of Fire planning area boundaries. Current ADF&G data for the Southcentral region indicates that 9,369 miles of anadromous streams occur in this area. Cursory analyses of the Southcentral region by BLM suggest approximately 103 miles of the cataloged anadromous waters are located on BLM lands.

East Side Susitna Drainage Area and West Side Cook Inlet-West Side Susitna Area — The East Side Susitna Area Drainage Area within the Ring of Fire planning area includes all Susitna River drainages from just north of its confluence with the Chulitna River, the Susitna River east side drainages from Talkeetna to (and including) Willow Creek. The West Side Cook Inlet-West Side Susitna Drainage Area within the Ring of Fire planning area includes all west side drainages of the Susitna River from its confluence with the Chulitna River to Cook Inlet, all west side drainages of this confluence of the Chulitna River, and all drainages emptying into Cook Inlet between the Susitna River and Cape Douglas.

This area supports one of the largest river systems in the State - the glacially fed Susitna River (drainage area 19,600 square miles), which extends from about the northern crest of the Alaska Range to Cook Inlet. This river and its tributaries are the second largest salmon-producing system within Cook Inlet. The Chakachatna River supports Chinook, sockeye, and pink salmon. Large populations of native rainbow trout are found in the clearwater drainages of the Susitna, Yentna, Talkeetna, and Skwentna rivers. Overwintering areas for rainbow trout include large Susitna River tributaries (e.g., Talkeetna River) and creeks in the lower Susitna area. Dolly Varden are found in the Kashwitna River (ADF&G 1985a). Resident Arctic char are found in the upper Susitna River drainage (ADF&G 1985b). Resident Arctic grayling occur throughout most of the clear water watersheds in southcentral Alaska, and overwinter in large glacial river systems like the Susitna (ADF&G 1985a; ADF&G 2004b). Spawning eulachon are plentiful in the Susitna River (ADF&G 2004b). White sturgeon is present in area rivers and lakes (Morrow 1980).

Knik Arm Drainage-Anchorage Area — This area includes all watersheds of the Matanuska, Knik, and Little Susitna rivers, including east side drainages of the Susitna River south of the Willow Creek drainage; and the Portage Creek drainages at the east end of Turnagain Arm. Each of these river systems support four or five species of Pacific salmon (Selkregg 1974-1976a; Alaskool 1998-2002). There are no steelhead populations in the Knik Arm Drainage. Rainbow trout are also found in the drainages of the Matanuska River (ADF&G 1985a). Many area lakes are stocked with rainbow trout, Arctic grayling, Arctic char, landlocked coho, and Chinook salmon (ADF&G 2005a). Resident Arctic grayling are found in the Knik and Matanuska watersheds (ADF&G 1985a; ADF&G 2004b). Spawning eulachon are plentiful in the Placer and Twentymile rivers near Portage in upper Cook Inlet (ADF&G 2004b). White sturgeon is present in area rivers and lakes (Morrow 1980).

Kenai Peninsula — This area includes all freshwater drainages bounded to the north by Turnagain Arm, on the west by Cook Inlet, and on the east by the Placer River and Kenai Lake drainages, and waters flowing into the Gulf of Alaska west of Port Bainbridge. The Kenai and Kasilof rivers support four species of Pacific salmon (Chinook, coho, sockeye, and pink). The Kenai River, in addition to the Russian River and Hidden Lake systems, is the largest producer of sockeye salmon in Cook Inlet, and therefore supports the largest sport sockeye fishery in Alaska. The Kenai River also supports the largest run of pink salmon in the area and is famous for its Chinook sportfishery. Besides the Kenai River, sportfisheries for rainbow trout include the Swanson River and Swan Lake canoe systems. Chinook and coho salmon are also found in the Russian, Funny, Killey, and Chickaloon rivers, while the Swanson and Fox rivers support pink and coho salmon. Chum salmon are the least abundant salmonids in the area, with small populations present only in the Fox and Martin rivers (USFWS 2005i).

Dolly Varden are found in the Kenai, Kasilof, Ninilchik, and Anchor rivers; and Deep and Stariski creeks (ADF&G 1985a). In the Kenai River, the sportfishery for Dolly Varden is gaining

popularity (USFWS 2005i). Steelhead trout are found in the Kenai and Kasilof rivers, and a limited number of streams, including Anchor, Stariski, Ninilchik, Deep, and Crooked Creeks (ADF&G 1985a). Lake trout are present in larger lakes such as Skilak, Tustumena, and Kenai lakes, and in the Kenai and Kasilof rivers (ADF&G 2005b). Although small, Hidden Lake provides the best lake trout fishery on the Kenai Peninsula (ADF&G 1985a; ADF&G 2005b). The distribution of round whitefish is limited to larger lakes like Skilak and Tustumena, and larger rivers like the Kenai (USFWS 2005i). Resident Arctic grayling are not native to the Kenai Peninsula, but have been stocked into some area lakes (ADF&G 1985a; ADF&G 2004b). Spawning eulachon are plentiful in the Kenai, Kasilof, and the Resurrection rivers (ADF&G 2004b). Northern pike were introduced illegally into the Soldotna Creek watershed in the 1970s and have spread into many southcentral area waters (USFWS 2005k). White sturgeon is present in area rivers and lakes (Morrow 1980).

Western PWS Area — The portion of this area within the planning area includes all freshwater drainages west of Valdez, counterclockwise around the PWS, and as far south as Cape Puget. The many short coastal streams in this area support four species of Pacific salmon (sockeye, pink, chum, and Chinook). Dolly Varden are also found throughout freshwater systems of this area, including Eshamy, Coghill, and Shrode lakes (ADF&G 1985a). The four species of Pacific salmon listed above and Dolly Varden are found in larger area systems like the Jackpot Lakes and Creek system, Coghill Lake and River system; and the Eshamy Lake and River system (supports all except pink salmon) (ADF&G 2004d). Dolly Varden are also found in Shrode Lake (ADF&G 1985a).

Southeast Region

Current ADF&G data for their Southeast regional boundary indicates that 7,227 miles of anadromous streams occur in this area. A visual estimate of this region suggests approximately 80 miles of the cataloged anadromous waters are located on BLM lands.

The Southeast region is part of a major drainage system that originates mainly from glaciers in Canada. The area's main rivers include the Stikine, Alsek, Taku, and Chilkat. All of these rivers and their associated lakes are listed by ADF&G as anadromous fish streams (for species such as Chinook, sockeye, and pink salmon, Dolly Varden, steelhead and cutthroat trout). Populations of northern pike have become established in the headwaters of some of these rivers (Selkregg 1974-1976c; Alaskool 1998-2002). The Chilkat River is one of the largest sport fisheries in southeast Alaska, primarily for sockeye salmon and Dolly Varden (ADF&G 2005c).

The Situk River supports large runs of steelhead trout, in addition to Chinook and coho salmon, and is therefore popular for sport fishing (ADF&G 2005c). Rainbow trout are found throughout southeast Alaska (ADF&G 1985b). A majority of the rivers (over 25) that support spawning runs of eulachon are located in southeast Alaska (e.g., Taiya, Stikine, and Chilkat rivers; Berners Bay, and the Situk River near Yakutat) (ADF&G 2004b). Resident species like white sturgeon are found throughout southeast area streams, whereas the range for round whitefish is limited to the area north of the Taku River (Morrow 1980).

3.2.8.4 Essential Fish Habitat

On October 11, 1996, Congress passed the Sustainable Fisheries Act (SFA) (Public Law 104-297), which amended the habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This 1996 reauthorization of the MSFCMA mandates that

federal agencies assess the effects of federal programs or projects on essential fish habitat (EFH) for commercial fish stocks in all life stages and associated habitats. The SFA also calls for direct action to stop or reverse the continued loss of fish habitats. The SFA requires consultation between the NOAA Fisheries (previously referred to as the National Marine Fisheries Service [NMFS]), the fishery management councils, and federal agencies to protect, conserve, and augment EFH. The SFA defines EFH as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Subpart J, Section 600.810 of the SFA defines an adverse effect to EFH as "any effect, which reduces the quality and/or quantity of EFH."

According to NOAA Fisheries, the EFH species of concern for the Ring of Fire PRMP/FEIS includes five species of Pacific salmon (Chinook, chum, coho, pink, and sockeye), and EFH habitat includes all of the anadromous waters listed in the ADF&G Catalog within the Ring of Fire planning area (Peltz 2005).

3.2.8.5 Other Aquatic Habitats

Critical Habitat Areas

State Critical Habitat Areas

Certain areas have been classified by the Alaska State Legislature as being essential to the protection of fish and wildlife habitat (Alaska Statute [AS] Title 16, Chapter 20). These areas are designated as a sanctuary, critical habitat area (CHA), or refuge, with the purpose of protecting and preserving habitat that is especially crucial to the perpetuation of fish and wildlife. ADF&G manages these special areas by restricting uses that are not compatible with the primary purpose. A special area permit is required before any habitat altering work may occur, including any construction activity in a designated State refuge, CHA, or sanctuary (ADF&G 2003). State CHAs within the Ring of Fire planning area include:

- Alaska Peninsula/Aleutian Chain Region
  - Egegik CHA
  - Pilot Point CHA
  - Port Moller CHA
- Southcentral Region
  - Anchor River and Fritz Creek CHA
  - Clam Gulch CHA
  - Kachemak Bay CHA
- Southeast Region
  - Chilkat River CHA

National Wildlife Refuges

NWRs were created to conserve wildlife, birds, and fish (specifically salmonids, but other fish families as well) and their habitats through management by USFWS. As described above for CHAs, a special area permit is required before any habitat altering work may occur. The NWRs that are located within the Ring of Fire planning area include: the Kenai Peninsula NWR (Figure 1.2-3), Becharof NWR, Kodiak NWR, Alaska Peninsula NWR, Izembek NWR, and the Alaska Maritime NWR (Figure 1.2-2) (USFWS 2005f).

The purpose of the Kenai Peninsula NWR is unique among Alaska refuges in that it is the only refuge for which providing opportunities for compatible fish- and wildlife-oriented recreation is a major purpose. Most of the aquatic habitats are in near-pristine condition and many of the fish species have significant recreational and commercial value, in addition to being important food resources for a variety of wildlife. The success of the fish populations in this NWR is dependent upon maintaining: genetic variability, water quality, protection of critical rearing and spawning habitats, and escapement of sufficient spawning stocks (USFWS 2005i).

The Becharof NWR lies between Katmai National Park and Preserve and Alaska Peninsula NWR, on the south side of the Peninsula. The streams that originate on the lands of these two NWRs support many of the salmon from the world's most valuable sockeye salmon fishery (Bristol Bay) (USFWS 2005h).

Kodiak NWR is managed to conserve aquatic habitat used by salmon for migration, overwintering, spawning, and rearing (USFWS 2005g). The Kodiak NWR occupies the south and western two-thirds of Kodiak Island and the northwestern part of Afognak Island. Some of the most pristine and productive salmon habitat in the Kodiak Archipelago is within the Kodiak NWR. Thirty-four percent of the anadromous streams in these areas are within the refuge boundary (USFWS 2005g). Salmon produced on the refuge make up approximately 65 percent of the quantity of total commercial harvest in the Kodiak Archipelago (USFWS 2005g).

The Izembek NWR is located on the Alaska Peninsula, between the Alaska Peninsula NWR and the Alaska Maritime NWR. In the Izembek NWR, thousands of spawning sockeye, chum, coho, and pink salmon provide food for the area's abundant brown bear (USFWS 2005l).

In the Aleutian Islands unit of the Alaska Maritime NWR, the number of streams in which salmon spawn is greater than in any other refuge of the U.S. (Mac, P.A. Opler et al. 1998).

3.2.9 Wildlife

The following discussion of the biological environment follows the four geographic areas of the Ring of Fire planning area, as described previously.

3.2.9.1 Wildlife Habitat

The Ring of Fire planning area spans a very large variety of wildlife habitat that represent most of the ecoregions in the North Pacific (Gallant, Binnian et al. 1995; Nowacki, Spencer et al. 2001). These ecoregions often stretch across several planning regions as presented below.

- Alaska Peninsula/Aleutian Chain Region
  - Bristol Bay – Nushagak Lowlands Ecoregion
  - Alaska Peninsula Mountains Ecoregion
  - Aleutian Chain Ecoregion
- Kodiak Region
  - Alaska Peninsula Mountain Ecoregion
  - Coastal Western Hemlock/Sitka Spruce Forest Ecoregion
- Southcentral Region
  - Cook Inlet Ecoregion
  - Alaska Range Ecoregion
  - Pacific Coastal Mountains Ecoregion
  - Coastal Western Hemlock/Sitka Spruce Forest Ecoregion
- Southeast Region
  - Coastal Western Hemlock/Sitka Spruce Forest Ecoregion
  - Pacific Coastal Mountains Ecoregion

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula has a great diversity of habitats including maritime tundra, boreal forest in the northern portion of the region, lowland tundra dominated by shrub communities along the Bristol Bay side of the peninsula (Bristol Bay – Nushagak Lowlands Ecoregion), and extensive small lakes and ponds, as well as several large lakes, such as Becharof Lake and Upper and Lower Ugashik Lake. The Alaska Peninsula Mountains Ecoregion includes mountains and rounded hills of the Aleutian Range, which extend the length of the peninsula. Dwarf shrub habitats with arctic and alpine species are one of the dominant plant communities with low shrub habitats of willow in more protected sites. Tall shrub alder habitats are widespread in this region. Other common communities include mesic graminoid herbaceous meadow of bluejoint reedgrass and forbs such as fireweed (Gallant, Binnian et al. 1995).

Terrestrial habitat on the Aleutian Chain is classified as marine tundra and is the product of persistent cloudy weather, fog, mist, drizzle, and rain with driving winds. As a result of the separation from the mainland, many species had to “island hop” from mainland Alaska. This is reflected in the decreasing diversity of plant and animals going from the mainland westward on the island chain (Armstrong 1977). This region is largely absent of trees. The vegetation is

classified as distinct subalpine or maritime tundra (Hulten 1968). Species composition is generally arctic-alpine species, dominated by heath, grass, and composite families. In general, three plant communities or habitats can be distinguished: beach communities, lowlands, and upland tundra. Lowland habitats consist of low shrub, mesic and dry graminoid herbaceous meadows, and shrub bog communities in poorly-drained areas. Upland tundra consists primarily of tall shrub communities restricted to riparian habitats along drainages. Other major habitats include rocky shorelines and sea cliffs, and sheltered bays with beach dunes and bars. Marine habitats include extensive nearshore kelp beds and eelgrass beds in more protected areas (Mac, P.A. Opler et al. 1998).

The Port Heiden Units and the Port Moller Units are BLM-managed lands recognized for their wildlife habitat value (Alaska Center for the Environment, Alaska Coalition et al. 2004). Both of these areas are near important habitat for Steller's eider, a species listed as threatened under the ESA (see Section 3.2.9.3), and have documented breeding habitat for a genetically distinct population of marbled godwit, a BLM sensitive species (Gill Jr., Tibbitts et al. 2004). These areas are both near or contain preferred corridors for future transportation/utility needs (ADNR, ADF&G et al. 1984). Both areas contain a great number of parcels that have been selected for conveyance by either Native corporations and/or the State.

Marbled Godwit

Barbara and Reindeer Creeks are both located in the vicinity of Port Heiden and are recognized for their high wildlife value (Figure 2.3-6). BLM manages approximately three miles of the 20-mile long Barbara Creek, and seven miles of the approximately 20-mile long Reindeer Creek. Both creeks support a unique population of marbled godwits, supporting the only breeding population for the Beringian subspecies. Subsistence users at Port Heiden use this area for fishing, hunting, and other gathering, with access gained primarily by off-highway vehicles (OHVs). Aircraft can also access the area. Both sites are Native-selected.

Kodiak Region

The Kodiak Island region includes portions of two ecoregions. The northern portions of the archipelago (Shuyak, Afognak and Raspberry Islands), and the northern portion of Kodiak Island are within the Coastal Western Hemlock/Sitka Spruce Forest Ecoregion, dominated by Sitka spruce. The southern portions of Kodiak are considered to be a part of the Alaska Peninsula Mountain Ecoregion. The coastal forest ecoregion ranges from southeast Alaska to Kodiak at the northwestern extent of the system (Gallant, Binnian et al. 1995). Sitka spruce is expanding its range southwestward on Kodiak Island and the Alaska Peninsula, invading dense shrub-tundra vegetation. Range expansion is occurring in response to post-glacial warming, which

melted the ice sheets on the North Pacific coast 14,000 years ago; the change is not in response to recent climate changes (Tae 1997)

BLM manages three miles of the seven-mile long Elbow Creek, which has been identified as supporting important fish and wildlife resources (Figure 2.3-6). Currently, there is one BLM big game hunting guide permitted in this area (refer to Section 3.3.11 for more information).

Southcentral Region

The wildlife habitat in the Southcentral region ranges from coastal rain forests in the western portions of PWS, to boreal forests of the Matanuska and Susitna Valleys, and Kenai Peninsula, to treeless maritime tundra of shrubs and tall grasses of the southwestern side of Cook Inlet. The coastal rain forest in this region is similar to the Southeast region with many of the same flora and fauna. The boreal forest communities are the result of a more continental climate with less rainfall, cold long winters, and warm summers (Mac, P.A. Opler et al. 1998). Plant growth and forest communities are strongly influenced by altitude, fire history, slope, and soil moisture. Permafrost is discontinuous or absent in most of the region. The maritime tundra in the western portion of this region is a product of a cool moist climate and has elements of both the boreal forest and interior mountain or alpine communities.

There are six BLM-managed areas on the west side of Cook Inlet and two BLM-managed areas near Palmer that are valued for their important biological resources, proximity to federal and State CSUs, and other factors (Alaska Center for the Environment, Alaska Coalition et al. 2004). The following is a brief description of each area:

The Iniskin River valley is cited for its high concentration of brown bears, excellent salmon habitat, and high recreational values (Figure 2.3-7). It is also adjacent to Lake Clark National Park and Wilderness and near a proposed access road corridor for the Pebble Mine. The BLM lands in this area have been highly prioritized for conveyance by Native corporations.

The Neacola Icefield and Blockade Lake area is cited for its remarkable visual beauty, recreational resources, and high quality habitat for moose, black bear, Dall sheep, and trumpeter swans (a BLM sensitive species). These lands are adjacent to Lake Clark National Park and Wilderness, Redoubt Bay State CHA, and Trading Bay State Game Refuge. These BLM lands are unencumbered; meaning neither the State nor any Native corporation has selected them (Figure 2.3-3).

The Ursus Cove-Bruin Bay-Kirschner Lake Complex includes rich estuary habitats that support shorebirds during migration, high concentrations of seabirds, harbor seals, and sea otters (Figure 2.3-7). The upland and riparian areas support very high densities of brown bears and good habitat for cliff-nesting birds. The McNeil River State Game Sanctuary lies to the south and the Lake Clark National Park and Wilderness is to the north. Native corporations have selected these lands for conveyance.

BLM administers some small parcels of land in the McArthur River valley (Figure 2.3-7) that have been selected by the State and are within the Trading Bay State Game Refuge (Figure 2.3-3). These parcels are recognized for their high habitat values for fish, moose, bears, waterfowl, and shorebirds, as well as for high recreational and subsistence values.

BLM lands in the middle stretch of Harriet Creek are recognized for their high value for bear habitat and salmon spawning, as well as their importance to water quality for the ecologically important Harriet Creek delta (which is not on BLM lands). This area is also near Redoubt Volcano and there is a potential for catastrophic changes in the case of an eruption. These parcels are primarily Native-selected.

The Chilligan River area is cited for its high habitat values that support moose, bears, Dall sheep, caribou, river otters, and bald eagles (Figure 2.3-7). These unencumbered BLM lands also include the Nagashlamina River valley and are used for wilderness tourism and commercial guided hunting.

The two areas of BLM land near Palmer that are highly valued are the Palmer Hay Flats and the Knik River Valley (Figure 2.3-5). BLM administers a number of land parcels within the Palmer Hay Flats State Game Refuge, some of which have been selected by the State. However, BLM expects to retain none of this land within the Palmer Hay Flats State Game Refuge in the long-term. This area is managed by the State for conservation of outstanding habitat that supports huge flocks of migrating waterfowl, shorebirds, and sandhill cranes, as well as salmon and moose. The Cook Inlet population of beluga whales is also known to use the estuaries adjacent to this area. Because of its proximity to major population centers, this area receives a great deal of recreational use.

BLM administers a large block of Native-selected land in the Knik River valley that has been cited for its outstanding visual beauty and recreational values, as well as high habitat values for moose, bears, wolves, Dall sheep, and fish (Figure 2.3-5).

Southeast Region

The Southeast region is within the Coastal Western Hemlock/Sitka Spruce Forest Ecoregion and is influenced primarily by the moderating maritime influence of the warm ocean currents in the North Pacific. This region is a continuation of temperate coastal rainforest that extends from northern California to the north end of Kodiak Island. The Coastal Range rises abruptly adjacent to the coastal areas, which results in heavy rains throughout the area, although there is considerable local variation (Selkregg 1974-1976c). Heavy snowfall at the higher elevations creates large icefields that feed numerous glaciers. Much of the terrain has been heavily modified through time by glaciers. Following the receding glaciers of the last ice age, the area was populated by vegetation from the south (Hulten 1937). Fauna that occupied this region were primarily from unglaciated areas of the northern regions (Klein 1965).

Wildlife habitats in the lower elevations are complexes of thick coniferous forests of Sitka spruce, western hemlock, red cedar and yellow cedar interspersed with muskegs, shore pine, and mountain hemlock where saturated soils prevent the growth of large trees. Tall shrub communities of Sitka alder occur on the higher sideslopes, while willow and alder communities occur along floodplains of the larger rivers. The higher mountain slopes support alpine tundra habitats of low and prostrate shrubs, grasses and forbs. Along the extensive coastline, nearshore habitats consist of steep rock shores with kelp beds and sea grasses, such as surfgrass and eelgrass; beaches of unconsolidated sand and gravel with salt-tolerant grasses and forbs; and extensive sand and gravel flats on river deltas and glacial outwash plains. Salt marsh communities are often associated with broad upper intertidal areas near outwash plains and mouths of major rivers. These habitats are of great importance to terrestrial mammals such as brown and black bears, but also to migrating waterfowl and shorebirds.

The Haines area block is cited for its mountain goat habitat (Figure 2.3-4). This area is also described as having a particularly diverse and unique set of flora and fauna due to its proximity to both interior Canadian ecosystems and coastal temperate rainforest ecosystems.

The Chilkat River runs from the terminus of the Chilkat Glacier and runs northwest making an eight-mile arch through Canada before returning back into Alaska (Figure 2.3-8). BLM manages the headwaters of this large drainage from the Canadian border to the Chilkat Bald Eagle Preserve. The upper reaches of this drainage are recognized for its high wildlife value, supporting moose, black and brown bears, mountain goats, Dall sheep, furbearers, and raptors. Because BLM manages the terminus of the Chilkat Glacier and the headwaters of this river, ecological values are also recognized as important to the many values and users downstream. This site is State-selected.

The Chilkoot Lake Power Site Withdrawal area reserves heavy recreational use, largely due to the strong anadromous runs of salmon that come through during the summer and fall (Figure 2.3-8). This area has been recognized for its abundant wildlife, including moose, brown and black bears, mountain goats, Dall sheep, furbearers, and raptors. Much of this area includes the Chilkat Bald Eagle Preserve.

Tahini River is a tributary of the Chilkat River and runs a total length of four miles before entering Canadian ownership (Figure 2.3-8). Near the Canadian border, on the U.S. side (BLM land), the Flemer joins the Tahini River. This river has tremendous wildlife value, supporting moose, brown and black bears, mountain goats, Dall sheep, furbearers, and raptors. ADF&G maintains a lease through BLM on the lower part of this river for fisheries research.

BLM manages approximately 12 miles of the 24-mile Tsirku River uplands(Figure 2.3-8). This river is recognized for scenery, geologic, and wildlife values. The river valley supports anadromous fish and provides excellent habitat for moose, brown and black bear, mountain goats, waterfowl, and bald eagles.

BLM administers a large number of small parcels throughout southeast Alaska that may contain stands of high-volume old-growth forests. The potential for these lands to support populations of various amphibians that are declining in many parts of their range is also cited as a reason for special management designation.

3.2.9.2 Wildlife Species Occurring within the Ring of Fire Planning Area

Amphibians and Reptiles

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula has only one species of amphibian, the wood frog (MacDonald 2003). Their range extends north of the Brooks Range. This species has been found within Katmai National Park and Preserve and is expected to occur throughout the region, although a thorough survey has not been conducted (Alaska Natural Heritage Program [ANHP] 2001). Because of the isolated nature of the Aleutian Chain and open stretches of water, especially Unimak Pass, the wood frog or other amphibians are not known to occur in this area (MacDonald 2003).

Kodiak Region

The isolated nature of the Kodiak Archipelago has likely prevented the colonization of this area by the wood frog, although the habitat is expected to be suitable for this species (MacDonald and Cook 1999).

Southcentral Region

The wood frog is one of two native amphibians inhabiting the Southcentral region, the other being the western toad. The western toad occurs as far north as PWS, but is not widely distributed and are not known to occur as far west as the Kenai Peninsula (Broderson 1994; MacDonald 2003). The wood frog inhabits diverse vegetation from grasslands to forest, muskeg, and tundra, and is common in suitable habitat.

Southeast Region

The Southeast region has more sightings of sea turtles than other areas of the State, but any occurrence of the four species is considered accidental (MacDonald 2003). Six species of amphibians are associated with this region. These include three salamanders: rough-skinned newt, northwestern salamander, and long-toed salamander; two species of frog, the wood frog and the Columbia spotted frog; and one toad, the western (boreal) toad (O'Clair, Armstrong et al. 1997; Carstensen, Wilson et al. 2003).

Only the wood frog and rough-skinned newt are distributed throughout the mainland and the Alexander Archipelago. The others, such as Columbia spotted frog and northwestern salamander are associated with the large trans-mountain river systems that connect with the more interior portions of Canada, such as the Taku or Stikine rivers (Carstensen, Wilson et al. 2003). All except the wood frog, whose range extends north of the Brooks Range, are near the northern extent of their range (Broderson 1994; Carstensen, Wilson et al. 2003). Introduced amphibians include the red-legged frog and the Pacific chorus frog (MacDonald 2003).

Population levels of amphibians appear to have decreased from past years based on anecdotal observations in several areas in southeast, although few surveys have been conducted (Carstensen, Wilson et al. 2003). The health of amphibian populations is a concern due to the declines of these species elsewhere in their range.

Land Birds

Over 450 species of birds have been recorded in Alaska and most of these species migrate through, breed, or are year round residents of the Ring of Fire planning area (Kessel and Gibson 1994; Gibson, Hainl et al. 2005). Birds are a key component of the ecosystem in all parts of the planning area and because many of these species range across several countries during their annual migration, are considered an international resource (Kessel and Gibson 1994).

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula provides important spring and fall staging areas during migration and moderately good nesting and rearing habitat for many species. The sea cliffs, bays and inlets and poorly drained lowlands provide abundant habitat for millions of birds during migration to and from nesting grounds in the Arctic.

Land bird resources of the Alaska Peninsula are dominated by migrant passerines, which nest in the expanses of lowland shrub tundra, wet tundra, forests, and alpine tundra in the mountain regions. Distribution of resident species is dependant on the habitat.

In the Aleutian Chain portion of this region, terrestrial bird species diversity is relatively low with only six bird species nesting west of the eastern Aleutian Chain (USFWS 2005a). Proximity to Asia results in the regular occurrence of Asian migrant passerines on the outer islands (Byrd and Day 1986; Tove 1988; Kessel and Gibson 1994).

The bald eagle is a common resident and breeder of the eastern Aleutians, but has not expanded to the westernmost islands, occurring only east of the Rat Island Group (Kessel and Gibson 1994).

Kodiak Region

Terrestrial birds of the Kodiak Region are generally similar to the adjacent Alaska Peninsula with the exception of Steller's jay, Townsend's warbler, blackpoll warbler, white-crowned sparrow, and Lincoln's sparrow, which are rarely seen on these islands, whereas they are common in similar habitat on the mainland. The bald eagle is the dominant raptor in the Kodiak region and Peale's peregrine falcon is rare in comparison to adjacent mainland areas (MacIntosh 1998).

Southcentral Region

Due to the great diversity of habitat within this region, from the coastal range and temperate rainforest, alpine tundra of the Alaska, Talkeenta, Chugach and Kenai Mountains to interior boreal forest of the upper Susitna River Valley and herbaceous and low shrub tundra of the Kamishak Bay area, terrestrial bird diversity is very high (Kessel and Gibson 1994). Both migrant and resident species include the majority of the terrestrial birds that occur in the State. Many neotropical migrants breed or pass through this region on their way to breeding grounds (NatureServe 2005).

Southeast Region

Land birds of this region are generally common throughout the coastal western hemlock/Sitka spruce forest temperate rainforest and Pacific coastal mountains ecoregion. Many species also use these habitats when they are migrating to breeding areas in northern Alaska. The number of resident species is greater than any other region in the Ring of Fire planning area (Mac, Opler et al. 1998). The Southeast region has a high diversity of raptors, the most prominent being the bald eagle. Bald eagles occur throughout southeast Alaska at its highest densities within their North American range. Very high concentrations occur along the Chilkat River near Haines, the Chilkat Bald Eagle Preserve, in late fall to feed on the abundant spawning salmon. Their nesting habitat is primarily old-growth trees along the coasts of the many bays and exposed shorelines, and within riparian areas along major rivers (Jacobson and Hodges 1999). Parts of the reserve include public lands, and there are demands for eagle viewing opportunities, particularly in Haines during the annual Bald Eagle Festival. High nesting densities of bald eagles and other raptors occur throughout the Ring of Fire planning area.

Waterfowl, Shorebirds, and Seabirds

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula supports a wide variety of waterfowl and other water bird species for breeding, staging for migration, and winter habitat. The Bristol Bay population of tundra swans is of particular interest because suitable habitat for nesting is available earlier than in most other nesting areas of Alaska. It is estimated that 18 percent of the western population of tundra swans breed on the Alaska Peninsula (USFWS 2003). The entire world population of emperor geese, estimated at 70,000 individuals in 2003, migrates through Izembek NWR each spring and fall (USFWS 2004f) (Figure 1.2-2). Most of the world population of Steller's eiders, a BLM

Special Status Species and listed as threatened under the ESA, traverse the Bering Sea from nesting grounds in arctic Alaska and Russia to molt and/or winter on the southern Alaska Peninsula and Izembek NWR. Several areas in this region have been designated by the USFWS as critical habitat for this species (USFWS 2001c) Native-selected lands occur in the Cape Lieskof area, approximately 10 miles northeast of the Izembek/Cold Bay area. A few parcels of Native-selected lands also occur adjacent to the Steller's eider critical habitat northeast of the Izembek Lagoon and north of Cold Bay on the Bering Sea coast (Figure 2.3-9).

The Alaska Peninsula's wetlands from Ugashik Bay to Port Heiden, including lands in the Ring of Fire planning area, are important areas for shorebirds, including marbled godwits, a BLM sensitive species, and rock sandpipers. Kvichak Bay, on the northern portion of the Alaska Peninsula have been recognized as hemispheric migration stopover sites for arctic nesting shorebirds or special interest winter habitat for a large segment of the worldwide populations of species such as rock sandpipers. The large numbers of migrant shorebirds, species diversity, and uniqueness and importance of the site contribute to the attraction of the area for bird watching (Gill Jr. and Handel 1981).

Lesser sandhill cranes of the Pacific Flyway population nest in the lowland habitat of Bristol Bay Region within the Ring of Fire planning area. These birds migrate to Central Valley, California to spend the winter (Petrula and Rothe 2003).

Because of the harsh weather, rugged terrain, and isolated nature of the Aleutian Chain, the diversity of waterfowl is low relative to the Alaska Peninsula. Five species of sea ducks are classified as BLM sensitive species in the Ring of Fire planning area: king eider, harlequin duck, long-tailed duck, black scoter, and surf scoter. Conservation concerns include high susceptibilities to oil pollution in marine environments, adverse interactions with fishing gear and vessels, and habitat effects from climate change.

The populations of the emperor goose and Aleutian Canada goose, a BLM special status species, are concentrated in this region (Eisenhauer and Kirkpatrick 1977; Kessel and Gibson 1994). The Aleutian Canada goose was recently removed from the ESA (Byrd 1998; USFWS 2001b).

The diversity of shorebirds in the Aleutian Chain is also limited. Some Asian migrants stop over on the islands as they make their way south along the western Pacific (Kessel and Gibson 1994).

Seabirds in the Aleutians are one of the most prominent components of the ecosystem. Some 40 million birds are believed to nest in this region. Over 100,000 tufted puffins nest on Kaligagon Island and approximately one million northern fulmars nest on Chugaluk Island (USFWS 2005a).

Kodiak Region

Waterfowl on Kodiak Island include migrant species, resident breeders, and a number of species that use the bays and coastline as winter habitat. Over 26 species of shorebirds regularly breed or pass through this region during migration (MacIntosh 1998).

Seabird colonies in the Kodiak region are generally small, but support a variety of common seabirds. Some of the larger colonies are located in the Barren Islands group between Kodiak and the Kenai Peninsula (Bailey 1976; Sowls, Hatch et al. 1978; MacIntosh 1998).

Southcentral Region

Geese are both migrants and breeders in this region in the Southcentral region and the coastal wetlands, such as the Palmer Hay Flats and the Susitna River, provide important staging areas for several species of geese.

The Southcentral region is a breeding area and wintering area for several species of dabbling ducks and diving ducks. Breeding habitat is primarily associated with the numerous ponds, lakes, and associated wetlands throughout the region. Wintering areas are dependant on the availability of open water, specifically large rivers or marine nearshore habitats in western PWS, outer Kenai Peninsula coast and lower Cook Inlet. Important staging areas for ducks include Trading Bay, Redoubt Bay, and Susitna River Flats in upper Cook Inlet, Palmer Hay Flats in Knik Arm, the Kenai River Flats, and Fox River Flats in Kachemak Bay.

During migration, over 30 species of shorebirds rely on the wetlands and coastal intertidal zone in this region to replenish fat stores. Certain river deltas and mudflats are especially important staging areas during migration. The Fox River Flats near Homer are used by hundreds of thousands to millions of small shorebirds during spring migration and are included in the Western Hemisphere Shorebird Reserve Network (Wright 1994; Western Hemisphere Shorebird Reserve Network 2005). The Pribilof rock sandpiper is the only shorebird species that winters in the Southcentral region where the majority of the population is concentrated in a small area (sometimes as restricted as 2 to 5 kilometers [km] of shoreline) and highly susceptible to perturbation (Gill Jr. and Tibbitts 1999).

The Southcentral region is a migratory stop over and breeding area for a distinct segment of the Pacific flyway population of lesser sandhill crane. Cranes form this populations also breed in the Bristol Bay region. These birds inhabit coastal wetlands of the Susitna River Flats and open bog and meadow habitats in low numbers throughout much of the coastal areas and muskegs with the boreal forest of this region. Wintering areas of Pacific flyway cranes are in the Central Valley, California (Petrula and Rothe 2003).

Seabirds occur throughout the rocky shorelines and islands of the Southcentral region and include all of the same species listed for the Alaska Peninsula, with the exception of crested auklet, whiskered auklet, and red-legged kittiwake. Solitary nesting seabirds include the marbled murrelet, a BLM sensitive species, which nests in old growth forest, and Kittlitz's murrelet, a BLM special status species, which nests at scattered sites located high on recently de-glaciated rocky slopes (Van Pelt and Piatt 2003).

Southeast Region

The Southeast region supports a diversity of waterfowl species both during migration and as a wintering area. This area is within the migration route referred to as the Pacific Flyway for birds making their way from wintering grounds in western North America, Central America, and South America to northern breeding grounds (Selkregg 1974-1976c). Over 20 species of shorebirds also migrate through this region.

Isolated islands and rocky islets on the outer coast of the archipelago provide habitat for nesting seabirds. Major colonies in this region include St. Lazaria Island near Sitka, Forester Island on the outer coast, and North Marble Island in Glacier Bay. Marbled murrelets are one of the more abundant seabirds in southeast Alaska, although it is difficult to determine their nesting density due to the thick forest habitat and their secretive habits (Quinlan and Hughes 1990). Kittlitz's

murrelets are also found in the region, but have more restricted habitat requirements and are concentrated in certain areas such as Glacier Bay.

Terrestrial Mammals

The distribution of mammals within the Ring of Fire planning area has been highly influenced by the retreat of ice sheets after the last glaciation (Mac, Opler et al. 1998). Some areas, such as Kodiak Island, remained isolated and were colonized by only a few terrestrial mammals. Terrestrial mammals never colonized most of the Aleutian chain on their own. However, many terrestrial mammals have been intentionally introduced over the years to support commercial ventures (e.g., fox farming) and as game animals (e.g., Sitka black-tailed deer and Roosevelt elk) (Bailey 1993; MacDonald and Cook 1996).

Alaska Peninsula/Aleutian Chain Region

The largest and most prominent land mammal on the Alaska Peninsula is the brown bear. They range from the northern peninsula, where they exhibit very high natural densities in the Katmai and Kamishak Bay areas, to Unimak Island at the base of the Aleutian chain (ADF&G 1985b). Black bears are not known to occur on the Alaska Peninsula south of Lake Iliamna at the base of the peninsula (Johnson 1994a).

Small mammals, such as voles and lemmings are common along much of the length of the peninsula and Unimak Island, at the base of the Aleutian chain.

The Alaska Peninsula supports three caribou herds: the Mulchatna, northern Peninsula, and southern Peninsula herds. The Mulchatna herd occupies the hills and lowlands of the Mulchatna and Nushigak River drainages west to Lake Iliamna and Lake Clark drainages to western Cook Inlet. The Mulchatna herd (which as ranged between 85,000 to 200,000 animals) moves throughout a geographic area encompassing a half million square miles within several Game Management Units and ranges into the Ring of Fire planning area on the west side of Cook Inlet. The northern peninsula herd occupies northern portions of the Alaska Peninsula, and migrates from spring calving grounds between Ugashik and Port Moller to winter range extending from Port Heiden to the Alagnak River (USFWS 2004g).

Caribou in the Northern Peninsula herd remained stable between 1981 and 2001 at 16,000 to 20,000, but has suffered decline in recent years. Optimal size of the Northern Peninsula herd is considered around 10,000 animals (Valkenburg, Keech et al. 2002). The southern Peninsula herd occupies the central and southwestern end of the peninsula, ranging from Umnak Island to Port Moller (USFWS 2004g).

Caribou in the Southern Peninsula Herd have ranged from 1,000 to 10,200, but are recovering from population lows after the mid-1990s. Optimal size of this herd is considered to be approximately 3,000 animals (Valkenburg, Keech et al. 2002).

Kodiak Region

Terrestrial wildlife in the Kodiak archipelago has been heavily influenced by its isolation from the mainland. Only six species of terrestrial mammals are native to this region; brown bear, red fox, river otter, short-tailed weasel, tundra vole, and little brown bat (USFWS 2004i). Between the 1920s and 1960s, several species of non-native mammals were introduced to increase subsistence and recreational opportunities in the archipelago. Eight species now commonly occur on the Kodiak NWR, including Sitka black-tailed deer, mountain goat, Roosevelt elk,

reindeer, beaver, red squirrel, snowshoe hare, and pine marten (USFWS 2004i). Bison occur on Kodiak Island but are kept as domestic livestock.

Brown bears are the largest predators. In 1993, aerial surveys revealed an estimated 2,842 bears on the island, with about 0.23 bears per square km (or 0.60 bears per square mile) (Barnes Jr., Smith et al. 1995). Black bears are absent from Kodiak Island (Johnson 1994a).

Southcentral Region

Because the Southcentral region spans four ecoregions, it has the highest diversity of terrestrial mammals in the Ring of Fire planning area. Brown bears occur throughout the west side of Cook Inlet, Alaska Range, Talkeetna Range, and Chugach Mountains and on the Kenai Peninsula, including limited areas on the western shores of PWS. Availability of salmon is a key factor in the occurrence of brown bears in coastal areas.

Black bear are well adapted to the coastal forest habitat and the boreal forest of southcentral Alaska, except on some smaller islands in western PWS. The presence of salmon is also a key factor in the occurrence of black bears (Selkregg 1974-1976a).

Sitka black-tailed deer did not occur north of Yakutat until they were introduced into PWS in 1930s and are now in limited areas on the mainland of the Kenai Peninsula (Selkregg 1974-1976a; MacDonald and Cook 1996).

Among the four regions considered in the Ring of Fire planning area, the Southcentral region is the only one with Dall sheep, an important game species. These sheep occur in the mountains of the Kenai, Chugach, and Alaska ranges, and the Talkeetna Mountains (ADF&G 1983). The headwaters of the Alaska Range watershed draining into the Susitna and Cook Inlet from the west support approximately 1,500 to 1,900 sheep. The Chugach Mountain watersheds draining into Cook Inlet provide habitat to 3,500 to 3,700 sheep. The Talkeetna Range supports approximately 1,000 to 1,500 sheep and the Kenai Peninsula area supports 1,500 to 1,800 sheep. In the Alaska Range, areas of important for Dall sheep within BLM-managed lands include Neacola Icefield and Blockade Lake area (located in the Neacola Block, Figure 2.3-3), Knik River valley, Chakachamna Lake area (Figure 2.3-3), and Chilligan River area (Figure 2.3-7).

Mountain goats occupy suitable habitat throughout the higher elevation of western Chugach Mountains, limited areas of the Talkeetna Mountains east of Denali National Park, the Kenai Mountains and south to the outer coast of the Kenai Peninsula. They are absent from the central and western Alaska Range (ADF&G 1985a). The Nelchina Caribou herd is the largest herd that regularly occurs in this region. They range between the upper Copper, Nelchina, and Susitna rivers basins, and reach the western extent of their range in the Talkeetna Mountains and central Alaska Range (Selkregg 1974-1976a; ADF&G 1985a). This herd is intensively managed by ADF&G and the current population is approximately 40,000 animals (Valkenburg and Keech 2002). The northern Alaska Peninsula herd ranges into the Southcentral region in the southwest corner of lower Cook Inlet (ADF&G 1985a).

After a 50-year absence from the Kenai Peninsula, caribou were reintroduced into their original range in the mid-1960s. In 1985 and 1986, 80 additional caribou were released at four sites in the Tustumena Lake and Caribou Hills area to the South (Ernst 2001). The Kenai Peninsula now has a total of five relatively small caribou herds:

- The Kenai Lowland herd ranges between the Kenai gas fields and Kenai airport and migrates east to spend the winter in the Moose River flats or the Funny River area.
- The Kenai Mountain herd ranges in the mountains north of the Sterling Highway and west of the Seward Highway.
- The Twin Lakes, Killey River, and Fox River herds roam areas in the middle Kenai Mountains between Skilak Lake and the Fox River that enters Kachemak Bay.

A subgroup of the Mulchatna caribou herd ranges into Southcentral region in the southern portions of the Alaska Range in the area of the Chilligan River, Naglishlamina River, Chakachamna Lake area, and Neacola Mountains.

Moose are distributed throughout the Cook Inlet basin, the Alaska Range, and the Chugach Range, but are largely absent from PWS with the exception of Kings Bay on the eastern side of the Kenai Peninsula (ADF&G 1985a). Fires generally benefit moose due to the increase in food such as herbaceous plants, shrubs, and saplings in post-fire seral communities, although the benefit is largely based on the intensity of the burn (BLM 2004j).

Southeast Region

More than 30 mammal species are endemic to the Southeast region and 10 more are essentially confined to this region. Several mammals reach the northern extent of their distributional range in this region. The highest diversity of mammals occurs on the mainland and the lowest diversity on the outer islands.

Brown bears are present on the mainland of southeast Alaska and on the islands north of Frederick Sound, including Baranof, Chichagof, and Admiralty Islands (MacDonald and Cook 1996). Brown bears are common on BLM-managed lands in the Haines block at the head of Lynn Canal. They use habitats from sea level to alpine areas throughout southeast Alaska. The late-summer season has been identified as the most critical or limiting period for brown bear. During this season, many brown bears concentrate along low-elevation valley bottoms and salmon streams (USFS 1997; Christensen and Van Dyke 2004). These are often the same areas of highest human use and most intense resource development activities. During this season, brown bears use a variety of habitats, with estuaries and riparian areas having the highest habitat value. Streams and rivers that produce anadromous fish have a higher value for brown bears than resident fish streams (USFS 1997).

Black bears are present throughout the mainland and on the islands south of Frederick Sound (MacDonald and Cook 1999). Black bears are more adept at modifying their behavior in areas affected by humans than brown bears. Sitka black-tailed deer are distributed throughout mainland southeast Alaska and the large islands of the archipelago. The Alexander Archipelago wolf (*Canis lupus ligoni*), an endemic subspecies of gray wolf and the primary predator of Sitka black-tailed deer, are largely confined to the islands south of Fredrick Sound.

Mountain goats live on steep, rocky terrain throughout southeast Alaska in suitable habitat (Johnson 1994b). One population of mountain goats and their habitat in the Haines/Skagway region has been monitored by the AFO. Survey and monitoring data may be used to generate management guidelines and initiate adaptive management for the tourist industry aircraft-supported flightseeing and other activities.

The quantity and quality of winter habitat is the most limiting factor for mountain goats in southeast Alaska. Old-growth trees with large, dense crowns have the highest value because they intercept the most snow and provide understory forage plants. Escape terrain is an important factor in goat habitat and they remain close to escape terrain throughout the year (Schoen and Kirchoff 1982; Fox 1983; Smith 1985).

All moose in the Southeast region resulted from natural migrations down the major river systems from Canada during the early twentieth century, except those at Berners Bay, which were transplanted there in the mid-1960s (MacDonald and Cook 1999). In addition to all drainages in Berners Bay, they occur near the foot of the Taku and Norris glaciers and a few occur in the Cowee/Davies and Eagle/Herbert drainages. On the west side of Lynn Canal, moose from the Chilkat Range population use a number of river drainages in the winter, especially around St. James Bay and the Endicott River. The Chilkat Valley holds the largest number of moose in the Lynn Canal area. Moose habitat in the Southeast region is associated primarily with riparian and post-glacial early-successional vegetation types. In most areas, much of the moose habitat is declining as a result of natural plant succession (USFWS 2003).

In 1987, a small herd of 33 Roosevelt elk were introduced to the Etolin and Zarembo Islands to provide recreational hunting opportunities to residents of the area (Eide 1994; ADF&G 1999). These animals have expanded to nearby areas and now number between approximately 250 to 300 animals (ADF&G 1999).

Marine Mammals

Alaska Peninsula/Aleutian Chain Region

Marine mammals are major wildlife resources within the Alaska Peninsula/Aleutian Chain region; however, the only species that would be expected to come in contact with BLM-managed lands within this ecoregion include:

- pinnipeds: Steller sea lions, harbor seals (rookeries and haulouts on BLM-managed lands) (Figure 2.3-9)
- toothed whales: beluga whales (travels up some rivers within the Ring of Fire planning area)

Critical habitats for the Steller sea lion are designated by NMFS in areas proximate to BLM-managed lands in the Cape Lieskof area (Figure 2.3-9). Although critical habitat designation does not automatically preclude particular activities, it does define areas that are important to ESA-listed species, and activities occurring near these critical habitats should be monitored appropriately.

Kodiak Region

For BLM managed lands, the same marine mammals would occur in the Kodiak region as along the Alaska Peninsula and Aleutian Chain. Steller sea lions, of the western distinct population segment (DPS), are found throughout this region (Calkins 1994) (see Section 3.2.9.3).

Southcentral Region

Harbor seals in this region, belonging to the Gulf of Alaska stock, are one of the most common marine mammals in the Southcentral region, and occur throughout the year in the lower Cook Inlet, west along the Gulf of Alaska coastline and PWS. Harbor seals in this region have suffered precipitous declines in recent years of up to 85 percent since the mid-1970s (Frost, Lowry et al. 1997). Although seals near Kodiak Island have shown signs of recovery since 1994, those on the Kenai Peninsula and in PWS have not (Fadley and Castellini 1996).

Steller sea lions, western DPS, also occur throughout lower Cook Inlet, outer coast of the Kenai Peninsula and the western portions of PWS. The largest Steller sea lion rookery in the region is on the Chiswell Islands, on the outer coast of the Kenai Peninsula (Angliss and Lodge 2004).

The Cook Inlet population of beluga whales occurs in the Cook Inlet and Shelikof Strait region, although a few individuals have been seen from Yakutat Bay to Kodiak Island (Angliss and Lodge 2004). The Cook Inlet population was first listed as a candidate species for the ESA in 1988 (NMFS 1999; NMFS 2000b; NMFS 2000c) (see Section 3.2.9.3).

Sea otters in this region belong to the southcentral Alaska stock. This stock ranges from lower Cook Inlet east to Cape Yakataga, including Kachemak Bay, the Kenai Peninsula coast, and PWS. Although rates of population growth vary among locations, the trend for the southcentral stock is generally increasing (USFWS 2002c).

Southeast Region

Steller sea lions in the Southeast region belong to the eastern DPS, which is listed as threatened under the ESA (see Section 3.2.9.3). In this region, Steller sea lions tend to move seasonally between rookeries on the outer coast of the Gulf of Alaska to more protected waters along inside passages in winter (Calkins and Pitcher 1982). In contrast to the decline of the western DPS during the past 20 years, the eastern DPS has been stable or increasing in most parts of its range (Calkins, McAllister et al. 1999). Harbor seals of the southeast Alaska stock are common throughout the Southeast region and their population is believed to be increasing in most areas of southeast Alaska (Angliss and Lodge 2004).

Sea otters in this region belong to the southeast Alaska stock. The population has increased rapidly since reintroduction and is presently continuing to increase its numbers and expand its range.

3.2.9.3 Special Status Species

Threatened and Endangered Wildlife Species

Federally listed threatened and endangered (T&E) species are those plant and animal species formally listed by the USFWS and NMFS under the authority of the ESA of 1973, as amended. An endangered species is defined as “one in danger of extinction throughout all or a significant portion of its range.” A threatened species is defined as “one likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” In accordance with Section 7(c) of the ESA, BLM has consulted with the USFWS and NMFS to determine which species listed as threatened or endangered under the ESA may be affected by the federal activities proposed in this EIS. A *Biological Assessment* that examines the potential effects of the proposed action on T&E species will be provided with the Record of Decision.

BLM also has responsibilities to implement management plans that conserve candidate species and their habitats and ensure that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed, as stated in BLM’s Policy Manual 6840 (BLM 2001b). BLM is responsible for preparing and maintaining, on a continuing basis, a current inventory of the public land and its resources. This inventory information, along with monitoring data, is used to evaluate the current condition of plants and animals and their habitats on the public land to determine if their status under the ESA should be changed (listed or delisted). For delisted species, BLM shall assess and determine the new status of the delisted species and determine if it should become a BLM sensitive species (BLM 2001b).

The following species were determined by the USFWS and NMFS to be present in the Ring of Fire planning area (Table 3.2-9).

Table 3.2-9. List of Threatened, Endangered, Candidate, and Delisted Species Found in the Ring of Fire Planning Area

Common Name	Scientific Name	Status
REPTILES		
Leatherback Sea Turtle	*Dermochelys coriacea*	E
BIRDS		
Short-tailed Albatross	*Phoebastria albatrus*	E
Steller's Eider	*Polysticta stelleri*	T
Kittlitz's Murrelet	*Brachyramphus brevirostris*	C
Aleutian Canada Goose	*Branta canadensis leucoparaeis*	D
MAMMALS		
Steller Sea Lion (western DPS)	*Eumetopias jubatus*	E
Steller Sea Lion (eastern DPS)		T
Great Whales (blue, fin, sei, bowhead, humpback, northern right, gray, and sperm whales)		E
Beluga Whale (Cook Inlet DPS)	*Delphinapterus leucas*	C
Northern Sea Otter (southwest DPS)	*Enhydra lutris*	T

Notes: C = candidate
D = delisted
DPS = distinct population segment
E = endangered
P = proposed
T = threatened

Reptiles

Leatherback Sea Turtle — Leatherback turtles are the largest of the sea turtles and are widely distributed throughout the world's oceans (Ernst and Barbour 1989). However, their occurrence in Alaskan waters is considered rare and they are typically seen well offshore, therefore would be very unlikely to occur on BLM-managed lands.

Birds

Short-tailed Albatross — The short-tailed albatross is a very large seabird that was almost driven to extinction in the early 1900s by feather hunters on their Japanese breeding colonies. The current population is estimated to be about 1,700 birds and is increasing (NOAA Fisheries 2003). They have been observed in Aleutian Island waters, the Bering Sea, and the Gulf of Alaska in all months of the year. Short-tailed albatross forage for small fish and squid along the edge of the continental shelf and do not come to land anywhere in Alaska (USFWS 2000). Since these birds occur in the offshore waters, it is very unlikely they would be found on BLM-managed lands.

Steller's Eider — Steller's eiders are small sea ducks that spend most of the year in nearshore marine waters, coming to land only to nest. Most of the Pacific population nests on the tundra of northeast Siberia (Solovieva 1997) while a small number nest in Alaska on the Yukon-Kuskokwim Delta (Flint and Herzog 1999) and the arctic coastal plain (USFWS 1999). The Pacific population winters primarily along the Alaska Peninsula, from the eastern Aleutian Chain to southern Cook Inlet (USFWS 2001c). In spring, large numbers concentrate in Bristol Bay before migration. Steller's eiders usually forage on a variety of shellfish and invertebrates within about 1/4 mile (400 meters) of shore in water less than 30 ft (10 meters) deep, but they can also be found in waters well offshore in shallow bays and lagoons or near reefs (USFWS 1997b; USFWS 2001c).

The Alaska-nesting population has decreased substantially since the 1920s (USFWS 1999). There is evidence that molting and wintering populations of Steller's eiders along the Alaska

Peninsula have declined since the 1960s, indicating that the Russian-nesting population of 100,000 to 150,000 birds may also be in decline (Kertell 1991; USFWS 1999). Steller's eiders were listed as threatened under the ESA on June 11, 1997 (62 *Federal Register* [FR] 31748) due to a substantial decrease in its nesting range in Alaska. The USFWS designated critical habitats for Steller's eiders on February 2, 2001 (USFWS 2001c), including breeding habitat on the Yukon-Kuskokwim Delta, and marine waters where concentrations of the birds undergo a flightless molting period in the fall, spend the winter, and stage for migration in the spring. The marine habitat includes three areas on the north side of the Alaska Peninsula that are within the Ring of Fire planning area: Seal Islands, Nelson Lagoon, and Izembek Lagoon. There are several parcels of Native-selected BLM land that are contiguous with the Izembek Lagoon Critical Habitat Area and at least one parcel of BLM land that is contiguous with the Nelson Lagoon Critical Habitat Area. The closest BLM land to the Seal Islands area is 15.7 miles away (25.9 km).

Kittlitz's Murrelet — Kittlitz's murrelets are endemic to the North Pacific Ocean, ranging discontinuously along the coast of Alaska with concentration areas in Glacier Bay, Malaspina Forelands, and PWS (Day, Kuletz et al. 1999). Kittlitz's murrelets nest at scattered sites located high upon recently de-glaciated rocky slopes, which can be far from the water. Because of their remote and cryptic placement, only a few nesting sites have been discovered (Piatt, Naslund et al. 1999). Kittlitz's murrelets forage on small fish in sheltered, nearshore waters that are glacially affected, such as at the heads of glacial rivers or tidal glaciers (Day, Kuletz et al. 1999).

The USFWS published a Notice of Intent (NOI) to consider Kittlitz's murrelet as a candidate for listing under the ESA on May 4, 2004. Recent abundance estimates range from 9,000 to 25,000. The USFWS identified several factors that are likely contributing to the substantial population decline that has been observed since the late 1980s, including glacial retreat due to global warming and oceanic regime shifts. These factors in turn cause habitat loss, decreases in forage fish prey availability, increased adult and juvenile mortality, and poor recruitment (USFWS 2004h). In addition, it is estimated that hundreds of Kittlitz's murrelets are caught annually in the Alaskan gillnet fisheries (Day, Kuletz et al. 1999; Piatt, Naslund et al. 1999).

Aleutian Canada Goose — The Canada goose was recently split into two separate species, Canada goose (*Branta canadensis*) and cackling goose (*Branta hutchinsii*) (American Ornithologists' Union 2004). The Aleutian subspecies was included with the other small-bodied variants into the cackling goose species. However, because all previous documents refer to the "Aleutian Canada goose", this nomenclature will be retained in this document to avoid confusion.

The Aleutian Canada goose is believed to have once nested on many treeless islands from the Alaska Peninsula westward along the Aleutian Chain to Russia and to winter from British Columbia to Mexico. The population was almost exterminated by predation from foxes that were introduced to its nesting islands by fox farmers starting in 1750 and continuing until the 1930s. Recovery efforts were extensive and included removal of foxes from the Aleutian Chain, protection of both nesting and wintering grounds in the NWR system, and reintroduction of Aleutian Canada geese to previous nesting islands. As a result, the population increased from only 790 birds in 1975 to about 37,000 birds in 2001. The species was firmly established on a number of western and central Aleutian Chain, as well as the Semidi Islands. Because it had recovered to the extent that it was no longer considered to be in danger of extinction, the Aleutian Canada goose was delisted from the ESA in March of 2001 (USFWS 2001b). The USFWS has established a five-year monitoring plan on both nesting and wintering grounds in

order to determine whether the species is maintaining the population levels and distribution that allowed it to be classified as recovered. The population on the Semidi Islands has had a very low reproductive rate and will be monitored for longer than five years to address concerns regarding its stability (USFWS 2001a).

Mammals

Steller Sea Lion — The Steller sea lion ranges along the North Pacific Ocean rim from northern Japan to California (Loughlin, Rugh et al. 1984). Mating and pupping occur in rookeries on relatively remote islands, rocks, and reefs. They are not known to migrate, but do disperse widely at times of the year other than the breeding season. In November 1990, NMFS listed Steller sea lions as threatened under the ESA in response to a population decrease of 50 to 60 percent during the previous 10- to 15-year period (55 FR 49204). In 1997, NMFS divided the species into two DPS based on differences in genetics, morphology, and population trends (Bickham, Patton et al. 1996; Loughlin 1997) (62 FR 30772). The western DPS was defined to be those Steller sea lions that occur to the west of 144°W longitude (approximately at Cape Suckling, just east of PWS) westward to Russia and Japan, including the Bering Sea. The eastern DPS was defined to be those Steller sea lions that occur east of 144°W, from southeast Alaska southward to California. The western DPS was listed as endangered while the eastern DPS remained classified as threatened (62 FR 24345).

Critical Habitat for the Steller sea lion was designated in 1993 (50 CFR 226.202). In areas used by the western DPS, it consists of the marine waters within 20 nautical miles (nm) of designated rookeries and haulouts, as well as key foraging areas in the Bogoslof district, Seguam Pass, and Shelikof Strait. It also includes the land within 3,000 ft (0.9 km) of those designated rookeries and haulouts. Critical Habitat around Steller sea lion haulouts on Amak Island, off the Alaska Peninsula, is proximate to BLM-managed lands in the Cape Lieskof area (Figure 3.2-9). In areas used by the eastern DPS, critical habitat consists of the marine waters and land within 3,000 ft (0.9 km) of designated rookeries and haulouts (50 CFR 226.202). Critical Habitat designation does not automatically preclude particular activities, but it defines areas that are important to the continued survival and recovery of ESA-listed species.

Steller sea lions have been effected by a number of anthropogenic factors, many of which will likely continue in the future. After passage of the Marine Mammal Protection Act in 1972, commercial hunting was prohibited, but subsistence hunting by Alaska Natives was allowed. A great deal of effort has been expended on trying to understand the reason(s) for the decline of the western DPS of Steller sea lions. The effects of human-influenced factors as well as natural factors, such as climate change, oceanographic fluctuations, and predation by transient killer whales, have been studied on their own and are increasingly studied as part of complex models.

In contrast to the precipitous decline of the western DPS during the past 20 years, the eastern DPS has been stable or increasing in most parts of its range. Sea lions from the eastern DPS have been subject to many of the same types of anthropogenic factors as the western DPS, but with different intensities. Subsistence hunting by southeast Alaska Natives has focused on harbor seals rather than sea lions and an average of only two sea lions are taken each year (Angliss and Lodge 2004).

Great Whales — There are seven species of baleen whales (blue, fin, sei, bowhead, humpback, northern right, and gray whale) and one toothed whale (sperm whale) that were depleted by commercial whaling and listed as endangered under the ESA in 1973. Because these species spend their entire lives at sea, much of it outside Alaskan waters, and most of the

time they are well away from shore, they have very little potential to be directly affected by BLM land management activities. As a result, this species will not be analyzed as part of the Chapter 4 discussion. For a complete description of the great whales, the reader is referred to the annual Stock Assessment Reports and other NMFS documents (Carretta, Barlow et al. 2001; Angliss and Lodge 2004; NOAA Fisheries 2004b).

Beluga Whale — Five DPS of beluga whales are recognized in Alaskan waters. The Cook Inlet population occurs in the Cook Inlet and Shelikof Strait region, although a few individuals have been seen from Yakutat Bay to Kodiak Island. The Cook Inlet population does not mix with the other stocks at any time of the year and is thus considered to be genetically isolated (Angliss and Lodge 2004). It is the only DPS in Alaska that has been considered for listing under the ESA. The Cook Inlet population was first listed as a candidate species for the ESA in 1988 (53 FR 33516). In 1999, NMFS was petitioned to list the DPS as endangered under the ESA (NMFS 1999). In 2000, NMFS determined that the DPS should be listed as depleted under the Marine Mammal Protection Act (NMFS 2000a), but that it did not warrant listing as threatened or endangered under the ESA (NMFS 2000b). However, this ruling confirmed that NMFS will continue to consider the Cook Inlet beluga DPS to be a candidate species for the ESA.

The Cook Inlet population has declined significantly from an estimated 1,300 whales in 1979 to 349 whales in 1998 (NMFS 2000a). This rapid decline was considered to have been caused by a high rate of subsistence harvests by Alaska Natives (NMFS 2003). In 1999, subsistence harvest of Cook Inlet belugas was halted and then greatly restricted by a co-management agreement between NMFS and the Cook Inlet Marine Mammal Commission (CIMMC), an Alaska Native organization (NMFS and CIMMC 2002). The latest aerial surveys conducted in June of 2004 estimate an abundance of 366 whales (NMFS 2005).

Northern Sea Otter — The USFWS is the federal agency responsible for oversight and management of sea otters and it currently recognizes three DPS in Alaska. The southwest Alaska DPS includes the otters along the Alaska Peninsula and Bristol Bay coasts, from the Barren Islands and Kodiak westward through the Aleutian and Pribilof Islands (USFWS 2004h). The southcentral and southeast Alaska populations have remained stable or increased while the southwest Alaska population has declined dramatically since the 1980s. In August 2005, the USFWS listed the southwest Alaska DPS as threatened under the ESA due to their precipitous decline in numbers. The USFWS did not identify critical habitat at the time of listing because it did not have sufficient information to identify specific physical and biological attributes or specific areas that are essential for the conservation of the population. The USFWS will continue to research critical habitat criteria as it reviews the status of the southwest DPS and may designate critical habitat in the future. Because sea otters spend most all of their time in nearshore waters, they are unlikely to occur on BLM-managed lands.

BLM Sensitive Species

BLM maintains lists of plant and animal species that warrant special attention on BLM lands in each state. The sensitive species designation, for species other than federally listed, proposed, or candidate species, includes native species such as those that:

- Could become endangered in, or extirpated from, a state, or within a significant portion of its distribution in the foreseeable future
- Are under status review by USFWS and/or NMFS

- Are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution;
- are undergoing significant current or predicted downward trends in population or density, such that federally listed, proposed, candidate, or State-listed status may become necessary;
- have typically small and widely dispersed populations;
- are inhabiting ecological refugia, specialized or unique habitats; or
- are State-listed, but which may be better conserved through application of BLM sensitive species status (BLM 2001b).

The following birds and mammals are listed as BLM sensitive species for Alaska and regularly occur in the Ring of Fire planning area (BLM 2004i). Their status in each of the regions is listed in Table 3.2-10.

Table 3.2-10. List of BLM Sensitive Bird and Mammal Species Found in the Ring of Fire Planning Area

Sensitive Species	Southeast	Southcentral	Kodiak	Alaska Peninsula/ Aleutian Chain
BIRDS				
Red-throated loon (*Gavia stellata*)	R	R	R	R
Yellow-billed loon (*Gavia adamsii*)	W	W	W	W
Trumpeter swan (*Cygnus buccinator*)	W	R	-	-
Tule white-fronted goose (*Anser albifrons elgasi*)	M	B	-	-
Brant (*Branta bernicla*)	M	M	M	M
King eider (*Somateria spectabilis*)	-	W	W	W
Harlequin duck (*Histrionicus histrionicus*)	R	R	R	R
Long-tailed duck (*Clangula hyemalis*)	W	R	W	R
Black scoter (*Melanitta nigra*)	R	R	R	R
Surf scoter (*Melanitta perspicillata*)	R	R	R	R
Queen Charlotte goshawk (*Accipiter gentilis laingi*)	R	-	-	-
Marbled godwit (*Limosa fedoa beringiae*)	M	-	-	B
Red knot (*Calidris canutus*)	M	M	-	-
Marbled murrelet (*Brachyramphus marmoratus*)	R	R	R	R
Olive-sided flycatcher (*Contopus cooperi borealis*)	B	B	-	-
Gray-cheeked thrush (*Catharus minimus*)	B	B	B	B
Townsend's warbler (*Dendroica townsendi*)	B	B	-	-
Blackpoll warbler (*Dendroica striata*)	M	B	-	B
McKay's bunting (*Plectrophenax hyperboreus*)	-	-	-	W
MAMMALS				
Canada lynx (*Lynx canadensis*)	R	R	-	R
Harbor seal (*Phoca vitulina concolor*)	R	R	R	R

Notes: Distribution information from Armstrong (1995) and other sources listed in the text.
B – breeding population R – resident species
M – migrates through area W – non-breeding season population

Birds

Red-Throated loon (*Gavia stellata*) — The red-throated loon, a BLM sensitive species, occurs throughout this geographic region. This species breeds throughout Alaska from the Arctic coast south to Vancouver Island. It winters in protected marine waters from the Aleutians south along the coast to Mexico. Red-throated loons nest on the edges of small, shallow lakes and feed mainly on small fishes (Reimchen and Douglas 1984). Individuals may fly up to 12 miles away from its nesting site to forage (Barr, Eberl et al. 2000). There is limited population trend data available, but some local declines have become evident. Surveys during the Alaska-Yukon Waterfowl Breeding Population Survey, 1971-1993, show a 53 percent decline (Groves, Conant et al. 1996).

Yellow-billed loon (*Gavia adamsii*) — This species nests in arctic coastal tundra and winters in protected nearshore marine waters from the eastern Aleutian Chain through southeast Alaska. Migration occurs by following the coastline, generally in between April and May in the spring, and between September and October in fall. The yellow-billed loon is generally found at sea in winter, either alone or in small numbers, feeding primarily on fish. The primary conservation concern centers on the small size of the population, estimated at 1,500 to 3,500 breeding birds in Alaska, but numbers appear to be stable (North 1994).

Trumpeter swan (*Cygnus buccinator*) — Trumpeter swans were once common throughout the northern U.S. and Canada until they were hunted to near extinction during the 19th century. A breeding population was discovered in Alaska in 1954 and the population has steadily increased as a result of conservation programs (Rosenberg and Rothe 1994). The trumpeter swans in Alaska are part of the Pacific Coast population, the largest of three main populations in North America (Matteson, Craven et al. 2003). This population of approximately 15,000 birds typically nests in undisturbed marshy areas adjacent to small lakes in interior and southcentral Alaska. They winter in coastal areas from Cordova south to Washington. Conservation concerns include lead contamination in their feeding habitats from lead shot previously used for hunting and disturbance from high levels of human activity near their nest sites.

Tule white-fronted goose (*Anser albifrons elgasi*) — The tule goose is one of three subspecies of greater white-fronted goose that breeds in Alaska. The breeding area of the tule goose has not been fully defined but appears to be concentrated on the west side of Cook Inlet. The population, estimated at 2,000 to 7,000 birds, winters primarily in the Sacramento Valley of California (Rothe 1994). Conservation concerns include hunting, development activities in breeding and migration staging areas (including the Copper River Delta), and habitat degradation from volcanic activity and climate change (NatureServe 2005).

Brant (*Branta bernicla*) — Brant are closely associated with marine and coastal habitats where they feed on aquatic vegetation. Nesting is primarily on the Yukon-Kuskokwim Delta and the Arctic coast of Alaska, Russia, and Canada. Most of the population forages on eelgrass at Izembek Lagoon and adjacent areas near Cold Bay for several weeks during fall migration before flying non-stop over the Gulf of Alaska to wintering grounds in California and Mexico (Reed, Ward et al. 1998). The spring migration proceeds up the coast of North America through southeast Alaska with staging at major estuaries. Most of the geese also stage at Izembek in the spring before moving north to nesting areas. The population has fluctuated from 110,000 to 185,000 birds since 1960 due to substantial variation in annual productivity (Rothe 1994). Conservation concerns include the loss of eelgrass habitat in staging and wintering areas and hunting pressure. Several parcels of Native-selected lands occur in the Izembek, Cold Bay, and

Cape Lieskof areas, which may not remain under BLM-management protections in the long-term.

Sea Ducks — There are five BLM sensitive species of ducks in the Ring of Fire planning area: king eider, harlequin duck, long-tailed duck, black scoter, and surf scoter. These species are all diving ducks that forage on crustaceans, fishes, and mollusks, mostly in near-shore marine waters from the Aleutians to southeast Alaska during the non-breeding season. King eiders and black scoters nest on tundra in western and northern Alaska. Harlequin ducks breed primarily along swiftly flowing streams throughout the Ring of Fire planning area. Long-tailed ducks and surf scoters nest near bodies of water in both tundra and taiga habitats in most of Alaska except the Southeast region and Aleutian subregion. Most king eiders and long-tailed ducks spend the winter from the Aleutian Chain east to Kodiak while the other species are more common from the Alaska Peninsula east to southeast Alaska. Non-breeding ducks can be found in coastal waters throughout the year. Populations of these species are generally very large worldwide and there is poor trend information except in specific localities where declines have been documented (Goudie, Brault et al. 1994). Conservation concerns include high susceptibilities to oil pollution in marine environments, adverse interactions with fishing gear and vessels, and habitat effects from climate change.

Marbled Godwit (*Limosa fedoa beringiae*) — The marbled godwit breeds mostly in the prairie grasslands of Canada and the U.S., but an isolated subspecies breeds only on the Alaska Peninsula in wetlands from Ugashik Bay to Port Heiden, which is included within the Ring of Fire planning area. This population of 1,000 to 3,000 birds is apparently a Beringian relic from the last ice age (Alaska Shorebird Working Group 2000). Breeding habitat has not been well defined, but appears to be composed of wet bog and meadow vegetation types, rather than the low shrub graminoid habitat that predominates in this region (Mehall-Niswander 1997). Conservation concerns for this subspecies center on its small size and extremely restricted breeding range. Migration stopover sites are not well known, but appear to include the Yakutat Forelands in southeast Alaska (Gratto-Trevor 2000).

Red knot (*Calidris canutus*) — This shorebird migrates between nesting habitat in northern Alaska and wintering grounds from California to South America. Large flocks use coastal habitats in southeast and southcentral Alaska as staging areas during migration, especially the Copper River Delta, where they feed on mollusks and invertebrates. The global population is estimated to be over one million birds with approximately 150,000 nesting in Alaska (Morrison, Gill Jr. et al. 2001). The population trend is unknown. Since this species shows strong fidelity to particular migration stopover sites, habitat preservation is the primary conservation concern in North America.

Marbled murrelet (*Brachyramphus marmoratus*) — Marbled murrelets are found along the Pacific coast of North America from California to the Bering Sea with the largest concentrations in southeast Alaska and Kodiak Island (Piatt and Naslund 1995). This species is listed as threatened under the ESA in Washington, Oregon, and California, but is not listed in Alaska. The preferred nesting habitat of marbled murrelets is low elevation, open canopy, old-growth forests near marine waters (USFS 1997). Marbled murrelets are found in these old-growth stands throughout the year, except for two months in the fall when the birds are flightless and stay at sea. Estimates of marbled murrelet abundance are based on at-sea surveys and total approximately 280,000 birds in Alaska (Piatt and Naslund 1995). Scientists have estimated a four to six percent annual decline in the rangewide population since the 1980s (USFS 1997).

Habitat loss and fragmentation by timber harvests and road building, oil spills, and incidental catch in fishing nets are all conservation concerns (DeGange 1996).

Queen Charlottes Goshawk (*Accipiter gentilis laingi*) — The Queen Charlotte goshawk is the smallest of three subspecies of the northern goshawk. This subspecies is found only in southeast Alaska and coastal British Columbia and is considered nonmigratory. Nest sites most often occur in closed-canopy, old-growth coniferous forests. Current population levels and trends are poorly known, with abundance estimates ranging between 100 to 800 nesting pairs in southeast Alaska (Iverson, Hayward et al. 1996). The USFWS received a petition to list the Queen Charlotte goshawk as endangered under the ESA in 1994, but it has not been listed to date (Kennedy 2003). Human-caused habitat fragmentation through the harvest of timber posses the greatest threat to the subspecies (and McClaren 2003).

Neotropical migrant songbirds — Olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are all songbirds (passerines) that migrate between nesting habitats in the boreal and coastal forests of Alaska and winter from California to South America. All of these species arrive in Alaska in May or early June, forage on insects during the breeding season, and start their southward migrations in August. Gray-cheeked thrush is widespread in the Ring of Fire planning area. Olive-sided flycatcher and Townsend's warbler are mostly found from southeast to central Alaska. Blackpoll warbler is more common in the western mainland parts of the State. Overall population levels for these species are not known, but population trend indices appear to be declining in breeding areas (Sauer, Hines et al. 2004). A major conservation concern for these species is habitat loss in both nesting and wintering areas due to logging, fire suppression, and road building. Pesticide contamination and increased predation as a result of habitat fragmentation are also concerns (Boreal Partners in Flight 1999).

McKay's Bunting (*Plectrophenax hyperboreus*) — McKay's bunting is a small songbird closely related to the more widespread snow bunting, but is known to breed on only two small islands in the Bering Sea. They spend the non-breeding season in small groups along the coast of northwestern Alaska, moving as far south as the Alaska Peninsula with occasional records in southcentral Alaska. No population survey has been attempted, but they are estimated to number only a few thousand birds. The primary conservation concerns are the very small population size and highly restricted breeding range (Lyon and Montgomerie 1995).

Mammals

Canada lynx (*Lynx canadensis*) — Lynx occur throughout mainland Alaska but generally not on marine islands. They inhabit much of Alaska's forested terrain and use a variety of habitats, especially those with early successional growth that favor an abundance of prey. During years when prey is abundant, lynx productivity and survival is high and the population increases. When prey are scarce the population declines substantially. Fire suppression over large areas has limited the amount of early successional habitats available and poorly regulated trapping pressure can quickly decrease local populations (Berrie, Ernest et al. 1994).

Harbor seal (*Phoca vitulina concolor*) — Harbor seals occur in marine waters and estuaries throughout Alaska. Harbor seals are most often found in water, but come onto land to rest, birth, and care for their young (Kinkhart and Pitcher 1994). There are currently three recognized stocks of harbor seals for management purposes, although the stock structure is currently being reviewed in light of new behavioral and genetic information. The southeast Alaska stock was estimated to have about 37,000 seals in 1993 and its numbers have increased since that time. The Gulf of Alaska stock, including animals in the Aleutian Chain, was estimated to have about

29,000 seals in 1996, but there is evidence that there have been significant declines in the population in certain areas compared to historic highs in the 1970s, especially around Kodiak. The Bering Sea stock, including animals on the north side of the Alaska Peninsula, was estimated to be 13,000 seals in 1995 (Angliss and Lodge 2004). Conservation concerns include disturbance at haulout sites, oil pollution in marine waters, subsistence hunting mortality, and adverse interactions with fishing gear.

3.2.10 Vegetation

The vegetation of an area is determined by a number of factors including climate, soils, permafrost, length of growing season, and disturbance from events such as fires, wind, glaciation, rivers, and volcanic eruptions. Three main vegetation communities have been identified in Alaska, including coastal temperate forests, interior forests (taiga or boreal forest), and tundra (Viereck, Dyrness et al. 1992). Unique ecoregions of these vegetation communities are discussed by BLM region as indicated in the summary text below (Gallant, Binnian et al. 1995; Nowacki, Spencer et al. 2001). The following text describes the vegetation communities that comprise these ecosystems, their physical and biological functions, and their general distribution within BLM regions.

All forest types perform basic functions in the global ecosystem: global temperature regulation, carbon storage, production (fixation of solar energy), water cycling, soil stabilization and biodiversity conservation (Perry 1994). These functions will not be discussed in general terms, but rather, there will be a discussion of how each forest community uniquely fulfils these roles in the global ecosystem. Refer to Forest Ecosystems (Perry 1994), or other forest ecology texts for a thorough description of forest functions.

3.2.10.1 Alaska Peninsula/Aleutian Chain Region

- Bristol Bay-Nushagak Lowlands Ecoregion
- Alaska Peninsula Mountains Ecoregion
- Aleutian Islands Ecoregion

Bristol Bay-Nushagak Lowlands Ecoregion

The northern portion of this region is influenced by both maritime and transitional climatic zones, (Nowacki, Spencer et al. 2001) (Figure 3.2-1). Dominant soils include Typic Haplocryands, Fluvaquentic Cryofibrists, Typic Vitricryands, Histic Pergelic Cryaquepts, Pergelic Cryaquepts, and Typic Cryochrepts formed in ash, outwash, and alluvial deposits (McNab and Avers 1994). Open meadows and wetland ecosystems are found in the flat expanses of the Bristol Bay-Nushagak Lowlands ecoregion (Selkregg 1974-1976b; Nowacki, Spencer et al. 2001) (refer to Section 3.2.11). Shrub communities of willow (*Salix* sp.) and alder (*Alnus* sp.) are scattered on the upper slopes, below the dwarf shrub tundra of the alpine area.

Alaska Peninsula Mountains Ecoregion

Alpine tundra communities dominate the mountain ranges of the Alaska Peninsula and Aleutian Chain. The climate influencing these tundra communities is characterized by heavy snow, strong winds, and short-growing seasons (Brewer 1994). Permafrost is generally continuous on north-facing slopes, but discontinuous on south facing slopes (Bailey 1995). On the Alaska Peninsula, Typic Haplocryands and Typic Vitricryands formed from glacial deposits and volcanic ash are the dominant soils (McNab and Avers 1994). Naturally occurring disturbances in alpine tundra result from wind, glaciation, avalanches, landslides, and soil or vegetation disturbance from burrowing or grazing mammals, respectively (Brewer 1994).

Alpine tundra communities are typically dominated by grasses (*Poa*, *Arctagrostis*, or *Festuca* spp.), sedges (*Carex* spp.), and forbs, such as mountain avens (*Dryas* spp.), cinquefoil (*Potentilla* spp.), lousewort (*Pedicularis* spp.), heather (*Cassiope* spp.), anemones (*Anemone*

sp.), and saxifrages (*Saxifraga* spp.). Low shrubs include crowberry (*Empetrum nigrum*), Labrador tea (*Ledum* spp.), blueberry, low-bush cranberry (*Vaccinium vitis-idaea*), bearberry (*Arctostaphylos* sp.), and dwarf birch (*Betula* sp.) and willow species (*Salix* sp.). Lichens are common throughout the alpine tundra communities (Selkregg 1974-1976a; Viereck, Dyrness et al. 1992).

Alpine tundra communities maintain streamflow, although natural disturbances can alter the water quality through increased sedimentation. Alpine tundra also functions as flood control; as the snow melts over a longer period in the higher elevations (Brewer 1994). Mountain goats, Dall sheep, caribou, pikas, arctic ground squirrels, and ptarmigans have all adapted to and inhabit the alpine tundra ecosystem (Brewer 1994; ADF&G 2004b). Between one and five amphibian; 36 and 67 butterfly; 33 and 50 mammal; 118 and 162 bird; zero and 12 conifer; three and 12 tree; and 538 and 792 vascular plant species are found within alpine, moist, and wet tundra communities of the Southcentral, Southeast and Kodiak regions (Ricketts, Dinerstein et al. 1999).

Aleutian Islands Ecoregion

Only three butterfly, five mammal, 100 bird, one tree (technically dwarf tree or shrub species), and 388 vascular plant species are found throughout the Aleutian Chain. There are no coniferous trees found in this region (Ricketts, Dinerstein et al. 1999). Species diversity within the Aleutian Chain region is affected by the distance of the islands from the mainland and the area available for habitat. As the area of an island decreases and/or its distance from the mainland increases, its species diversity tends to decrease due to the saturation of species (small area of habitat) and/or inefficiency at replacing lost species (distance from mainland). The same number of species would not be expected on each island, rather, a decrease in species diversity would be expected moving along the Aleutian Chain (MacArthur and Wilson 1967). Furthermore, species diversity tends to decrease as elevation increases; thus fewer species would be expected in the alpine tundra communities relative to the lowland wet or moist tundra communities (Merriam 1898).

The Aleutian Chain islands are influenced by the maritime climate of heavy precipitation, cool summers, and warm winters, which provides for occasional pockets of coastal temperate forests in the northeastern extent (Viereck, Dyrness et al. 1992). The main natural disturbance to vegetation in this ecoregion is from ocean-spawned storms with high winds and heavy rains (McNab and Avers 1994). Typic Haplocryands and Typic Vitricryands are the dominant soil types formed from volcanic ash (McNab and Avers 1994), and permafrost is generally absent (Bailey 1995). The Aleutian Chain islands are generally dominated by oceanic meadow-heath (tundra) communities, otherwise known as ericaceous shrub communities (Viereck, Dyrness et al. 1992; Bailey 1995; Nowacki and Brock 1995). Common ericaceous species include Labrador tea (*Ledum palustre*), blueberry, low bush cranberry, crowberry, and bog rosemary *(Andromeda polifolia*).

Alpine tundra communities consisting largely of lichens are found on mountain slopes and ridges, high plateau-valleys, and low plateau slopes (McNab and Avers 1994) (refer to the Alaska Peninsula Mountains Ecoregion discussion above). Grass and sedge communities dominated by beach ryegrass (*Leymus arenarius*), hairgrass (*Deschampsia* sp.), fescue (*Festuca* sp.), alkali grass (*Puccinellia* sp.), and sedges, align much of the Aleutian Island coast (Selkregg 1974-1976b) (Figure 3.2-2).

The Aleutian shield fern is a federally listed endangered species (*Polystichum aleuticum*) and is found on Adak Island (USGS 2005) (refer to Section 3.2.10.5). Its preferred habitat includes cliffs and rock outcrops on east facing volcanic slopes from 1,200 to 1,725 ft in elevation. It is found in protected gullies, grottos, and on ledges, associated with the species *Carex macrochaeta, Salix rotundifolia, Anemone narcissiflora* and *Arnica unalaschensis* (Lipkin and Murray 1997).

3.2.10.2 Kodiak Region

- Alaska Peninsula Mountain Ecoregion
- Coastal Western Hemlock/Sitka Spruce Ecoregion

The maritime climate of heavy precipitation, cool summers, and warm winters (Selkregg 1974-1976c) provides for the well-developed coastal forests of Sitka spruce in the northeastern part of the Kodiak Archipelago. Main vegetation disturbance occurs from intense ocean-spawned storms (McNab and Avers 1994). Upland tundra ecosystems consisting of meadow-heath communities, similar to the Aleutian Chain with dense shrub and ground cover, are generally found on the mountainous slopes (Gallant, Binnian et al. 1995; Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004) and western portions of Kodiak Island (McNab and Avers 1994). Typic Haplocryands and Typic Vitricryands soil types formed from glacial deposits and volcanic ash from the 1912 eruption of Mount Katmai and Novarupta support the meadow-heath vegetation (McNab and Avers 1994).

The southwestern portion of Kodiak Island, lower Aliulik Peninsula, and the Trinity Islands were not glaciated like the rest of the region, therefore the vegetation communities in these areas are unique to the archipelago. Many of the species found in these areas are similar to those found in the Alaskan Arctic tundra ecosystem (Viereck, Dyrness et al. 1992; Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004). The coastline of the archipelago is mostly exposed bedrock, with occasional rocky seacliffs. Extensive gravel beaches and tide flat complexes are found along the Trinity Islands (Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004).

Alaska Peninsula Mountains Ecoregion

The alpine tundra vegetation communities that form the Alaska Peninsula Mountains Ecoregion, located in part in the Kodiak region, are described in Section 3.2.10.1.

Coastal Western Hemlock/Sitka Spruce Forest Ecoregion

The coastal western hemlock/Sitka spruce forests of the Kodiak region occur on the northeastern tip of the archipelago. Refer to Section 3.2.10.4 for a detailed description of the vegetation communities that form this ecoregion.

3.2.10.3 Southcentral Region

- Cook Inlet Ecoregion
- Alaska Range Ecoregion
- Coastal Western Hemlock/Sitka Spruce Forest Ecoregion
- Pacific Coastal Mountains Ecoregion

The vegetation in the Southcentral region is influenced by three climate zones: the coast adjacent to the Gulf of Alaska is generally maritime, while the coast adjacent to Cook Inlet is within a transitional climate zone, fluctuating between maritime climates to more extreme, continental conditions (Selkregg 1974-1976a). Interior regions are influenced by continental climate zones, which have extreme summer and winter temperatures and light precipitation (Selkregg 1974-1976c). The influence of climate and topography, allows for bands of coastal temperate forest ecosystems along the Gulf of Alaska coast, transitioning inland to taiga or boreal forest ecosystems (Selkregg 1974-1976c; Viereck, Dyrness et al. 1992; Gallant, Binnian et al. 1995; Nowacki, Spencer et al. 2001). The gentle slopes and the influence from both maritime and continental climates in the Cook Inlet basin support expansive wetland ecosystems (Nowacki, Spencer et al. 2001). All the mountain ranges in Alaska, including the Chugach, Kenai, Talkeetna, and Alaska mountain ranges of southcentral Alaska support upland tundra communities (Viereck and Little 1972; Nowacki, Spencer et al. 2001). Rocky shorelines are found along the western Gulf of Alaska coasts, gravel and sandy beaches along the eastern coasts, and extensive mudflats on the Cook Inlet estuarine embayment complex (Selkregg 1974-1976a) (Figure 3.2-2).

Cook Inlet Ecoregion

Spruce-hardwood communities, interspersed with brush/shrub, meadow, and wetland communities, dominate taiga or boreal forest ecosystems of the Cook Inlet ecoregion. These communities are influenced by a transitional or continental climate, with light precipitation, heavy snowfall and more extreme temperature changes between seasons than maritime climates. The main naturally occurring mechanisms for disturbance in boreal forest communities are fire, spruce bark beetle infestations (Brewer 1994), and flooding in the lowlands (McNab and Avers 1994). Up to 80 percent of mature spruce in individual stands in the Cook Inlet region have been infested by the spruce bark beetle (Ricketts, Dinerstein et al. 1999). Dominant soil types in the upland boreal forests are generally Aquepts formed in clayey to silty glaciolacustrine sediments over gravelly glacial drift. The lowlands consist of more diverse soil types, including Haplocryands, Andic Haplocryands, Andic Humicryods, Sphagnic Borofibrists, Terric Borosaprists, and Typic Borohemists (McNab and Avers 1994). Permafrost is present in the northern reaches, however, the permafrost is either discontinuous or non-existent within most of the BLM regions (Selkregg 1974-1976a). Large tracts of boreal forest are found within the Cook Inlet basin (Selkregg 1974-1976a; Ricketts, Dinerstein et al. 1999; Nowacki, Spencer et al. 2001).

Spruce-hardwood forests are dominated by white spruce (*Picea glauca*), black spruce (*Picea mariana*), paper birch (*Betula papyrifera*), balsam popular (*Populus balsamifera*), and quaking aspen (*Populus tremuloides*) in the overstory; and willow, alder (*Alnus* spp.), crowberry, Labrador-tea, prickly rose (*Rosa acicularis*), low-bush cranberry, and high-bush cranberry (*Viburnum edule*) in the shrub layer (Viereck and Little 1972). The herbaceous layer consists of horsetail (*Equisetum* spp.), dwarf dogwood, fireweed (*Epilobeum angustifolium*), twinflower (*Linnaea borealis*), wintergreen (*Pyrola* spp.), blue-joint grass (*Calamagrostis canadensis*), club moss (*Lycopodium* spp.), and feather moss (*Bryopsida* spp.) (Viereck, Dyrness et al. 1992). Two conifer, between seven and 10 deciduous, and between 510 and 738 vascular plant species are found in the Alaskan boreal forest communities (Ricketts, Dinerstein et al. 1999).

Brush or shrub communities found interspersed among the boreal/taiga forests, consist of many of the same species that are found in the shrub and herbaceous layers of the spruce-hardwood communities. The shrub layer is generally dominated by alder, willow, devilsclub, blueberry,

Alaska spirea (*Spiraea beauverdiana*), and prickly rose, with an herbaceous layer dominated by blue-joint grass, fireweed, and horsetail (Viereck, Dyrness et al. 1992).

Graminoid herbaceous communities are dominated by grass-like plants. Stands of beach ryegrass are generally found along the coast between the beach and forest (refer to Section 3.2.11). Hair grass and blue-joint grass meadows are common farther inland. Forb herbaceous communities are found on well-drained sites, and are dominated by such species as angelica (*Angelica* spp.), lupine (*Lupinus* spp.), wormwood or sagewort (*Artemisia* spp.), peas (*Lathyrus* spp.), anemones, larkspur (*Delphinium* spp.), monkshood (*Actonitum delphinifolium*), cow parsnip (*Heracleum lanatum*), fireweed, and ferns (Viereck, Dyrness et al. 1992). Herbaceous meadows provide cover for large mammals while resting, and are utilized by insectivorous birds as “hawking” grounds (Selkregg 1974-1976a).

The Cook Inlet Basin taiga is considered a “nationally important” biologically distinctive region of North America (Ricketts, Dinerstein et al. 1999). These forests provide important wildlife habitat to moose (*Alces alces*), small mammals, and nesting sites for chickadees and birds of prey, such as northern goshawk, northern hawk owl, boreal owl, and great gray owls (ADF&G 2004b). Shrub communities are very important as songbird nesting habitats (Kessel 1998). Healthy forests help to protect biodiversity: 166 bird, 40 butterfly, 34 mammal, one snail, and one amphibian species occur in the Alaskan boreal forests (Ricketts, Dinerstein et al. 1999).

Alaska Range Ecoregion

The steep, rugged mountains of the Alaska Range are sparsely vegetated or unvegetated in a substantial portion of its area. Where vegetation does exist, alpine and moist tundra communities dominate. Shallow soil types including Aquepts, Orthents, Umbrepts, and Ochrepts are present, but much of the area lacks soil. Snow avalanches are the main disturbance type in this ecoregion (McNab and Avers 1994).

Coastal Western Hemlock/Sitka Spruce Forest Ecoregion

The coastal western hemlock/Sitka spruce forests of the Southcentral region extend along the Gulf of Alaska coast up to the southern tip of the Cook Inlet. Refer to Section 3.2.10.4 for a detailed description of the vegetation communities that form this ecoregion.

Pacific Coastal Mountains Ecoregion

The Pacific Coastal Mountains ecoregion located in part in the eastern extent of the Southcentral region consists of the Chugach, and Kenai mountain ranges. Icefields, glaciers, and bare rock cover approximately 70 percent of these mountain ranges, with mostly Inceptisol soil types in the remaining area. Timberline is generally low, forming around 1,000 to 2,000 ft near PWS, but can be as low as 500 ft. Where soil has accumulated, alpine tundra communities form (McNab and Avers 1994).

3.2.10.4 Southeast Region

- Coastal Western Hemlock/Sitka Spruce Forest Ecoregion
- Pacific Coastal Mountain Ranges

Southeast Alaska covers over 42,000 square miles (Selkregg 1974-1976c) and is differentiated from other regions in Alaska by its high annual rainfall and relatively high species diversity. The

Southeast region lies within a maritime climate zone characterized by heavy precipitation, cool summers, and warm winters (Selkregg 1974-1976c). Ecosystem vegetation studies generally divide southeast into coastal temperate forest and alpine tundra ecosystems (Viereck and Little 1972; Viereck, Dyrness et al. 1992; Bailey 1995; Gallant, Binnian et al. 1995; Nowacki and Brock 1995; Nowacki, Spencer et al. 2001). Grass-sedge meadows are found adjacent to the coasts, separating the beachline from the coastal temperate forests (Selkregg 1974-1976c) (Figure 3.2-2). Forested wetlands and expansive muskegs are interspersed among the lowlands and benches of this region (Mac, Opler et al. 1998).

Coastal Western Hemlock/Sitka Spruce Forest Ecoregion

The northern coastal forests of Alaska comprise more than one-fourth of the world's coastal temperate rainforests (Ricketts, Dinerstein et al. 1999). The vegetation is influenced by the maritime climate, with 3.33 to 16.67 feet (40 to 200 inches) of precipitation annually, depending on location (Alaska.com and Anchorage Daily News 2004). The major naturally occurring mechanisms for vegetation disturbance are wind (blow-downs), landslides, avalanches, floods, and glaciation (Ricketts, Dinerstein et al. 1999). Coastal Sitka spruce/western hemlock forests dominate the Southeast Alaska BLM region, and extend along the Gulf of Alaska coast up to the southern tip of Cook Inlet within the Southcentral region (Selkregg 1974-1976a; Nowacki, Spencer et al. 2001). These forests are distributed from sea level up to timberline at 2,000 to 3,000 ft. The dominant soils are Spodosols (Bailey 1995). Permafrost is not present (Selkregg 1974-1976c).

The tree layer of the coastal temperate forest community is dominated by Sitka spruce and western hemlock, although Sitka spruce becomes more dominant as these forests progress westward along the coast. Mountain hemlock and Alaska cedar can also be found interspersed, although Alaska cedar is not found west of PWS. Sitka spruce, western hemlock and Alaska cedar are all utilized by the forest products industry (Selkregg 1974-1976c). Red alder is common along streams, beach fringes, and disturbed soils; and black cottonwood is typically found on floodplains and deglaciated areas (Viereck and Little 1972). The shrub layer is dominated by rusty menziesia, blueberry, salmonberry, and devilsclub (Viereck and Little 1972; Viereck, Dyrness et al. 1992). Common plants found in the herbaceous layer include oak fern, wood fern, spleenwort-leaved goldthread, dwarf dogwood, trailing raspberry, false lily-of-the-valley, skunk cabbage, coolwort or foamflower, twisted stalk, and Sphagnum mosses (Viereck, Dyrness et al. 1992). Eight coniferous, 14 deciduous, and approximately 615 vascular plant species have been recorded in the coastal spruce-hemlock forest communities of Alaska (Ricketts, Dinerstein et al. 1999).

These coastal Sitka spruce-western hemlock forests are considered to be one of the "globally outstanding" biologically distinctive ecoregions of North America (Ricketts, Dinerstein et al. 1999). This rating is based upon the size (estimated at 15,047,000 acres), capacity of the forest to store carbon, and importance in providing fish and wildlife habitat (Ricketts, Dinerstein et al. 1999). The conservation of this ecosystem is considered essential to preserving the biological diversity of the associated components and ecological processes (USFS 2003a). Mature coastal forests serve as habitat for a number of mammals and birds. Ricketts *et al.* (1999) report 166 bird, 44 mammal, 36 butterfly, 10 snail, four amphibian, and one reptile species occupying the coastal temperate forests of Alaska. Sitka black-tailed deer and mountain goats use these forests as wintering habitat, while black bears are found in the forests year-round. Brown bears occasionally utilize the coastal forests, however, they are more often found in the alpine tundra or coastal marshes. Small mammals depend on the forests for food and shelter. Several bird

species either build their nests in the heart of the forests, or along the forest edge. The largest and one of the most locally abundant nesters in the coastal forests is the bald eagle. Bald eagles generally rely on older Sitka spruce, ideally located within 200 yards of salt water or rivers (Selkregg 1974-1976c).

Pacific Coastal Mountains Ecoregion

The Pacific Coastal Mountains ecoregion located in part in the Southeast region consists of the Coast and St. Elias mountain ranges. Icefields, glaciers, and bare rock cover approximately 70 percent of these mountain ranges, with mostly Inceptisol soil types in the remaining area. Timberline is generally low, forming around 1,000 to 2,000 ft near PWS, but can be as low as 500 ft. Where soil has accumulated, alpine tundra communities form (McNab and Avers 1994).

3.2.10.5 BLM Special Status Plants

Threatened and Endangered Plant Species

There is only one plant species listed under the ESA in Alaska. The Aleutian shield fern (*Polystichum aleuticum*) is listed as endangered, meaning that the species "is in danger of extinction throughout all or a significant portion of its range."

Aleutian Shield Fern (Polystichum aleuticum)

The Aleutian shield fern is a small non-flowering plant that is currently only known to exist on Adak Island on cliffs and rock outcrops of east-facing volcanic slopes (Lipkin and Murray 1997). Its preferred habitat includes cliffs and rock outcrops on east facing volcanic slopes from 1,200 to 1,725 ft in elevation. It is found in protected gullies, grottos, and on ledges, associated with the species *Carex macrochaeta, Salix rotundifolia, Anemone narcissiflora,* and *Arnica unalaschensis* (Lipkin and Murray 1997). Because it occurs in very low numbers and in a highly restricted and unstable area, the danger of extinction related to natural disturbances is very high. The USFWS has decided not to designate critical habitats for the species because publication of detailed maps where specimens have been found would only increase the threat of unauthorized collectors effecting the population. All known sites are located on NWR lands and are protected from development or other potentially adverse activities. Spores have been collected from wild ferns and have been successfully cultivated in the botanical greenhouses at the University of Alaska in Fairbanks, where a research population is maintained (USGS 2004e)

BLM Sensitive Plants

Rare and sensitive plants of Alaska have been described by the ANHP in cooperation with the USFWS, BLM, NPS, and USFS. From the ANHP list, BLM has designated sensitive plant species that are known or suspected to occur in the Ring of Fire planning area, indicated in Table 3.2-11. Rare and sensitive plants are generally assigned a status code by The Nature Conservancy and an international network of Natural Heritage Programs and Conservation Data Centers (Lipkin and Murray 1997).

Rare and Sensitive Plants Status Codes

Global Rank:

- G1: Critically imperiled globally because of extreme rarity (<5 occurrences or few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (critically endangered throughout its range).
- G2: Imperiled globally because of rarity (6-20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range (endangered throughout its range).
- G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (21 to 100 occurrences) (threatened throughout its range).
- G4: Widespread and apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- T#: Global rank of the described subspecies.
- G#G#: Global rank of species uncertain, best described as a range between the two ranks.
- G3Q: Indicates some uncertainty about taxonomic status that might affect global rank.

State Rank:

- S1: Critically imperiled in state because of extreme rarity (<5 occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (critically endangered throughout in state).
- S2: Imperiled in state because of rarity (6-20 occurrences), or because of other factors making it very vulnerable to extirpation from the state.
- S3: Rare or uncommon in the state (21-100 occurrences).

Table 3.2-11. BLM Sensitive Plants and their Associated BLM Regions

Common Name	Scientific Name	Status	Ecosystem	BLM Region
Aleutian wormwood	*Artemisia aleutica*	G1/S1	Alpine tundra: windswept, gravelly fellfields from 700-1,200 ft elevation	Alaska Peninsula/Aleutian Chain: Kiska and Rat Islands
Purple wormwood	*Artemisia globularia var. lutea*	G4T1/S1	Alpine tundra: moist, windswept, acidic tundra on gravelly or sandy sites; granitic fellfields; mountain sides or hillsides from 50 to at least 500 ft elevation	Southcentral: Seward Peninsula
Upswept moonwort	*Botrychium ascendens*	G3/S1	Herbaceous meadows: mesic meadows and sandy sites near sea level	All regions: Sea level in Alaska
Sessile-leaved scurvy grass	*Cochlearia sessilifolia*	G1G2Q/S1S2	Sparsely vegetated: gravel bars in the intertidal zone, submersed at high tide	Kodiak: Kodiak and Sitkalidak Islands
Aleutian whitlow-grass	*Draba aleutica*	G2G3/S2	Sparsely vegetated/alpine tundra: gravely alpine sites and solifluction areas	Alaska Peninsula and Aleutian Chain: Aleutian and Pribilof Islands; Commander Islands (Russia)
Tundra whitlow-grass	*Draba kananaskis*	G1Q/S1	Sparsely vegetated: rocky alpine slopes, approximately 3,700 ft elevation	Southcentral: Hope on the Kenai Peninsula; southwest Alberta (Canada)
Calder's lovage	*Ligusticum calderi*	G3/S1	Alpine tundra: limestone, wet to moist alpine and subalpine near rocky habitats, 1,900-2,100 ft elevation	Kodiak and Southeast: Kodiak Island, Dall Island and southern Prince of Wales Island; Queen Charlotte Islands and northern Vancouver Island (Canada)
Aleutian shield-fern	*Polystichum aleuticum*	G1/S1 Endangered	Sparsely vegetated: cliffs and rock outcrops on east-facing volcanic slopes, 1,200-1,725 ft elevation; protected gullies, grottos, and on ledges	Alaska Peninsula/Aleutian Chain: Adak and Atka Islands
Smooth-fruited netleaf willow	*Salix reticulata spp. glabellicarpa*	G5T2/S1	Alpine tundra: in wet depression, alder thickets, mossy ravines, cliff and rock ledges from 2,000 to 3,000 ft elevations	Southeast: near Juneau; Queen Charlotte Islands (Canada)
Aleutian saxifrage	*Saxifraga aleutica*	G2G3/S2S3	Sparsely vegetated/alpine tundra: windswept ridges and summits, in fine and coarse screes to 2,000 ft elevation; prostrate shrub-herbaceous tundra	Alaska Peninsula and Aleutian Chain: central and western Aleutian Chain
Queen Charlotte butterweed	*Senecio moresbiensis*	G3/S2	Alpine tundra/sparsely vegetated: alpine and subalpine with open, rocky, or boggy slopes, grassy talus slopes, or rocky heathers from 700-2,500 ft elevation, usually on limestone	Southeast: Coronation, Heceta, and Dall islands and southern Prince of Wales Island; Queen Charlotte Islands and northern Vancouver Island (Canada)

Source: Lipkin and Murray (1997)

3.2.11 Wetlands-Riparian

3.2.11.1 Management

In 33 CFR§328.3(a), wetlands and riparian areas are considered jurisdictional waters of the U.S. regulated by the USACE. The complete definition of waters of the U.S. is as follows:

1. all waters that are currently used, or were included in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. all interstate waters including interstate wetlands;
3. all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    - which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    - from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    - which are used or could be used for industrial purpose by industries in interstate commerce;
    - all impoundments of waters otherwise defined as waters of the U.S. under the definition;
    - tributaries of waters identified in paragraphs (a)(1)-(4) of this section;
    - the territorial seas; and
    - wetlands adjacent to waters (other than waters that are themselves wetlands) as described above.

Wetlands are defined as a subset of U.S. jurisdictional waters in Part 3 of the above definition. The USACE provides an additional description of wetlands:

> "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

In the late 1970s and early 1980s, the National Wetland Inventory of the USFWS began mapping the wetlands of Alaska using aerial photography. These maps utilize the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin Classification System) (Cowardin, Carter et al. 1979) to classify the different types of wetlands and other waters of the U.S.

According to the USACE and the Cowardin Classification System, wetlands include palustrine emergent, scrub-shrub, forested wetlands, and estuarine emergent wetlands. Other waters of the U.S. include palustrine aquatic beds and open water habitats, lacustrine habitats, riverine habitats, and other estuarine intertidal habitats.

Palustrine wetlands are nontidal wetlands with vegetation dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens, or wetlands that lack such vegetation and are less than 20 acres, have less than 0.5 percent salinity and have less than 6.6 ft of water at low water (Cowardin, Carter et al. 1979).

The lacustrine system includes waters that are greater than 6.6 ft deep and 20 acres in size, but with ocean-derived salinity less than 0.5 percent. Also, trees, shrubs, persistent emergents, emergent mosses, or lichens have less than 30 percent coverage. These are permanently flooded lakes, reservoirs, and tidal lakes (Cowardin, Carter et al. 1979).

The riverine system includes all habitat contained within a channel, except where ocean-derived salts exceed 0.5 percent, or wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses, or lichens (Cowardin, Carter et al. 1979). There are four main subclasses of the riverine system: tidal, lower perennial, upper perennial, and intermittent (Cowardin, Carter et al. 1979).

- The tidally influenced lower waters of rivers and streams fall into the tidal subclass. This portion of the river or stream generally consists of mud substrates and typically has a well-developed floodplain (Cowardin, Carter et al. 1979).
- Lower perennial rivers have low gradients and slow water velocity with no tidal influence. The substrate generally consists of sand or mud (Cowardin, Carter et al. 1979).
- Upper perennial rivers have high gradients and fast moving waters, with substrates of rock, cobbles, or gravel (Cowardin, Carter et al. 1979).
- Intermittent streams do not flow year-round (Cowardin, Carter et al. 1979).

Tidal and lower perennial rivers more commonly support suitable fish habitat rather than upper perennial or intermittent rivers and streams. For more information on the anadromous streams that occur in the geographic area, refer to Section 3.2.8.

Estuarine systems include the intertidal and subtidal subclasses. The substrate of intertidal habitats is periodically exposed by the tides, and includes the splash zone. Tidal habitats and adjacent tidal wetlands, extending to the seaward limit of emergent vegetation and/or upstream to where the ocean-derived salts measure less than 0.5 percent during low flow periods are included in the intertidal subclass (Cowardin, Carter et al. 1979).

Estuarine subtidal and marine waters are continuously submerged (Cowardin, Carter et al. 1979). The marine biota supported by these waters is described in Sections 3.2.8 and 3.2.9.

3.2.11.2 Alaska Peninsula/Aleutian Chain Region

- Bristol Bay-Nushagak Lowlands Ecoregion
- Alaska Peninsula Mountains Ecoregion
- Aleutian Islands Ecoregion

<u>Bristol Bay-Nushagak Lowlands Ecoregion</u>

This region is dominated by moist and wet tundra, which supports palustrine emergent (grass-sedge) wetlands. Wet tundra is confined primarily around the areas of Ugashik Bay, Port Heiden, and Port Moller. The moist tundra of the Alaska Peninsula is largely found outside of the

BLM regional boundary, northwest of the Becharof and Egegik River drainages (Selkregg 1974-1976b). The vegetation in these areas is influenced by the cool maritime weather generated by the Bering Sea (Mac, Opler et al. 1998).

Palustrine emergent wetlands are mostly associated with groundwater seeps or muskeg and bog communities, some of which are extensive. Emergent and scrub-shrub wetlands may also be identified as moist or wet tundra communities (Viereck, Dyrness et al. 1992). Emergent wetlands are often components of larger wetland complexes of aquatic bed/open water features or scrub-shrub wetlands. Emergent wetland vegetation is dominated by a variety of species, including several sedges, cottongrasses (*Eriophorum* spp.), bulrush (*Scirpus* spp.), horsetail (*Equisetum* spp.), buckbean (*Menyanthes trifoliata*), mare's-tail (*Hippuris vulgaris*), marsh marigold (*Caltha palustris*), bog orchid (*Platanthera dilatata*), and in bog environments, sphagnum mosses (*Sphagnum* sp.). These communities typically have a low shrub component of cloudberry (*Rubus chamaemorus*), marsh cinquefoil (*Comarum palustre*), blueberry, low-bush cranberry, bog cranberry (*Vaccinium oxycoccus*), and Labrador tea (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c).

Palustrine emergent wetlands are generally rated as having high groundwater recharge functions, as saturated soils may conduct water downward into the groundwater system. However, this rating is dependent upon the location of the wetland in the watershed (Adamus Resources Assessment Inc. 1987). The groundwater discharge and lateral flow function rating is also dependent upon the location, with wetlands near a surface water outlet generally being more effective. Emergent wetlands adjacent to streams and rivers may reduce erosion, provide storage during floods, and reduce turbidity (Adamus Resources Assessment Inc. 1987). Wildlife habitat value in these wetlands varies, depending upon the type of vegetation and habitat structure available. Larger areas provide habitat for waterfowl and shorebirds during the summer. The wetter habitats are an important nesting ground of the trumpeter swan (Selkregg 1974-1976a). Muskegs also offer an important feeding habitat for the little brown bat (*Myotis lucifugus*) (Selkregg 1974-1976c).

The riverine system of the Chignik River provides important habitat to all five species of salmon, steelhead, and Dolly Varden. Two large stocks of sockeye salmon spawn from Chignik Lake and Black Lake (Selkregg 1974-1976a). The Egegik and Ugashik rivers also support sockeye, chum, pink, and coho salmon, Arctic char, Dolly Varden, northern pike, and Arctic grayling. The rivers on the Aleutian Chain are shorter, and support fewer species; the common species are chum salmon, Arctic char, Dolly Varden. Coho, pink, and king salmon are also present, but less common (Selkregg 1974-1976b).

A large percentage of the Alaska Peninsula's western coastline is dominated by estuarine unconsolidated beaches of sand and gravel in contrast to the extensive estuarine rocky shoreline (exposed bedrock) along the eastern coastline (Selkregg 1974-1976a).

Unconsolidated shore habitats have less than 30 percent vegetation coverage, less than 75 percent coverage of stones, boulders, or bedrock, and are within the influence of the tides (Cowardin, Carter et al. 1979). Estuarine unconsolidated shores are generally rated moderate-high for riparian support (in this case estuary support), and high to very high for fish habitat, wildlife habitat, regional ecological diversity, and ecological replacement cost. These high ratings are due to the presence of species of conservation concern (e.g., Steller sea lion, harlequin duck, etc.), migrating waterfowl and shorebirds, and/or migrating fish, such as salmon and Pacific herring.

Estuarine rocky shores are characterized by bedrock, stones, or boulder substrate with vegetation cover less than 30 percent (Cowardin, Carter et al. 1979). These rocky shores support marine invertebrates, which in turn, provide foraging habitat to marine birds and mammals.

Alaska Peninsula Mountains Ecoregion

The vegetation in the Alaska Peninsula mountain ranges is dominated by upland alpine tundra communities, described in Section 3.2.10.1. Wetland habitat in this ecoregion is limited.

Aleutian Islands Ecoregion

In the Aleutian Chain, moist tundra is found on the lower mountain slopes (Selkregg 1974-1976b). The rivers on the Aleutian Chain are shorter, and support fewer species; the common species are chum salmon, Arctic char, and Dolly Varden. Coho, pink, and king salmon are also present, but less common (Selkregg 1974-1976b). Soft, unstable beach sediments align most of the Aleutian Chain coastline of over 3,000 islands, headlands, rocks, islets, spires, and reefs (Wilderness.net 2005).

3.2.11.3 Kodiak Region

- Alaska Peninsula Mountain Ecoregion
- Coastal Western Hemlock/Sitka Spruce Forest Ecoregion

The lowlands of southwest Kodiak and Tugidak islands support the only extensive wetlands in this region, generally of the wet and moist tundra (palustrine emergent) vegetative types. The riverine system of the Karluk River on southwestern Kodiak Island provides important sockeye salmon habitat; once considered the most productive sockeye salmon areas in the North Pacific. Karluk Lake provides important habitat to all five species of salmon, steelhead, and Dolly Varden (Selkregg 1974-1976a). Most of the remaining rivers in the region tend to be short and steep, originating in small mountain lakes or small glaciers. Major lacustrine habitats (lakes) are mainly found in southwest Kodiak Island and include Karluk, Frazer, Red, Akalura, and South Olga lakes (Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004).

Estuarine unconsolidated shores composed of sandy substrates are found on the west coast of Kodiak Island and the Trinity Islands. These sandy substrates support marine invertebrate populations of clams and polychaetes. Few estuarine emergent wetlands or mudflats are found in the archipelago, mostly occurring at the heads of bays or around lagoons on Kodiak and Afognak islands. However, extensive tideflats are found around the Trinity Islands, providing valuable habitat for marine birds and mammals. The eastern coast of Kodiak Island near Chiniak and Ugak bays support rocky seacliffs, which provide haul-outs for marine mammals and nesting sites for marine birds. Exposed rocky shorelines (exposed bedrock) comprise at least 50 percent of the Kodiak and Afognak islands coastline. These coastlines provide habitat for marine invertebrates and in turn, serve as highly valued foraging habitat for marine birds and mammals (Kodiak Island Convention & Visitors Bureau and Kodiak Chamber of Commerce 2004).

3.2.11.4 Southcentral Region

- Cook Inlet Ecoregion
- Alaska Range Ecoregion
- Coastal Western/Hemlock/Sitka Spruce Forest Ecoregion
- Pacific Coastal Mountains Ecoregion

Cook Inlet Ecoregion

The lowlands of southcentral Alaska support several extensive freshwater wetland areas, including the Kenai-Susitna Wetlands (Selkregg 1974-1976a):

- The Kenai-Susitna Wetlands consist of 5,700 square km of mostly palustrine forested wetlands transitioning from temperate rainforests to taiga. These palustrine wetlands support breeding trumpeter swans and other waterfowl, and all species of salmon are found in area streams (riverine system) and lakes (lacustrine system) (Selkregg 1974-1976a).

Scrub-shrub wetlands are dominated by shrubs and/or trees that are less than 20 ft tall (Cowardin, Carter et al. 1979). Scrub-shrub wetlands may also be identified as moist tundra (Viereck, Dyrness et al. 1992). Scrub-shrub wetlands are dominated by either broadleaf deciduous or needle-leaved evergreen communities of Labrador tea, tamarack (*Larix laricina*), dwarf birch, black spruce, shore pine (*Pinus contorta var. contorta*), mountain hemlock, western hemlock, bog rosemary, bog laurel (*Kalmia polifolia*), blueberry, crowberry, low-bush cranberry, bog cranberry, and rusty menziesia. Willow and alder are also common in many scrub-shrub communities. The herbaceous layer is dominated by skunk cabbage (*Lysichiton americanus*), deer cabbage (*Fauria crista-galli*), goldthread (*Coptis* sp.), sedges, and grass species (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c).

The groundwater recharge, discharge, lateral flow, surface hydrologic control, nutrient transformation, and export functions are dependent on the wetlands proximity to surface water outlets and vary considerably on a case-by-case basis. Scrub-shrub wetlands can provide riparian support when in proximity to streams by stabilizing banks and reducing sediments and toxicants in the water (Adamus Resources Assessment Inc. 1987). Scrub-shrub wetlands provide some habitat for disturbance-sensitive wildlife habitat, although many of these wetlands can serve as blueberry foraging areas for bear or foraging habitat for moose (especially riparian willow scrub-shrub wetland). Songbirds also may use scrub-shrub bogs for nesting and rearing young during the summer months and support some resident birds during the winter. The regional ecological diversity for scrub-shrub areas is generally moderate to high, based mostly on vegetative diversity.

Forested wetlands are dominated by trees taller than 20 ft (Cowardin, Carter et al. 1979). Large areas of forested wetlands exist within Alaska, mostly of the needle-leaved evergreen subclass. The tree layer consists mainly of black spruce, mountain hemlock, western hemlock, and the occasional Sitka spruce, white spruce, or shore pine. The shrub and herbaceous layers consist of the same species listed under scrub-shrub wetlands, but in lower abundance. Some saturated forested wetlands have buttressed trees and a thick sphagnum moss layer (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c).

Forested wetlands provide several important functions including groundwater recharge, discharge, and lateral flow; surface hydrologic control; and nutrient transformation/export. The degree to which they provide these functions, however, is largely dependent on their proximity to surface water outlets. Forested wetlands can provide riparian support functions when in proximity to streams by stabilizing banks and reducing sediments in the water (Adamus Resources Assessment Inc. 1987). Forested wetlands are typically rated moderate to low for wildlife habitat depending on location, but provide forage and cover for several species. The regional ecological diversity of forested wetlands in southeast Alaska tends to be higher relative to the rest of Alaska, based largely on the abundance of various habitat structures (e.g., snags, pools, fallen logs). These habitat types are especially abundant in old-growth forests. The ecological replacement cost of forested wetlands is moderate to high, depending upon the percent coverage of large trees and soil type (Adamus Resources Assessment Inc. 1987).

Palustrine aquatic bed wetlands are permanently flooded areas containing vegetation that grows on or below the surface of the water for most of the growing season (Cowardin, Carter et al. 1979). The common dominant vegetation in aquatic bed wetlands consists of floating-leaf pondweed (*Potamogeton natans*), northern burreed (*Sparganium hyperboreum*), and yellow pond lily (*Nuphar polysepalum*). Mare's tail, water horsetail, sedges, and rushes (*Juncus* spp.) are commonly found along the edges of aquatic beds (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c).

Many of the functions of these sites are dependent on location. Ponded wetlands that are connected by permanent or intermittent streams likely have low surface hydrologic control. Open water wetlands may serve as important fish habitat, depending on the depth and duration of inundation and access to the area (Adamus Resources Assessment Inc. 1987). These wetlands often serve as habitat for many waterfowl or water-dependent bird species. Because ponds are often associated with other wetlands types, such as emergent and scrub-shrub wetlands, they are generally rated as having moderate-high to high ecological diversity. Ponds and aquatic beds are relatively easy to replace (from an engineering perspective) and thus have low ecological replacement cost (Adamus Resources Assessment Inc. 1987).

Coastal tidelands, saltmarshes (estuarine emergent wetlands) and wet shorelands comprise the estuarine system of the Southcentral region. Rocky shores dominate the northwest Gulf of Alaska coast, while unconsolidated shores of sand and gravel comprise most of the northeastern Gulf of Alaska coast. The southcentral coastline is utilized by over 90 species of birds as a feeding and/or resting place. Lower tidal riverine systems are prime habitat for the spawning and rearing of coho, pink, and chum salmon.

Alaska Range Ecoregion

The Alaska Range is sparsely or unvegetated in a substantial portion of its area. The remaining area is dominated by alpine tundra vegetation, described in Section 3.2.10.3.

3.2.11.5 Southeast Region

Coastal Western Hemlock/Sitka Spruce Forest Ecoregion

The Yakutat Forelands comprise the most extensive freshwater wetlands in the Southeast region. Located south of Yakutat Bay, the Yakutat Forelands support extensive palustrine emergent, forested, open water/aquatic bed wetlands, riverine systems, lacustrine open water

lakes, and estuarine emergent wetlands along its shoreline. Muskegs and bog communities are found interspersed among the upland forest that dominates the rest of Southeast region landscape (Selkregg 1974-1976c).

The shoreline of the Southeast region consists of estuarine unconsolidated shore, rocky shorelines, and estuarine emergent wetlands. Estuarine emergent wetlands (saltmarshes) generally form adjacent to freshwater streams and separate the forest from the beachline. Extensive saltmarshes are found in the Yakutat Forelands, the Berners Bay area north of Juneau, Mendenhall Flats in Juneau, and along the Stikine River. The Yakutat Forelands and the Stikine River wetlands are the most important to waterfowl and shorebirds in the area. Large populations of dabbling ducks, snow geese, Canada geese, whistling swans, and many other migrating water birds utilize these areas (Selkregg 1974-1976c).

Estuarine emergent wetlands, or salt marshes, are within the intertidal zone with varied species composition according to the level of exposure to salt water. Estuarine emergent wetlands are located throughout the BLM regions, separating beach from forest. The water regime of these wetlands is defined by the frequency of flooding (e.g., irregularly flooded, regularly exposed) (Cowardin, Carter et al. 1979). Dominant vegetation in these wetlands depends on the tidal elevations. Vegetation of upper beach areas consists of beach ryegrass, silverweed (*Argentina anserina*), beach pea (*Lathyrus japonicus*), beach lovage (*Ligusticum scoticum*), sedges, and grasses. The substrate is mostly gravel and sand. Areas more frequently inundated support salt-tolerant sedges and forbs, alkali grass, goose tongue (*Plantago maritima*), arrow grass (*Triglochin maritimum*), sea milkwort (*Glaux maritima*), and salt brush (*Atriplex alaskana*) (Selkregg 1974-1976a; Selkregg 1974-1976b; Selkregg 1974-1976c).

Salt marshes generally provide moderate to high sediment or toxicant retention and nutrient transformation functions, depending on the vegetation density (Adamus Resources Assessment Inc. 1987). Salt marshes tend to be highly valued as wildlife and migratory bird habitat, providing both foraging habitat and cover from predators (Brewer 1994). For example, over 100,000 geese and swans have been observed in the Upper Cook Inlet of the Southcentral region during spring migration (USGS 2002a). The salt and fresh water influence creates high levels of ecological diversity, in regards to both vegetative and animal diversity (Adamus Resources Assessment Inc. 1987).

The riverine system is largely composed of upper perennial rivers, short and steep streams with high velocity waters, unsuitable for fish habitat. Larger, lower perennial rivers, however, support all five species of salmon, steelhead and cutthroat trout, and Dolly Varden (Selkregg 1974-1976c).

Pacific Coastal Mountains Ecoregion

The Pacific Coastal Mountains of southeast and southcentral Alaska are composed almost entirely of icefields, glaciers, and bare rock. The remaining area is dominated by alpine tundra (refer to Section 3.2.10.3). Wetland habitat in this ecoregion is limited.

3.2.12 Noxious Weeds and Invasive Plant Species

.Undesirable plants are known as weeds. Plants that are particularly aggressive, invasive and difficult to control may be legally designated as "Noxious Weeds". The Alaska Administrative Code lists prohibited and noxious weeds in the state of Alaska and the list was last amended in 1983. Additionally, non-native plants that escape cultivation or are introduced as contaminants in soil, gravel, seed, mulch, or other plant materials have invaded Alaska and are now common along the roadways. As levels of these undesirable plants increase, they could adversely affect wildlife habitat, rare plants, forest and rangeland resources, water quality, visual quality, recreation opportunities, land value, crop and forage production. Public concern about the harmful effects of invasive non-native plants continues to increase. As a result, a group of concerned Alaskans developed the Committee for Noxious and Invasive Plant Management (CNIPM) and produced a statewide Strategic Plan for Noxious and Invasive Plant Management in Alaska (Hebert 2001).

Alaska has a total of 1,373 known native and introduced plants. Of this total, 144 species or 10.5 percent are introduced species with free-living populations (Rejmanek and Randal 1994). The abundance and distribution of non-native plants that occur in the Ring of Fire planning area are unknown. Reports of non-native plants can be downloaded from the Alaska Exotic Plant Information Clearinghouse (AKEPIC) hosted by the University of Alaska's Natural Heritage Program at http://akweeds.uaa.alaska.edu/.

3.2.12.1 BLM Management of Noxious Weeds and Invasive Plant Species

BLM's primary concern with noxious weeds and other non-native invasive plants is to prevent them from reducing land health by colonizing public lands and interrupting native plant communities and ecosystem function. The objective of the BLM in managing undesirable plants is stated in BLM Manual 9015 - Integrated Weed Management: "The BLM has and shall continue to remain active in developing, demonstrating, and applying the essential science, technology, and stewardship necessary to effectively manage and prevent the spread and infestation of noxious weeds... to more fully integrate all BLM programs into actions which will improve the quality and ecological conditions of lands under the BLM management in the United States."

BLM is committed to using an Integrated Pest Management (IPM) approach in addressing invasive plants on BLM managed lands. The focus of IPM is on long-term prevention, eradication or suppression of pests. The integrated approach to weed management incorporates the best suited manual, mechanical, chemical, cultural (including prescribed fire) and biological control techniques that have least impacts on the environment and human health. The most cost effective method of weed management is prevention of new infestations. BLM cooperates with CNIPM and other partners to educate employees and public land users about invasive plants.

Invasive non-native plants and legally designated noxious weeds are more prevalent in areas of human disturbance and they are increasing in wildland areas as well. Non-native plants generally colonize disturbed areas where there is bare soil and little competition from other plants. Unmanaged disturbed lands, utility and road rights-of-ways commonly host invasive non-native plants as these areas are maintained in early seral condition. Weeds in these areas produce seed and other propagules that can be spread into other areas. In Alaska, recreation activities are considered one of the primary pathways for the introduction of invasive plants to

public lands. Most of the BLM managed lands within the Ring of Fire planning area are remote without road access so they are at low risk of infestation and it is anticipated that there are little or no weed infestation on the majority of the parcels; however, there has been no formal weed surveys on these public lands. Organized inventories on BLM managed lands began in 2004. An inventory in the Ring of Fire planning area is planned at Campbell Tract in 2005 and 2006. Data collected in inventories will be shared through the web-based AKEPIC database.

The goal of BLM is to keep invasive non-native plant populations low enough to prevent undue degradation of public lands and encourage desirable healthy native vegetation. BLM will prevent the spread of weeds in all areas by including weed prevention measures in all authorizations and activities where there is a likelihood of spread. When weeds are detected, BLM will use an integrated pest management approach to control the weeds and as appropriate, cooperate with the state and adjacent land managers.

Table 3.2-12. Alaska Invasive Plant Species and their Associated BLM Region

Common Name	Scientific Name	Rank*	Habitat	BLM Region
Common yarrow	*Achillea millefolium var. millefolium*	NA	Dry, well-drained open sites including grassland, meadows, open forest, roadsides and waste areas	All Regions
Sneezewort	*Achillea ptarmica*	NA	Wet meadows, marshes, and stream banks	Southeast and Southcentral
Garlic mustard	*Alliara petiolata*	70	Forest edges, hedgerows, shaded roadsides, and urban areas, and occasionally in full sun	Southeast: Juneau
Smooth brome	*Bromus inermis ssp. inermis*	62	Roadsides, forests, prairies, fields, lawns, and lightly disturbed sites	Southeast, Southcentral and Alaska Peninsula/Aleutian Chain
Cheatgrass (downy brome)	*Bromus tectorum*	78	Pastures, rangeland, winter crops, sand dunes, shrub-steppe area, roadsides, and waste places	All regions: Juneau, Anchorage, northwest Kodiak
Siberian peashrub	*Caragana arborescens*	65	Roadsides and gardens	Southcentral: Anchorage
Spotted knapweed	*Centaurea biebersteinii*	88	Highways, waterways, railroad ways, pipelines, grasslands, and open forests; establishes primarily in non-wetlands or riparian sites, however it can invade streambanks and nearby meadows	Southeast and Southcentral: Skagway, Valdez, Prince of Wales Island, and along Turnagain Arm
Lambsquarters	*Chenopodium album*	35	Cultivated fields, roadsides, and waste areas	Southeast, Kodiak, and Southcentral: Afognak, Kodiak, Middleton Island, Skagway, and Anchorage,
Canada thistle	*Cirsium arvense*	76	Roadsides, railway embankments, lawns, gardens, abandoned fields, agriculture fields, pastures; observed on exposed substrates following drawdown in wetlands, but is common in saturated soils	Southeast and Southcentral: Afognak, Sitka, Juneau, and Wasilla
Bull thistle	*Cirsium vulgare*	60	Common in recently or repeatedly disturbed areas such as pastures, rangelands, along roads and ditches	Southeast and Southcentral: Haines, Prince of Wales Island, Ketchikan and Anchorage
Narrowleaf hawk's beard	*Crepis tectorum*	43	Cultivated fields, pastures, forage stands, fallow lands, roadsides and railroads; established along Knik River	Southeast, Alaska Peninsula/Aleutian Chain, and Southcentral: Seward, Skagway, Lake Clark, Unalaska, Anchorage, and Wasilla
English/Scotch broom	*Cytisus scoparius*	69	Invades pastures, cultivated fields, roadsides, dry scrubland, native grasslands, dry riverbeds, and other waterways	Southeast: Sitka, Ketchikan, and Prince of Wales Island
Flixweed	*Descurainia sophia*	47	Common in dry, well-drained anthropogenically disturbed areas (e.g., roadsides, railroads, pastures, cultivated areas, old fields) where the native vegetation has been damaged or destroyed	Southeast, Alaska Peninsula/Aleutian Chain, and Southeast

Table 3.2-12 (continued). Alaska Invasive Plant Species and their Associated BLM Region

Common Name	Scientific Name	Rank*	Habitat	BLM Region
Purple foxglove	*Digitalis purpurea*	51	Roadsides, fields, forest edges, wet ditches, moist meadows, open woodland, and pastures	Southeast and Southcentral: Ketchikan, Petersburg, Sitka, Juneau, and Anchorage
Quackgrass	*Elymus repens*	59	Invades gardens, yards, crop fields, roadsides, ditches, and other disturbed, moist areas; colonizes mixed-grass prairies and open woodlands; often a serious pest in alkaline wetlands in arid regions of Oregon and California	Southeast, Southcentral, and Kodiak
Hempnettle	*Galeopsis bifida*	43	Waste places, roadsides, gardens, and agricultural lands; also found in open woods	Southeast, Southcentral, and Kodiak: Kodiak, Afognak, Ketchikan, Yakutat, Skagway, Sitka, Seldovia, Kenai, Seward, Admiralty Island, Anchorage, and Matanuska-Susitna Valley
Baby's-breath	*Gypsophila paniculata*	NA	Pastures, roadsides, hay fields, and waste places	Southcentral: Anchorage and Matanuska-Susitna Valley
Dames rocket	*Hesperis matronalis*	NA	Moist to mesic woodlands and meadows, along roadsides, fencelines, and in open areas; has been invading riparian and wetland habitats in Boulder, Colorado foothills; recorded in mesic meadows of interior Alaska and escaping to southern and southeast Alaska	Southeast
Orange hawkweed	*Hieracium aurantiacum*	71	Roadsides, gravel pits, and pastures, occurs in moist grasslands	Southeast, Southcentral and Kodiak: Juneau, Willow, and Kodiak
Narrow-leaved hawkweed	*Hieracium umbellatum*	35	Generally observed in disturbed mesic areas; native range includes streambanks, moist meadows, grasslands, and forests; in Alaska it is found in disturbed areas, but has been recorded invading 40-year abandoned fields along Stikine River	Southeast and Southcentral: Anchorage, Matanuska-Susitna Valley, Wrangell Island, and Petersburg
Foxtail barley	*Hordeum jubatum*	63	Roadsides and waste areas; common on tidal flats, terraces, and river banks	Southeast, Southcentral, and Kodiak
Ornamental jewelweed	*Impatiens glandulifera*	82	Riparian areas, streambanks, lowlands, wet meadows, forests, and roadside ditches; planted in gardens and parks	Southeast and Southcentral: Haines, Wrangell, and Anchorage
Oxeye daisy	*Leucanthemum vulgare*	61	Pastures, waste areas, meadows, and roadsides	Southeast, Southcentral, and Alaska Peninsula/Aleutian Chain: Juneau, Seward, Ketchikan, Anchorage, Aleutian Chain

Table 3.2-12 (continued). Alaska Invasive Plant Species and their Associated BLM Region

Common Name	Scientific Name	Rank*	Habitat	BLM Region
Yellow toadflax	*Linaria vulgaris*	63	Roadsides, fences, rangelands, croplands, clear cuts, and pastures; reported from cottonwood and spruce dominated riparian habitats in Colorado; found along shoreline of Cook Inlet and Turnagain Arm	Southeast and Southcentral: Seward, Sitka, Juneau, Skagway, Anchorage, and Wasilla
Bush honeysuckle	*Lonicera tatarica*	67	Roadsides and forest edges, pastures and abandoned fields; occurs in marshes in Ohio	Southcentral: Anchorage
Bigleaf lupine	*Lupinus polyphyllus*	55	Moist to wet, open habitats (e.g., seashore, streamside, wet meadows), and disturbed sites; it may invade sandy river terraces in southcentral Alaska	Southeast and Southcentral: Seward, Kenai Peninsula, Mitkof Island, Matanuska-Susitna Valley, and Anchorage
Purple loosestrife	*Lythrum salicaria and L. virgatum*	79	Cattail marshes, sedge meadows, open bogs, along streams and river banks, and lake shores	Southcentral: Anchorage
Disc mayweed	*Matricaria discoidea*	34	Grains, fields, farm, farm yards, waste places, and roadsides	All Regions: Anchorage, Seward, Juneau, Kodiak, Baird Inlet, Kenai Fjords National Park, Katmai National Park and Preserve, Wrangell-St. Elias National Park and Preserve, and the ROW of the Trans Alaska Pipeline
White sweetclover	*Melilotus alba*	80	Has been observed invading thousands of acres along river system: Nenana, Stikine, and Matanuska; tendency of seed to disperse by water	Southeast and Southcentral: Skagway, Anchorage, and Wasilla
Yellow sweetclover	*Melilotus officinalis*	65	Pastures, roadsides, neglected fields, and waste places, open disturbed, upland habitats such as prairies, savannas, and dunes; one site of infestation was an acidic wetland in lower Susitna Valley, Alaska	Southcentral: Anchorage, McCarthy, Seward, Whittier
Eurasian watermilfoil	*Myriophyllum spicatum*	89	Fresh to brackish water of fish ponds, lakes, slow-moving streams, reservoirs, estuaries, and canals	Southeast, Southcentral, and Alaska Peninsula/Aleutian Chain
Reed canarygrass	*Phalaris arundinacea*	83	Marshes, fens, wet meadows and prairies, floodplains, old fields, roadsides, and ditches	Southeast and Southcentral: Skagway, Craig, Petersburg, Juneau, Seward, Sitka, Ketchikan, Anchorage, and Talkeetna
Common timothy	*Phleum pratense*	56	Roadsides, along waterways, in dry to wet meadows	All Regions
Common plantain	*Plantago major*	NA	Cultivated fields, lawns, roadsides, and waste areas; open woods and in valleys in mid-montane sites	All Regions

Table 3.2-12 (continued). Alaska Invasive Plant Species and their Associated BLM Region

Common Name	Scientific Name	Rank*	Habitat	BLM Region
Annual bluegrass	*Poa annua*	NA	Meadows, open woodlands, prairies, and disturbed sites	Southcentral and Southeast
Kentucky bluegrass	*Poa pratensis*	57	Wetland and riparian habitats, gardens, pastures, roadways, meadows, open woodlands, and prairies; native range includes swamps and marshes, wet meadows, and streambanks	All Regions
Japanese knotweed	*Polygonum cuspidatum*	84	Near water sources, such as along streams and rivers, waste places, utility ROW, neglected gardens, and around old homesites	Southeast and Southcentral: Juneau, Sitka, Port Alexander, and Anchorage
European bird cherry	*Prunus padus*	60	Native range includes wet woodland, meadows, riverbanks, and forest clearcuts; found along riparian areas in Anchorage	Southeast and Southcentral: Baranof Island and Anchorage
Bouncingbet	*Saponaria officinalis*	34	Roadsides, railroads, waste places, fields, and pastures	Southcentral: Wasilla
Ragwort	*Saponaria officinalis*	34	Roadsides, railroads, waste places, fields, and pastures	Southcentral: Wasilla
Perennial sowthistle	*Sonchus arvensis*	58	Gardens, cultivated crops, roadsides, and fertile waste areas; it may occur on disturbed sites of meadows, beaches, ditches, and river and lake shores	Southeast and Southcentral: Hyder, Hoonah, Anchorage, and Palmer
Perennial/moist sowthistle	*Sonchus arvensis ssp. uliginosus*	59	Gardens, cultivated crops, roadsides, and fertile waste areas; it may occur on disturbed sites of meadows, beaches, ditches, river, and lake shores	Southeast and Southcentral: Hyder, Hoonah, Anchorage, and Palmer
European mountain ash	*Sorbus aucuparia*	53	Forests and suburban habitats	Southeast and Southcentral: Juneau, Ketchikan, Craig, Petersburg, Sitka, and Anchorage
Cordgrass	*Spartina alterniflora, S. anglica, S. densiflora, and S. patens*	NA	Intertidal zones (e.g., bays, lagoons, ponds, and ditches)	NA
Common tansy	*Tanacetum vulgare*	59	Observed in beach meadows in Haines	Southeast and Southcentral
Common dandelion	*Taraxacum officinale*	64	Lawns, pastures, and cultivated fields	All Regions
Yellow salsify	*Tragopogon dubius*	48	Common weed of cultivated crops, roadsides, and waste areas	Southcentral: Turnagain Arm
Alsike clover	*Trifolium hybridum*	57	Weed of lawns, roadsides, and disturbed sites	All Regions
White clover	*Trifolium repens*	59	Weed of lawns, roadsides, and disturbed sites	All Regions
Scent false mayweed	*Tripleurospermum perforata*	48	Found along irrigation ditches, shorelines, streams and pond edges, as well as roadsides, perennial forage crops, pastures, lawns, gardens, and waste areas	Southcentral

Table 3.2-12 (continued). Alaska Invasive Plant Species and their Associated BLM Region

Common Name	Scientific Name	Rank*	Habitat	BLM Region
Common mullein	*Verbascum thapsus*	NA	Abandoned meadows and pastures and along roadsides	Southcentral: Anchorage
Bird vetch	*Vicia cracca*	75	Roadsides and disturbed areas	Southeast, Southcentral, and Alaska Peninsula/Aleutian Chain: Seward, Ketchikan, Unalaska, Anchorage, and Wasilla
Winter vetch	*Vicia villosa*	52	Common along roadsides and disturbed areas; invading roadsides at Westchester Lagoon, Anchorage	Southcentral: Anchorage

Notes: *Ranking system was developed by the NPS which evaluates the threat of the invasive species to natural communities in Alaska; species are evaluated on climatic compatibility, ecosystem and community effects, biological characteristics, and ability to be controlled. The ranking system is from 0 to 100 (low-high), and represents the probability that species will spread throughout Alaska.
ROW – right-of-way

Source: ANHP (2004)

3.2.13 Wildland Fire and Fuels

Public and firefighter safety is the number one priority in all fire management activities. The Wildland Fire and Fuels Management program supports identified land use and resource management objectives and wildland fire is used to protect and maintain natural and cultural resources and, as nearly as possible, function in its natural ecological role. Wildland fire management options recognize fire as an essential ecological process and natural change agent of many Alaskan ecosystems and provide for the protection of human life and site-specific values. In areas where the objective is to exclude fire or minimize fire size, vegetation manipulation by various methods is a resource management tool to safeguard identified sites and maintain species diversity.

3.2.13.1 Fire Policy in Alaska

The BLM participated with other federal and State land management agencies and Native groups in completing 13 interagency fire management plans between 1980 and 1988. Plans for areas applicable to the Ring of Fire PRMP/FEIS included Kuskokwim-Iliamna, Kenai Peninsula, Matanuska-Susitna, Kodiak-Alaska Peninsula, and Southeast. This set of plans provided a statewide, coordinated, cost effective, landscape scale approach to fire management. Each plan contains a description of the local environmental and socioeconomic conditions, natural and cultural resources, fire history and behavior, and local subsistence activities. The plans also provided a consistent interagency approach to operational procedures and the identification and prioritization of values to be protected. The four management options defined in the plans are flexible enough to allow different agencies to manage fire on their lands according to policies and mandates exclusive to their agencies.

In 1998, under the direction of the Alaska Wildland Fire Coordinating Group, the common operational elements in 13 plans were consolidated into the Alaska Interagency Wildland Fire Management Plan (AIWFMP) (AWFCG 1998). This single document provided the land managers and fire suppression organizations unified operational guidance and direction. It augmentd effective and efficient operations across administrative boundaries and the range of management option designations continued to provide a balance between suppression to protect life, property and resources, and wildland fire use to regulate fuels and maintain healthy ecosystems.

In order to comply with the National Fire Plan and the 2001 Review and Update of the 1995 Federal Wildland Fire Management Policy, the BLM Alaska amended all of its land use plans in July 2005. The Land Use Plan Amendment for Wildland Fire and Fuels Management for Alaska (BLM 2005) identifies land use and resource objectives, wildland fire suppression options, and fuels (vegetation) management activities that achieve those objectives. Management options as defined in the interagency plans were incorporated. The amendment is applicable to all BLM-managed lands in Alaska. Fire management options emphasize the protection of human life and site-specific values and also recognize fire as an essential ecological process and natural change agent of the Alaskan ecosystems. Firefighter and public safety are identified as the number one priority in all fire management activities. Wildland fire use is clearly identified as an acceptable management practice. The amendment also reinforces BLM-Alaska's commitment to support the interagency wildland fire program, consider the latest available technology and methods, and support scientific research to study fire effects and improve business practices.

3.2.13.2 Fire Management

Fire management practices within the Ring of Fire planning area are directly tied to the interagency program. The four management options (Critical, Full, Modified, Limited) defined during the 1980s planning effort have been assigned (Table 3.2-13), in collaboration with adjacent land managers, to all BLM-managed lands (Figures 3.3-1 through 3.3-4). The management option classifications establish priorities for allocating fire-fighting resources and are based on values to be protected, resource management objectives, policies, and mandates. Fires are suppressed at minimum cost considering firefighter and public safety, benefits, values to be protected, and consistency with resource objectives. If a wildland fire is not contained by initial response forces, a Wildland Fire Situation Analysis is jointly completed by the suppression agency and field office staff to identify suppression alternatives and management constraints.

Table 3.2-13. Fire Management Options

Option	Intent	Management
Critical	Protect areas where there is a threat to human life, inhabited property, designated physical developments, and structural resources designated at National Historic Landmarks.	Highest priority for assignment of available suppression resources to exclude fire from the area/site.
Full	Protect cultural and historical sites, uninhabited private property, natural resource high-value areas, and other high-value areas that do not involve the protection of human life and inhabited property.	Priority is below Critical for available suppression resources to suppress fires at the smallest reasonably possible acres.
Limited	Allow fires to burn under the influence of natural forces within predetermined areas to accomplish land and resource management objectives. Estimated costs of suppression efforts are also a factor.	Surveillance to observe fire activity and to determine if site-specific values or adjacent higher priority management areas are compromised. Site-specific actions when necessary, to protect human life and site-specific values.
Modified	Balance acres burned with suppression costs and accomplish land and resource objectives. Strategies are based on an annual conversion date.	Priority for assignment of available suppression resources is below Full. Suppression efforts vary: When risks of large fires are high, the initial response to a fire is analogous to Full without the intent to minimize acres, but to balance acres burned with suppression costs. When the risks are low, the appropriate response to a wildland fire is analogous to Limited.

Source: (ADNR, ADF&G et al. 1998)

In addition to landscape scale management options, site-specific designation of Critical, Full, Avoid, and Non-sensitive have been established for structures, cultural, and paleontological sites, small areas of high resource value and T&E species habitat in order for the field office staff to give suppression agencies more specific guidance for small sites. BLM permits and leases that authorize structures on BLM lands should contain wildland fire management information. It is the individual's responsibility to take precautions in order to protect the permitted/leased site and personal property on that site from wildland fire intrusion. Unauthorized structures are not protected. Additional information on BLM Structure Protection Policy is in Appendix J.

Suppression agencies implement the appropriate management response to a wildland fire based on the management option assigned to the BLM-managed land by the AFO staff. Under a Reciprocal Fire Protection Agreement between BLM and the State, fire suppression on BLM lands is the responsibility of the State in the Alaska Peninsula/Aleutian Chain, Southcentral, and Kodiak regions, and the Haines Block in the Southeast region; under an Interagency

Cooperative Fire Protection Agreement, the USFS is the responsible agency for the Southeast region. Other than suppression, fire and fuels management activities on BLM-administered land including, but not limited to, fire trespass, prevention, education, prescribed fire, and hazardous fuels reduction are the responsibility of the AFO staff.

3.2.13.3 Fuels Management

The BLM AFO has approved, funded, and implemented hazardous fuels and wildland urban interface mitigation projects on the Campbell Tract Facility and cooperatively developed, funded, and implemented projects in support of the military mission with U.S. Army-Alaska and BLM-Alaska Fire Service for withdrawn lands on Fort Richardson. Also, as part of the President's Healthy Forests Initiative, BLM removed approximately 340 cords of dead standing and down beetle kill spruce from a 40-acre parcel of BLM-managed lands off of Kalifornsky Beach Road in Kenai. The lands are surrounded by rural residential subdivisions. Removal of the dead spruce was necessary to reduce fire risk and improve the health of the forest. Prescribed fire, wildland fire use, and manual or mechanical fuels reduction projects are viable resource management tools available for use.

3.2.13.4 Fire History

Alaska Peninsula/Aleutian Chain Region

Fire as an environmental factor is insignificant in the Alaska Peninsula/Aleutian Chain region; fire occurrence is very low. Many islands have no recorded fire history (AWFCG 1998). In the southeastern coastal forests of the Alaska Peninsula/Aleutian Chain region, the majority of the fires are small, human-caused, and associated with logging operations or recreational activities (AWFCG 1998).

Kodiak Region

Historically, lightning fires are rare (ADNR 2005e) in the Kodiak region; lightning-caused fire as a environmental factor has been insignificant in this area (AWFCG 1998). Fire occurrence in this region is generally low. However, human-caused wildland fires do occur. Approximately 1,135 acres are burned annually on Kodiak Island (ADF&G 2002a) and wildland/urban interface fires occur occasionally in this region.

On Kodiak Island, since the implementation of the Interagency Fire Management Plan, two fires burning more than 1,000 acres have occurred; neither affected BLM-managed land. Both were human-caused:

- Moser Bay fire, started on Full Management Option land and burned 14,000 acres of the Kodiak NWR in 1997.
- Larsen Bay fire, started on Full Management Option land on Native land and burned 3,250 acres of Native and USFWS land in 1996.

Another human-caused fire in 1996, the Kazakof Bay fire, burned 1,200 acres of Native land designated as Full Management Option land on Afognak Island.

Southcentral Region

Fire plays a dominant ecological role in the establishment and appearance of the expansive forests in areas within this region. Fire serves as a vital environmental influence in cold-dominated ecosystems, where it may be a chief factor in maintaining soil productivity. The diversity of vegetation types and wildlife species that occur in Alaska are largely the result of past fires. Fires release nitrogen and other nutrients from woody vegetation back into the soil, making it available for new plant growth and compensating for the lack of nutrients in the soil, a major limiting factor to plant growth. Without fire, organic matter accumulates, the permafrost table rises, and overall ecosystem productivity deteriorates. Vegetative communities become much less diverse, and their value as wildlife habitat decreases (Foote 1983). The natural fire regimes vary greatly between coastal and interior forest types, but in general they are characterized by low frequency/high intensity fire events. Open/closed black spruce forests burn with a frequency similar to that of black spruce woodlands. Stands can be ready to burn within 40 years, once a moss/lichen layer has developed, but the average fire return interval for both woodland and closed spruce stands is estimated to be 80 years. The range of reported fire cycles from black spruce forests is roughly 40 to 120 years (Viereck 1983). However, much older stands are not uncommon. The floodplain white spruce forest type is characterized by longer fire cycles, estimated at 110 years, with a range of 80-150 years. Under the USFS scheme of classification (Hardy 2001) both have been classed into fire regime group 4 - moderate frequency, stand replacement.

The Campbell Tract Facility in the Anchorage area is managed under the Critical Management Option; fire management is addressed in “A Management Plan for Public Use and Resource Management of the Campbell Tract Facility 1988” (BLM 1988b).

Management options for lands withdrawn for military purposes are assigned by the military. Fire management for lands withdrawn for U.S. Army Alaska is addressed in the Integrated Natural Resource Management Plan 2002-2006 Volume 2 Fort Richardson (2002).

The Neacola Mountains contain some of the largest blocks of unencumbered BLM-managed lands. No fire occurrence has been reported in this area. These lands are currently managed under a Limited Management Option. Should a fire occur, it would be permitted to burn under the influence of natural forces and continue a natural fire regime.

Wildland fire is a major issue in Anchorage, the Matanuska-Susitna Valley, and the Kenai Peninsula where, due to population density, there is a problematic wildland-urban interface pattern. BLM manages isolated tracts in these areas and the fire management option assigned is in accordance with the surrounding lands. A few lightning-caused wildland fires do occur; but most of the fires are human-caused (ADNR 2005e). The risk of wildfire has increased substantially in these areas over the past decade. There has been a massive increase in fuels created by the widespread spruce bark beetle outbreak. Temperatures over the last several decades have been increasing, resulting in a longer fire season. The population of southcentral Alaska has also been growing, leading to increasing probabilities of human-caused fires (Ross, Daterman et al. 2001). Wildland fires occur in these areas of the Southcentral region from April through October, although most occur from May to July (Ross, Daterman et al. 2001).

In the Anchorage and Matanuska-Susitna areas, a majority of the fires are on State and privately owned lands and are contained by initial response forces. In 1996, Alaska’s first major

wildland-urban interface fire, the Miller's Reach #2 fire, burned 37,366 acres and destroyed 344 structures (Nash 1997).

Humans have heavily influenced the northeastern part of the Kenai Peninsula since the 1880s through mining, railroad construction, timber harvesting, and other activities (Ross, Daterman et al. 2001). Intentional or accidental human-caused fires have affected these forests for a long time. The Kenai Peninsula experiences very little lightning, so the majority of the fires that have occurred during the 20th century have been human-caused. Studies on fire history have been conducted in the Kenai NWR using white and black spruce. The white spruce study found that virtually every stand had burned only once in the 9,000 years that spruce forests have existed on the central Kenai. The black spruce study results suggested a substantial acceleration in fire frequency associated with European settlement. Human settlers and their fires have created more early successional hardwood vegetation, bringing more moose into the forests of the Kenai (Berg 2000). Fire return intervals on the Kenai NWR for the black spruce forest are estimated to be 46 to 62 years (Ross, Daterman et al. 2001).

Several major fires have occurred on the Kenai Peninsula since the implementation of the interagency fire management plans. All were human-caused; none of the fires were reported to have affected BLM-managed lands. In 2004, the Glacier Creek fire burned 7,125 acres on the Kenai NWR designated as Limited. In 2001, the Kenai Lake Fire burned 2,075 acres on the CNF. In 1996, the Crooked Creek Fire burned 17,500 acres started on Native land in an area designated as Full Management Option, and the Hidden Creek Fire burned 5,200 acres on the Kenai NWR. The Windy Point fire in 1994 burned 3,500 acres in Limited Management Option land, also on the Kenai NWR. The Pothole Lake Fire in 1991 started in a Limited Management Option area and burned 7,900 acres; the majority of those acres were on the Kenai NWR. Although statistics were not yet available at the time this analysis was prepared, two major fires occurred on the Kenai Peninsula in 2005.

Southeast Region

A closed needle-leaf forest consisting of spruce, hemlock, and cedar (Wittwer 2004) dominates the temperate rainforests of southeast Alaska. Wildland fire risk is currently low to moderate in southeast Alaska. An average of 38 fires per year burn approximately 200 acres in the southeast, with low to moderate burning intensity. Fires in this region are almost exclusively human caused (Wildland Fire Lessons Learned Center 2003). The southeast climate is typically cool with high precipitation, and the spruce bark beetle outbreak has not yet penetrated the Tongass National Forest (TNF), which covers much of southeast Alaska. In 2002, NOAA reported the driest spring on record for much of southeast Alaska, resulting in elevated fire danger and burn bans (see Figure 3.3-4) (National Climactic Data Center 2002).

3.2.14 Visual Resources

Scenic quality is an essential component of most recreation activities. In Alaska, the opportunity to experience a natural environment that has been, for the most part, undisturbed by modern human influence, creates a romantic image that appeals to recreationists across the globe. The wide-open spaces, and relatively few public roads throughout the State, make recreating in Alaska an appealing destination (Brown 2002).

BLM uses Visual Resource Management (VRM) on BLM-managed lands within the Ring of Fire planning area to manage the quality of the landscape. Management objectives include minimizing potential effects to visual resources resulting from development activities. The visual resources of BLM-managed lands within the Ring of Fire planning area were inventoried and classified in accordance with procedures outlined in BLM Handbook 8410-1 (BLM 1984). It involved identifying the visual resources through a photo inventory process and use of data collection sheets, and then assigning the areas to Visual Resource Inventory classes. These classes did not establish management direction for the inventoried areas, but were used to describe existing conditions and establish VRM classes. The four different VRM classes identify the objectives for managing visual resources. The class assignments take into consideration the value of the visual quality and anticipated future land uses, and define the maximum amount of landscape alteration and surface disturbance that could occur.

BLM Visual Resource Inventory and Management

BLM evaluates visual values based on a rating system that considers:

- **Scenic quality:** the visual appeal of a piece of land,
- **Sensitivity level:** the public concern for the scenic qualities of the land, and
- **Distance zones:** the relative visibility from access routes and observation points.

Based on these factors, lands are placed in one of four visual resource inventory classes. Inventory classes II through IV (the lowest) are assigned based upon the combined scores from the three factors, while class I is reserved for lands previously designated by Congress or administratively to preserve a natural landscape, such as a Wilderness area or a wild segment of a Wild and Scenic River.

During planning, BLM assigns VRM classes. These define the visual objectives that BLM intends to achieve for its lands. The objectives for the VRM classes are:

I Preserve the existing character of the landscape; change to the characteristic landscape should be very low and not attract attention.

II Preserve the existing character of the landscape; change to the characteristic landscape may be seen, but should be low and not attract the attention of the casual observer.

III Partially retain the existing character of the landscape; change to the characteristic landscape should be moderate and may attract attention, but not dominate the view of the casual observer.

IV Provides for action that would make major modifications to the existing character of the landscape; change to the characteristic landscape can be high, dominate the view, and be the major focus of the viewer.

The inventory classes for the planning area are described in Chapter 3 and the VRM classes are described for each alternative in Chapter 2 (Figures 2.4-1 through 2.4-12).

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula and Aleutian Chain region spans a diversity of terrains, varying from the mountainous terrain of the Aleutian Range, to the vast lake and wetland lowlands on the north side of the Alaska Peninsula and in the drainage basins of lakes and rivers. In the Ugashik area along the southern coast of the region, visual resources include fjords, volcanic peaks, rugged cliffs, and glaciers. Chiginagak Volcano, southeast of Mother Goose Lake, also has active steam vents (USFWS 1985b). The coastline in this section of the Aleutians includes bays, small rocky islands, tidal flats, and a chain of both rounded and peaked volcanoes. The lowland areas of the region offer little variety in the visual landscape, with a slow progression into rolling hills and uplands. There is sparse human settlement throughout the entire region, allowing the area to retain almost total natural characteristics.

Kodiak Region

Irregular coastlines of bays, inlets, and rugged mountains characterize Kodiak and adjacent islands. However, there are also a wide variety of other visual landscapes throughout the region, including glacial valleys, tundra uplands, lakes, spruce forests, wetlands, sand and gravel beaches, salt flats, and meadows. Mountainous terrain, with several peaks more than 4,000 ft in elevation, characterizes the interior of Kodiak Island.

Southcentral Region

The Southcentral region of the Ring of Fire planning area includes lands associated with the MSB, MOA, KPB, and CNF, presenting a diversity of visual resources to residents and viewers alike. The scenic quality of the area bolsters the positive experience and the setting for many types of recreation activities, and is a major attraction itself for tourists.

In the MOA and MSB areas, views can be expansive, with dramatic vertical relief rising from the shallow foothills up into the rugged Chugach Mountains. The steep mountain peaks rise up well above treeline. Snowfields, glaciers, and river drainages are commonly visible from atop these peaks. Long-range views from the area to the Alaska Range and Denali also add to the visual quality. The Cook Inlet basin provides an abundance of scenic resources including wetlands, tidal flats, beaches, vertical bluffs, rocky coasts, bays, and inlets. The Anchorage skyline can also be considered a scenic resource, and can be viewed from numerous locations in the area.

There are several cultural modifications to the landscape that can detract from the visual quality. In the Knik River Valley, OHV use is heavy and occurs on some of the BLM parcels located in that area. The presence of numerous trails and attendant OHV noise produced are discordant to the natural surroundings. There are also several visible single-track hiking trails in this region of the Ring of Fire planning area.

The Kenai Peninsula encompasses natural scenery of extraordinary diversity and quality. The southern portion of the peninsula, with its icefields, tidewater glaciers, fjords, and bays offer spectacular and ever-changing views.

Along the north side of Cook Inlet, in the Chakachamna and Neacola Mountains regions, no cultural modifications to the landscape can be seen. On the south side of Chakachamna River and Lake, steep, craggy mountains characterize these areas with elevations approaching 7,000 ft, and extensive icefields and glaciers that stretch for miles. There are intense visual contrasts between the dark rocks of the mountains, and the ice and snow. The viewshed in this area is

dramatic, capturing the immediate attention of the viewer. Among BLM-managed lands in the Ring of Fire planning area, the southern Neacola Mountains block is considered unique, and represents visual resources of regional importance. To the north of Chakachamna River and Lake, the terrain can be characterized as broad, forested river valleys, borered by small mountain ranges. While the visual landscape in this area is undeveloped, it is not of the same visual resource caliber as the lands to the south.

Rock spire south of Shamrock Glacier in the Neacola Block.

Further south along the north shore of Cook Inlet in the Ursus Cove region, the visual quality is quite high. Southwest of Ursus Cove, Kirschner Lake and its waterfall into Cook Inlet are particularly striking features in the landscape (Figure 2.3-7). Coastal cliffs, mountains, meandering rivers, and alpine lakes add additional scenic variety. The area also provides outstanding views of Fortification Bluffs, Augustine Volcano, and Cook Inlet. There are minimal cultural modifications to this area, which in turn help to maintain its high natural scenic value.

Southeast Region

Southeastern Alaska is well known for its high visual qualities. The geologic and other natural forces at work in the area create many opportunities for stunning views, within an ever-changing natural setting.

In the Haines-Skagway region, foothills dramatically give way to steep alpine tundra and rock faces (Figure 2.3-2). Snowfields and glaciers are also visible at higher elevations. The moderate to steep lower and mid-level slopes of the mountains in the area are densely covered by undisturbed coniferous forest. Steep valley sides are interrupted by rivers carrying sediments from glacial melt water, eventually becoming braided stream channels. At the mouth of these rivers, the valleys widen to form extensive wetland areas with visually interesting vegetation. At lower elevations, the irregular rocky shores along streams and rivers, or along upper Lynn Canal, juxtapose nicely against the high mountain ranges of glaciated ice fields often visible in the background. Rich color combinations are displayed during the summer with blue glacier ice and snowfields in the higher elevations, and clear streams, riparian vegetation, and flowering plants at the lower elevations.

3.2.15 Paleontological Resources

Paleontological research has been limited in recent years and is supplemented with only occasional and accidental discoveries by amateur paleontologists and mining operations adding additional information to the region's prehistory. Because the statewide inventory of cultural resource sites maintained by the State of Alaska also includes known paleontological sites on BLM lands, that information is also reviewed whenever a Section 106 review is done for compliance with the National Historic Preservation Act (NHPA). Occasional remains are located on an irregular and unpredictable basis. Paleontological research permits are issued on an as-needed basis by the BLM Alaska State Office to interested researchers. This permit requires that the researcher submit a report of the season's findings so that BLM is better able to manage newly located remains.

Paleontological remains within the Ring of Fire planning area span from Middle Ordovician age graptolites and brachiopods from the Thorne Bay vicinity and Prince of Wales Island in the Southeast region, to Late Pleistocene gastropods and bivalves from the Bootlegger Cove Clay, Cook Inlet area in the Southcentral region, to late Paleocene age plant materials from the Chignik area in the Alaska Peninsula and Aleutian Chain region.

Incidental research has been conducted in the Talkeetna Mountains, where 90 million-year-old dinosaur remains have been located. Future work is planned in the Talkeetna Mountains to locate and collect a variety of paleontological remains. However, the project is dependent upon university funding and the availability of the interested researchers.

The BLM AFO does not currently have a systematic inventory for paleontological resources on BLM-managed lands within the Ring of Fire planning area. For the purposes of this discussion the Alaska Paleontological Database (www.alaskafossil.org), which contains information on fossil locations in Alaska, was reviewed and randomly sampled to provide a brief description of some of the paleontological resources within the Ring of Fire planning area. Congressional funding for the Minerals Data and Information Rescue in Alaska project conducted by Dr. Ming Zhang and Dr. Robert Boldest supports the database. The database is a work in progress with 5,951 entries, from an estimated 14,000 localities, made to date. These include vertebrates, invertebrates and paleobotany. Palyntological (fossil pollen) data for the State of Alaska are not available in the Alaska Paleontological Database.

Alaska Peninsula/Aleutian Chain Region

There are numerous paleontological sites located on BLM public lands in the Alaska Peninsula and Aleutian Chain region. Bivalves are the oldest fossils documented in this region and are from the Late Triassic age and located in the Kamishak Chert Formation of Iliamna quadrangle (Stanton and Martin 1912). Numerous Jurassic to Neogene aged fossils of bivalves, ammonoids, belemnites, scleractinian "button" corals, gastropods, and snails have been reported in the Iliamna, Mount Katmai, Sutwik Island, Chignik, Port Moller, Stepovak Bay, Naknek, Ugashik, False Pass, Rat Island, and Afognak quadrangles.

Kodiak Region

There are numerous paleontological sites located in the Kodiak region. The oldest fossils in this region include hydrozoans, gastropods, bivalves, scleractinian "solitary" corals, and echinoderms, which are from the Late Triassic period and were discovered in slabs of limestone

in the Kodiak quadrangle (Silberling 1966). Bivalves, plants, ammonoids, chitons, annelida, gastropods, scleractinian corals, belemnites, brachiopods, and foraminifera of Jurassic to Pleistocene age have also been reported in the Afognak, Karluk, and Trinity Islands quadrangles.

Southcentral Region

There are a variety of paleontological sites located in the Southcentral region. The oldest fossils, conodonts, are Middle Ordovician to Triassic aged and are located in the massive to thinly laminated limestone, locally clastic with graded chert grit sandstone of the Tlikakila complex in the Lake Clark area (Harris 1984).

Foraminifera, bivalves, scleractinian corals, ammonoids, gastropods, plants, nautiloids, decapods, brachiopods, scaphopods, belemnites, crustaceans, echinoderms, bryozoans, rugose corals, crinoids, tabulate corals, radiolarians, stromatoporoids, trilobites, sponges, cnidaria, and hydrozoans of Silurian to Paleocene age have been reported in the Iliamna, Lake Clark, Kenai, Seldovia, Talkeetna, Talkeetna Mountains, Anchorage, Seward, and Blying Sound quadrangles. Research has been conducted in the Talkeetna Mountains, where 90-million year old dinosaur remains have been located. Future work is planned to locate and collect a variety of paleontological remains.

Southeast Region

There are numerous paleontological sites located in the Southeast region with deposits ranging from the Ordovician to the Holocene ages. The oldest fossils, ostracodes, are from the Ordovician age and located in the Red Bay area off of the western tip of Dead Island in the Petersburg quadrangle. Conodonts are located in the Luck Creek Breccia in the Craig quadrangle.

Numerous Ordovician to Holocene aged fossils have been discovered in the Yakutat, Skagway, Atlin, Mount Fairweather, Juneau, Sitka, Sumdum, Port Alexander, Petersburg, Bradfield Canal, Craig, and Ketchikan quadrangles. These include bivalves, gastropods, scleractinian corals, echinoderms, trace fossils, decopods, barnacles, ammonoids, rugose corals, cephalopods, conodonts, foraminifera, ostracodes, plants, stromatoporoids, tabulate corals, sponges, bryozoans, brachiopods, hydrozoans, vertebrates, radiolarian, crinoids, heliolitid corals, echinoderms, algae, annelida, graptolites, trilobites, and belemnites.

3.2.16 Cultural Resources

Cultural resources include sites and materials of prehistoric Native American, and historic European, Euro-American, and Native origin (e.g., traditional cabin sites, camp sites, burial grounds, traditional subsistence harvest sites, and other traditional land use areas, landscapes, symbols and place names). This analysis relies on an assessment of available literature regarding cultural resources in the Ring of Fire planning area and the application of existing laws and regulations regarding the assessment of effects on cultural resources caused by an undertaking.

Key assumptions in the following discussion are that cultural resources are assumed to be eligible or potentially eligible for the National Register of Historic Places (NRHP) unless stated otherwise, and that information for the following section relies on best available information from existing literature and database resources/inventories.

3.2.16.1 Relevant Legislation Affecting Cultural Resources

The assessment of effects to cultural resources must be consistent with Section 106 of the NHPA (36 CFR 800), the Alaska Historic Preservation Act (AS 41.35.010-41.35.240; applies to State lands only), NEPA, and several other federal and State standards. Under NEPA, this assessment generally includes historic properties, other culturally valued places, cultural use of a biophysical environment, and sociocultural attributes. From a regulatory perspective, “historic properties” meet the criteria for inclusion in the NRHP as defined in the NHPA (36 CFR 800). Many sites meet the broader definition of “cultural resources,” such as Alaska Heritage Resource Survey (AHRS) sites, which individually may or may not be listed on or eligible for the NRHP, but are of cultural importance.

Archaeological, traditional, and historic sites are non-renewable resources. Cultural resources are important not only for the presence of artifacts, but also for the cultural importance to certain groups (e.g., Traditional Cultural Properties) and contextual information preserved in the sites. This contextual information includes the locations, relative positions, and associations of artifacts and sites with other aspects of prehistoric and historic human presence. These relationships are key to contextualizing the human past. The continuity between prehistoric and historic sites, expressed through continued use by Native people, maintains the cultural identification with the resource. Cultural resources in the Ring of Fire planning area are subject to the legal protections that include, but are not limited to, the NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and the Archaeological Resource Protection Act (ARPA). Responsibility for enforcing these protections begins with the managing agency, such as BLM, and the State Historic Preservation Officer (SHPO). An inventory of cultural resources, reported historic (over 50 years old) and prehistoric sites within the State of Alaska (e.g., objects, structures, buildings, sites, districts, and travel ways) is maintained by the Office of History and Archaeology (e.g., AHRS) (ADNR 2005m). The NPS maintains the NRHP, a registry of cultural resources determined to be important on a local, State, or national level (NRHP 2005). However, despite previous archaeological and cultural resource surveys in the Ring of Fire planning area, there may yet exist an unknown number of as-yet undiscovered and undocumented cultural resources.

3.2.16.2 Alaska Peninsula/Aleutian Chain Region

The ADNR Office of History and Archaeology has documented approximately 3,160 cultural resource sites in the Alaska Peninsula/Aleutian Chain region (ADNR 2005m). These sites include both prehistoric and historic resources. This number likely represents only a small portion of possible cultural resource sites in this region of the Ring of Fire planning area because the entire region has not been inventoried for cultural resources. However, the number of cultural resource sites occurring on BLM-managed lands within this region would be much smaller.

Overview of Regional Prehistory

Known prehistory in the Alaska Peninsula/Aleutian Chain region begins approximately 9,000 years ago with the Anangula site in the Fox Islands (McCartney 1984) (Table 3.2-14). Later sites on the Aleutian Chain are attributed to the Aleutian Tradition, largely based on the Chaluka Mound site on Umnak Island, and date to between 4,500 years ago until contact. Aleutian Tradition sites are found throughout the archipelago (McCartney 1984). In the eastern Aleutian Chain, the period from 4,000 years before present (BP) to contact are divided into the Margaret Bay (4,000-3,000 BP), Amaknak (3,000-1,000 BP), and Late Aleutian (1,000 BP to contact) phases (Knecht and Davis 2001) (Table 3.2-14).

Sites of great antiquity in the Alaska Peninsula vicinity include Igiugig, Koggiung, and the Ugashik Narrows, and are attributed by Dumond to the Paleo-Arctic tradition, which may range in age from 9,000 to 7,000 years BP (Dumond 1984). Northern Archaic materials, ranging from 4,000 to 5,000 years BP, have been excavated in the area and were uncovered as site components at Ugashik Narrows, the nearby Ugashik Knoll site, and the Koggiung site; Dumond excavated some later phase Northern Archaic materials at the Brooks River Beachridge site (Dumond 1984). Maschner (2002) has more recently uncovered large sites further west on the Alaska Peninsula approximately 6,000 years of age which consist of groups of small house depressions in clusters of 5 to 20. Broad similarities connect many of the sites in the greater region. It is likely that sites of similar vintage may be found in other areas of the Alaska Peninsula, such as the recently designated Amalik Bay Archaeological District National Historic Landmark, some components of which have been dated to 5,600 years BC (NPS 2005). Some of the artifacts found at Port Moller, for example, are similar to those attributed to the Takli Birch Phase on Shelikof Strait near Kodiak Island that date to the same time. Faunal remains indicate a reliance on a broad range of subsistence resources including sea and land mammals, fish (e.g., cod, and halibut), migratory waterfowl and other marine birds, and invertebrates. Between 1,500 and 1,100 years before the birth of Christ (BC), a new archaeological complex entered the lower Alaska Peninsula region to coincide with the previous inhabitants. This complex occurs at the Russell Creek site in Cold Bay and has some similarities to Arctic Small Tool Tradition (ASTt) (Maschner 2002).

After 1,100 BC, much of the region continued with the same organization as the previous 3,000 years with the brief ASTt intrusion having little effect on subsequent regional technology, settlement systems, or household organization. Between 500 and 200 BC, a major earthquake occurred on the lower Alaska Peninsula and raised the sea level several meters. This raise in sea level may have effected salmon spawning streams and lakes, as well as flooded many lagoon systems, created new island groups, and altered the intertidal regimes. Villages dating to the period following the earthquake (500-600 BC) are larger than previous villages, exhibit an increased use of marine mammals, particularly walrus and whale, and exhibit an importation of

finished polished slate tools and rare examples of pottery. Archaeological sites dating to almost 1,000 years ago at Izembek Lagoon contain ground stone artifacts and gravel tempered pottery in addition to flaked stone tools. Around common era/Anno Domini (AD) 1150, Aleut culture on the lower Alaska Peninsula exhibited many of the characteristics present in the ethnographic and ethnohistoric literature, such as large corporate households, large villages, and evidence of rank, warfare, resource intensification, craft specialization, and expanding trade networks (Maschner 2002).

Table 3.2-14. Prehistoric Timeline of the Alaska Peninsula/Aleutian Chain Region

Culture	Date *	Representative Site
Aleutian Chain		
Early Anangula Phase	9,000 - 7,000 BP	Anangula, Hog Island Blade Site, Oiled Blade Site
Late Anangula Phase	7,000 - 4,000 BP	Margaret Bay (levels 4, 5), Agnes Beach (lower level), Airport site, Powerhouse site, Cahn site 'K'
Amaknak Phase	3,000 - 1,000 BP	Summer Bay, Cahn's Site 'D', Amaknax
Late Aleutian Phase	1,000 - 200 BP (AD 950 - 1750) (Contact)	Tanaxtaxak, Eider Point, Reese Bay, Morris Cove, Bishop's House
Upper Alaska Peninsula		
Paleo-Arctic Tradition	7045±295 BC - 5725±260 BC 5945±95 BC - 5818±95 BC	Ugashik Narrows phase Koggiung phase
Northern Archaic Tradition	3105±70 BC - 2860±85 BC 3065±70 BC 1890±130 BC	Ugashik Knoll phase Graveyard phase Brooks River Beachridge phase
Takli Alder	5830±120 - 4320±115 BP (3880 - 2370 BC)	Kukak Isolated Housepit Site (MK-6a), Pedro Bay (Lake Iliamna)
Takli Birch	5650±115 - 2810±100 BP (3700 - 860 BC)	Takli Island, Takli Site (MK-12), Takli Island Hook Point (MK-14)
Takli Cottonwood	1680±100 (AD 270)	Takli Island Hook Point (MK-14)
Kukak Beach	1460±95 (AD 490) - 1075±100 (AD 875)	Kukak Site KK1
Kukak Mound	775±95 (AD 1175)	Kukak Site KK1
Brooks River Phase	300±75 (AD 1650)	Brooks River Camp component
Historic Koniag		
Chirikof Island/Middle Alaska Peninsula		
Old Island Complex	4029±63 (2079 BC)	Chirikof Island, Site No. 9
Anchorage Complex	Late 1st millennium BC	Chirikof Island, Site No. 9
Scree Complex	0-800 AD	Chirikof Island, Site No. 9
Bluff Complex	Undated (800 AD?)	Chirikof Island, Site No. 9
Late Prehistoric Koniag		Chirikof Island, Site No. 9
Historic		Chirikof Island, Site No. 9
Lower Alaska Peninsula		
Anangula Tradition	6000 BC	
Aleutian Tradition	2500 BC - AD 1000	Port Moller/Hot Springs
Port Moller	1500 BC - AD 1500	Port Moller/Hot Springs

Notes: *Dates are based on the radiocarbon data ranges from representative sites.
AD – common era/Anno Domini
BC – years before the birth of Christ
BP – years before present

Source: Clark (1984a; 1984b), Knecht and Davis (2001).

Overview of Regional History

An historic timeline for the Alaska Peninsula/Aleutian Chain region is depicted in Table 3.2-15. Throughout most of the Russian period, the Russians moved Aleut hunters to different hunting territories (e.g., Pribilof Islands, Fort Ross, Unalaska and Copper Island [Attuans], Bering and Copper islands in the Commander group [Atkans]). The relationship between the Russians and the Aleuts was an influential one based on warfare, trade, and missionization (Black, McGowan et al. 1999).

Table 3.2-15. Historic Timeline of the Alaska Peninsula/Aleutian Chain Region

Date	Event
1741	Vitus Bering and Aleksei Chirikov led expeditions from Kamchatka to establish Russian sovereignty in Northwest America. Bering landed on Kayak Island and later wrecked and died on Bering Island, while Chirikov's attempt to land resulted in the loss of 2 ships and 1/3 of his crew at the hands of the Tlingit. Chirikov made a hasty return to Kamchatka and sighted some of the Aleutian Chain on his way.
1743	Crews under Emilian Bassof began traveling to the Commander Islands for furs. Similar trips were made in 1745, 1747, and 1749.
1745	Mikhail Nevodchikof sailed to the Aleutian Chain of Agattu (Near Islands) and Attu in the pursuit of furs. Crews returned to the Near Islands by 1749.
1760	Russian presence on the Aleutian Chain was established. The Russian government began trading with and collecting taxes from Natives.
1762	Aleuts from the Fox Islands killed a number of Russian hunters. Russians retaliated and forcibly gained control over the Aleutian Chain.
1781	Establishment of the Shelikhov Company (later the Russian America Company), which began active trading in Kodiak Island and Aleutian Chain.
1799	The Russian America Company was granted a monopoly on trade and hunting in all colonized areas; established permanent stations on the Alaska Peninsula and elsewhere.
1824-1825	Russian Orthodox Church established missions on Unalaska and Atka Islands.
1830s	The smallpox epidemic caused major decline in the Native population throughout southcentral and other areas of Alaska, reaching the Aleutian Chain in 1938.
1867	The U.S. purchased Alaska from Russia for $7.2 million.
1880s	Salmon canneries were established throughout the Southcentral region, Kodiak, and the Aleutian Chain, and affected subsistence resource availability.
1884	Congress passed the Organic Act of 1884, ordering the education of all school age children in Alaska and encouraging the assimilation of Natives into Western culture.
1900	Congress passed legislation that funded the establishment of independent schools for white children.
1911	Hunting of sea otters was forbidden in a treaty signed by Japan, Russia, Great Britain, and the U.S., and taking of fur seals was limited to the U.S. government.
1912	The last Aleut religious school, at Unalaska, was forcibly closed by the federal government.
1912	Katmai eruption resulted in relocations (e.g., Perryville).
1912	Commercial whaling station on Akutan Island (1912-1942) was established.
1913	The Aleutian Chain was reserved as a NWR (EO 1733).
1924	Congress passed the Indian Citizenship Act, granting Alaska Natives the right to vote.
1930	Throughout the 1930s, federal schools were established in numerous Aleut villages. After WWII, Aleut students were sent to the Bureau of Indian Affairs boarding school.
1936	The Indian Reorganization Act was established to determine possessory rights in Alaska.
1942	In response to WWII attacks and invasions of Kiska and Attu islands from the Japanese, Aleuts west of Unimak Island were evacuated to southeast Alaska. Upon return to their homelands, the Aleuts found that some villages had been destroyed.
1942	Residents of Attu were captured by the Japanese, and survivors were returned to Atka Island in 1945.
1943	The Akutan reservation was set aside on Akun and Akutan islands for exclusive use by its Native inhabitants.
1949	Integration of Native and non-Native schools.
1959	Alaska was admitted to the Union as the 49th state.
1966	The Alaska Federation of Natives was formed to pursue settlement of Native land claims.
1971	Congress passed ANCSA.
1980	Congress passed ANILCA.
1980	Creation of Alaska Peninsula NWR and Izembek NWR (Figure 1.2-2).

Notes: ANCSA – Alaska Native Claims Settlement Act
ANILCA – Alaska National Interest Lands Conservation Act
EO – Executive Order
NWR – National Wildlife Refuge
U.S. – United States
WWII – World War II

3.2.16.3 Kodiak Region

The ADNR Office of History and Archaeology has documented approximately 1,640 cultural resource sites in the Kodiak region, which include prehistoric and historic resources (ADNR 2005m). As the entire region has not been inventoried for cultural resources, undocumented cultural resources may continue to be found in the region as additional surveys are conducted. However, the number of cultural resource sites occurring on BLM-managed lands within this region would be much smaller.

Overview of Regional Prehistory

The Kodiak Archipelago has been continuously occupied since at least 6,500 BC. Researchers have divided the earliest documented culture on Kodiak Island, Ocean Bay, into two stages: Ocean Bay I (e.g., Sitkalidak Island near mouth of Afognak River) and Ocean Bay II (Table 3.2-16). Ocean Bay people occupied coastal areas for the purposes of sea mammal hunting, as well as the mouths of streams in the summer in order to exploit salmon runs. In addition, Ocean Bay people harvested sea mammals (e.g., seals, sea lions, sea otter, porpoise, and whales), birds, marine invertebrates, fish (cod, sculpin, halibut), and occasional land mammals (Clark 1984a). A near-absence of evidence for habitations does not allow for a description of Ocean Bay dwellings; however, Clark (1997) believes that the quantity of artifacts and debris at Ocean Bay sites suggest relatively permanent occupation of some sites. A transition from stone flaking to ground slate working gave rise to late Ocean Bay I and Ocean Bay II (Clark 1997).

The Kachemak Tradition followed the Ocean Bay Tradition. The Kachemak Tradition appears on Kodiak Island during the second millennium BC and lasted for more than 2,000 years (Clark 1984a). Clark (1997) breaks the Kachemak Tradition into two phases: Late Kachemak (regional) or Three Saints (local) and Early Kachemak (regional) also called Old Kiavak or Afognak Phase (local). During the Kachemak period, there is strong evidence of trade with the mainland (Clark 1997).

Table 3.2-16. Prehistoric Timeline of the Kodiak Region

Culture	Date *	Representative Site	Notes
Ocean Bay			
Ocean Bay I	6620±60 - 4698±71 BP (4670 - 2748 BC)	Ocean Bay (Sitkalidak Roadcut Site), Afognak River, Uganik Island, Rice Ridge, Zaimka, Kizhuyak Bay, Kiavak, Roadcut, SAS 49, SAS 121, Tanginak Spring, Nunakakhnak, Old Karluk	Characterized by flaked stone tools, microblades and slotted points, stone lamps, and prismatic blades.
Ocean Bay II, Late Ocean Bay I (Takli Culture)	4850±120 (2900 BC) - 3130±85 (1180 BC)	Ocean Bay (Sitkalidak Roadcut Site), Afognak River (AFG-008, AFG-011), Uganik Island, Outlet, Array, Chiniak River Village, Rice Ridge, Zaimka, Kizhuyak Bay, Roadcut, SAS 36, SAS 68, SAS 82, SAS 120	Prominent ground slate industry.
Kachemak			
Early Kachemak (Old Kiavak)	3263±61 (1313 BC)	Old Kiavak Site	Transition from Ocean Bay to Kachemak. Characterized by cobble tools, the appearance of toggle harpoons and labrets, and abundant fishing weights.
Late Kachemak (Three Saints and Uyak Intermediate Level)	2033±52 - 1110±100 BP (83 BC - AD 850)	Three Saints, Crag Point	Characterized by strong evidence of trade with mainland, prominent art, ritual artifacts (modified human bone), abundant fishing weights.
Koniag			
Ceramic Koniag	937±49 - 280±44 BP (AD 1013 - 1670)	Old Kiavak Site, Kiavak, Rolling Bay	Characterized by evidence of sweat baths and pottery (Ceramic Koniag), prominent wood working industry, highly developed ceremonialism, large villages and chambered houses, subsistence focus on salmon.
Aceramic Koniag	600±100 - 298±44 BP (AD 1350 - 1652)	Monashka Bay, Kizhuyak	
Historic Koniag	120±50 - 90±70 BP (AD 1830 - 1860)	SAS 02, SAS 10, Slab Grave Site, KOD-336	Russian contact period.

Notes: *Dates are based on the radiocarbon date ranges for representative sites.
AD – common era/Anno Domini
BC – years before the birth of Christ
BP – years before the present

Source: Clark (1984a; 1997), Fitzhugh (2005).

The Koniag Tradition followed the Kachemak Tradition, a blending of the Kachemak Tradition with cultural traits diffused from the Bering Sea region and the Cook Inlet and PWS areas. The cultural ancestors of the contemporary Koniag were living on the archipelago from at least 800 - 1,300 AD (Clark 1984a). Archaeological evidence indicates a prominent woodworking industry and a focus on salmon as a subsistence resource (Clark 1997). The Koniag, or Alutiiq, migrated between sedentary winter and summer fish camps while harvesting fish, whales, and other sea mammals and living in semisubterranean, multi-room sod houses that housed as many as 20 people (Endter-Wada, Mason et al. 1993).

Overview of Regional History

Table 3.2-17 provides a brief overview of key points in the history of the Kodiak region. In the middle parts of the 18th century, Russian promyshlenniki (frontiersmen) were attracted to the Kodiak region by the reported abundance of sea otters, fish, and seals. In 1784, the first

Russian settlement on Kodiak Island was established by Gregorii Shelikov at Three Saints Bay on the southwestern end of Kodiak near the present village of Old Harbor. Disease, relocation, and warfare reduced the Koniag population. By the middle of the 19th century, the Koniag had consolidated their populations at seven sites that are the location of present-day villages.

The ownership of Alaska was transferred to the U.S. in 1867. The general policy of the U.S. toward Alaska Natives was primarily one of neglect in the beginning of the American period. Epidemic diseases continued to decrease the Native population. An important culture changing activity that occurred and prospered during the American period was commercial fishing and other extractive industries. From 1835 to 1869, the American whaling fleet operated in the Kodiak area and sea otter hunting continued until the late 19th century. In 1882, the first cannery on Kodiak Island was built on Karluk Spit. The eruption of Mt. Katmai in 1912 disrupted the commercial fishing industry for several years through the destruction of many salmon spawning streams. The Katmai eruption also resulted in the relocation of Alaska Peninsula Alutiiq to Kodiak Island (e.g., Perryville) and resulted in social and marriage ties between the Alaska Peninsula Alutiiq and Kodiak Island residents. The commercial fishery brought outsiders onto Kodiak Island as cannery workers and fishermen. These non-Native fishermen often settled in the area and married Natives further influencing changes in social organization. Other Kodiak Island industries included fox farming and trapping. The importation of cattle and sheep as livestock resulted in efforts to control bear populations in order to reduce bear predation of livestock. In 1941, concern for the welfare of bear populations resulted in the establishment of the Kodiak NWR (Figure 1.2-2).

Table 3.2-17. Historic Timeline of the Kodiak Region

Date	Event
1763	Russians began settlement on Kodiak Island, but were initially unsuccessful due to violent encounters with Native inhabitants.
1781	Establishment of the Shelikhov Company (later the Russian America Company), which began active trading in Kodiak and surrounding islands.
1783	A crew under Gregorii Shelikov forcibly settled at Three Saints Bay on Kodiak Island, thus establishing a permanent Russian presence.
1786	Russian settlement (fort and trading post) established at Karluk.
1792	Russian outpost at Three Saints Bay moved to site at St. Paul's harbor.
1799	The Russian America Company was granted a monopoly on trade and hunting in all colonized areas.
1802	Russian Orthodox Church established a school that encouraged the use of the Native language and helped create a literate Creole class.
1808	Russian America Company headquarters moved to Sitka, lessening trade activity in the Kodiak and Cook Inlet regions.
1830s	The smallpox epidemic caused declines in population throughout much of Alaska.
1867	The U.S. purchased Alaska from Russia for $7.2 million. The Alaska Commercial Company assumed all Russian-American company assets and competition between fur traders resumed.
1882	A salmon fishery was located near Kodiak and the first cannery was built on Karluk Spit.
1884	Congress passed the Organic Act of 1884, ordering the education of all school age children in Alaska and encouraging the assimilation of Natives into Western culture.
1892	Residents of Afognak Island were not allowed to subsistence hunt or commercial fish near island due to a presidential proclamation setting aside the Afognak Forest and Fish Culture Reserve. The ban lasted until 1909 when Afognak residents were allowed to take salmon for personal use under the supervision of the superintendent of the Afognak hatchery.
1893	Baptists opened a mission and orphanage on Woody Island, directly across from Kodiak.
1898	U.S. Department of Agriculture started an experimental cattle breeding ranch at Kalsin Bay.
1900	Congress passed legislation that funded the establishment of independent schools for white children.
1911	Community of Larsen Bay was established.
1912	Eruption of Mt. Katmai.
1924	Congress passed the Indian Citizenship Act, granting Alaska Natives the right to vote.
1930s	Federal schools were established throughout the region, which prohibited the teaching of Native languages.
1933	Post office established at Akhiok (closed in 1945).
1936	The Indian Reorganization Act was established to determine possessory rights in Alaska.
1939	U.S. Naval Base built at Kodiak City. This base was converted to a U.S. Coast Guard Base in 1972.
1940	Kodiak City was incorporated as a first class city.
1941	Kodiak NWR was established (Figure 1.2-2).
1949	Native and non-Native schools were integrated.
1950s	The crab industry was introduced to Kodiak Island.
1959	Alaska was admitted to the Union as the 49th state.
1964	Tsunamis caused by the 1964 earthquake destroyed villages on and around Kodiak, forcing some villages to relocate and/or rebuild.
1965	Port Lions founded by former residents of Afognak.
1966	The Alaska Federation of Natives and Kodiak Area Native Association were formed to pursue settlement of Native land claims.
1971	Congress passed ANCSA.
1978	KIB was organized.
1980	Congress passed ANILCA.
1989	*Exxon Valdez* oil spill.

Notes: ANCSA – Alaska Native Claims Settlement Act
ANILCA – Alaska National Interest Lands Conservation Act
KIB – Kodiak Island Borough
NWR – National Wildlife Refuge
U.S. – United States

Source: Stephen R. Braund & Associates (2005).

World War II increased the non-Native population on Kodiak Island. Kodiak served as the Aleutian Campaign Command Center during World War II, and a Navy submarine and air station was constructed at Women's Bay. The 1964 earthquake damaged many parts of the island, especially Old Harbor, Kaguyak, Afognak, and Ouzinkie. Old Harbor was rebuilt in the same location, the residents of Kaguyak were relocated to Akhiok, and Port Lions was constructed to house the residents of Afognak. Some of the canneries that were destroyed were never rebuilt (e.g., Shearwater and Ouzinkie canneries).

3.2.16.4 Southcentral Region

The Southcentral region includes two major cultural groups, the Athabaskan speaking Dena'ina in the Cook Inlet area and the Sugcestun speaking Alutiiq peoples of PWS, outer Cook Inlet, and the coast east of Iliamna Bay on the Alaska Peninsula along Shelikof Strait. There are approximately 5,250 cultural resource sites, which include both prehistoric and historic resources, in the Southcentral region (ADNR 2005m). This likely represents a small percentage of cultural resources in the region, as the entire region has not been inventoried for cultural resources. However, the number of cultural resource sites found on BLM-managed lands within this region would be much smaller.

Overview of Regional Prehistory

During the last glacial period of the Pleistocene, much of the Southcentral region was under the ice of expanded alpine glaciers, which extended from the Chugach and Alaska ranges to the water's edge along the North Pacific. Approximately 15,000 years ago, retreating glacial ice opened areas of land to possible human and animal colonization (Reger and Pinney 1996). By nine to eight thousand years ago, there should have been some human presence in Cook Inlet, although evidence for this early occupation may have been inundated by rising sea levels, tectonic uplift, and subsidence. Herbaceous tundra dominated the region prior to 13,700 years ago, when woody shrubs such as dwarf birch and willow, grasses and sedges came to dominate the plant communities of the region. By 10,500 years ago, poplars began growing among the willow stands, and by 9,500 years ago, alder invaded the lowlands (Reger and Pinney 1996). In the Southcentral region, the relatively few well-excavated sites roughly parallel the sequence described in Clark (1984a; 1984b), with relatively late differentiation in Cook Inlet between Eskimoid and Athabaskan style assemblages.

The earliest known radiocarbon dated sites in the region are less than 5,000 radiocarbon years old (Table 3.2-18). Components of the Beluga Point site are presumed to be eight to ten thousand years old based on comparative typology of artifacts, particularly microblades and burins (Workman 1996b). Long Lake in the Matanuska Valley has yielded several localities with diagnostic artifacts indicative of the time of their manufacture. Locality B yielded a blade, two bifaces, and retouched flakes with a radiocarbon date of 6606 ±115 BP. The remaining early sites are in the Kenai Peninsula: two near the Russian River on a relict glacial terrace, the Round Mountain site, and two sites near Seward with microblades, bifaces, and microblades (Workman 1996b). Other sites of this period occur on the upper Kenai River (Reger and Boraas 1996). Workman (1996b) believes that up to 10 different archaeological traditions may have had temporary occupancy in Lower Cook Inlet and Kachemak Bay from 10,000 to 3,000 years ago.

Approximately 3,000 years ago, distinct occupations with relatively long term continuity begin to appear in the western Kenai Peninsula, while in Kachemak Bay variable assemblages occur indicating sequential reoccupation of sites (Reger and Boraas 1996). This occupation included a

riverine and marine component that lasted in Cook Inlet until 1,000 years ago (Reger and Boraas 1996).

At approximately 1100 AD, a new archaeological culture arrived in Cook Inlet: the Dena'ina. Over the following hundred years the Dena'ina began to colonize the areas formerly occupied by the Eskimo-like Kachemak people (Reger and Boraas 1996). The preceding Kachemak people along with their material culture appear to have retreated to the mouth of the inlet, returning to the outer coastal areas. Similarities between Kachemak and archaeological materials in other regions, including Kodiak and the Alaska Peninsula, continue after the apparent replacement of Kachemak in Cook Inlet (Reger and Boraas 1996).

Table 3.2-18. Prehistoric Timeline of the Southcentral Region

Culture	Date *	Representative Site	Notes
Notched Point (Northern Archaic Affiliation)	4795±165 - 4650±150 (3564 - 3373 BC)	Round Mountain II (SEW-214)	Earliest Radiocarbon dates reported in cultural context in Cook Inlet. Prior to Kachemak, sites are "sparse and not well evaluated."
Ocean Bay II	4440±90 (3059 BC)	Sylva Site (SEL-245)	
BPS-I	4155±160 (2205 BC)	Beluga Point (ANC-054)	Beluga Point sites reported to have connections with Bristol Bay and Kodiak areas.
BPS-II	4080±150 (2130 BC)	Beluga Point (ANC-054)	
ASTt-Like	4005±110	Chugachik Island (SEL 033)	
Kachemak I	2706±118 (748 BC)	Yukon Island (SEL 001)	
Kachemak II	2740±75 - 1475±70 (858 BC - AD 475)	Chugachik Island, Merrill (Kenai River)	
Kachemak Sub-III	2310±70 - 1475±70 BP (360 BC - AD 475)	Chugachik Island, Cottonwood Creek	
Riverine Kachemak (Kachemak II or III)	2755±160 - 151±125 BP (967 BC - AD 1799)	Nilnunqa, Tustumena Camp, KEN-147, KEN-214, Merrill, Moose River, SEW-756	
Kachemak III	2330±70 - 1100±60 BP (399 BC - AD915)	Cottonwood Creek, Yukon Island, Moose River, Point West of Halibut Cove, Seal Beach	
Fox Farm Bluff - Post Kachemak/ Norton	1315±250 - 570±80 BP (AD 625 - 1380)	Yukon Fox Farm Bluff, Port Graham	
BPN-III	790±120 - 650±70 BP (AD 1257 - 1296)	Beluga Point (ANC-054)	
Dena'ina	1210±50 - 50±50 BP (AD 792 - 1900)	Moose River Site, Clam Gulch Site, Nilnunqa, KEN-094, KEN-214, KEN-230, KCHS Site, Nelson Site, Pelch Site, Point West of Halibut Cove, Seal Beach	Dena'ina occupation is believed to have occurred in the last 500 to 1,000 years. Indicators include houses in the Dena'ina style (semi-subterranean, multi-roomed, with central hearths.)
Historic Kenai Peninsula Eskimo			

Table 3.2-18 (continued). Prehistoric Timeline of the Southcentral Region

Culture	Date *	Representative Site	Notes
Prehistoric Cultures of PWS			
Ocean Bay	3800 BP	Uqciuvit Village	
Palugvik 1-2	1753±105 - 1727±105 BP (AD 205 - 231)	Palugvik	
Palugvik 3-4			
Historic Chugach Burial Caves			

Notes: *Dates are based on the radiocarbon date ranges for representative sites.
AD – common era/Anno Domini
ASTt – Arctic Small Tool Tradition
BC – years before the birth of Christ
BP – years before present

Source: Reger and Boraas (1996), Workman (1996b) and Stephen R. Braund & Associates (2005).

The Eskimoid material culture associated with historic Koniag, Chugach, and Unegkurmiut, corresponds well with similarly timed phases on the Upper Alaska Peninsula and in PWS. The latter area is complicated by the paucity of deeply stratified sites, likely caused by sea level changes and tectonic subsidence of lands in the area associated with both plate boundary activity and deglaciation (Clark 1984a). Clark argues for continuity between Eskimo like material culture bearing sites throughout the wider region as contrasted to the Dena'ina material culture found in contested areas of Outer Cook Inlet (Clark 1984a).

Overview of Regional History

Table 3.2-19 briefly outlines historic events in the Southcentral region. Russian fur traders, active in the vicinity of the Sea of Okhotsk, continued their established patterns of integrating new peoples into the frontier of Russia and into Alaska following the return of Chirikov and then Bering's men in the 1740s. The competition between imperialistic nations for territories in the Pacific included voyages of trade and exploration funded or endorsed by Britain, Spain, France, and the U.S. During the 19th century, the U.S. and Britain became occasionally cooperative competitors for sea otter, fur seal, beaver, and other pelts, supplying in turn trade goods and food for the Russian America Company. Due to concerns that Alaska would be taken by force of arms by a competitive nation due to the impossibility of Russia defending it, efforts were made to sell Alaska to the U.S. beginning in the 1850s, concluding in the sale of Alaska in 1867 (Black 2004).

Table 3.2-19. Historic Timeline of the Southcentral Region

Date	Event
1774	Spanish navigator Juan Perez sailed to PWS, but turned back due to weather.
1778	Captain James Cook arrived in Cook Inlet and began trade relations with the Dena'ina.
1783	Fur hunting crews under Potap Zaikov wintered in PWS, but were unable to hunt due to Native Chugach hostility.
1785	The Russians having established settlement on Kodiak Island, Grigorii Shelekhov ordered exploration of PWS and outer Cook Inlet. Hostages were taken and a post was established in Cook Inlet.
1786	The Lebedev-Lastochkin Company established a post on the Kenai Peninsula, and rival companies followed.
1791	The Lebedev-Lastochkin Company established another post on the Kenai River. In the 1790s, violent conflict between competing companies and Native inhabitants occurred.
1799	Rival trading companies were consolidated into the Russian America Company, which was granted a monopoly over the fur trade in all colonized regions.
1808	Russian America Company headquarters moved to Sitka, lessening trade activity in the Kodiak and Cook Inlet regions.
1819	Andre Il'ich Klimovskiy explored the Lower Ahtna area and established Copper Fort. Further expeditions ended in violence and the post was closed in 1848.
1830s	Smallpox epidemic caused major decline in the Native population throughout southcentral and other areas of Alaska.
1845	The first Russian Orthodox priest arrived at Nikolaevskiy Redoubt to serve Cook Inlet. Cook Inlet Dena'ina participated in the Russian Orthodox Church gradually after the 1940s.
1867	The U.S. purchased Alaska from Russia for $7.2 million. The Alaska Commercial Company assumed all Russian American Company assets and competition between fur traders resumed.
1880s	Salmon canneries established throughout the Southcentral region, Kodiak, and the Aleutian Chain, affected resource availability.
1884	Congress passed the Organic Act of 1884, ordering the education of all school age children in Alaska and encouraging the assimilation of Natives into Western culture.
1900	Congress passed legislation that funded the establishment of independent schools for white children.
1924	Congress passed the Indian Citizenship Act, granting Alaska Natives the right to vote.
1930s	Federal schools were established throughout the region, which prohibited the teaching of Native languages.
1936	The Indian Reorganization Act was established to determine possessory rights in Alaska.
1942	Campbell Airstrip was established as a military airbase.
1949	Native and white schools were integrated.
1959	Alaska was admitted to the Union as the 49th state.
1964	The 1964 earthquake caused destruction throughout southcentral Alaska.
1966	The Alaska Federation of Natives was formed to pursue settlement of Native land claims.
1971	Congress passed the ANCSA.
1980	Congress passed the ANILCA.
1989	*Exxon Valdez* oil spill.

Notes: ANCSA – Alaska Native Claims Settlement Act
ANILCA – Alaska National Interest Lands Conservation Act
PWS – Prince William Sound
U.S. – United States

Source: Townsend (1981), and Stephen R. Braund & Associates (2005).

Following the sale of Alaska to the U.S., Russian subjects were given three years to leave Alaska and the territory was placed under Army, Navy, and finally Revenue Cutter Service jurisdiction until a local government was formed by the Organic Act of 1884 (Brooks 1973). The Alaska Commercial Company and other fur companies were active in Cook Inlet and PWS, harvesting wild furs in exchange for credit at company stores. By the end of the 19th century, salmon canneries were built in several areas of the Southcentral region, and Native people were seasonally employed at the canneries or as commercial fishermen (Davis 1984).

Several episodes of epidemic disease swept the region, depopulating many communities and forcing the consolidation of many Native people into a few centralized towns with schools, mail, and hospital services. Development of urban centers and transportation infrastructure in Cook

Inlet, World War II mobilization, and Cold War base building had further effects on people of the region, displacing some from the Anchorage and Kenai areas. Competition for land and resources increased as Native peoples were at a low population due to chronic and epidemic diseases. Another important influence on the Southcentral region peoples has been natural and man-made disasters. These include volcanic eruptions on the Alaska Peninsula, the 1964 Good Friday earthquake, and the *Exxon Valdez* oil spill (Davis 1984). For example, Chenega residents abandoned their homes after the tsunami associated with the earthquake washed the community away, but they reestablished the community following the passage of ANCSA. Other efforts have been ongoing to retain and revitalize Native culture in the face of more exposure to the outside world, including language classes, cultural heritage festivals, and other efforts to maintain the connection to their heritage (Davis 1984).

Talkeetna Village Airstrip

Located in the middle of Talkeetna, the Talkeetna Airstrip is listed on the NRHP. The site serves to provide information to educate the public about the importance of early aviation in the exploration and settlement of southwestern Alaska. The history of aviation in Alaska is of particular interest to the local community, as well as the ever-growing number of visitors to this area.

The Talkeetna Airstrip

Knik River

There are approximately 297 cultural resource sites, two identified as prehistoric and 63 identified as historic, in the vicinity of the proposed Knik River SRMA (ADNR 2005m) (Figure 2.3-5). A large number of the documented sites are associated with mining, homesteading, and agriculture (Colony Farms). Currently, 11 sites in the vicinity of the proposed Knik River SRMA are listed on the NRHP, but not located on BLM-managed lands. The ADNR Office of History and Archaeology has recorded 63 cultural resource surveys in the Knik River area.

Potential archaeological sites in the vicinity of the Knik River include former village and camp sites used by Knik Dena'ina peoples (Kari and Fall 2003). An archaeological survey and inventory coupled with consultation with knowledgeable elders from the Dena'ina community would be required before actions are undertaken in this area.

Neacola Mountains

There is only one prehistoric cultural resource site documented in the area of the proposed Neacola Mountains ACEC (ADNR 2005m) (Figure 2.3-3). The ADNR Office of History and Archaeology has recorded one cultural resource survey in the Neacola Mountains area. While the majority of the Neacola Mountains area has not been surveyed, it has been an important path to the interior from the coast and from Susitna River communities in prehistoric and historic times for the Dena'ina people. During the historic period, trade between inland Dena'ina, Deg Hit'aan, and Upper Kuskokwim peoples was undertaken through the passes in the area, and it was used annually as a prime mountain goat and mountain sheep hunting area (Fall 1981; Fall, Foster et al. 1983; Kari and Fall 2003).

3.2.16.5 Southeast Region

There are approximately 4,800 cultural resource sites in the Southeast region (ADNR 2005m). These sites include both prehistoric and historic resources. As the entire region has not been inventoried for cultural resources, undocumented cultural resources may continue to be found in the region.

Overview of Regional Prehistory

The prehistory of the Southeast region is relatively poorly known due to the limited number of excavations done in the region. Complicating factors for the location, identification, and investigation of older sites include changes in marine sea levels, the effects of glaciation, and active geological processes effecting site formation and preservation. The early prehistory is of particular interest to researchers studying the colonization of the Americas by people traveling from Eurasia at or before 15,000 years ago. Later prehistoric and historic period archaeology is comparatively well-documented due to the number of travelers, explorers, and colonizers arriving in the region beginning in the 1700s. Russian, British, French, Spanish, and American fur traders and explorers visited, traded, fought, and established settlements along the coast, with the Russian and British nationally chartered monopoly fur companies building forts along the coasts and rivers of the region (Gibson 1976; Black 2004).

Geological and sea level changes have likely affected the types and locations of sites. The interrelated effects of continental glaciation lowered and raised sea levels through the amount of water locked up in the glaciers. As they melted, the sea level would rise, and as they accumulated, the sea level would fall. Glaciers cut through the coastal mountains, themselves formed from the interplay between subducting continental plates and glaciers pushing down on plate sections. As glaciers retreated, the weight was removed and the plate sections rebounded at rates up to 25 millimeters per year (Larsen, Motyka et al. 2004). In some cases, rather than an entire plate section rising, only one section would rise while the other fell. Thus, some sites may be underwater while others may be high above the current tide line by several meters. Tectonic effects caused by plate movement as well as by glacial retreats and advances may also change the altitude and attitude of plate segments, such as in Lynn Canal and in the Wrangell vicinity (Butzer, Butler et al. 2004).

The overarching research question for much of Alaskan prehistoric research is the search for the first people to arrive in the new world from Eurasia. Early human remains were discovered by Timothy Heaton in On Your Knees Cave on Prince of Wales Island, including human bone dated at 9,730 and 9,880 years ago and a bone artifact dated at 10,300 years ago (Heaton 2003). Other researchers are working to connect the interior and coastal populations to determine which group came first and what connections existed between them (Ames and Maschner 1999).

Table 3.2-20. Prehistoric Timeline of the Southeast Region

Culture	Date*	Representative Site	Notes
Paleomarine	8,300 - 6,600 BC	Hidden Falls (component I), Ground Hog Bay 2 (component II and III)	Characterized by the use of microblades struck from wedge shaped cores, unifacially reduced pebble and cobble scrapers and few or no bifacially reduced stone tools.
Transitional	3920 BC - AD 1780	Lake Eva (component I, II, and III), Point Couverden, Irish Creek	Transitional stage covers the period of technological change between the Paleomarine and Developmental Northwest phases. Ground stone tools became dominant over microblade and unifacial stone tools during this period.
Developmental Northwest Coast			
Early	2780 BC - AD 640	Hidden Falls (component II), Coffman Cove, Traders Island, Rosie's Rockshelter (upper and lower)	Earliest evidence of ground stone and bone industry.
Middle	1000 BC - AD 1860	Hidden Falls (component III), Sarkar Entrance, Young Bay, Greens Creek, Portage Arm	Continuation of ground stone and bone industry, with more emphasis on unilaterally barbed ground bone points, ground stone knives.
Late	AD 570 - AD 1770	Starrigavan, Russian Cove, Bear Shell Midden, Ground Hog Bay (component I), Daxatkanada, Old Town	Late phase characterized by larger structures ("winter villages") and presence of copper tools, stone bowls and lamps, etc.

Notes: *Dates are based on the radiocarbon date ranges for representative sites.
AD – common era/Anno Domini
BC – years before the birth of Christ
BP – years before present

Source: Davis (1990) and Stephen R. Braund & Associates (2005).

Overview of Regional History

Table 3.2-21 provides a brief overview of key points in southeast Alaska history. Chirikov's expedition in 1741 represents the first direct encounter between the Tlingit people and Europeans. His sighting of Mt. St. Elias, the Coast Range, and the Stikine River would later be used to establish the boundaries of Alaska for the Russian Empire and later for the U.S. (Solovjova and Vovnyanko 2002; Black 2004).

Table 3.2-21. Historic Timeline of the Southeast Region

Date	Event
1741	Vitus Bering and Aleksei Chirikov led expeditions from Kamchatka to establish Russian sovereignty in Northwest America. Chirikov reached southeast Alaska, but did not land.
1774	Arrival of Europeans on the Northwest Coast. Spanish Navigator Juan Perez sailed to PWS, but weather forced him to turn around. The following year, the Spaniards traveled as far as Mt. Edgecumbe near Sitka.
1775	Initial smallpox epidemic caused an estimated 30 percent decline in the total Native population.
1778	British Captain James Cook explored the coast of Alaska, traveled through PWS, and sighted Mt. Edgecumbe.
1799	Aleksandr Baranov established a fort and trading post at Sitka. The Tlingits attacked the town the following year, and Russians later recaptured and rebuilt the town.
1821	The Russians allowed the Tlingits to return to Sitka and rebuild their village.
1835	The smallpox epidemic reached southeast Alaska.
1867	The U.S. purchased Alaska from Russia for $7.2 million. The Alaska Commercial Company assumed all Russian American Company assets and competition between fur traders resumed. U.S. Army occupied southeast Alaska until 1877.
1869	Tlingit clan chiefs met to discuss objections to the sale of Alaska. The U.S. Treasury Department recorded their official complaint.
1878	Salmon canneries were established in southeast Alaska. In 1879, federal legislation outlawed aboriginal fish traps. Later, commercial fish traps were permitted.
1879	The U.S. Navy returned to Tlingit territory to open the area to settlement.

Table 3.2-21 (continued). Historic Timeline of the Southeast Region

Date	Event
1880	Chilkat Tlingit chiefs agreed to allow access to interior lands for mining prospectors.
	Joe Juneau and Dick Harris (led by an Auk Tlingit) struck gold near Juneau, resulting in the arrival of thousands of prospecting miners.
1881	U.S. Navy removed Tlingit Natives from Juneau.
1884	The Organic Act of 1884 ordered the education of all school age children in Alaska and encouraged the assimilation of Natives into Western culture.
1889	Tlingit clans presented their land claims to the president of the U.S. The president denied their requests.
1896	Discoveries of gold in the Dawson area begins the Klondike Gold Rush.
1897-1898	Large influxes of people in search of their fortunes in the Klondike Gold Rush arrive in Alaska.
1899	The Tlingit present a petition to the U.S. Congress for the establishment of reservations and schools. U.S. Congress denied the petition.
1900	Completion of the White Pass and Yukon Railroad.
1900	Congress passed legislation that funded the establishment of independent schools for white children.
1912	The Alaska Native Brotherhood, a primarily Tlingit organization, was founded in Sitka to promote Native Alaskan social welfare.
1924	Congress passed the Indian Citizenship Act, granting Alaska Natives the right to vote.
1923	The Alaska Native Sisterhood was founded, and both brotherhood and sisterhood camps emerge throughout Tlingit and Haida villages.
1930s	Federal schools were established, which prohibit the teaching of Native languages.
1936	The Indian Reorganization Act was established to determine possessory rights in Alaska.
1946	The Alaska Native Brotherhood successfully lobbied for passage of the Antidiscrimination Act.
	A boarding school for Native high schools students opened in Mt. Edgecumbe.
1949	Native and white schools were integrated.
1959	Alaska was admitted to the Union as the 49th state.
	The use of fish traps, which affected salmon populations and Native subsistence, were abolished by the Department of the Interior.
1966	The Alaska Federation of Natives was formed to pursue settlement of Native land claims.
1968	The Central Council of Tlingit and Haida were awarded $7.5 million by the U.S. government for taking 2.5 million acres of land from the Native people.
1971	ANCSA was passed.
1980	ANILCA was passed.

Notes: ANCSA – Alaska Native Claims Settlement Act
ANILCA – Alaska National Interest Lands Conservation Act
PWS – Prince William Sound
U.S. – United States

Source: Stephen R. Braund & Associates (2005).

Haines Block

There are approximately 128 cultural resource sites in the area of the proposed Haines Block SRMA (ADNR 2005m) (Figure 2.3-4). Of these 128 sites, the ADNR Office of History and Archaeology has identified 37 sites as historic and three sites as prehistoric. A large number of these documented sites are associated with mining. There are currently 10 sites in the Haines Block listed on the NRHP. To date, the ADNR Office of History and Archaeology has recorded 83 cultural resource surveys in the area around the proposed Haines Block SRMA.

The land in this area includes the prehistoric and historic routes to the interior owned by Chilkoot and Chilkat Tlingit people, important trade routes for a variety of commodities. During the Russian period, the Tlingit sent trade goods to the interior and down the Yukon, providing competition to the Hudson's Bay Company in the fur trade (McClellan 1981). Later, Tlingit packers profited by assisting Klondike Gold Rush miners ascending the passes to get to the Upper Yukon River gold fields (Brooks 1973). Recent finds in the vicinity include human remains in the ice which show the time depth of human passage through the mountains here (Schuster 1999a; Schuster 1999b). Gold Rush period archaeological materials and historic structures and properties are most likely present in this area.

Tsirku River

BLM manages approximately 12 miles of the 24-mile Tsirku River uplands, recognized largely for its scenic, geologic, and wildlife values (Figure 2.3-8). The Tsirku River corridor is a tributary of the Chilkat River, a river with many significant AHRS sites and important native villages. Although no AHRS surveys have been conducted here, it has high to moderate potential for the discovery of cultural resources, some having unique or exemplary qualities because the Tsirku River corridor provides important access and fishery resources.

Dalton Cache

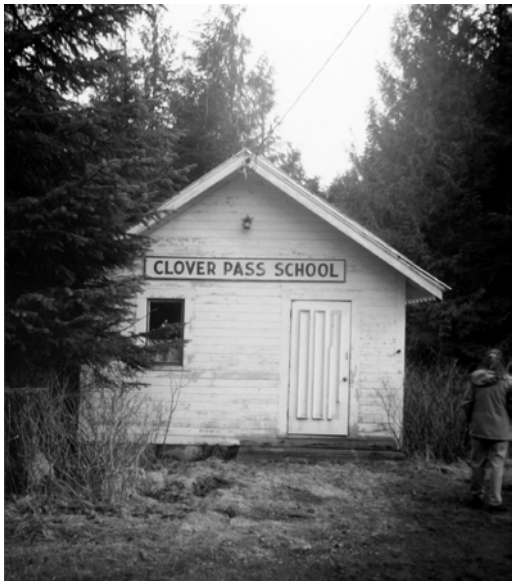
The Dalton Cache building was built by Jack Dalton in 1896 as an inn for travelers along the Dalton Trail. The cabin sits partially within the 60-ft strip on the U.S.-Canada border, which was set apart as a public reservation by presidential proclamation in 1908. It is located along the Haines Highway at the present border crossing approximately 50 miles northwest of the city of Haines. The building has been maintained and repaired by BLM and GSA over the years to preserve the character of the structure and to provide an educational and interpretive opportunity. It is one of the few remaining original cabin structures dating back to the days of the Klondike Gold Rush. It was listed on the NRHP in 1973.

The Dalton Cache, near Haines.

Sitka Blockhouse

The Sitka Blockhouse site is contained on a 0.603 acre parcel of land located in downtown Sitka. It is a replica of an 1804 Baranov stockade built to protect Novoarkangel'sk (present day Sitka). The original blockhouse was dismantled in 1899 and was replaced by an octagonal replica in 1921 because the metal in the building was interfering with readings of the Sitka

Magnetic Observatory. The citizens of Sitka raised money to build a replica of that blockhouse. It was constructed in 1926 in the totem pole park of what later became the Sitka National Historic Park. After this replica was destroyed in 1959, the NPS built another replica of the blockhouse in 1962 in the current location. BLM has managed the facility as an interpretive site since 1977. The building provides an interpretive opportunity for visitors to learn about the early Russian occupation of southeast Alaska.



Clover Pass School

Clover Pass School is the last of the small, independent schools that served the outskirts of the Ketchikan area. The nearly 50-year old one-room school house was built by Clover Pass community members in 1947, after petitioning the school district for a teacher's salary and the USFS for a special use permit. The residents formed the Clover Pass Workers Club and raised money and dought donations for a building. When the school opened, there were 12 students in eight grades enrolled. After the Ketchikan Gateway Borough School District was created in 1961, the school closed. Local residents used the building as a community center until the late 1990s. It was listed on the NHRP in 2005.

Hyder Storehouse No. 4

The Hyder Storehouse No. 4 is a small rock building that stands at the international border between British Columbia and Alaska near the town of Hyder. The storehouse was built in 1896 by the USACE to support the later survey of the Alaska-Canada border. Storehouse No. 4 is one of four storehouses built along the Portland Canal, a seventy mile fjord. Later, changes to the border put the other three storehouse inside Canada. The Hyder Storehouse No. 4 was the first masonry structure built in Alaska. It predates the Klondike Gold Rush, and is still in relatively good shape. Its builder, Captain David DeBose Galliar is an engineer of historic significance. All of these facts contribute to this building being placed on the NRHP. BLM is continuing work to rehabilitate and interpret the structure for visitors to southeast Alaska.

3.3 Resource Uses

3.3.1 Forestry

The Alaska BLM AFO manages the vegetation resources on BLM-managed lands in the Ring of Fire planning area. Individuals, small businesses, and large corporations harvest products ranging from mushrooms to saw timber each year. It is the goal of BLM's forest resources program to manage these resources under the principles of sustained yield for the benefit of present and future generations (BLM 2004k). It is BLM's policy to follow the Alaska Forest Resources and Practices Act (FRPA) (1978) in conducting all forest management activities.

State and nationwide program goals seek to protect and improve forest health and provide forest products commensurate with public demand. While little demand currently exists for forest products in the planning area, there are several types of harvest permits issued by BLM. Forest management activities on BLM-managed lands within the planning area currently include free use harvest of material for personal use, such as firewood and house logs. Small timber sales are also typical on BLM-managed lands within the planning area. Land clearing operations for public ROW or military purposes are authorized under permit. Wildfire fuels reduction projects involving the harvest of timber have also occurred.

Most lands with forest resources are located in remote areas with poor or economically unfeasible access. Many of the timber stands are several hundred miles from the nearest road and beyond economic parameters for helicopter logging or operations based from saltwater. Few silvicultural treatments such as thinning, planting, fertilization, or genetic tree improvement have taken place. The access and economic limitations likely contribute to the low demand for forest products on BLM-managed lands within the planning area.

While there is not a current forest products inventory for the BLM-managed lands within the Ring of Fire planning area, existing demand is likely well below that which the area is estimated to be capable of producing. National program guidance requires that a forest inventory be conducted on BLM lands so that an allowable sale quantity can be determined, commensurate with public demand. In addition, a survey for insect and disease effects would be useful to determine potential management actions. Approximately 100,000 board ft are annually harvested through permits or use authorizations. It is possible that as many as 200,000 board ft of forest products per year may be needed in the foreseeable future. This volume would not support any commercial operator. Attempts in the past to hold large timber sales to attract regional or national interest were not successful. The soft wood market for pulp and dimension lumber has not been strong in the past several years. Asian demand for pulp products has diminished for Alaska based products. Several large contractors in Alaska have closed their doors recently due to a lack of demand. Given market conditions, population levels, and foreseeable demand, it is unlikely that the demand for forest products will exceed the potential supply in the foreseeable future.

Undoubtedly, some residents harvest forest resources without permits or authorizations. While the quantity harvested is unknown, it would be reasonable to assume that it is at least equivalent to the amount harvested under permit. Because much of the material used by small permittees can be acquired more easily from other, more convenient sources, a low level of demand for forest products on BLM-managed land is expected to continue in the foreseeable future. Very few commercially manageable timber stands occur on BLM managed lands in the Southeast region.

3.3.1.1 Forest Health

BLM forest health issues are largely the result of the spruce bark beetle epidemic. Much of the mature white spruce within the planning area has died as a result of this infestation. Lack of access to the timber, coupled with poor markets for the product, and an excess of dead spruce available from other sources has made silvicultural treatments on BLM land nearly impossible. A great deal of dead spruce saw timber will lose its value as it continues to rot. After five to 10 years the material will have essentially no commercial value. As dead trees fall to the ground, the material is a liability in the form of increased fuel for wildfire and an impediment to travel for humans and migrating animals. Without a market for, or access to, this material, little of it will be harvested. As more deadfall accumulates, successional species, such as grass, will invade and provide a source of flash fuels that could contribute to large and uncontrollable fires by igniting the timber. Small-scale forest fuel reduction projects are in the planning stage to protect high value populated areas.

The ADNR Division of Forestry has developed a forest health protection program that monitors the bark beetle infestation, uses natural pheromones to mitigate the infestation, conducts wood pest surveys, and aerial forest damage surveys (ADNR 2005c). Aerial surveys revealed that insect and disease activity in Alaskan forests nearly doubled between 2002 and 2003. While the bark beetle outbreak increased seven percent over the 2002 level, the aspen leaf miner increased 15 percent, and the birch leaf roller infestation increased by 70 percent. The aspen leaf miner population has now spread throughout the State including the Anchorage Bowl, Palmer, Seward, Haines, and Skagway. Spruce aphid defoliation was found throughout the southeast including Juneau, Sitka, Ketchikan, and Wrangell boroughs (USFS 2003b).

3.3.1.2 Management Concerns

If large fires occur on BLM lands, conifer reforestation efforts will likely be hampered by a lack of available seeds and seedlings. Aerial applications of seed would likely be the only cost effective method of reforestation that would be beneficial. Without seeding the sites, they would likely become dominated by hardwoods.

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula/Aleutian Chain region primarily consists of Region III type forests (ADNR 2004b), which is interior spruce/hardwood, south and west of the Alaska Range. A small portion at the north end of the peninsula is in Region II, which is interior spruce/hardwood, south of the Alaska Range, and a small portion is in Region I, which is coastal Sitka spruce/hemlock (ADNR 2004b).

Kodiak Region

On Kodiak, Sitka spruce and western hemlock are prevalent on the lowlands and mountain slopes with some trees reaching 150 ft in height. However, most of the island is within the boundaries of Kodiak NWR, managed by the USFWS for bear and fish habitat (Figure 1.2-2). The USFWS rarely conducts commercial timber harvest (USFWS 2004e). Timber in the Kodiak region is generally too difficult to access (such as Marmot Island), has conservation easements on the land, or is located on State park land (ADNR 2003a). No timber sales were planned at the time (ADNR 2003a) of writing. The scattered timber on Kupreanof Peninsula and Chiniak

Peninsula are insufficient to support a timber harvest industry on Kodiak. Native corporations have done some small harvesting.

Southcentral Region

The CNF occupies most of the Southcentral region, about 1.2 million acres (Figure 1.2-3). Approximately 27 percent, or 319,000 acres of the CNF is forested land. Approximately 85 percent of forested lands are composed of western hemlock, mountain hemlock, and Sitka spruce; the remaining 15 percent is cottonwood, white spruce, aspen, paper birch, and Alaska yellow-cedar forest types. These forest types are primarily found on the Kenai Peninsula, PWS, and the Copper River Delta.

In 2005, as part of the President's Healthy Forests Initiative, BLM removed approximately 340 cords of dead standing and down beetle kill spruce from a 40-acre parcel of BLM-administered lands off of Kalifornsky Beach Road in Kenai. The lands are surrounded by rural residential subdivisions which could be threatened in the event of wildland fires. Removal of the dead spruce was necessary to reduce fire risk and improve the health of the forest.

Results of timber removal on BLM-managed lands in Kenai.

The Halibut Cove Natural Forest Research Area was withdrawn from all forms of appropriation under the public land laws, including the mining and mineral leasing laws and reserved under the jurisdiction of BLM as a forest study area by Public Land Order (PLO) 2980 on January 29, 1963.

Southeast Region

Southeast Alaska's timber harvest has been on a decline since record highs in 1990 to its record low in 2001 at just 221 million board feet (MMBF). Slightly less than ten million acres, or 60 percent, of the TNF is forested land. Western hemlock and Sitka spruce stands make up 98 percent of forested land. Approximately 5.5 million acres of the forested land is considered productive. To date approximately 0.5 million acres of the productive forestlands on the TNF have been converted into a second growth cycle due to fire or wind. This is approximately 15 billion board ft of timber.

3.3.2 Grazing

3.3.2.1 Livestock Grazing

There are currently no active grazing permits, or local dependence upon BLM-managed lands in the planning area for livestock grazing. Logistical difficulties, climate, predators, disease, insects, plant communities ill-adapted to annual grazing, and marginal soils for converting wildlands to hay or pasture, are all factors that limit sustainable livestock grazing opportunities. Further complicating the grazing opportunity is the effect it would induce to sustainable levels of use for other natural resources on BLM-managed lands in the planning area. On most BLM-managed lands within the planning area, the demand for a sustainable harvest of naturally occurring wildlife is more practical and in greater demand than grazing. The only current and anticipated local dependence on grazing resources would be recreational and commercial saddle, pack, and draft animals that utilize BLM land in pursuit of hunting, fishing, back country recreation, and similar activities. There are no BLM administered lands with livestock grazing with the exception of potential unauthorized use. Some withdrawn lands do allow cattle grazing. If and when the State or ANCSA selections are revoked, grazing use may or may not be continued.

3.3.2.2 Reindeer Grazing

No reindeer grazing operations or permits currently occur on BLM-managed lands within the planning area. There are no known feral or domesticated reindeer using BLM-managed lands in the Ring of Fire planning area.

3.3.3 Farmland

The USDA NRCS has not designated any Prime or Unique Farmlands on BLM-managed land within the Ring of Fire planning area. Congress has defined farmland throughout the U.S. based on rich soils, temperature, acidity, susceptibility to flooding, erosion, unique characteristics (i.e., cranberry bogs), and statewide or local importance. Only three areas in Alaska have been identified by NRCS as having any of these characteristics. All three are located within the Ring of Fire planning area, but not on BLM-managed lands, and have characteristics of Farmlands of Local Importance. Palmer, Wasilla, and the Upper Susitna Soil and Water Conservation Districts have criteria for Farmlands of Local Importance, which are soils greater than 20 inches in depth; have different combinations of clay, sand, silt, and loam; vary in permeability and drainage; rarely flood; and have only a slight slope and erosion. In addition to soil types, the frost-free season and growing degree-days are determining factors in Alaska crop growth (NRCS 2005a). These factors combine to reduce both the availability and desirability of BLM managed lands for use as farmland. However, BLM does entertain requests to use small, isolated parcels for farming activities, such as growing hay, on a case-by-case basis.

3.3.4 Lands and Realty

There are two primary objectives of the lands and realty program in the AFO. One objective is to implement the use of public lands as authorized by the Federal Land Policy and Management Act of 1976 (FLPMA), the Mineral Leasing Act of 1920 (MLA) and the Recreation and Public Purposes Act of 1954 (R&PP). The second objective is to facilitate the transfer of lands to the State of Alaska, the Native corporations and individuals through the application of the entitlement Acts.

The BLM can authorize use of public lands through: FLPMA and MLA ROW grants; FLPMA leases and land use permits; R&PP Act leases and/or patents. FLPMA authorized withdrawals for benefit of Federal Agencies; and FLPMA land tenure adjustment actions such as Sales, Exchanges or Acquisitions. BLM also addresses realty trespass issues that affect selected and non-selected public lands and provides support to other internal programs that protect or utilize resources. To facilitate the transfer of lands to Native corporations, the AFO reserves and manages ANCSA 17(b) easements which provide access to publicly owned lands.

The lands and realty program operates in accordance with multiple laws, regulations, and guidance; a full list can be found in Appendix C. The following laws have a significant influence on BLM lands and realty management in the Ring of Fire planning area:

- **Alaska Statehood Act (1958)** requires 103,350,000 acres of federal land to be conveyed to the State. Current statistics for land title transferred to the State are:
  - 102,550,000 acres for General Purposes, 85 percent conveyed.
  - 400,000 acres for community grant selected from national forests, 87 percent conveyed.
  - 400,000 acres for community grant selected from public domain, 24 percent conveyed.
  - Section 6(m) makes the Submerged Lands Act (1953) applicable to Alaska, whereby the State is granted title to the beds of all navigable waters as other states in the union, unless specifically withheld at the time of Statehood.
- **Native Allotment Act (1906)** authorized the allotment of up to 160 acres of non-mineral land to Indian or Eskimo people in Alaska.
- **Alaska Native Claims Settlement Act (ANCSA) (1971)** granted Alaska regional corporations the right to select approximately 44 million acres of federal land in Alaska.
- **Alaska Native Interest Lands Conservation Act (ANILCA) (1980)** established and redesignated National Parks and Preserves, National Wildlife Refuges, National Conservation and Recreation Areas, Wild and Scenic Rivers, National Monuments, and wilderness areas on federal lands in Alaska.
- **FLPMA (1976)** requires BLM to prepare land use plans to manage use, occupancy, and development of federal land.
- **R&PP Act (1954)** authorizes the sale or lease of public land to State and local governments and qualified non-profit organizations for public uses, such as campgrounds, schools, firehouses, and law enforcement and municipal facilities.
- **NHPA (1966)** requires that every BLM realty action undergo a mandatory review by the Advisory Council on Historic Preservation, per Section 106 of the NHPA.

3.3.4.1 Land Status

Of the 365.5 million acres of land in Alaska, approximately 234.7 million acres are federally owned land, of which BLM manages 86 million acres. Of the 61.4 million acres of land within the Ring of Fire planning area, the AFO administers 1.3 million acres. This includes all public land and federal mineral estate managed by the AFO from below Dixon Entrance in southeast Alaska to Attu Island at the western end of the Aleutian Chain, a linear distance of approximately 2,500 miles (BLM 2003c). The 1.3 million acres of BLM-managed lands located in the Ring of Fire planning area are just a portion of the 16 million acres of public land and federal mineral estate that the AFO administers in the State. Large areas of federally owned lands in the planning area are managed by BLM, Department of Defense (DOD), U.S. Coast Guard (USGS), USFS, NPS and the USFWS. Other landowners include: the State of Alaska, ANCSA corporations, and other private owners. BLM procedures and policies must be consistent with FLPMA, which declares public lands to remain in federal ownership, and continue to be managed for multiple use to serve national interest (BLM 2003d). The following description of land status within the Ring of Fire planning area is organized by region (Figure 1.2-1).

Of the 1.3 million acres of land managed by BLM in the planning area, approximately 800,000 acres have been selected by the State of Alaska under the Alaska Statehood Act (1958), and by Native corporations under ANCSA. However, adjudication of these selection applications has not yet been completed; therefore, while BLM has management responsibilities for all 1.3 million acres, they must consult with the State or Native corporations when making management decisions that affect these lands. BLM also manages the subsurface estate for lands in other federal management units, such as the USFWS and NPS. BLM has no jurisdiction over the surface estate of such lands, and would coordinate subsurface management activities with the appropriate surface estate landholder.

Alaska Peninsula/Aleutian Chain Region

The largest consolidated area of BLM land on the Alaskan Peninsula covers most of the western coast from Kanatak to Cape Kukmlik. Smaller concentrations are located near Port Heiden and Chignik Lake. USFWS holds a large percentage of land, along the Alaska Peninsula that has been divided into several NWRs; the Becharof NWR at the northern end of the Alaska Peninsula, Alaska Peninsula NWR, Alaska Maritime NWR, and Izembek NWR have the authority to monitor and manage activities on these lands by requiring permits (ADNR, ADF&G et al. 1984). This region also has a smaller amount of Native Patent or Interim Conveyance (IC) land and NPS land, relative to the amount of BLM land in the area. Figure 1.2-2 in Appendix A illustrates the land ownership of this region.

The State of Alaska has received patent or tentative approval (TA) of several large parcels. State land along the Alaska Peninsula/Aleutian Chain region is concentrated along the northwest edge of the Alaska Peninsula and is divided into areas managed to protect resources such as wildlife and habitat. These areas include: the Izembek Game Refuge, and three CHAs; Port Moller, Port Heiden, and Cinder River. Native corporations own land in the Cold Bay, Port Moller, and Port Heiden areas (USDOI 1985).

Kodiak Region

BLM lands within this region are primarily inholdings scattered throughout USFWS land. Most BLM land in the Kodiak region is located along the coastal portions of Kodiak Island, particularly around Karluk and Kodiak, and along the Aluilik, Hepburn, and Moser Peninsulas.

The southern two-thirds of Kodiak Island is managed by USFWS, and is primarily within the Kodiak NWR. Surrounding Kodiak NWR are smaller, portions of State Patent or TA, and Native Patent or IC, land. State land is primarily in the areas of Shuyak, eastern Afognak, western Raspberry, northeastern Kodiak, Sitkinak, and Tugidak islands. Native land is primarily in the area of Afognak Island, Whale Island, Spruce Island, Karluk River, Sturgeon River, eastern Raspberry Island, Sitkalidak Island, and coastal areas on northern Kodiak Island (ADF&G 2002a). The USCG manages over 18,000 acres of withdrawn public land for operation of the Kodiak Coast Guard Base. Land ownership in the Kodiak Region is displayed on Figure 1.2-2 in Appendix A.

Southcentral Region

Although the Southcentral region consists mainly of State Patent or TA, USFS, and NPS land, there are several large parcels of BLM land concentrated west and southwest of Tyonek, and around Tuxendi Bay. Two of the largest blocks of BLM-managed land in the Ring of Fire planning area occur in the Neacola Mountains and Knik. Many smaller parcels are concentrated near Eklutna, Anchorage, Soldotna, Talkeetna, Moose Pass, Seward, in the Chigmit Mountains north of Williamsport, and near Dutton and Ursus Cove on the west side of Cook Inlet. USFWS, Native Patent or IC, and some military land (particularly in the Anchorage area) surround some BLM tracts of land. Some of this land is Native-selected and State-selected. Neacola Mountains, on the west side of Cook Inlet, have many Native village corporation selections, as well.

Parks and forests within the Southcentral region include: Lake Clark National Park and Preserve, Kenai NWR, Kenai Fjords National Park, CNF, Chugach State Park, and many other recreation and State marine parks. In addition to surface lands, BLM manages the subsurface of

specific lands in the Southcentral region, including the estate beneath USFWS, USFS, and NPS lands, and scattered private parcels in the MSB. BLM has withdrawn federal lands associated with Fort Richardson Army Post (FRAP) and Elmendorf Air Force Base (EAFB) to the DOD. Land ownership in the Southcentral region is displayed on Figure 1.2-3 in Appendix A.

Anchorage, the largest city in Alaska, is located in the Southcentral region, and is increasing in population and size yearly. In 1998, approximately 258,000 people living in the Anchorage Bowl were using three quarters of the available land. By 2020 it is predicted that the Anchorage Bowl will increase by approximately 81,800 more residents and 31,600 more housing units within the municipality (MOA 2000). Future growth is expected to be balanced between Anchorage and existing nearby communities.

Southeast Region

The Southeast region has two large tracts of BLM land located in the Haines-Skagway area. The boundaries of one parcel form a rectangle, with its southwest corner resting at Klukwan and stretching up to the Canadian border. The other parcel is south of Klukwan along most of the border of Glacier Bay National Park and Preserve, and the Haines Borough boundary from the Canadian boarder to Davidson Glacier. All of the BLM land near the Haines and Skagway area is State-selected.

The USFS manages a majority of the land in the Southeast region including the TNF, Admiralty Island National Monument, and Misty Fjords National Monument. The NPS manages the Klondike Goldrush National Park in Skagway. Other lands in the region are Native Patent or IC, State Patented or TA, and the Metlakatla Indian Reservation. Figure 1.2-4 in Appendix A displays the land ownership in the Southeast region.

3.3.4.2 ANCSA Section 17(b) Easements

Section 17(b) of ANCSA established a requirement that BLM "identify public easements across lands selected by the Native village and regional corporations, and at periodic points along the courses of major waterways which are reasonably necessary to guarantee international treaty obligations, a full right of use and access for recreation, hunting, transportation, utilities, docks and such other public uses" (1971). These easements are reserved for access across lands conveyed to Native village or regional corporations to publicly owned land that is otherwise “land locked” by privately owned land (BLM 1990b). ANCSA 17(b) requires appropriate easement for public access be identified. Easements may not be reserved for recreation purposes (BLM 2005e). Once these lands are conveyed the Native village or regional corporations will own the surface rights, and in most cases the regional corporations will own the subsurface rights (ADNR 1984).

There are approximately 2,050 17(b) easements reserved statewide under the authority of ANCSA. Approximately half are managed by BLM, the rest are managed by USFWS, NPS and other federal agencies (BLM 1990b). Within the Ring of Fire planning area, management of these easements is determined using the December 12, 1988 MOU (AK-974-MOU-809) signed by BLM, NPS, and USFWS; the August 14, 1990 MOU between BLM and the USFS (AK-974-MOU-20); and the Department of Agriculture MOU (AK-975-MOU-20). No such agreement to manage easements currently exists between BLM and the State of Alaska. Coordination between the landowner and BLM is one of the keys to successfully managing the use and maintenance of these easements.

Active easement management has commonly been requested by Native corporations and the general public, so that easements be properly located and marked. Additional requests have been made to terminate duplicative or unnecessary easements. If the easement provides access to lands managed by the USFS, USFWS, or the NPS, management responsibilities are transferred to those agencies after the lands are conveyed. Otherwise, BLM continues to manage the easement. When BLM identifies easements, the appropriate federal agencies are notified. BLM receives recommendations from State and federal agencies, but is not required to accept easement recommendations.

3.3.4.3 FLPMA, R&PP Act, and MLA Actions

Rights-of-Way

A ROW issued under FLPMA Title V, or MLA Section 28 authority grants an applicant the authority to use specific public land to build such things as roads, communication facilities, power lines, or oil and gas pipelines. Generally, ROWs are issued for long-term projects that require significant investment. ROWs are a possessory interest in land, in that BLM will consult with the entity holding a ROW if they plan an action that could affect their authorized use. Usually, ROWs are issued for a specified term for the project with the option to renew.

Communication sites will continue to be a demand placed on public land. Types of uses may include cellular phone services and microwave sites. The Telecommunications Act (1996) and President Clinton's Executive Memorandum of August 10, 1995 require BLM to facilitate requests, if they are not in direct conflict with current or planned use of the property. BLM's ability to accommodate multiple land uses depends on the degree of compatibility between the uses, or the degree to which the proposed land use is compatible with other resource values. For example, utility and transportation corridors can accommodate multiple compatible land uses. Telephone lines can be co-located with electric distribution lines. Fiber optic cables or natural gas lines may be buried next to roads and highways.

Recreation and Public Purposes Act of 1954

Under the R&PP Act, State and local government agencies, municipal utilities, and non-profit entities can acquire public land (at less than fair market value) through a patent or lease. The eventual patent of lands underlying the Clover Pass School will follow this process. Patents contain a reversionary clause requiring BLM concurrence of any change in use and ownership; otherwise the land reverts back to the U.S. Considering evolving land ownership patterns in the Ring of Fire planning area, less land is becoming available in close proximity to communities that is available for use under the R&PP Act.

Land Use Authorizations

Land use authorization means any authorization, deriving its authority from FLPMA Section 302, to use the public lands under 43 CFR §2920. Land use authorizations are used to permit activities when other land actions cannot be used, such as a right-of-way or R&PP lease, etc. Permits authorize an applicant to use public lands for specified purposes, normally involving little or no land improvement, construction or significant monetary investment. Permits do not convey a possessory interest in land and are normally issued for three years or less and may be renewed with the discretion of the Authorized Officer. Leases authorize uses of public lands involving substantial construction, development, or land improvement and the investment of

large amounts of capital which are to be amortized over time. A lease conveys a possessory interest and is revocable only in accordance with its terms and the provisions of 43 CFR §2920.9–3. Leases are issued for a term, determined by the Authorized Officer, which is consistent with the time required to amortize the capital investment. Easements may be used to assure that uses of public lands are compatible with non-Federal uses occurring on adjacent or nearby land. The Authorized Officer determines the term of the easement.

Under existing levels of development, building infrastructure on remaining public lands may be acceptable. Three factors determine how much development is allowed to occur:

1. The level of development that is acceptable to the public.
2. Impacts to existing co-located uses – incompatibility among types of uses.
3. Development reaches a stage where significant effects affect the proper functioning of other resources.

Selected Lands

On selected lands, prior to the issuance of a ROW or Land use authorization, BLM will obtain the views of the Native Corporation if the lands are selected by a Native Corporation. 43 CFR § 2650.1. If the lands are state selected Section 906(k) of ANILCA requires BLM to receive a letter of concurrence from the State of Alaska, prior to permitting activities. If the proposal is on land that has been top-filed by the State, pursuant to 906(e) of ANILCA, a letter of concurrence is not required.

Land Tenure Adjustment

When all of the conveyances resulting from entitlement acts are complete, a broken/scattered land pattern may result in some areas. These broken/scattered land patterns may be difficult to manage by land owners (individual Alaska Natives, Native Corporations, and the State of Alaska). It is likely that the landowners may want to consolidate their lands through land exchanges, disposal, or acquisitions.

A conservation easement is an acquisition authorized by FLPMA. Conservation easements conserve natural or man-made resources on land (Ohio State University 2005) and also protect land from incompatible uses (BLM 2005p). The landowner is allowed to maintain existing land uses while the conservation easement protects the land from subdivision and development.

3.3.4.4 Foreseeable Changes in Land Ownership

Changes in land ownership (disposals) result in transfer of title from public domain to the State of Alaska, Native corporations, individuals, local governments, etc. Section 203 of FLPMA establishes criteria under which public lands may be considered for disposal. Under BLM policy, plans may identify lands as suitable for disposal only when the disposal criteria for the proposed action (i.e., lands exchange, R&PP Act) are met. In general, all such proposals are to be reviewed under the criteria established by FLPMA on a case-by-case basis and will require a site-specific EA.

BLM's mission statement includes the responsibility to convey lands to the State of Alaska, Native corporations, and individuals. The BLM Alaska Land Transfer Program (ALTP) was established to fulfill the mandates of the Native Allotment Act (1906), the Alaska Statehood Act

(1958), and ANCSA (1971). These acts require BLM to convey millions of acres of land to individual Alaska Natives, Native corporations, and the State of Alaska. Under these acts, the State of Alaska was allowed to select up to 125 percent of their allotted entitlement. In 2004, Native corporations had approximately eight million acres of remaining entitlement under ANCSA, but still had around 40 million acres of selection. The land management complications resulting from the overselections were a major driver behind BLM's goal to complete the ALTP by 2009. To aid in this pursuit, the Alaska Land Transfer Acceleration Act (2004) was passed December 10, 2004, which improved the pace of the conveyance process. It is estimated that approximately 85 percent of the land entitlement of the State of Alaska and Native corporations has been conveyed (BLM 2003a; BLM 2003d). Once land selected by the Native corporations is conveyed, Native village and/or regional corporations will own the surface rights, and the regional corporations will own the subsurface rights (ADNR, ADF&G et al. 1984).

Through the R&PP Act, non-profit groups, as well as local and State governments, have obtained land through leases or patents for uses such as sewage treatment plants, schools, fish hatcheries, and shooting ranges (BLM 2003a). Requests are handled on a case-by-case basis, allowing for prioritizing cases that may effect other programs or resources. Cases are required to comply with NEPA. In addition to information derived from NEPA compliance analysis, other factors are considered prior to determining whether an authorization will be granted: public input, constraints with existing land use plans, and possible conflicts with other uses. Requests for changes in land ownership would cause a review as to the potential that the tract of land has to offer the national and local public (BLM 2003a).

Public land sales are used to sell land that is isolated and hard to manage, no longer needed for any federal purposes, or to be disposed of to serve a public need or interest identified in a land use plan (BLM 2005e). Land that has become difficult or uneconomic to manage will be considered for sale or exchange. Disposals through exchange would result in more efficient federal management of the public lands. The assumption is that manpower devoted to managing tracts that are small, difficult, or uneconomic could be better used where the public benefits are greater (BLM 2003a). There may be municipal, school, and federal reserves and withdrawals that may be no longer needed by the U.S. for the purposes for which they were reserved. In the communities where this is occurring, the land could potentially be used locally through the R&PP process, or they could be selected by the University of Alaska and sold or leased to support university operations (BLM 2003a).

A parcel of BLM land in Cape Pole, AK proposed for sale.

3.3.4.5 Withdrawals

A withdrawal is a formal action that sets aside, withholds, or reserves federal lands by administrative order or statute for public purposes. Withdrawals can withhold land from uses, transfer land between federal agencies, and dedicate land for a particular public use (BLM 2004b). Withdrawals are governed by 43 CFR Part 2300.

Table 3.3-1. Summary of Existing Withdrawals Within the Ring of Fire Planning Area

Withdrawal Type	Acres Withdrawn	Department	Segregative Effect
Lighthouse Reserves	29,000	U.S. Coast Guard	Closed to settlement, location, sale, entry, or other disposition.
Air Navigation Sites	3,300	BLM and Federal Aviation Administration	Closed to settlement, location, sale, entry or other disposition, including State selection.
Administrative Sites	25,000	BLM, USGS, U.S. Coast Guard, USFWS, NOAA	Closed to public land laws including State selection, the mining laws and mineral entry
Recreational Withdrawals	1,000	BLM, Department of Defense	BLM withdrawals are closed to all forms of appropriation under the public land laws, including mining, but not the mineral leasing laws. Department of Defense withdrawals are from all forms of appropriation under the public land, mining, but not the mineral leasing, laws nor disposal of materials under the act of July 31, 1947.
Alaska Railroad Withdrawals	1,400	Alaska Railroad Corporation	Closed to public land laws including State selection, the mining laws and mineral leasing laws.
Power Site Classifications, Power Site Reserves, and Power Projects	2,000	BLM, Alaska Energy Authority and FERC	BLM withdrawals are closed to public land laws, including State selection, but not ANCSA entitlement; open to mineral location (subject to regulations in 43 CFR 3731); and open to mineral leasing. Power Project Withdrawals are closed to public land laws and open to mineral location (subject to regulation in 43 CFR 3731), in the application state. Upon issuance of a preliminary permit or license by FERC, they are closed to mineral location. It is open to mineral leasing throughout.

ANCSA: Alaska Native Claims Settlement Act
BLM: Bureau of Land Management
CFR: Code of Federal Regulations
FERC: Federal Energy Regulatory Commission
USGS: U.S. Geological Survey
USFWS: U.S. Fish and Wildlife Service
NOAA: National Oceanic and Atmospheric Administration

Millions of acres underlying both BLM public land and BLM-managed State- or Native-selected lands in Alaska are withdrawn by public lands orders issued pursuant to ANCSA 17(d)(1). The ANCSA 17(d)(1) withdrawals are a series of public land orders issued from 1972 to 1975 that placed a protective withdrawal on federal lands for the purpose of study and review to determine the proper classification and "to ascertain the public values in the land..." The intent of the withdrawals was to limit appropriation of the lands in order to complete inventories of resources and assessment of values, which would then allow for an orderly development of BLM's management objectives for present and future public needs. In the 1980s, studies and assessments were completed, and opening orders were issued on some lands covered by the ANCSA 17(d)(1) withdrawals. No further actions have been taken since that time. These ANCSA 17(d)(1) withdrawals closed the areas to mineral leasing, and in some areas, to the exploration of metalliferous minerals. Increasingly, the State of Alaska, local government agencies, Native corporations, and private industry are calling for these lands to be opened to the mineral and public land laws.

The current land use planning process will initiate assessment of resource values and make recommendations on opening lands withdrawn by the ANCSA 17(d)(1) orders.

In addition to the ANCSA 17(d)(1) withdrawals, there are hundreds of acres of administrative, recreation, power site, military, and other withdrawals in place, many of which were created for a specific purpose that may now be obsolete. This planning process will evaluate the need for maintenance or revocation of these withdrawals. Table 3.3-1 gives a summary of existing withdrawals within the Ring of Fire planning area.

Under authority derived from FLPMA, BLM processes withdrawals at the request of other federal agencies for such uses air navigation equipment, recreational withdrawals, office sites, etc. Once land has been withdrawn for a specific agency, that agency manages the land until such time the withdrawal is no longer needed. When the withdrawal is due to expire (usually 20 years), BLM contacts the agency managing the withdrawal to inquire whether the withdrawal is still needed. If the withdrawal is no longer needed, BLM processes a revocation of the withdrawal and a restoration of the land to the public domain. If the land is unsuitable for use in the public domain, the land is disposed of through the General Services Administration. Creating, modifying, renewing or revoking withdrawals for other federal agencies will continue to be an important function of BLM. As populations grow throughout the region, pressures placed on resources will continue to escalate, which may effect the number of requests from federal agencies for withdrawals, and demands for withdrawal review may increase from the State and local governments. As part of the land planning process BLM will review existing withdrawals.

3.3.4.6 Coordination with Other Agencies' Management Plans and Guidelines

BLM administers 1.3 million acres of surface estate lands in the Ring of Fire planning area, of which approximately 798,000 acres are State- and Native-selected lands, and approximately 486,000 acres are unencumbered BLM lands.

Management and Guidelines for Critical Habitat, State Parks, and State Refuges

- **Federally Designated Critical Habitat**—Designated Critical Habitats for Steller sea lions are found along the shoreline of all BLM regions, and Steller's eiders are associated with the waters along the Alaska Peninsula and Aleutian Chain region. Federal law mandates that critical habitats be managed to protect these unique

resources. In addition there are several State-designated CHAs within the Ring of Fire planning area managed to protect valued resources such as bald eagles, salmon, migrating birds, etc.

- **State Parks**—There are many State parks in the Ring of Fire planning area managed for public use such as camping, picnicking, recreation, trail use, historical features, boating, fishing, and other marine resources.
- **State Refuges**—The State game refuges preserve lands for hunting, fishing and other recreation activities.

Management and Guidelines for Other Public Lands Within the Ring of Fire Planning Area by Region

Alaska Peninsula/Aleutian Chain Region

Alaska NPS manages three units located in the Alaska Peninsula/Aleutian Chain region in the vicinity of BLM-managed lands (Figure 1.2-2).

- **Katmai National Park**—Managed for its brown bear viewing opportunities at Brooks Camp, Brooks River, Naknek Lake, and Brooks Lake shorelines during the world's largest sockeye salmon run in July (NPS 2004h).
- **Aniakchak National Monument and Preserve**—Managed to protect the unique scenic viewshed, and the volcanically active Aleutian Mountains (NPS 2004g).
- **Alagnak Wild River**—Designated as a wild river by Title VI 601 of ANILCA (1980) to preserve the upper 56 miles of river in the Aleutian Range (NPS 2004j).
- **Aleutian World War II National Historic Area**—Located at the U.S. Army Base Fort Schwatka on Amaknak Island, the area was established to interpret and educate the public about the Aleut people and the role of the Aleutian Chain in defense of the U.S. during World War II (NPS 2004i).

The USFWS manages four wildlife refuges in the Alaska Peninsula/Aleutian Chain region in the vicinity of BLM-managed lands: the Alaska Maritime NWR, the Becharof NWR, the Alaska Peninsula NWR, and the Izembek NWR (Figure 1.2-2).

- **Alaska Maritime NWR**—Managed to conserve marine mammals, seabirds, other migratory birds and 4.5 million acres of tundra, rainforest, volcanoes, streams, lakes, beaches, and reefs stretching from Cape Lisburne on the Chukchi Sea to the Aleutians and eastward to Forrester Island on the border of British Columbia (USFWS 2005a).
- **Becharof NWR**—Established to conserve brown bears, salmon, migratory birds, caribou, marine birds and mammals by protecting important wildlife habitat, including coastline, tundra, rivers and active volcanoes. Becharof NWR is most biologically significant for its 300,000-acre lake (USFWS 2004c).
- **Alaska Peninsula NWR**—Managed for a wide range of land, coastal and offshore habitat for a variety of fish and wildlife, and important habitat (USFWS 2004g).
- **Izembek NWR**—Izembek NWR is 315,000 acres, of which 300,000 acres of it is designated wilderness. It is ecologically unique because of its diverse wilderness and watershed and the 150 square mile Izembek Lagoon, which supports the world's largest bed of eelgrass (USFWS 2004f).

Kodiak Region

The USFWS manages the Kodiak NWR near BLM-managed lands (Figure 1.2-2).

- **Kodiak NWR**—Managed primarily for the protection of the brown bear population and habitat. The refuge includes nearly two-thirds of Kodiak Island, encompassing 1.9 million acres (USFWS 2004e).

Recommendations for Kodiak NWR land use and acquisition are listed in the Kodiak Archipelago Bear Conservation and Management Plan (ADF&G 2002a) and include continuing to acquire small parcels of high-priority bear and salmon habitat, recognizing subsistence activities, retaining salmon rehabilitation plans, and striving to ensure free movement of bears through their natural ranges.

Southcentral Region

The NPS manages two national parks within this region, the Kenai Fjords National Park, and the Lake Clark National Park (Figure 1.2-3).

- **Kenai Fjords National Park**—This park is located on the south side of the Kenai Peninsula and includes 669,983 acres of icefields, glaciers, glacially carved valleys, and fjords (NPS 2004f).
- **Lake Clark National Park and Preserve**—Established to protect the scenic beauty representative of many regions of Alaska, extending from Cook Inlet, over the Chigmit Mountains to west of the interior. This park includes two active volcanoes, Mt. Redoubt and Mt. Iliamna (NPS 2004e).

The USFWS manages the Kenai NWR (Figure 1.2-3).

- **Kenai NWR**—The Kenai NWR was established to conserve and balance fish and wildlife, fulfill the international treaty obligations of the U.S. with respect to fish and wildlife and their habitats, ensure water quality and quantity, and provide for research, education, and recreation (USFWS 2004d).

The USFS manages the CNF (Figure 1.2-3).

- **Chugach National Forest**—The CNF is Alaska's second largest forest at 5.5 million acres and extends over the Kenai Peninsula, PWS and the Copper River Delta (Stockdale 2002).

Southeast Region

Within the Southeast region, the NPS manages the Wrangell-Saint Elias National Park and Preserve, Klondike Gold Rush National Historical Park, Glacier Bay National Park and Preserve, and Sitka National Historical Park (Figure 1.2-4).

- **Wrangell-Saint Elias National Park and Preserve**—In 1979, Wrangell-Saint Elias was designated a World Heritage Site. A year later, Wrangell-Saint Elias, covering 13.2 million acres, was designated as a national park and preserve with 10 million acres designated and managed as wilderness area (NPS 2004a).
- **Klondike Gold Rush National Historical Park**—This park consists of fifteen buildings restored within the Skagway Historic District in the style of the 1897-1898 Gold Rush, Chilkoot Trail, White Pass Trial, and Dyea Townsite (NPS 2004b).

- **Glacier Bay National Park and Preserve**—Designated in 1980, Glacier Bay National Park and Preserve is a 3.3 million acre glacier-crowned maritime wilderness of mountain ranges and coastal beaches, stretching north from Alaska's Inside Passage to the Alsek River. No part of the park is more than 30 miles from the coast, creating a moist climate and productive ecosystem. The park and preserve are a natural laboratory for observing glaciers, as well as vegetation and wildlife (NPS 2004c).
- **Sitka National Historical Park**—This 113-acre park commemorates the 1804 Battle of Sitka between Alaska Natives and the Europeans. It is Alaska's oldest federally designated park (NPS 2004d).

There is one national forest located in the Southeast region (Figure 1.2-4).

- **Tongass National Forest**—Seventeen million acres of temperate rainforest in southeast Alaska, managed for multiple use by the USFS. The TNF makes up about 80 percent of southeast Alaska (USFS 1997; USFS 2001a).

3.3.4.7 State of Alaska Area Management Plans Within the Ring of Fire Planning Area by Region

Alaska Peninsula/Aleutian Chain Region

- **Bristol Bay Area Plan**—Portions of the Bristol Bay Area Plan are within the Ring of Fire planning area. The Bristol Bay Area Plan, which is currently under revision, provides management guidelines for State lands, and will apply to lands that are selected by, and conveyed to the State. The Bristol Bay region is a very productive fishing, hunting, and trapping area. This area is also used for recreation, guiding operators, and subsistence (ADNR, ADF&G et al. 1984).

Kodiak Region

- **The Kodiak Area Plan**—The Kodiak Area Plan directs management of 570,882 acres of State-owned uplands, 6,396 acres of State-selected uplands, and 3,372,239 acres state-owned tidelands. The plan provides for multiple use and sustainable yield management, including protection of access, habitat, recreation, water quality, watersheds, scenery, and trails. Compatible authorizations are allowed, and all land is open to mineral entry except for a few scattered parcels, which will remain closed by ADNR (ADNR 2003a).

Southcentral Region

- **Kenai Area Plan**—This area plan manages the Kenai Peninsula, excluding the Kenai NWR, primarily for multiple use purposes (Figure 1.2-3). A primary focus is the community of Seward, which has experienced, and is expected to continue experiencing, population growth issues. Upper Resurrection Bay and associated watersheds have been nominated as an Area Meriting Special Attention under this plan (ADNR 2001a).
- **Susitna Area Plan**—The State of Alaska owns, or has selected, 60 percent of the land in the Susitna area, which covers 15.8 million acres in southcentral Alaska in the vicinity of Wasilla, Houston, Big Lake and Willow. The goal of the plan is to sustain regional values, such as developing basic industries for the regional economy; offering land for community expansion; providing for recreation opportunities and local timber supplies; and protecting the natural environment, fish and wildlife resources, visual quality, access, and open space (ADNR, ADF&G et al. 1985).

Southeast Region

- **Alaska Chilkat Bald Eagle Preserve**—This preserve was created by the State of Alaska in 1982 to protect and perpetuate the world's largest concentration of bald eagles and their CHA, to sustain and protect salmon runs, and to provide for subsistence activities. The preserve consists of 48,000 acres of river bottom land of the Chilkat, Klahani, and Tsirku rivers (ADNR 2004e).
- **Northern Southeast Area Plan**—This area is situated to the north of the towns of Haines and Skagway, and consists of 204,298 acres of State-owned uplands, 429,808 acres of State-selected uplands, and 3,442,464 State-owned tidelands. Some sales of State land to Alaskan residents have taken place in the Northern Southeast planning area. There have also been land conveyances to the Sitka and Haines boroughs, the City of Skagway, and the City of Port Alexander in accordance with the Municipal Entitlement Act (1978). The goals of this plan are to provide for economic development, and minimize fiscal costs by providing services and facilities, such as schools and roads, public use, natural environment, settlement, and sustainable yield.

Mining Sites Within the Ring of Fire Planning Area by Region

Southcentral Region

The AFO has six mining sites where valid federal mining claims are being used and/or occupied by individuals involved in mining activities. Five of these mining sites have had no mining activity in over 10 years, but structures and/or equipment still remain. Use and occupancy of these sites are no longer mining related and are not reasonably incident to mining. The goal of the AFO 3715 program is to resolve all use and occupancies that are not reasonably incident to mining through removal actions or transfer of affected lands to the State of Alaska or Native corporations.

Southeast Region

There are 664 federal mining claims under BLM direction in the Southeast region. While some major mines have been, or are in the process of being developed on USFS lands, mining activity on BLM lands has been declining for over 20 years, with most of the activity associated with exploration work. Only a few of these claims are currently being actively mined.

3.3.4.8 Access

Access refers to the physical ability and legal right of the public, agency personnel, and authorized users to reach public lands. Land use authorizations include a ROW grant, an easement, lease, permit, or license to occupy, use, or traverse public lands issued for these purposes. Title XI of ANILCA ensures access to conservation system units (CSUs) (i.e., national parks, monuments, preserves, NWRs, Wild and Scenic River corridors, national forests, wilderness areas, and national conservation and recreation areas). Title V of FLPMA authorizes BLM to issue ROWs across public lands, except designated wilderness areas, for roads, trails, highways, railroads, other transportation systems and facilities, and for power lines and communication sites. R.S. 2477, a federal law active from 1866 to 1976, authorized the construction of roads over "historic ROWs" on public lands, primarily for homesteading purposes. Potential consequences of these roads include loosely regulated access and a potential increase in trespass issues on federal land.

BLM provides services to support the mineral industry, utility companies, the timber industry, persons interested in conservation or resource protection, and research scientists. As growth and development continues throughout the Ring of Fire planning area, infrastructure will expand to meet demands. ROWs for transportation and utility corridors on public land will increase as well.

In order to attain access to BLM parcels across State land, specific requirements must be met. For example, 11 AAC 51.015, 51.025 and 51.045 include specific easement requirements for widths, section-line, and waters on Kodiak Island. ADNR reserves public easements and access corridors before selling, leasing, or otherwise disposing of the land. Access would be provided across State land to other pubic and private lands, but would be limited in areas that threaten safety or provide for special use. When an access route is constructed for resource development, public access shall be retained. Other guide lines on Kodiak may affect public and trail access management such as cultural resources, fish and wildlife habitat, harvest areas, forestry, material sites, recreation, tourism, scenic resources, settlement, and subsurface resources (ADNR 2003f).

Alaska Peninsula/Aleutian Chain Region

According to the Bristol Bay Area Plan (ADNR, ADF&G et al. 1984), there is no ground access from outside the Bristol Bay area. Transportation within the Bristol Bay region occurs along several roads, by all-terrain vehicles, or by snowmachines during the winter (ADNR, ADF&G et al. 1984).

Kodiak Region

More than 90 percent of the region's population lives along the road system that circumscribes Chiniak Bay on the northeastern side of Kodiak Island.

Southcentral Region

Unlike the other three regions in the Ring of Fire planning area, much of the Southcentral region is highly accessible by highway, rail, port, and air facilities. In the Southcentral region, onsite surveying and management of BLM land is possible. The Glenn Highway connects Anchorage to nearby communities such as Eagle River, military bases, and Interior Alaska. The Seward Highway offers access to the Kenai Peninsula. The Alaska Railroad connects ports with major cities. Air transportation in the region includes five airfields and landing strips (ADNR 2001a).

The 127-mile Seward Highway was designated a National Scenic Byway and an All-American Road by the Federal Highway Administration (FHWA) (ADOT&PF 2004a). The Iditarod Trail was designated a National Historic Trail (NHT) and CSU by Congress, which makes it subject to provisions of ANILCA (ADNR 2001a). Management of BLM land along the Seward Highway will aim to be compatible with these designations. ADOT&PF has requested that BLM participate in designing a transportation plan that considers the Pile Bay Road area on the west side of Cook Inlet as an access corridor.

Most of the land surrounding the community of Hope is State Patent or State Tentatively Approved. This land is managed by the ADOT&PF for road ROWs, material sites, and the Hope Airport (ADNR 2001a). There is a BLM parcel of land on the south of this State land.

Southeast Region

Of the 33 communities in southeast Alaska, approximately eight have populations greater than 1,000 people, and only three of these communities are connected to other parts of the mainland by road (USFS 1997). The State of Alaska has prepared the Southeast Alaska Transportation Plan, which identifies 34 essential transportation and utility corridors to improve connectivity throughout the region. The ultimate development plan is to construct a highway through each of these corridors. Corridor Number 2 extends southerly from Dyea (to the west of Skagway) along Taiya Inlet to Taiya Point, and then on to the Haines road system (Figure 2.3-4). This corridor crosses the easternmost portion of the Haines Block SRMA. Although these townships are State-selected, due to over-selections, there is a strong possibility that these townships will remain under BLM management.

3.3.4.9 Unauthorized Use, Occupancy or Development of Public Lands

Activities that do not appreciably alter the physical character of public lands and resources managed by BLM, but do not have to have prior approval by BLM, are considered unauthorized uses. Unauthorized occupancies are activities that result in unapproved full- or part-time human occupancy or use of BLM-managed lands. Activities that disturb the earth's surface, or which physically alter the character of public lands or vegetation without prior approval of BLM are considered unauthorized developments. Collectively, the above activities can be termed as trespass situations.

When presented with a trespass situation, BLM has three options to resolve the situation; removal of the trespasser, authorization of the trespass activity, or sale of the land to the trespasser. Each situation is handled on a case-by-case basis, according to BLM regulations and policies.

Factors to consider that could result in the removal of the trespasser and rehabilitation of the land could include:

- Situations involving new trespass, public safety, or public complaints.
- Areas identified for long-term federal management.
- Selected or public lands on which resources are being removed without authorization or where resource damage is occurring.

Resolutions involving the authorization of the trespasser could include:

- Authorization by lease, permit or ROW for legitimate uses or public benefits, if consistent with identified area objectives.
- Authorization by permit on selected lands where the selecting entity prefers that the trespasser be authorized. This could be contingent upon the land being conveyed within the near future.

Resolutions involving the sale of public land to the trespasser could include:

- Situations where all criteria of FLPMA Section 203 for disposal of land have been met. All costs to process a sale would be borne by the trespasser. Competitive sales could be used where more than one interested party is present.

Alaska has many instances where people have constructed recreational cabins without authorization. The BLM Alaska cabin policy applies to these cases. Unauthorized cabins may become the property of the U.S. Government and be could managed as administrative sites, emergency shelters, or as public use cabins. Other possible management actions on unauthorized cabins could include the removal of the structure.

BLM staff resolves unauthorized occupancy issues through land sales, where land is uneconomical to manage. If an authorization is not appropriate to resolve a trespass situation, the removal of the structures and restoration of the land is pursued (BLM 2003a).

3.3.5 Hazardous Materials

Hazardous materials are defined as any material that because of its quantity, concentration, or physical or chemical characteristics, may pose a hazard or potential hazard to human health or the environment. Hazardous materials include flammable or combustible material, toxic material, corrosive material, oxidizers, and compressed gasses.

The Hazardous Materials Management Program, a program that provides guidance supplemental to the National Contingency Plan, typically supports and guides other programs or agencies to ensure that they adhere to all federal and State environmental laws and regulations regarding hazardous materials (USEPA 1990). The Hazardous Materials Management Program could review all NEPA compliance documents produced for actions on BLM-managed lands within the Ring of Fire planning area for hazardous materials management environmental compliance. If the Hazardous Materials Management Program found BLM-managed land within the Ring of Fire planning area that contained hazardous substances, all surface and/or subsurface activities would be suspended until BLM AFO obtained direction from the appropriate federal and/or State regulatory agency. Monitoring would be carried out in response to assessment, cleanup, and restoration of a contaminated site. Monitoring would be coordinated with other programs to ensure that those program objectives were met.

3.3.5.1 Laws, Regulations, and Policies

The BLM hazardous materials program focuses on environmental protection. Environmental protection encompasses the land, water, people, and habitat associated with jurisdictional federal lands. The backbone of this program is found in federal and State environmental laws and regulations. Federal and State laws cover the release, storage, handling, and disposal of hazardous materials, fuels, and other hydrocarbons. These laws provide guidance for investigation and cleanup of contaminated lands, worker chemical safety, or exposures, transportation of hazardous materials, and legal liabilities. The hazardous materials program is governed by national laws which protect both humans and the environment, such as: FLPMA, as amended, 43 U.S.C. 1701 *et seq.;* NEPA of 1969, as amended, 42 U.S.C. 4321 *et seq.*; the CAA of 1990, as amended, 42 U.S.C. 7418; the CWA of 1987, as amended, 33 U.S.C. 1251; and the Safe Drinking Water Act, 42 U.S.C. 201. More specifically, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. 9601 *et seq.*, addresses risks posed to human health and the environment resulting from releases or potential releases of hazardous substances. The Resources Conservation and Recovery Act of 1976; 42 U.S.C. 3251 *et seq*., provides legal requirements on hazardous and solid waste management (generation, storage, transportation, disposal), underground fuel storage tanks, spill investigations and cleanup, recycling, permits, and munitions. The USACE has an environmental quality Formerly Used Defense Sites (FUDS) Program Policy to regulate management and cleanup of FUDS on federal lands (USACE 2004b). Not all FUDS involve hazardous materials.

On BLM-administered lands, BLM has broad authorities and responsibilities to respond to hazardous substance releases by selecting and implementing removal and remedial actions, maintaining administrative records, notifying the public, recovering costs, and working with potentially responsible parties. For cleanup actions, BLM follows federal law with its authority under CERCLA. BLM coordinates all cleanup actions with the ADEC and works to accommodate their guidance and perspective. Similarly, BLM notifies and coordinates hazardous material activities with specific Native corporations on Native-selected lands.

Hazardous materials are a broad category of substances or chemicals as defined by 49 CFR 171.8. Hazardous materials are also defined by multiple other federal regulations, but may be summarized as follows: hazardous materials are substances or materials capable of posing an unreasonable risk to health, safety, and property. Some regulations list specific chemicals as hazardous, and evaluate other materials based on their characteristics: toxic, ignitable, corrosive, or reactive. Hazardous materials are sometimes used or produced by recreational or industrial processes. They also result from illegal activities, such as solid and liquid waste dumping, drug manufacturing, or unauthorized firearm activities. Authorized industrial processes may include timber harvesting and mineral exploration or production; recovered minerals may include oil and gas, metallic ores, and gravel or rock material for construction processes. If the use of properly managed hazardous materials on federal lands were eliminated, it would have a negative effect on many legitimate uses of public lands. Generally, BLM staff does not sample or cleanup hazardous waste, but contracts with qualified firms that specialize in remedial actions. When a hazardous waste incidence report is filed, BLM coordinates the review with a specified contractor.

BLM manages hazardous materials on BLM-managed lands within the Ring of Fire planning area in a manner that is consistent with federal, State, and local governmental requirements and constraints. The BLM Alaska Environmental Protection Program is responsible for identifying and protecting public lands and the users of those lands from the effects of hazardous materials and waste. The Environmental Protection Program is responsible for the:

- Inventory of public land for hazardous materials,
- Investigation and reporting of hazardous waste/materials sites,
- Assurance that conveyed lands to and by the federal government do not contain known hazardous materials/wastes,
- Completion of cleanup of contaminated federal sites,
- Support of legal actions to recover cleanup costs on hazardous waste sites, and
- Point of contact for the emergency response plan (BLM 2005c).

3.3.5.2 Hazardous Materials within the Ring of Fire Planning Area

The AFO is responsible for administering the Environmental Protection Program for BLM-managed lands within the Ring of Fire planning area. Typical hazardous materials and waste issues on BLM properties are generally found around abandoned mines, logging operations, abandoned military sites, illegal dumps, or are due to accidental spills of hazardous materials. Hazardous materials may threaten the health and safety of public lands and its users directly or indirectly through the contamination of soil, surface water, or ground water. A summary of potential hazardous materials sources within the Ring of Fire planning area are described in Table 3.3-2.

Table 3.3-2. Activities and Associated Hazardous Materials

Potential Hazards	Examples
Hazardous materials associated with historic and active mine operations	Acid rock drainage, chemicals associated with processing ore or used in laboratories (i.e. cyanide); explosives such as dynamite, ammonium nitrate, caps, and boosters; heavy metals from mine tailings; asbestos; petroleum hydrocarbons from mine operations (e.g., fuel, oil, solvents, lead-acid batteries)
Hazardous materials associated with historic and active logging operations	Asbestos; petroleum hydrocarbons from logging operations (e.g., fuel, oil, solvents, lead-acid batteries)
Military operations	Unexploded ordinances; petroleum hydrocarbons from military operations (e.g., jet fuel, diesel fuel, gasoline, solvents); PCBs; asbestos; lead based paint; heavy metals
Illegal dumping	Unauthorized drum dumping of waste fuels and oils; solid waste dumping; dumping of lead acid batteries
Illegal activities	Drug labs, debris burn sites; illegal firearm activity (lead and heavy metal effects)
Spillage of hazardous materials	Materials spilled from overturned trucks, cars, or train cars; spillage from pipelines
Oil and Gas activities	Hydrogen sulfide gas, oil spills; petroleum hydrocarbons from drilling wastes and operations; heavy metals and fuel contamination from drilling wastes (e.g., chromium, barium, diesel based drill muds).
Facilities on public land either federal or private (under a ROW)	Leaking underground storage tanks, asbestos; petroleum hydrocarbons

Notes: PCB – polychlorinated biphenyl
ROW – right-of-way
Source: BLM (2004b; 2004c)

Abandoned mine operations and former military sites are the most common sites on BLM-managed lands where hazardous materials effects have been identified. Former mine claimants and military operations have left hazardous materials in the form of drums of chemicals, fuels, oils, solvents; as well as batteries, asbestos, heavy metal contaminated mine tailings, and fuel contaminated soils. Typically, the USACE or other DOD agencies perform funding, management, and cleanup operations of FUDS and other DOD sites involving hazardous materials and are not specifically listed in this document. The USFS typically manages cleanup of sites associated with logging operations on federally controlled forest areas. However, BLM typically manages cleanups of abandoned mines and illegal dumping activities on non-DOD property where there have been hazardous material effects.

Abandoned Mine Lands

The BLM Abandoned Mine Lands (AML) Program is administered under federal policy to meet federal and State cleanup requirements. The AML Program addresses the mines as environmental and safety hazards on public land resulting from a culmination of former mining activity on federal claims (BLM 2004b). The AML program focuses on the longer term cleanup of mine related waste materials that may be considered hazardous to human health and the environment. If hazardous materials are present at abandoned mine sites they are most often considered non-time critical removal actions under the National Oil and Hazardous Substances Pollution Contingency Plan rather than emergency removal actions that are typical of many hazardous materials problems. Typical hazardous materials found at the sites include petroleum hydrocarbons from diesel powered equipment and building heating fuel, lead acid batteries associated with heavy equipment and vehicles, asbestos insulation and lead paints used in mine building construction, and mine tailing wastes. The AML program also focuses on physical

safety dangers from open shafts and pits. None of the 22 sites on the current BLM AML program list are located in the Ring of Fire planning area (BLM 2004c).

Illegal Dumping

Illegal dumping of hazardous materials is a management concern on BLM property. BLM's policy is to identify potentially responsible parties (PRPs) who are liable for hazardous substance releases affecting BLM lands or resources. After a PRP is identified, BLM will ensure that the PRP cleans up the hazardous substance, or reimburses BLM for costs incurred to cleanup the hazardous substance release. An illegal dumping site within the Ring of Fire planning area was within the Soldotna area, and was noted on ADEC's contaminated site listing as the Kalifornsky Beach Road Midnight Dump Site. Five drums of waste oil were dumped at the site in 1992. Subsequent cleanup actions removed approximately 20 cubic yards of contaminated soil. Final cleanup actions were completed and a closure letter issued by ADEC in 2004.

Log Transfer Facilities

Log transfer facilities associated with timber harvests have been potential sources of hazardous materials. Petroleum-related substances are the most common contamination; lead batteries have been found on some sites. These cleanup actions have typically been administered by the USFS. In the TNF in southeast Alaska, 50 years of timber sale contracts have resulted in hundreds of log transfer facilities. The primary users were Ketchikan Pulp Company and Alaska Pulp Corporation. In 1997, the Ketchikan Pulp Company entered into an agreement with the USFS to perform environmental cleanup work at all sites contaminated by the Ketchikan Pulp Company operations. Alaska Pulp Company has a MOU with the USFS to review sites used by the Alaska Pulp Company and cleanup sites that are identified as contaminated (USFS 2004a). The CNF also has log transfer facilities. The *Revised Chugach Resource Management Plan* (Appendix B of that plan), contains discussion on possible PWS and lower Copper River log transfer facilities (USFS 2002a).

ADEC and USEPA Listed Sites

There are no USEPA-permitted hazardous materials waste disposal facilities on or adjacent to public lands within the Ring of Fire planning area. Non-hazardous waste solid waste disposal facilities are regulated by USEPA and administered by ADEC under 18 AAC 60. BLM no longer permits landfills on public land; however, closed landfills of various sizes exist on or near public lands. Hazardous chemicals, if present, can possibly leach hazardous chemicals. Other potentially regulated sources of hazardous materials within the Ring of Fire planning area include the use of aboveground storage tanks (ASTs) and underground storage tanks (USTs). With the exception of specifically excluded UST uses (e.g., home heating oil), UST operations are regulated by the USEPA and administered by the ADEC under 18 AAC 78. A listing of permitted USTs in Alaska can be obtained at the following web site: http://www.state.ak.us/dec/spar/csp/db_search.htm. Based on that database, no BLM-owned regulated USTs are located in the Ring of Fire planning area; however, there may be USTs on BLM-managed lands that are owned by other entities (e.g., DOD, other federal agencies).

USEPA and ADEC have identified contaminated sites within the Ring of Fire planning area. ADEC contaminated sites program is administered under the regulatory authority of 18 AAC 75. This program identified sites that are known to have contamination currently or that have been

cleaned up during administration of the program. Approximately 65 percent of the 3,796 recorded ADEC contaminated sites are within the Ring of Fire planning area (ADEC 2005). Approximately 53 sites are listed within the Ring of Fire planning area on the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database (USEPA 2005a). The CERCLIS database is a compilation by the USEPA of the properties or facilities which the USEPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to CERCLA of 1980 (also known as the Superfund Act). Of those 53 sites, three are on the CERCLA National Priorities List as active sites and include: EAFB, FRAP, and Adak Naval Station.

Due to the large area included in the Ring of Fire planning area, sites may be included in both the ADEC and USEPA databases. Additionally, other regulatory programs may have sites that are not included in the ADEC and USEPA databases, such as those reported to the U.S. Coast Guard or other federal agencies.

3.3.6 Leasable Minerals

Mineral resources on BLM-managed surface and subsurface lands are divided into categories based on provisions of various mining laws. These resources are referred to as “leasable,” “locatable,” and “salable” minerals. Leasable minerals include oil and gas, CBNG, geothermal fluids, and certain solid minerals, such as coal, potassium, sodium, phosphate, and oil shale. Locatable minerals consist primarily of metallic minerals, precious minerals and gemstones, and certain nonmetallic industrial minerals generally found in lode or placer deposits (ENSR Corporation and Booz Allen & Hamilton Inc. 2003; USFS 2004d; BLM 2004e). Salable minerals include common varieties of construction aggregate (sand and gravel), building stone, pumice, clay, and limestone.

The following discussion of mineral resources in the Ring of Fire planning area is based on information included in the *Mineral Potential Report* (Appendix G) which discusses the potential for both mineral occurrence and economic development of minerals. Potential for mineral occurrences refers to the prediction of the likelihood of the presence of these resources. Development potential describes whether or not a mineral occurrence is likely to be explored or developed within the next 10- to 15-years under given geologic and nongeologic assumptions and conditions (BLM 1985). Development potential requires the projection of Reasonably Foreseeable Development (RFD) per BLM guidance (BLM 1990a). Occurrence potential for each mineral type, and RFD scenarios are presented in following sections. A more detailed analysis of mineral potential is presented in Appendix G.

3.3.6.1 Fluid Leasable Minerals

Pending oil and Gas Leases

Pending noncompetitive oil and gas lease offers, most of which were filed in the 1960s, were “grandfathered in” by Congress when it passed Sec. 5106(a) of the 1987 Federal Onshore Oil and Gas Leasing Reform Act (101 Stat. 1330-256, 259) (Reform Act). The Reform Act requires BLM to issue leases for these suspended offers unless such lease issuance would not be lawful under other applicable law. Sec. 5106(a) states:

> *Notwithstanding any other provision of this subtitle and except as provided in subsection (b) of this section, all noncompetitive oil and gas lease applications and offers and competitive oil and gas bids pending on the date of enactment of this subtitle shall be processed, and leases shall be issued under the provisions of the Act of February 25, 1920, as in effect before its amendment by this subtitle, except where the issuance of any such lease would not be lawful under such provisions or other applicable law.*

There are 14 suspended oil and gas lease offers comprising 61,885 acres of State and Native selected lands within the Ring of Fire planning area. All are located on the Alaska Peninsula. If the mineral estates underlying these offers are not conveyed as entitlement lands to the State of Alaska under the Statehood Act or to a Regional Native Corporation under the Alaska Native Claims Settlement Act, the offers will be adjudicated and, if appropriate, leases will be issued at such time as the land withdrawals suspending the offers are removed.

If the mineral estates are conveyed, the offers will be rejected. As is the case with all leases issued under the Mineral Leasing Act of 1920, as amended, site-specific environmental

analyses will be performed and appropriate bonding will be required prior to the authorization of any on-the-ground lease activities.

Oil and Gas Known Play Areas

Sedimentary basins with oil and gas potential are located within the Ring of Fire planning area in the following areas: on the Alaska Peninsula, the Cook Inlet and Susitna basins in southcentral Alaska, and in the Yakutat area of southeast Alaska (Ehm 1983; Kirschner 1992). The USGS conducts estimates of oil and gas resources in the U.S. based on the concept of a "play," which is defined as a set of oil and/or gas accumulations sharing similar geographic boundaries and geologic attributes, such as source rock, reservoir type, and trap (USGS 1995; Beeman, Obuch et al. 1996).

Alaska Peninsula/Aleutian Chain Region

The Aleutian Islands are generally considered to have no onshore oil and gas potential; however, areas of the Bering shelf region at the east end of the Aleutian Chain are considered to have the potential for oil and gas in Tertiary deposits. On the Alaska Peninsula, there are two areas that have been designated as plays by the USGS: (1) Mesozoic strata containing potential oil reserves along the southeast part of the peninsula; and (2) Tertiary sandstones beneath the Bristol Bay area containing primarily natural gas reserves. The USGS gives these plays a probability of occurrence of 24 to 32 percent (Molenaar 1996). A number of exploration wells have been drilled on the Alaska Peninsula, but commercial quantities have not yet been found.

Kodiak Region

The onshore portion of Kodiak Island is considered to have little geologic potential for oil and gas, whereas the offshore areas to the northwest (Shelikof basin), southwest (Tugidak basin), and southeast (Kodiak shelf area) are known to have potential. Some oil and gas leasing activities and exploration have been conducted on the Kodiak shelf and in Shelikof Strait, which is a southern extension of Cook Inlet basin.

Southcentral Region

Cook Inlet basin of southcentral Alaska is a known oil and gas province with around 15 currently producing oil and gas fields in the onshore portion of the basin. These onshore fields are located near the inlet; the closest fields are approximately 15 miles east of BLM's unencumbered lands in the Neacola Mountains and approximately 50 miles west of the Knik River block of selected lands. A number of additional fields are located in offshore Cook Inlet outside of the Ring of Fire planning area. Recent onshore exploration has taken place in the Ninilchik and Deep Creek areas of the Kenai Peninsula, and in the Pretty Creek and Kustatan (Redoubt) areas on the west side of Cook Inlet (ADNR 2003d). Discovered reserves in Cook Inlet basin are contained within two confirmed plays: (1) the Hemlock-Tyonek oil play consisting of middle Tertiary sandstone reservoirs; and (2) the Beluga-Sterling gas play consisting of mostly younger sandstones, which contain an estimated 6.14 trillion cubic feet of gas in discovered reserves (Magoon 1996). Natural gas in the Beluga-Sterling play comes primarily from coalbeds in the basin (the only difference between conventional gas and CBNG resources in this area is the reservoir: the CBNG reservoirs are coalbeds, while the conventional gas reservoirs are mostly sandstones).

Two other plays are located in the Southcentral region: (1) a late Mesozoic oil play in Cook Inlet basin, and (2) the west edge of the Copper River basin. The Copper River basin is located

mostly outside of the Ring of Fire planning area to the east. Both of these plays have been given low probabilities of occurrence by the USGS (Magoon 1996; Magoon and Valin 1996).

Southeast Region

The eastern part of the Gulf of Alaska sedimentary basin extends into the Yakutat area of southeast Alaska (Ehm 1983; Kirschner 1992). The Yakutat onshore area was explored in the late 1950s through early 1960s, with most wells turning up dry. The USGS includes this area in the Yakutat Foreland/Lituya play, which targets oil and gas in Tertiary sandstones and is given a 40 percent probability of occurrence (Bruns 1996). Outside of the Yakutat area, the USGS considers southeast Alaska to have negligible hydrocarbon potential (Selkregg 1974-1976c; Bruns 1996).

Oil and Gas Occurrence Potential

Oil and gas potential maps for the Ring of Fire planning area are presented in Appendix G (Figures G-15 through G-18). Based on BLM (1990a) guidance, all areas located within USGS plays are considered to have high potential regardless of their probability rating. Thus, plays of the Alaska Peninsula, Cook Inlet, Susitna, and Copper River basins, and Yakutat area described above, are all considered to have high occurrence potential. Small slivers of medium oil and gas potential were mapped around the north, west, and northeast margins of Cook Inlet basin where play area boundaries lie within basin boundaries. All other areas of the Ring of Fire planning area were considered to have low to no oil and gas potential.

Coalbed Natural Gas Regional Occurrence

CBNG occurs in association with coal-bearing formations in which the gas is generated. Unlike conventional oil and gas, coalbeds function as both the source and reservoir for CBNG, with the largest resources of CBNG typically located away from coal mining areas where the coal layers are deeper. CBNG tends to develop in areas of high rank coal (bituminous or greater) and at depths ranging from 500 to 6,000 ft (Rice 1996; Tyler, Scott et al. 2000).

Alaska Peninsula/Aleutian Chain Region

The Aleutian Islands are not known to contain coal-bearing sedimentary rocks; thus, the potential for CBNG is very low. On the Alaska Peninsula, coals associated with Cretaceous-aged rocks are generally considered to have a higher potential for CBNG than that of the Tertiary-aged rocks, whose rank is generally too low for CBNG generation.

Kodiak Region

With the exception of several known outcrops in the southeast part of Kodiak Island, the extent and rank of coal layers within the coal-bearing sedimentary rocks are largely unknown. Based on very limited information, the potential for CBNG occurrence on Kodiak is estimated to be similar to that of the coal itself, that is, low to moderate.

Southcentral Region

Coal is found in several formations in the Cook Inlet-Susitna basin of southcentral Alaska, including the Chickaloon, Tyonek, Beluga, and Sterling Formations. Of these, the Tyonek and the Chickaloon formations have the highest CBNG potential (Smith 1995). There has been much interest in CBNG in the Matanuska-Susitna Valley in the past decade, as several test wells have been drilled along both sides of the Castle Mountain fault, driven in part by State leasing incentives for shallow gas above 3,000 ft. (Figures 3.7-1 and 3.7-2).

Southeast Region

The CBNG potential of the eastern Gulf of Alaska-Yakutat basin in southeast Alaska is highly speculative, and is based on the potential presence of Tertiary-aged coals in the subsurface that are of high rank where they outcrop about 150 miles to the northwest. The Angoon and Admiralty districts are considered potentially prospective for CBNG for local use. The potential for CBNG in Kuiu district coals is considered to be limited due to their low rank.

Coalbed Natural Gas Occurrence Potential

CBNG potential is included on the coal potential maps in the *Mineral Potential Report* in Appendix G (Figures G-19 through G-21), and BLM-managed subsurface mineral estate is shown in Appendix A (Figures 3.7-1 and 3.7-2). Most areas of the Ring of Fire planning area with known or suspected high rank coal in the subsurface were considered to have high CBNG potential. In the absence of evidence for high potential, coal-bearing formations and mineral terranes, basins were considered to have medium potential, as were known coal fields and districts with lower rank coals.

Areas of high potential were mapped in all regions of the Ring of Fire planning area except for the Aleutian Chain. These include areas near: the Herendeen Bay and Chignik coal fields, Ugashik coal district, and Bristol Bay coastal plain on the Alaska Peninsula; the Cook Inlet and Susitna basins of southcentral Alaska; and the Gulf of Alaska-Yakutat basin and areas near the Angoon and Admiralty coal districts of southeast Alaska. Areas of medium CBNG potential lie on the Alaska Peninsula, Kodiak Island, and southeast Alaska.

Geothermal Known Resources

Geothermal resources of varying temperatures are known to occur throughout much of the Ring of Fire planning area. Thermal springs are produced by subsurface hydrothermal systems, which transfer heat to the surface through fluids, as opposed to heat transferred through solid rock.

High-temperature (subsurface temperatures greater than 150˚C) geothermal resources are known or suspected to occur within the Ring of Fire planning area in volcanoes of the Aleutian arc, the Alaska Peninsula, the west side of Cook Inlet, and the Edgecumbe volcanic field along the western edge of southeast Alaska. Some high-temperature reservoir sites in the Aleutian Chain are near population centers or small villages such as Adak, Atka, Umnak (Nikolski), Makushin (Unalaska), and Akutan.

In the Aleutians and Alaska Peninsula, areas with moderate (between 90˚ and 150˚C) to low (less than 90˚C) temperature geothermal systems include sites near Akutan, Unalaska, Cold Bay, and Port Moller. Several moderate and low-temperature systems occur on Chichagof and Baranof Islands as evidenced by at least nine thermal springs; in the Stikine River area northeast of Wrangell; and in the Bell Island and Bradfield Canal areas north of Ketchikan.

Geothermal Leases and Past Industry Interest

Known geothermal resource areas (KGRAs) are lands designated by BLM where it has been determined that persons knowledgeable in the field of geothermal development would spend money to develop the resource, such as geothermal water or steam. There are three KGRAs located in the State of Alaska, two of which are located in the Ring of Fire planning area: the Okmok Caldera and the Geyser Spring Basin of Umnak Island. Neither of these KGRAs have

been developed because a local market (or sizable community) does not exist in these areas to justify such a project.

Several areas within the Ring of Fire planning area have been investigated for potential development of geothermal resources for electrical power generation (for example, on Unalaska Island), but none have been developed in the region to date. Several low- to moderate-temperature thermal springs in southeast Alaska (Bell Island, Tenakee Springs, Baranof, and Goddard) have been developed for various local uses, including tourism, community bathhouses, agriculture, aquaculture, and heating of local dwellings. ADNR has leased land on Mt. Spurr (west of Tyonek) to the Chugach Electric Corporation for geothermal development. Although the company has not yet developed their tracts, additional lands have been requested (KPB 2005).

Geothermal Occurrence Potential

Geothermal potential maps for the Ring of Fire planning area are presented in the *Mineral Potential Report* in Appendix G (Figures G-22 through G-25). Areas within the Ring of Fire planning area were mapped as having high potential where Quaternary volcanism is present, as well as thermal features such as high temperature hot springs, fumeroles, vents, or geysers. Volcanic areas with lower temperature hot springs (<50 degrees Celsius) were mapped as medium potential. Low potential areas include broad regions of potential thermal waters mapped by Motyka *et al*. (1983).

High to medium geothermal potential areas are found in discontinuous areas in the Aleutians, on the Alaska Peninsula, along the west side of Cook Inlet, and in southeast Alaska. Low potential areas generally encompass the entire Aleutian arc and western southcentral Alaska, plus several isolated areas within southeast Alaska.

3.3.6.2 Solid Leasable Minerals

Several varieties of solid mineral commodities are considered leasable minerals under the Mineral Leasing Act for Acquired Lands (1947). Only two of these, coal and phosphate, have been documented in the Ring of Fire planning area. Two occurrences of phosphate are been reported by the U.S. Bureau of Mines (USBOM) (1995) and Kline and Pinney (1994): one at an unknown site in Tuxedni Bay along the southwest side of Cook Inlet, and one in southeast Alaska on Snettisham Peninsula. Because of the low occurrence of phosphate within the Ring of Fire planning area, it will not be discussed further.

Coal Known Deposits and Fields

Sedimentary rocks with coal deposits are known to occur in a number of areas within the Ring of Fire planning area, including the Alaska Peninsula, Kodiak Island, Cook Inlet and Susitna basins, and scattered areas of southeast Alaska. Coals are generally classified by “rank,” which represents the general degree of metamorphism they have experienced, as well as an approximate measure of heat value. From high to low rank, these include anthracite, bituminous, subbituminous, and lignite.

Alaska Peninsula/Aleutian Chain Region

The Aleutian Islands are not known to contain coal-bearing sedimentary rocks. The Alaska Peninsula contains two distinct coal basins: (1) bituminous coals deposited in Cretaceous-aged sedimentary rocks along the southeast half of the peninsula, including those in the Herendeen

Bay Field, Chignik Field, and Ugashik District; and (2) coals deposited in Tertiary-aged sedimentary rocks, ranging from bituminous to lignite, that are widely distributed along the northwest side of the peninsula beneath the Bristol Bay lowland (Smith 1995).

Kodiak Region

Although there are no coal fields or districts in the Kodiak Islands region, coal is known to occur on Sitkinak and Sitkalidak Islands off the southeast side of Kodiak, as well as near the Ayakulik River on southwest Kodiak Island (USFWS 1987a).

Southcentral Region

Several major coalfields occur in the Cook Inlet-Susitna basin of southcentral Alaska, including the Yentna, Susitna, Matanuska, Beluga, and Kenai fields. Coals in these fields range from anthracite to subbituminous, and occur within the thick Tertiary-aged nonmarine sedimentary sequence in this basin.

Southeast Region

Several localized areas in southeast Alaska are known to contain lignite to bituminous coal, such as the Angoon, Admiralty, and Kuiu coal districts. Isolated occurrences of coal are found near Yakutat and Lituya bays, in the northeast Glacier Bay area, in the northeast corner of Admiralty Island, on southwest Baranof Island, and at Kasaan Bay on Prince of Wales Island (Merritt 1986; Merritt and Hawley 1986).

Coal Occurrence Potential

Coal potential maps for the Ring of Fire planning area are presented in the *Mineral Potential Report* in Appendix G (Figures G-19 through G-21). Areas were mapped as having high potential if they were part of a designated coal field or district; and medium potential if they were part of a coal-bearing sedimentary formation, basin, or mineral terrane unit (Beikman 1980; Ehm 1983; Resource Data Inc., Alaska Earth Sciences Inc. et al. 1995). Areas of high coal potential are found in all regions of the Ring of Fire planning area except the Aleutian Chain. Large areas of medium coal potential lie on the Alaska Peninsula, Kodiak Island, and southcentral Alaska where coal-bearing formations, basins, or mineral terranes extend outside of, or in between, high potential areas.

3.3.7 Locatable Minerals

In the late 1800s, the USDOI began to define hardrock minerals as “locatable” if they could be found on public lands in quantity and quality sufficient to make the land more valuable by their existence (ENSR Corporation and Booz Allen & Hamilton Inc. 2003; BLM 2004e). The General Mining Law (1872) established the authority for locatable mineral mining claims, and provided the basis for subsequent mining laws that, over time, substantially reduced the number of minerals considered locatable. However, under certain circumstances, mineral materials can be considered locatable minerals.

The term “mineral deposit” refers to a mineral occurrence of sufficient size and grade that could have economic potential (Cox and Singer 1986). Mineral deposits generally fall into one of two categories: lode or placer. Lode deposits occur within hard rock and can be found either near the surface of the earth or at depth. Placer deposits are eroded surficial lode deposits that have been washed into valleys or streams through rain runoff. Mineral prediction is often based on “mineral deposit model” classifications, which describe attributes of specific mineral associations and the types of rocks they are found in. The term “mineral occurrence” refers to localities recorded for scientific or economic interest, typically available on databases, for example, USBOM (1995), and USGS (2004a; 2004b). Mineral “terranes” have been mapped in Alaska, most recently by RDI *et al*. (1995), to depict rock assemblages that share origins and processes known to result in concentrations of certain minerals. Known Mineral Deposit Areas (KMDAs) have been mapped by several authors, for example, Resource Data Inc. *et al.* (1995), to depict rocks with an increased likelihood of hosting significant mineral deposits. A detailed description of locatable mineral occurrences, deposits, deposit models, terranes, and KMDAs in the Ring of Fire planning area is presented in the *Mineral Potential Report* (Appendix G). In addition, terranes, KMDAs, significant lode deposits, and placer mining districts are depicted in maps in Appendix G (Figures G-26 through G-29). Significant mineral deposits are summarized below for each region of the Ring of Fire planning area.

3.3.7.1 Regional Occurrence

Alaska Peninsula/Aleutian Chain Region

Mineral terrane information is generally unavailable for the Aleutian Chain; however, throughout the islands, several occurrences of gold, silver, copper, lead, and zinc have been documented. On the Alaska Peninsula, there are several significant mineral deposits associated with intruded vein and porphyry deposits (large crystals in fine-grained igneous rocks). These deposits are estimated to contain reserves of gold, silver, copper, and molybdenum. The Apollo Mine on Unga Island produced gold in the early 1900s from vein deposits within volcanic rocks.

Kodiak Region

As with the Aleutian Chain, the Kodiak Islands have not been explored as extensively as other areas of the Ring of Fire planning area. Mineral terranes encompass a number of chromium, gold, silver, copper, and lead occurrences. A significant deposit of chromite is located in the southwest part of the island. Placer deposits of gold and other heavy minerals occur along the western and southern beaches of the Kodiak region (Selkregg 1974-1976a; USBOM 1995; USGS 2004a).

Southcentral Region

Southcentral Alaska is traversed by several mineralized regions and historical mining districts, including the west side of Cook Inlet, the Yentna-Petersville area, the Talkeetna Mountains, and the Chugach and Kenai mountains. Vein and porphyry deposits along the west side of Cook Inlet may host significant concentrations of gold, silver, zinc, copper, and lead (Nokleberg, Bundtzen et al. 1987; Nokleberg, Bundtzen et al. 1994a; Nokleberg, Plafker et al. 1994b; Szumigala, Swainbank et al. 2002). Although outside of the Ring of Fire planning area, the Pebble copper-gold porphyry deposit on the north side of Iliamna Lake [e.g., (Department of Commerce, Community, and Economic Development [DCCED] 2004b)] provides an indication of the type of deposits that may occur in association with intrusive rocks along the Aleutian-Alaska Range.

The Yentna-Petersville area is known primarily for its past gold production from placer deposits. The Hatcher Pass-Willow Creek Mining District in the Talkeetna Mountains contains vein gold deposits hosted in granitic rocks, as well as placer gold deposits (Szumigala, Swainbank et al. 2002). Significant deposits of chromite are found along the western front of the Chugach and Kenai mountains, and a number of significant gold quartz vein deposits intrude the central part of the mountains. The Hope-Girdwood area is also a significant placer gold mining district. Massive sulfide deposits potentially containing copper, lead, zinc, gold, and silver are reported along the western and northern margins of PWS (Nelson and Miller 2000).

Southeast Region

Southeast Alaska has a long history of mineral prospecting and mining. Gold and other heavy minerals have been found in beach sands in the Yakutat area. Significant deposits of nickel, copper, molybdenum, and gold have been reported in the Glacier Bay area. The Haines-Klukwan area contains a number of overlapping lode and placer deposits containing significant concentrations of gold, lead, zinc, copper, iron, titanium, vanadium, and nickel (Nokleberg, Bundtzen et al. 1987; USBOM 1988; ADNR 1993a; Nokleberg, Bundtzen et al. 1994a; Szumigala, Swainbank et al. 2002).

Admiralty Island and the Juneau Gold Belt are known for historical mining of placer gold and gold-quartz veins (for example, Alaska-Juneau Mine, the largest mine, and Kensington Mine, the largest deposit in the gold belt); massive sulfide deposits with significant reserves of zinc, lead, copper, silver, and gold, such as occurs at Greens Creek Mine (the largest producing mine in southeast Alaska); and nickel-copper deposits (Nokleberg, Bundtzen et al. 1987; Clough 1988; Redman, Maas et al. 1988; Nokleberg, Bundtzen et al. 1994a; Szumigala, Swainbank et al. 2002). The Chichagof and Baranof islands, the islands of the Petersburg and Kupreanof mining districts (Stikine area), and the Ketchikan Mining District in southern southeast Alaska contain similar deposits of vein gold, nickel-copper, and massive sulfides, as well as copper-molybdenum porphyry deposits, polymetallic veins, skarn deposits (mineralized limestones), and dike swarms rich in uranium and rare-earth elements (Maas, Bittenbender et al. 1995; Bittenbender, Still et al. 1999; Still, Bittenbender et al. 2002).

Several varieties of nonmetallic industrial minerals are located in southeast Alaska. These include gypsum deposits on Chichagof Island, high purity limestones in the Prince of Wales area, large high grade barite deposits near Klukwan and Petersburg, and several gemstone occurrences. Limestones of chemical or metallurgical grade, and those suitable for making cement, are considered locatable under mining law (43 CFR 3830.1) (Warfield 1962).

3.3.7.2 Mining Claims

Current federal and State mining claims (BLM 2004d) are depicted on maps in the *Mineral Potential Report* (Appendix G, Figures G-26 through G-29). Federal mineral claim locations generally indicate the level of mineral potential known in 1971 and before, as there has been no opportunity to stake federal mining claims on most BLM lands within the Ring of Fire planning area since 1971 due to ANSCA and ANILCA land withdrawals.

There are no active claims in the Aleutian Islands. The Apollo Mine on Unga Island is the only active State claim on the Alaska Peninsula; there are no federal claims in this region. Placer gold claims (State) are located on the western and southern beaches of the Kodiak Islands. In southcentral Alaska, numerous federal and State claims are located in the Yentna-Petersville area, the northern Talkeetna Mountains, the Hatcher Pass-Willow Creek Mining District, the Girdwood-Hope area, and in northwestern PWS. In southeast Alaska, numerous claims are held in the Haines-Klukwan area, the Juneau Gold Belt, and on Admiralty Island. Active federal and State claims are currently held on three vein gold deposits on Chichagof and Baranof islands; and on Woewodski, Zarembo, and Kupreanof islands in the Stikine area. In the Ketchikan Mining District, active claims are held on Prince of Wales and adjacent islands, Duke Island, and on the mainland near Hyder, the Cleveland Peninsula, and Misty Fjords National Monument.

3.3.7.3 Occurrence Potential

Locatable mineral potential maps for the Ring of Fire planning area are presented in Appendix G (Figures G-26 through G-29). Areas were mapped as high potential where existing federal and State mining claims indicate past interest in a region or locality, where significant lode deposits have been documented, or where specific investigations have previously identified high potential areas, for example, ADNR (1993a), Bittenbender *et al.* (1999), and Nelson and Miller (2000). Areas mapped as medium potential include placer mining districts, mineral terranes, KMDAs, and mineral occurrences identified in USBOM and USGS databases.

3.3.7.4 Industry Interest

Most lands in the Ring of Fire planning area with known mineral potential were previously selected and conveyed as part of statehood, ANSCA, and ANILCA land-selection processes. BLM does not actively manage locatable mineral activities on subsurface federal mineral estate. Thus, development of locatable minerals on remaining BLM-managed surface tracts is expected to be minimal over the life of the PRMP/FEIS, except where technical or economic conditions have changed since the original assessments and land selections. Mineral investigations conducted since the 1970s have expanded the knowledge of mineral potential within the Ring of Fire planning area.

Demand for locatable resources, most notably gold, depends strongly on the current price, and the operational and administrative costs imposed by regulation and inaccessibility. The price of gold has ranged between $320 and $460 per ounce since 1980. In a study conducted for the CNF, Nelson and Miller (2000) suggest that gold prices would need to remain above $400 per ounce for large-scale placer or lode gold operations to be economically viable in this area. While gold was the primary commodity of interest prior to 1970, industry economics have evolved in the last 30 years to include an interest in base metals (copper, lead, and zinc) typically contained within massive sulfide deposits. In addition, in the past two decades, low-grade disseminated gold and copper deposits (like those of the Pogo and Fort Knox mines in interior

Alaska) have become increasingly important due to the advancement of processing technologies.

Alaska Peninsula/Aleutian Chain Region

The potential for development of locatable minerals on BLM-managed lands within the Alaska Peninsula/Aleutian Chain of the Ring of Fire planning area is expected to be low over the life of the PRMP/FEIS, even in areas of high occurrence potential, due to their remoteness and inaccessibility. Interest in developing known significant deposits on the Alaska Peninsula may increase over the life of the PRMP/FEIS, however, if commodity prices were to increase substantially.

Kodiak Region

As in the Alaska Peninsula/Aleutian Chain region, the potential for development of locatable minerals on BLM-managed lands in the Kodiak Region of the Ring of Fire planning area is expected to be low over the life of the PRMP/FEIS. Interest in developing known significant deposits in the Kodiak region may increase over the life of the PRMP/FEIS; however, if commodity prices were to increase substantially.

Southcentral Region

Due to the higher accessibility of southcentral Alaska compared to other parts of the State, locatable mineral development potential is generally considered to be moderate for areas of high occurrence potential. Based on recent industry interest in intrusion-related disseminated gold and porphyry copper-gold deposits (similar to the Pebble copper-gold porphyry deposit at Iliamna Lake), BLM-managed tracts located in the Aleutian-Alaska Range along the west side of Cook Inlet may receive a moderate level of industry interest, although overlying host rocks are sparse in this area. On the Kenai Peninsula, there may be interest in small-scale placer gold production in areas mapped as high occurrence potential along the Girdwood-Seward corridor. In western PWS, BLM-managed surface tracts at the head of Kings Bay overlap areas are rated as highly favorable for undiscovered Chugach-type vein gold or placer deposits (Nelson and Miller 2000).

Southeast Region

Small tracts of BLM-managed surface lands overlap areas designated as high occurrence potential in the following areas of southeast Alaska: near Klukwan, near the city of Juneau, Hawk Inlet at the north end of Admiralty Island, near Hyder, and at three locations on southern Prince of Wales Island (Trocadero Bay, Billie Mountain, and Aiken Cove). State-selected tracts near Klukwan lie near deposits with recent industry interest and many claims in the area. The Hawk Inlet tracts are adjacent to the Greens Creek Mine. Aiken Cove lies at the north end of a massive sulfide deposit rated as having high development potential by Maas *et al.* (1995).

3.3.8 Salable Minerals

The Materials Act (1947) defined certain mineral types that could be disposed of by contract sale or free-use permit, as “salable” or “mineral materials.” These include common varieties of construction aggregate (sand and gravel), building stone, pumice, and clay.

3.3.8.1 Known Deposits/Resources

Sand and gravel—Sand and gravel and other aggregate resources are common throughout the Ring of Fire planning area, occurring primarily in association with unconsolidated surficial deposits of fluvial, glacial, shallow marine, and eolian origin. These resources are found in broadly mapped areas, such as along the north coastal plain of the Alaska Peninsula, the Anchorage Bowl, western Kenai Peninsula, Matanuska-Susitna Valley, and the Yakutat area (Beikman 1980). Additional localized sources of sand and gravel include individual stream valleys, slope deposits, and beach deposits.

Building stone—Many types of rock that are typically used for building stone, such as granite, basalt, greenstone, limestone, marble, and sandstone, are found throughout the Ring of Fire planning area. Limestone and marble, in particular, are abundant in southern southeast Alaska (Beikman 1980).

Pumice—Pumice is a light-colored, frothy, volcanic glass rock. Most of the pumice deposits are located on the Aleutian Islands and Alaska Peninsula, far from centers of construction, although some pumice is present on Augustine Island in lower Cook Inlet (USBOM 1995). Volcanic ash is also likely to be present in large amounts throughout the Aleutians, Alaska Peninsula, and Cook Inlet area.

Other—Other salable minerals documented within the Ring of Fire planning area include clay used in making bricks and ceramic products, and quartz crystals used as gemstones and in industrial applications. Several clay deposits are located in southcentral Alaska, the Matanuska Valley, Homer, and near Moose Pass on the Kenai Peninsula (Kline and Pinney 1994). Large quartz crystals, typically found near hot springs, in granite porphyries, and vein deposits (Sorden 2002), are likely to be common in the eastern Aleutians, the Aleutian-Alaska Range, Talkeetna Mountains, Kenai Peninsula, and southeast Alaska.

3.3.8.2 Past Production

Sand and gravel is an important commodity in Alaska, ranking only behind oil and gas in value to the State’s economy. Past production in the Ring of Fire planning area has largely been project driven, with peaks occurring during periods of military construction, discoveries of oil and gas fields in Cook Inlet, and urban growth in the Anchorage and Matanuska-Susitna Valley areas (Bundtzen, Eakins et al. 1982). Recent annual production of sand and gravel and crushed rock aggregate in the Ring of Fire planning area is reported to be on the order of 8.6 millions tons in southcentral Alaska, 1.1 million tons in southeast Alaska, and 40,000 tons for the Alaska Peninsula and Kodiak Island combined (Szumigala, Swainbank et al. 2002).

Most past production of building stone within the Ring of Fire planning area has been from limestone and marble quarries in southeast Alaska. Measured reserves of high quality marble in southeast Alaska are estimated to be over 800 million tons (Bundtzen, Eakins et al. 1982).

Clay has historically been mined from at least two formations in southcentral Alaska: the Pleistocene Bootlegger Cove Clay in the Anchorage area, and alteration products of Jurassic volcanic rocks in eastern Matanuska Valley near Sheep Mountain (Rutledge, Thorne et al. 1953).

3.3.8.3 Occurrence Potential

Salable mineral potential maps for the Ring of Fire planning area are presented in Appendix G (Figures G-30 through G-33). The maps depict potential for three salable mineral types: sand and gravel, limestone/marble, and pumice. Areas were considered to be high potential where known mineral occurrences and extraction sites have been identified in the USBOM (1995) mineral occurrence database, and along road systems where aggregate resources are likely to have been previously developed (Kline and Pinney 1994). Areas were mapped as medium potential on the basis of geologic environment and inferred processes (BLM 1985), and include geologic units or terranes favorable for the specific salable mineral types.

High potential ratings were given to isolated road systems on several islands in the Aleutian Chain, as well as near Cold Bay and Port Moller on the Alaska Peninsula. Documented pumice sites near Chignik Lagoon and Mount Katmai on the Alaska Peninsula, and along the southwest side of Lower Cook Inlet were also given high potential ratings. Stone and aggregate extraction sites and roaded areas on northeast Kodiak Island were considered high potential, as well as all of the primary road systems and known sand and gravel sites in southcentral Alaska. In southeast Alaska, much of Prince of Wales, Kupreanof, and northern Kuiu islands were considered high potential based on existing stone quarries, as were isolated roaded areas near many of the southeast Alaska communities. Areas of medium potential for sand and gravel, pumice, and limestone, were mapped throughout the Ring of Fire planning area based on geologic unit associations.

3.3.9 Renewable Energy

FLPMA identifies lands available or not available as potential renewable energy program sites, taking into consideration the resources on the land (BLM 2005t). As part of the National Energy Policy, President George W. Bush recommended BLM establish the National Energy Office to implement the President's policy to produce integrated energy, environmental and economic policy by using new technologies and programs to diversify our energy resources on public lands (BLM 2001a).

3.3.9.1 Renewable Energy Potential within the Ring of Fire Planning Area

BLM land throughout the western U.S. is being surveyed for renewable energy potential through a coordinated effort between BLM and the U.S. Department of Energy (BLM and U.S. Department of Energy 2003). While Alaska is not included in this study, potential renewable energy resources have been identified in the Ring of Fire planning area.

Potential renewable energy sources in the Ring of Fire planning area include (but are not limited to): wind, hydro, solar, and geothermal energy. Geothermal resources within the planning area are discussed in the *Mineral Potential Report* (Appendix G). There are current and past applications of wind, hydroelectric, and solar power throughout Alaska. A brief overview is provided below, followed by a description of potential resources available in the Ring of Fire planning area. At this time there are no plans to use BLM land to develop, study, or use photovoltaic (PV) systems. BLM is currently studying possibilities to increase solar and wind energy systems on BLM-managed lands, although Alaska is not included in that study at this time (BLM 2005d).

Wind Power

Alaska has some of the top wind resources in the nation. Some local wind power studies and programs have been carried out in Alaska. The first utility wind power farm began operating in Kotzebue in 1997 under the Kotzebue Electric Association Cooperative, and nearly tripled in size in 1999, producing 335,522 kilowatt-hours (Kotzebue Electric Association 2005). Chugach Electric has surveyed the land around Anchorage for adequate wind conditions and available land to support wind power development. Fire Island is the only site in the area that Chugach Electric found appropriate. Private companies, such as ABS Alaska, provide natural power and alternative energy products (ABS Alaska 2005). The Alaska Energy Authority is assessing potential wind power in rural Alaska. (Alaska Energy Authority 2005).

The Department of Energy has identified Cold Bay as a candidate for a wind turbine site in the Alaska Peninsula/Aleutian Chain region. Maps from the *Wind Energy Resource Atlas of the United States* (Elliott, Holladay et al. 1987) classify Alaska's coastal regions as having outstanding and superb wind power potential when wind power and wind speed were measured. Outstanding (class 6) and superb (class 7) are the top wind power classes in the seven class ranking system. The regional description from the atlas reveals that the largest area of superb wind power potential occurs in Alaska from the Aleutian Islands along the Alaska Peninsula; most of the northern and western coastal areas; islands in the Bering Sea and Gulf of Alaska; and mountainous areas in northern, southern, and southeastern Alaska (Elliott, Holladay et al. 1987).

Alaska Peninsula/Aleutian Chain Region

The entire Alaska Peninsula has excellent (class 5) to superb (class 7) wind power potential, because it is situated along a storm track from Asia to North America. It is the largest area of high wind power in the country (MAFA 2003). Both the Pacific Coast and Bristol Bay/Bering Sea side of the islands and peninsula receive high winds. Winter is the season of maximum wind power throughout the area (Elliott, Holladay et al. 1987).

Kodiak Region

Kodiak has good (class 4), excellent (class 5), and superb (class 7) potential for wind power. The exposed areas on the southern coast of Kodiak receive the highest winds, while inland areas and the northern coast, which are partially protected by the Alaska mainland receive less wind (Elliott, Holladay et al. 1987).

Southcentral Region

Wind data from Bruin Bay and mariner's comments describe the area from Iliamna Lake to Kamishak Bay across Cook Inlet to the Barren Islands as extremely windy. *The Wind Energy Resource Atlas of the United States* shows lower Cook Inlet ranging in wind power potential from fair (class 3) and good (class 4) to superb (class 7) (Elliott, Holladay et al. 1987), primarily in the area from Iliamna Lake to Kamishak Bay (MAFA 2003). The Kenai Peninsula's wind potential is fairly low, ranging from low (class 1) throughout most of the peninsula, to fair (class 3) and excellent (class 5) along the southeastern coast (Elliott, Holladay et al. 1987).

Southeast Region

Because most of southeast Alaska is heavily wooded and mountainous, wind power potential is site-specific. Exposed areas such as Cape Spencer, Cape Decision, and Cape Hinchinbrook, and North Dutch Island reflect excellent (class 5) wind power potential or higher. Most of the western coast of the Southeast region is blanketed by superb (class 7) wind potential because of high exposure. Coastal mountains have wind potential that varies significantly from one ridge crest to another (Elliott, Holladay et al. 1987). Lynn Canal experiences high southern and southeasterly winds due to tall shores and narrower width at the northern end of the canal near Haines and Skagway, which funnel winds up the canal (NOAA 2004).

Geothermal

Alaska has a high level of tectonic activity that guarantees major geothermal resources. There are over 140 hot springs, and 40 active volcanoes in Alaska (Davis 1984). Several volcanoes with geothermal potential, such as Mt. Spur, are located relatively close to Anchorage on the west side of Cook Inlet, although not located on BLM-managed lands. See Appendix G for further discussions of geothermal potential within the Ring of Fire planning area.

Hydroelectric Power

Hydroelectric power is produced by storing water in reservoirs behind dams and directing it through turbines (BLM 2005a). Alaska has more than 35 hydroelectric power plants, from as small as 60 kilowatts from the Indian Creek plant, serving Chignik (State of Alaska 2004a), to 126 megawatts from Bradley Lake plant which serves Alaskans from the Kenai Peninsula to Fairbanks (Alaska Power Association 2005). A list of hydroelectric power projects within the State can be found on the State of Alaska website http://www.state.ak.us/rca/Hydroelectric/040427_Projects.pdf. According to a Geological Information Systems *Evaluation of Potential Hydropower Sites Throughout the United States*, Alaska has more than a quarter of the available water energy in the U.S. (Carroll, Reeves et al. 2004). In accordance with the

National Energy Policy, public land could be evaluated in the future for potential water energy (BLM 2001a).

Biomass

Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities. BLM is installing a biomass demonstration project on the Campbell Tract at the AFO's 10,000 square foot Campbell Creek Science Center. This demonstration project will utilize the large amount of beetle-killed spruce available in the Southcentral region as its source of energy, thereby reducing the Science Center's dependence on natural gas as its energy source for heat.

Solar Power

PV technology, or PV panels, convert sunlight directly into electricity (BLM 2004b). Traditionally, this technology has been associated with areas that have consistent, large amounts of sunlight. Although Alaska does not have consistent sunlight, studies are being done for options to use solar panels in Alaska (Western Area Power Administration 2003). No information on specific solar power potential on BLM-managed lands within the Ring of Fire planning area was found.

Anchorage has been included in the 2002 Million Solar Roofs Initiative for a PV system program. *Concepts for Integrating PV into Rural Alaskan Housing and Utilities* discusses how potential placement of PV systems (vertical, on the south façade) could improve the capacity of a PV system in Alaska (Seifert 2000).

3.3.10 Off-Highway Vehicles

OHV use on BLM-managed lands in Alaska and in the Ring of Fire planning area is increasing due to greater public interest in unconfined, outdoor recreation opportunities, rising disposable income for use on recreational pursuits, and advances in vehicle technology and affordability. As compared to the national average, OHV sales and subsequent use in Alaska has increased at a slightly lower rate. However, it is anticipated that combined with the rise in popularity of Alaska as a recreation and tourist destination, and the ease of OHV travel in many areas without formally established trails, OHV use will continue to rise.

OHVs include any motorized wheeled vehicle capable of travel on or immediately over land or natural terrain (43 CFR 8340). All-terrain vehicles (ATVs), such as snowmachines, four-wheelers, and motorcycles, are all considered OHVs. Section 811 of ANILCA states that BLM must provide, “reasonable access to subsistence resources on public lands.” This allows the use of OHVs, including snowmachines and other forms of surface transportation, on public lands for traditional and subsistence activities, as well as travel to and from villages and homesites, subject to reasonable regulation. Local residents depend on these trails for recreational pursuits, and they are also an important facet of everyday life. Subsistence activities play a major part in the management of OHV trails, allowing access for the harvest of fish, game, firewood, and numerous other natural bounties.

BLM regulation 43 CFR 8340 recognizes OHV use as an “acceptable use of public land wherever it is compatible with established resource management objectives.” To comply with 43 CFR 8342.1, all BLM lands must be designated in one of the following categories:

- **Open**—Areas will remain open where there is no compelling resource protection needs, user conflicts, or safety issues to warrant limiting cross-country travel.
- **Limited**—Those areas that are restricted in order to meet a specific resource management objective. Restrictions can include vehicle weight, type of vehicle, seasonal limitations, or travel restricted to designated trails.
- **Closed**—Areas are closed to all vehicular use in order to protect natural resources, ensure visitor safety, or reduce conflicts.

The only BLM land designated as closed to OHV use within the Ring of Fire planning area are the AFO’s Campbell Tract Facility in Anchorage and those lands within the boundaries of Chugach State Park. Lands within the Chugach State Park are managed in accordance with State Park regulations, which prohibit the use of motorized vehicles on all park lands, except on the Eklutna Lakeside and Bird Creek trails (11 AAC 20.015). Within the State Park, vehicles are allowed on established parking areas and roads as described in 11 AAC 12.020(g), and snow vehicles are allowed on Chugach State Park lands during times when there is adequate snow cover to protet underlying vegetation (11 AAC 20.040). All other BLM-managed lands in the planning area are currently undesignated, making them effectively open to OHV use. Use is commonly focused on road accessible areas surrounding large population centers, such as Anchorage, and remote communities where OHVs serve as the primary mode of transportation. Aerial photos of high use areas reveal an expansive network of trails as a direct result of the unregulated use, particularly in the Knik River Valley.

During the months of May through September, OHV use tends to be centered on personal recreation. After September, use may shift from recreation-based to use in support of sport or

subsistence activities (NPS 2003a). Winter OHV use is typically by snowmachine with packed trails limited to major travel routes associated with the road system. Use during this time is mostly recreational though subsistence activities also take place. There are approximately 33,000 registered snowmachines in Alaska; however, it is estimated that there are actually over 95,000 in use (NPS 2003a).

3.3.10.1 Resource Concerns

OHV use in Alaska, and within the Ring of Fire planning area, has increased substantially since the early 1980s, when the introduction of four-wheelers and Argo-type machines (all-terrain and amphibious 6x6 and 8x8 vehicles) intiated a dramatic explosion of use (Bane 2001). Over the past few years, OHV use has continued to rise, which has led to an increase in user conflicts on the trails. Public comments received for the Draft RMP/EIS (Chapter 6) suggests conflicts between motorized and non-motorized users are emerging as the range and intensity of OHV use expands.

Many trails have evidence of resource damage, such as muddy bogs that grow in size as users take alternate routes around the mudholes, creating a braided trail pattern. Braided trail sections more than 200 ft wide are not unusual in Alaska (Meyer 2002). These widened trails not only leave a visual scar on the landscape, but they also contribute to vegetation and soil damage.

Adverse effects from OHVs on vegetation and soils increases as the amount of OHV use increases. Once OHV use is terminated within an area, damaged vegetation cover has been shown to recover, and the exposure of bare ground decreases. However the structure and composition of the vegetation regrowth in the affected area may not match that of surrounding, unaffected areas because OHVs can transport and facilitate the spread of invasive species (non-native) in disturbed areas (NPS 2003a).

The public has drawn attention to inadequate maintenance of many existing roads and trails where OHV use has caused widening, braiding, and ponding. BLM is beginning to receive proposals for easement rehabilitation projects, signifying that trail deterioration is a major concern among trail users and landowners. There is a large amount of land within the Ring of Fire planning area that is selected by Native corporations; continued coordination between BLM and Native corporations regarding easement use and maintenance needs to be maintained.

3.3.10.2 Off-Highway Vehicle Management

Current AFO management practice includes inventory and documentation of OHV trail development and interim management until OHV use classifications are implemented. Proposed actions involving OHV use are analyzed on a case-by-case basis to ensure minimal effect to visual, cultural, and biological resources. However, due to the size, remoteness, and large geographical distances between most of the BLM-managed units of the Ring of Fire planning area, many of the units are rarely visited by BLM personnel. Compliance checks for permitted actions often do not occur, particularly in remote portions of the planning area, allowing unauthorized use of BLM lands to occur without consequence.

During the summer of 2002, AFO recreation staff inventoried and assessed the majority of BLM-managed lands within the planning area. Assessment criteria included factors such as vegetation type, topography, use type, seasonal frequency, historical use, and local input. Data collected was compiled into Arc-Geographic Information System (GIS) coverage maps, which

illustrate broad use areas. The majority of concentrated OHV use within the planning area is within the Knik River valley. The remainder of the Ring of Fire planning area experiences low levels of generalized OHV use in the lower elevations, with a few more evident trails found in higher elevations.

A substantial amount of BLM land in the planning area has been selected by the State and is awaiting official conveyance. BLM consults with ADNR in efforts to manage OHVs on State-selected lands in the planning area.

Alaska Peninsula/Aleutian Chain Region

Lands that are within close proximity to villages contain OHV trails that are primarily used to access subsistence areas. BLM-managed lands traversed in these areas are limited to very small sections or portions of sections. This area receives little snow, thus the primary vehicle for overland transport is the ATV. The trails are frozen for much of the winter and can become very wet and susceptible to damage during the summer months. Smaller OHVs (four-wheelers) are often transported by single engine aircraft to remote airstrips and used in hunting operations. Webs of OHV trails stem off into the surrounding landscape from these airstrips (Bane 2001).

Kodiak Region

The majority of Kodiak Island is comprised of the Kodiak NWR (Figure 1.2-2); however, there are small, scattered parcels of BLM land spread throughout the island. Within the refuge boundaries, OHV use is allowed along designated routes or areas by special use permit (USFWS 2004e). This would include OHV use occurring on small parcels of BLM-managed lands that fall within the refuge boundaries. Outside of Kodiak NWR boundaries, the highest potential for OHV use is on lands south of the City of Kodiak along the road network.

Southcentral Region

Aerial photography reveals expansive networks of OHV trails in the Southcentral region, particularly in the Knik River Valley and upland areas, and adjacent to the Kashwitna River. The Chickaloon River drainage contains an ANCSA 17(b) easement often traveled by OHV users.

OHV use in the Knik River Valley has a long history and is tied exclusively to recreation activities (Minors 2004). OHV use is present year round and is concentrated primarily along the north side of the Knik River. With easy road access and numerous staging areas, the entire valley, up to the face of the Knik Glacier receives moderate to heavy motorized OHV use from ATVs, motorcycles, snowmachines, and high lift four-wheel drive vehicles. OHV trails throughout the riverbed area, are not as evident as those in upland areas due to the strong winds that help eliminate tracks. The lack of sensitive ecosystems within the gravel bed of the river makes the riverbed area more resilient to heavy OHV use.

OHV users in the Knik River Valley.

The Knik River uplands, including Friday and Hunter Creeks, have experienced an expansion of trail systems due to advancing OHV technology, which allows the vehicles to travel over more challenging terrain. A majority of the upland management authority lies with the State of Alaska. However, the Knik Glacier Trail, a State-recognized R.S. 2477 route, runs over approximately seven miles of BLM-managed lands. OHV use in the uplands can be year-round, but is mainly concentrated between the months of April and September. Motorcycles and snowmachines all use the area, but levels of effects from these OHV types on BLM lands are low.

The Kashwitna River drains west from the Talkeetna Mountains into the Susitna River. This area is easily accessible by the road network and contains numerous motorized OHV trails that extend onto BLM-managed lands. The OHV use is seasonal and most active during the fall moose hunting season. OHV tracks in this area can be seen from the air because the sub-alpine tundra is essentially treeless, and trails are widespread. The southern portion of BLM-managed lands in this area contains a segment of a CHA for the protection of rutting and post-rutting concentrations of moose.

Several other areas in the Southcentral region receive OHV use. The Chickaloon River Trail within BLM-managed lands is approximately 30 miles long and is used primarily by ATVs.

Southeast Region

The steep and rocky terrain of the Southeast region, particularly the Haines/Skagway area, is not conducive to ATV or snowmachine use. However, there is some OHV use in the upper Tsirku and Takhin River corridors. Snowmachine use in the upper Tsirku River has been documented, yet use levels are extremely low. ATVs have been reported in the upper Tsirku, but the vehicles are flown in and primarily used for mining purposes. No recreational OHV use has been documented on BLM lands in the upper Tsirku or Takhin River drainages. It is not expected that OHV use in these areas will substantially increase over the next 10 years.

There are also some BLM-managed lands within the Chilkat Bald Eagle Preserve surrounding Chilkoot Lake. Motorized use on the Chilkoot River is prohibited. Within the preserve, there are no areas where OHV use is limited, although large-scale commercial tour operations are subject to some regulation. The western side of Chilkoot Lake contains a poorly maintained trail through a Native allotment with no public easement. Although this land is private, it receives some OHV use, primarily from ATVs; however, poor trail conditions and other restrictions inhibit travel further than two miles from the trailhead. Water crossings along this road are prohibited as a habitat protection measure for anadromous streams.

3.3.11 Recreation

People are willing to invest large amounts of time and money to visit Alaska. The visitor industry is the only private sector basic industry that has grown continuously since statehood, and continues to grow each year (Colt 2001). Tourism is one of the driving forces behind Alaska's economy, and outdoor recreation is an important part of the Alaskan experience for both residents and visitors alike.

Within the Ring of Fire planning area, there is a diverse array of year-round recreation opportunities. Lands and waters within the planning area support a variety of dispersed recreation activities, including hunting and fishing, motorized and non-motorized boating, camping, hiking, skiing, sightseeing, wildlife viewing, and other traditional recreation activities. The use of guides and outfitters is an important component of BLM's recreation and land management throughout the planning area as many recreation visitors access BLM lands only with the assistance of guides and outfitters. There are numerous commercial recreation activities available within each region of the planning area.

Many visitors to Alaska experience the State from a cruise ship. In a recent survey, more visitors arrived at their first point of entry in Alaska on a cruise ship than any other mode of transportation (Northern Economics Inc. 2004). Cruise ship travelers may view or visit BLM lands via other commercial recreation providers, including glacier landings or flight seeing excursions.

OHV use is a popular mode of access and source of recreation in the planning area. For further discussion of OHV activities and management, refer to Section 3.3.10.

Is the purpose of a designated Special Recreation Management Area (SRMA) to promote increased recreation use?

It is a common misunderstanding that areas designated as a SRMA are managed primarily for promoting recreation use. This label can be misleading; management is designed to maintain or improve the values and character of the area. Public involvement is a key component for developing an SRMA plan. During the collaborative planning process, a primary strategy, management objectives and outcomes will be determined for each SRMA to help define desired activities, experiences, and benefits to the area. The planning process addresses recreation management, marketing, monitoring, and administrative support (e.g., visitor services, permits and fees, and appropriate use restrictions) necessary to achieve explicitly stated recreation management objectives and setting prescriptions (BLM Land Use Planning Handbook -1601, 3/11/05). Based on past public involvement pertaining to the two proposed SRMA areas in Haines and in the Knik, we recognize the common interest and essential need to balance a combination of diverse resources, such as wildlife and habitat. This effort will promote the concept of multiple use management and ensure participation by the public, State and local governments, Indian tribes and appropriate federal agencies (per the objective of resource management planning).

Many of the BLM-managed lands in the planning area are remote units adjacent to State, federal, or Native lands, or they are located within larger CSUs managed by the NPS, USFWS, or USFS. There are also areas of heavier recreation use that are accessible from the road system; the proximity of some BLM-managed lands to Anchorage, Haines, Skagway, and other

population centers increases the intensity of recreation demand. There are no designated SRMAs or recreation facilities under BLM management in the planning area, with the exception of the Campbell Tract Recreation Management Area and the Iditarod NHT. They are each managed by their own plan and will not be discussed further in this PRMP/FEIS.

Due to the ease of accessibility to some parcels of BLM-managed lands that are located on the road system, and minimal regulatory limitations and oversight on the scattered lands of the planning area, local recreation use within the planning area is increasing. Hunting and fishing, and pursuit of OHV recreation opportunities (Section 3.3.10) are becoming more popular with area residents. In addition, urban populations within the planning area also depend on these lands for recreation.

3.3.11.1 Recreation Management

The priorities of the BLM AFO recreation program are to provide opportunities for environmentally responsible recreation; reduce threats to public health, safety, and property; and protect natural and cultural heritage resources. Due to the size, remoteness, and large geographical distances between the majority of the BLM lands within the Ring of Fire planning area, field projects can be expensive and logistically difficult. Many BLM-managed lands are rarely visited by BLM staff, and compliance checks for permitted actions often do not occur, particularly in remote regions, potentially allowing unauthorized use of these lands to occur without consequence.

3.3.11.2 Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) used by BLM serves as a conceptual framework for inventory, planning, and management of recreation resources. The ROS is designed to recognize that people differ in their needs and in the recreation experience they desire. To manage recreation, land managers should provide opportunities for visitors to obtain satisfying experiences by managing the resource setting and activities that occur within it (BLM 1981). As a precursor to this planning effort, existing recreation opportunities on BLM-managed lands within the Ring of Fire planning area were inventoried and classified within the ROS system during the 2002-2003 field season.

The ROS is typically divided into six major classes, based on experience, setting and activity opportunities, which are:

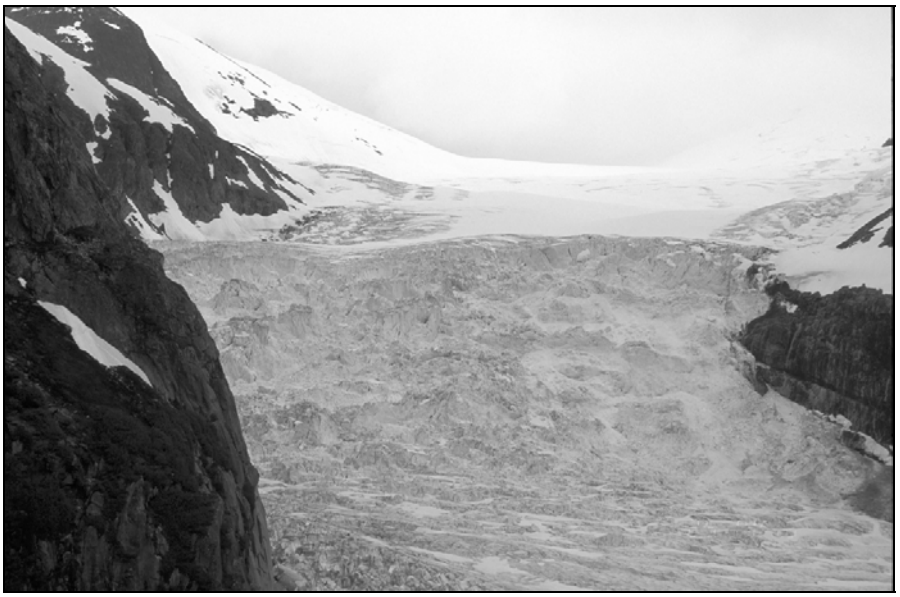
- Urban
- Rural
- Roaded Natural
- Semi-Primitive Motorized
- Semi-Primitive Non-motorized
- Primitive

Due to the large, fragmented land base of the BLM lands within the planning area, providing and applying site-specific, long-term recreation management prescriptions is quite difficult. The ROS applications are therefore fairly general. In 2002 and 2003, the majority of BLM-managed lands within the Ring of Fire planning area were inventoried to determine existing setting character

using ROS. (Figures 3.6-1 through 3.6-3). Based on the inventory completed in 2003, the majority of BLM-managed lands within the Ring of Fire are classified as semi-primitive motorized (see Figures 3.6-1 through 3.6-3 for exceptions).

3.3.11.3 Special Recreation Permits

The BLM AFO currently administers special recreation permits (SRP) for commercial use recreation activities on BLM lands within the Ring of Fire planning area. Requests for SRPs have increased over the past 10 years. In 1992, approximately 17 SRPs were issued, primarily to big game hunting guide services. Since then, nine additional SRPs have been issued on BLM lands within the planning area (26 total). Five of the nine SRPs have been issued to helicopter and fixed-wing assisted commercial tourism operations, such as heli-skiing, glacier landing tours, and backcountry adventures in the Haines/Skagway area. The remaining four of the recently issued SRPs were issued to big game hunting guide services.



Chilkat Glacier in the Haines Block SRMA.

<u>Alaska Peninsula/Aleutian Chain Region</u>

Most of the BLM-managed lands within this region are small, scattered tracts that are often used by local residents as corridors for access or recreation activities. A remote, unmodified natural environment characterizes the region, and is classified as primitive with the ROS. Concentrations of recreationists are rare, and evidence of other users is minimal. For Alaskan residents and tourists wishing to visit this region, Anchorage and communities on the Kenai Peninsula serve as the departure points for commercial or private airplanes. There are dispersed opportunities for hunting, fishing, camping, hiking, and wildlife viewing on and around BLM-managed lands. The region is known for its excellent fishing and big game hunting opportunities for brown bear, moose, and caribou (ADNR, ADF&G et al. 1984). There are several commercial lodges catering to hunters and fishermen; however, none are located on BLM-managed lands.

Kodiak Region

The island of Kodiak offers residents and visitors a variety of recreation opportunities, including hunting, fishing, camping, hiking, and wildlife viewing. Many lakes and streams on the island are home to world-class salmon runs, along with species such as rainbow trout and Dolly Varden. Sportsmen come from all over the world for the chance to hunt Kodiak brown bears. Sitka black-tailed deer are also popular among hunters on Kodiak, as bag limits are generous. BLM does not operate any public use cabins or recreation facilities on Kodiak; however, the USFWS maintains several remote cabins, that serve visitors who also participate in such activities as wildlife viewing, birding, hiking, camping, floating rivers, and fishing.

Southcentral Region

Over half of the State's population lives in the Southcentral region. A majority of recreation use within the Ring of Fire planning area is focused on road accessible areas near population centers. BLM parcels in this region similarly experience relatively higher recreation use. A majority of the lands within this region are managed by the State and various other federal agencies.

Tourism in the Southcentral region is likely to increase over the next decade, placing additional pressures upon public lands for recreation opportunities. Recreation activities will likely increase as commercial opportunities are developed. There are a number of guiding operations that operate west of Anchorage; use seasons vary with annual hunting seasons. Attempts are made to perform annual compliance checks on BLM permittees, or when designated camps are in use.

The majority of the State's established and maintained trails are within the Southcentral region. Most motorized recreation occurs north of Anchorage, with the heaviest use areas concentrating around the trails and lands around the Knik River Valley (OHV Section 3.3.10). Recreational trail access from the road system is extremely important in the Southcentral region. However, the largest threats to recreation resources in this region is road-accessible land (particularly via OHVs) and the lack of management resources for the area.

The south fork of the Eagle River is recognized for its unique recreational value (Figure 2.3-7). BLM manages approximately 6 miles of this 12-mile branch of the Eagle River. The riverine resource is extremely valuable in that it provides a unique wildland/urban interface for local recreationists, with easy access to extreme mountain country, remoteness, and high quality scenery and riparian habitats. There is good foot, cross-country skiing, and mountain bike access up the valley floor.

Friday Creek confluence in the Knik River SRMA.

Southeast Region

The Southeast region of the Ring of Fire planning area has a diversity of recreation activities, including hunting, fishing, camping, hiking, and wildlife viewing. BLM manages several units in this region; however, a majority of the lands within this region are managed by the State and various other federal agencies.

The Chilkoot Lake Power Site Withdrawal is recognized for its high recreational value (Figure 2.3-8). Chilkoot Lake is road accessible from Haines to the State-managed campground at the southern end of the lake. The campground is near the outlet of the lake and contains a boat launch facility. This entire area receives heavy recreational use, primarily due to the strong runs of salmon during the summer and fall. There is an abandoned road that skirts the western edge of the lake that is used by OHVs and mountain bikes. BLM's management authority covers the upper Chilkoot Valley above the lake.

Many visitors to the Southeast region view public lands and wildlife from cruise ships, Alaska Marine Highway ferries, or other boats. Helicopters and fixed-wing aircraft also provide viewing opportunities for commercial tour groups in the Haines/Skagway area. Helicopter companies also provide access for dispersed recreation backcountry use, heli-skiing activities, and glacier landing tours. Fixed-wing aircraft are commonly used for scenic over-flight tours and providing access for dispersed backcountry recreation.

3.4 Special Designations

3.4.1 Special Management Areas

Special Management Areas (SMAs) contain resources or opportunities that warrant discrete management strategies. BLM has several types of SMAs to address these management needs. These include:

- Areas of Critical Environmental Concern (ACECs) provide a management framework where special attention is required to protect and augment the resource values;
- Special Recreation Management Areas (SRMAs) are managed for recreation values;
- Wild and Scenic Rivers (WSRs) protect the free-flowing character of designated river segments, as well as river-related ORVs;
- Wilderness Study Areas (WSAs) are managed for natural characteristics and primitive recreation;
- NHTs are managed for historical significance;
- Research Natural Areas (RNAs) provide protection for ecological processes, biological diversity, and opportunities for observational activities associated with research and education; and
- Outstanding Natural Areas (ONAs) provide protection for unique scenic, scientific, educational, and recreational values.

BLM public lands contain resources that are scientifically, ecologically, culturally, educationally and recreationally important. There are a variety of laws concerning the management and use of these resources such as the FLPMA (1976), the Wilderness Act (1964), National Trails System Act (1968), and the Wild and Scenic Rivers Act (WSRA) (1968). Many of these laws establish procedures for formally recognizing areas that are unique or that contain important resource values. Congressionally designated areas include Wild and Scenic Rivers, Wilderness, NHTs, RNAs, and ONAs. ACECs, SRMAs, and WSAs are BLM designations established through land use planning or other administrative procedures.

3.4.1.1 Areas of Critical Environmental Concern

An ACEC is defined in FLPMA, Public Law 94-579, Section 103(a) (1976) as “an area within the public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect human life and safety from natural hazards.” ACECs are identified through the RMP/EIS planning process. While an ACEC may emphasize one or more unique resources, other existing multiple-use management can continue within an ACEC, so long as the uses do not impair the values for which the ACEC was designated. BLM has proposed the southern block of the Neacola Mountains (229,000 acres) for designation as an ACEC to protect its unique, regionally significant visual resources.

In the ACEC designation process, BLM identifies goals, standards, and objectives for each area, as well as general management strategies and uses, including necessary constraints and mitigation measures. This direction should be specific enough to minimize the need for subsequent ACEC management plans, although the proposed Neacola Mountains ACEC is an exception. In this case, the primary basis for the Neacola Mountains ACEC, visual resources,

would benefit from a subsequent implementation-level plan that includes the NEPA process. ACECs must meet the relevance and importance criteria in 43 CFR 1610.7-2(a) and must require special management under 43 CFR 1601.0-5(a) to protect and prevent irreparable damage to the important resources mentioned above.

What's the difference between ACECs and other SMA designations (like WSAs)?

An ACEC is a designation that highlights areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural and scenic values; fish, wildlife resources or other natural systems or processes; or to protect human life and safety from natural hazards. BLM establishes special management measures for these areas through land use planning. The designation is a record of significant values that must be accommodated when BLM considers future management actions and land use proposals.

ACECs differ from other special designations, such as Wilderness Study Areas, in that designation by itself does not automatically prohibit or restrict other uses in the area. While WSAs are managed to a "non-impairment" standard that excludes surface disturbing activities and permanent structures that would diminish the areas' natural character, the management of ACECs is focused on the resource or natural hazard of concern. This varies considerably from area to area, and in some cases may involve surface disturbing actions.

ACECs and SRMAs may not differ in practicality depending upon the resource values, ACECs, in and of themselves, do not prohibit special recreation permits. SRMAs may significantly restrict recreation permitting. BLM can apply different management tools under each SMA. The distinction we practice is that areas where the issues and use conflicts focus on recreation will be SRMAs, areas where other use authorizations are expected or where the predominate use is hard to distinguish will be ACECs.

The restrictions that arise from an ACEC designation are determined at the time the designation is made, and are designed to protect the values or serve the purposes for which the designation was made. In addition, ACECs are protected by the provisions of 43 CFR 3809.1-4(b)(3), which requires an approved plan of operations for surface management and all activities under mining laws except casual use. ACEC recommendations and resource use limitations require a FR notice providing a 60-day comment period under 43 CFR 1610.7-2(b).

There are no designated ACECs on BLM-managed lands within the Ring of Fire planning area.

3.4.1.2 Special Recreation Management Areas

SRMAs are managed for unique recreation resources. Detailed recreation planning and more intensive management is typically needed to guide use in these areas. SRMAs are identified through the RMP/EIS planning process. Each SRMA has a distinct primary recreation-tourism market. For each SRMA selected, BLM determines whether that primary market-based strategy will be to manage for a *destination* recreation-tourism market (usually involve areas with use fees, facilities, and interpretive displays), a *community* recreation-tourism market (may involve use fees, attract a variety of local users based on its value to community recreationists for direct health benefits), or an *undeveloped* recreation-tourism market (does not usually involve use fees or facilities, and access is difficult).

SRMAs are divided into Recreation Management Zones (RMZ) when they have more than one recreation market. Each RMZ has four defining characteristics:

1. Serves a different recreation niche within the primary recreation market;
2. Provides a different set of recreation opportunities and facilitates the attainment of different experience and benefit outcomes (to individuals, households and communities, economies, and the environment);
3. Has distinctive recreation setting character; and
4. Requires a different set of recreation provider actions to meet the strategically-targeted primary recreation market demand.

Hunter Creek Drainage, Knik River SRMA.

Extensive Recreation Management Areas (ERMA) are recognized as having dispersed recreation with limited recreation issues or management concerns. ERMAs are those areas not designated as an SRMA, but contain special features that provide for unstructured recreation activities such as hunting, dispersed camping, hiking, and wildlife viewing. Most of these public lands are offered for use by recreationists with few restrictions. Therefore, actions within ERMAs are generally implemented directly from land use plan decisions and do not require activity-level planning. Currently, there are no designated ERMAs within the Ring of Fire planning area.

VRM classes (see Section 3.2.14) need to be correlated with the recreation management objectives prescriptions that have been set for each delineated RMZ. The ROS criteria approach is parallel with how SRMAs are determined under the market-based strategy. Lands managed as a SRMA meet one of the five categories: roaded, natural, semi-primitive motorized, semi-primitive non-motorized, and primitive (see Section 3.3.11 for a description of ROS). BLM applies ROS categories to a land area's physical, social, and managerial parameters. The categories describe the existing conditions that define a land area's capability and suitability for providing a particular range of recreational experience opportunities. The ROS criteria approach is parallel with how SRMAs are determined under the market-based strategy.

The Campbell Tract Recreation Management Area in Anchorage is the only SRMA in the Ring of Fire planning area. The Campbell Tract will not be affected by decisions made in this PRMP/FEIS, and will continue to be managed under the 1988 Management Plan for Public Use and Resource Management on the BLM Campbell Tract Facility. When they have more than one recreation market, RMZs for proposed SRMAs in Chapter 2 will, if enacted in the Record of Decision, be determined in the subsequent Integrated Activity Plan. Such RMZs may designate areas of non-motorized recreation if the objective is to provide for solitude or natural quiet.

3.4.1.3 Wild and Scenic Rivers

Through passage of the WSRA (1968), Congress established the National Wild and Scenic Rivers System. Rivers are defined as flowing bodies of water or estuary or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes. They also must be free-flowing and with their immediate environments possess at least one outstandly remarkable value (ORV), e.g., scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values (BLM 1997b).

The three phases of a WSR Study are the: elegibility determination, classification analysis, and suitability assessment. The first phase, elegibility, consists of an analysis to see whether the river is “eligible” for future WSR designation. To be eligible, the river must meet the criteria of being free-flowing, and posess at least one ORV. A determination that a river is eligible for designation does not lead immediately to a recommendation that it should be added to the WSR system. There are currently no rivers designated as part of the National System on BLM-managed lands within the Ring of Fire planning area. BLM inventoried 50 potential rivers and glaciers within the planning area to determine their potential WSR designation. Of the 50 rivers and glaciers initially evaluated, nine were glaciers which were determined not to meet the WSR free-flowing criteria, and two river segments that are not located on BLM-managed lands. A total of 39 river segments were evaluated to determine if they met the eligibility standards. Of these 39 (Table 3.4-1), 14 were found eligible and moved forward through the classification analysis. This phase determines whether the river should be tentatively classified as a recreational, scenic, or wild river if it were to be designated by Congress. This tentative classification is based on the level of development present in the river corridor. The suitability process requires an inventory of all river areas, a determination of the free-flowing nature, consideration of ORVs that are river-related and regionally and/or nationally significant, and tentative classification of the river segments.

The 14 eligible river segments have characteristics that would make them a worthy addition to the WSR system. Factors considered in evaluating their suitability are found in BLM Manual 8351 and include, among others:

- Jurisdictional considerations;
- Activities which would be foreclosed without designation;
- Expressed federal, state, or local interest in the designation;
- Local interest in the designation; and
- The degree that the State or its political subdivision might participate in the preservation and management of the river should it be proposed for inclusion in the NWSRS.

The relevant segments of the rivers that were evaluated are not solely under BLM's jurisdiction. In many cases, they are owned or selected by the State of Alaska or Native Corporations. Long-term retention of many of these segments is unlikely, and any designation will not carry forward in the title transfer documents. Given the extremely short lengths of river segments under BLM jurisdiction, coupled with selection status by the State and/or Native Corporations, these river segments cannot be managed or protected as WSRs. The remaining river segment not selected by the State or a Native Corporation, while having scenic values, is not remarkable in comparison to the surrounding landscape. Therefore, none of the 14 river segments have been determined as suitable for designation as WSRs. However, ORVs identified for these river segments have been noted, and will be taken into consideration in BLM management of these lands. This includes consideration of measures to avoid and/or mitigate impacts on ORVs during review of any proposed activities that might affect these river segments.

Table 3.4-1. Summary of River Segment Eligibility and Tentative Classification

River Segment	BLM Miles (Approx.)	Comments
Chickaloon River	14	Not eligible-no ORV found.
Coal Creek	7	Not eligible-no ORV found.
Eagle River (Withdrawal portion)	3	Not eligible-no ORV found.
Eagle River, S. Fork	6	Found eligible for its ecological function (Wildland urban interface and water resources); tentatively classified as Recreational.
Friday Creek	8	Not eligible-no ORV found.
Hunter Creek, S. & N. Forks	2	Not eligible-no ORV found.
Kashwitna River	8	Not eligible-no ORV found.
Kings River	9.5	Not eligible-no ORV found.
Knik River	14	Not eligible-no ORV found.
Little Willow Creek	3.5	Not eligible-no ORV found.
Lucile Creek	4	Not eligible-no ORV found.
Montana Creek	1	Not eligible-no ORV found.
Resurrection River	1	Not eligible-no ORV found.
Ship Creek	4.5	Not eligible-no ORV found.
Thunderbird Creek	3	Not eligible-no ORV found.
Wasilla Creek	2	Not eligible-no ORV found.
Wolverine Creek, S. & N. Forks	4	Not eligible-no ORV found.
Chilligan River	5.9	Found eligible for its scenery & wildlife; tentatively classified as Wild and/or Scenic.
Harriet Creek	1.6	Not eligible-no ORV found.
Iniskin River	4.4	Found eligible for its recreation, wildlife and ecological function; tentatively classified as Wild.
Kirschner Lake Complex	1	Found eligible for its scenic primitive setting and recreation opportunities; tentatively classified as Wild and/or Scenic.
McArthur River	8.5	Found eligible for its ecological function and wildlife; tentatively classified as Recreational.
Nagishlamina River	12.2	Not eligible-no ORV found.
Redoubt Creek	1.1	Not eligible-no ORV found.
Skwentna River	8.3	Not eligible-no ORV found.
Tuxedni River	4	Not eligible-no ORV found.
Ursus Cove Complex	1	Found eligible for its wildlife and ecological function (estuary habitat); tentatively classified as Wild.
Burro Creek	2.3	Not eligible-no ORV found.
Chilkat River	5.8	Found eligible for its wildlife; tentatively classified as Wild.
Chilkoot River	7.5	Found eligible for its ecological function and scenery; tentatively classified as Wild and/or Scenic.
Chilkoot Lake Power Site Withdrawal	1	Found eligible for its wildlife; tentatively classified as Recreational.
Nourse River	4.2	Not eligible-no ORV found.
Takhin River	8.3	Not eligible-no ORV found.
Tsirku River	11.9	Found eligible for its scenery, wildlife, and geology; tentatively classified as Wild and/or Recreational.
Tahini River	2	Found eligible for its wildlife; tentatively classified as Wild and/or Recreational.
Buskin River	7.6	Not eligible-no ORV found.
Elbow Creek	2.9	Found eligible for its ecological function (large variety of wildlife and habitat); tentatively classified as Recreational.
Barbara Creek	4	Found eligible for its wildlife; tentatively classified as Wild.
Reindeer Creek	8	Found eligible for its wildlife; tentatively classified as Wild.

3.4.1.4 Wilderness Study Areas

Section 603 of FLPMA directed BLM to survey all of its lands to identify roadless tracts, evaluate them for wilderness characteristics, and identify those areas that possess these characteristics as WSAs (Lucas, Hendee et al. 1990). To be designated as a WSA, an area has to posses the following characteristics:

- Roadless area of at least 5,000 acres of public lands or of a manageable size.
- Generally appears to have been affected primarily by the forces of nature.
- Provides outstanding opportunities for solitude or primitive and unconfined types of recreation.

Also, as discussed in Section 1.3.2, broad support from elected State and federal officials is required before BLM can consider WSA designations in resource management planning efforts, and the State of Alaska has identified no such support. There are currently no designated WSAs on BLM-managed lands within the Ring of Fire planning area.

3.4.1.5 National Historic Trails

NHTs are established under the National Trails System Act (1968) and subsequent amendments. The National Trails System Act was amended in 1978 to include the Iditarod NHT. According to the Act, NHTs are "…extended trails, which follow as closely as possible and practicable to the original trails or routes of travel of national historic significance." The Act further states, "…only those selected land and water based components of a historic trail which are on federally owned lands and which meet the NHT criteria established in the Act are included as Federal protection components of a NHT."

The Iditarod NHT is managed by BLM to promote the preservation, use, and enjoyment of the historic route. The Iditarod NHT is also designated as a CSU, requiring adherence to ANILCA provisions. It is managed under the terms of the Iditarod NHT Comprehensive Management Plan and through a number of agreements with other entities. Even though the NHT does cross land within the Ring of Fire planning area, management decisions for the NHT will not be made within this planning effort. Under the terms of the management plan and cooperative agreements, BLM coordinates management activities with the partner agencies, but does not have authority to dictate terms or conditions on management of these portions of the trail. This plan does not cover lands crossed by the NHT within the Ring of Fire planning area, as the NHT is managed under its own management plan.

3.4.1.6 Research Natural Areas

Under FLPMA Section 102(a)(8), BLM's role is guided primarily by the mission to manage lands in a manner that will protect scientific and environmental values, and to "preserve and protect certain public lands in their natural condition." RNAs are established and managed to protect ecological processes, conserve their biological diversity, and provide opportunities for observational activities associated with research and education (BLM 1997b). RNAs may be designated separately or as a type of other administrative designations, such as ACECs. There are no designated RNAs on BLM-managed lands within the Ring of Fire planning area.

Research Natural Areas

Research Natural Areas (RNAs) that are representative of common ecosystems in natural condition typically serve as baseline or reference areas. To help answer resource management questions, the "baseline" RNAs can be compared with similar ecosystems undergoing silvicultural or other land management prescriptions. In this way, RNAs make an important contribution to ecosystem management within BLM.

RNAs are managed to maintain the natural features for which they were established, and to maintain natural processes. Because of the emphasis on natural conditions, they are excellent areas for studying ecosystems or their component parts and for monitoring succession and other long-term ecological change. Non-manipulative research and monitoring activities are encouraged in RNAs, and can be compared with manipulative studies conducted in other areas.

RNAs can also serve as sites for low-impact educational activities. These areas are available for educational use by university and school groups, native plant societies, and other organizations interested in pursuing natural history and educational field trips.

3.4.1.7 Outstanding Natural Areas

ONAs, were created under the authority of the Classification and Multiple Use Act of 1964. ONAs are established to protect unique scenic, scientific, educational, and recreational values for the enjoyment of current and future generations. Recreation activities center on those that foster education and interpretation of the ONAs' unique resources. The preservation of these resources in their natural condition is the primary management objective (Utah-BLM 2005). ONAs are designated as types of ACECs using the ACEC designation process. BLM's first and only ONA was established in 1980, and is located on the Oregon coast.

As part of the Wilderness Inventory process that began in 1979 (see Section 3.4.1.4), ONAs became Instant Study Areas (ISAs). ISAs are lands that were previously classified as natural or primitive areas and were identified as ISAs under Section 603 of FLPMA. Interim Management Policy has applied to these areas since that time and will continue until Congress acts to designate or release these areas from study. There are no ONAs on BLM-managed lands within the Ring of Fire planning area.

3.4.1.8 Special Management Areas within the Ring of Fire Planning Area

Alaska Peninsula/Aleutian Chain Region

Barbara Creek and Reindeer Creek in the Alaska Peninsula/Aleutian Chain region are being evaluated for Wild and Scenic River designation through this PRMP/FEIS planning process (Figure 2.3-6). Becharof NWR and Wilderness Area, managed by the USFWS, is adjacent to BLM-encumbered lands (Figure 1.2-2).

Kodiak Region

Elbow Creek in the Kodiak region is being evaluated for Wild and Scenic River designation through this PRMP/FEIS planning process (Figure 2.3-6). Kodiak NWR managed by the USFWS, is adjacent to BLM-encumbered lands (Figure 1.2-2).

Southcentral Region

The few segments of the Iditarod NHT located within the Ring of Fire planning area are in the Southcentral region. None are located on BLM managed lands. The Neacola Mountains are being evaluated as an ACEC through this PRMP/FEIS planning process. McArthur River, Chilligan River, the South Fork of the Eagle River, Kirschner Lake Complex, Iniskin River, and the Ursus Cove Complex are being evaluated for Wild and Scenic River designation through this PRMP/FEIS planning process (Figure 2.3-7). The Halibut Cove Forest Study Area was withdrawn from all appropriation under the public land laws and reserved under the jurisdiction of the BLM as a forest study area by PLO 2980 on January 29, 1963 (Figure 2.3-1). The area was identified by the Society of American Foresters as a valuable remnant Sitka spruce stand that would provide a baseline reference to track climate and other changes through recurrent study of the natural vegetation. The area remains in a relatively pristine state and has been monitored periodically by researchers from various universities. This area continues to be studied as a natural forest ecosystem by the University of Alaska-Fairbanks.

There are several federal and State protected areas that are adjacent to BLM-encumbered lands in the Southcentral region. Federal lands include the Lake Clark National Park and Preserve managed by the NPS, Kenai NWR managed by the USFWS, and CNF managed by the USFS (Figure 1.2-3). Areas managed by ADNR include Caines Head State Recreation Area and the Chugach State Park (Figure 1.2-3). ADF&G manage areas including Trading Bay State Game Refuge and Redoubt Bay CHA, Palmer Hay Flats State Game Refuge and other CHAs (Figure 1.2-3).

Southeast Region

The Chilkoot Lake Power Site Withdrawal, Tsirku River, Tahini River, Chilkat River, and Chilkoot River have been evaluated for Wild and Scenic River designation through this PRMP/FEIS planning process (Figure 2.3-8). There are several federal and State protected areas that are adjacent to BLM-encumbered lands in the Southeast region. Federal lands include TNF managed by the USFS and Klondike Gold Rush National Historic Park (State lands), Misty Fjords, and Admiralty Island National Monument managed by the NPS. Areas managed by ADNR include Haines State Forest Resource Management Area and Chilkat Bald Eagle Preserve. Areas managed by ADF&G include Mendenhall Wetland State Game Refuge (Figure 1.2-4).

Lake Carlanna is located above Ketchikan and is an integral portion of the 1,835 acres for use as the Ketchikan Municipal Watershed by the Act of July 27, 1939 (Figure 2.3-2). These lands are withdrawn from all forms of location, entry, or appropriation, whether under the mineral or nonmineral land laws of the U.S., and the lands have been set aside as a municipal water supply for the use and benefit of the people of the City of Ketchikan. The watershed provides habitat for a variety of species including amphibians, deer, wolves, and bear. BLM co-manages the withdrawal with the USFS. Although it does occur, recreation use has not been encouraged in the past due to the past use of the land as the source of water for the community. Although the watershed Is no longer the primary source of water for the City of Ketchikan, the watershed continues to provide the community’s backup water supply in dry seasons.

3.5 Social and Economic

3.5.1 Introduction

The lives of many Alaska residents are intricately connected to the natural environment. The earliest residents of the area lived off the lands and waters. Relationships with the natural environment have been developed over generations; the natural environment and social environment remain closely related in the Ring of Fire planning area. Cultural identity, subsistence uses, resource-dependent economies, and quality of life indicators are linked to the natural environment.

The purpose of this section is to describe the social and economic relationships in the Ring of Fire planning area. The potential effects of proposed alternatives will be described in Chapter 4.

This analysis takes a regional approach and will typically be presented by borough or census subdivision. The regional approach was selected due to several factors. The project area is expansive; land parcels are unconsolidated, and there are limits on management actions due to unresolved land selections (by the State and Native corporations). The large parcels that are managed by BLM are typically not in close proximity to communities. Where specific communities could be closely affiliated with actions that occur on lands managed by BLM, a sub-regional analysis will be presented (e.g., Butte, Eklutna, Haines, Palmer, Skagway, and Tyonek).

With the regional focus, the socioeconomic indicators that will be used for this analysis include:

Economics

- Regional Economies
- Income and Employment (by Industry Sector)
- Economic Ties to BLM Lands
- Revenue Sources (including payment in lieu of taxes [PILT])

Population and Demographics

- Population
- Ethnicity
- Age
- Migration
- Poverty

Social Information

- Crime Rates
- Unemployment
- Educational Attainment
- Community Resiliency
- Quality of Life

3.5.1.1 Area of Influence

The Ring of Fire planning area encompasses a vast land area that includes rural communities and urban population centers. The primary area of social and economic influence includes the boroughs and census areas in the Alaska Peninsula/Aleutian Chain, Kodiak, southcentral Alaska, and Southeast regions.

While many of BLM-managed lands within the planning area are difficult to access and not in close proximity to communities, the planning area produces amenities and resources, including intangible values, which are utilized in varying degrees by Alaska residents as well as tourists. With such a large, unconsolidated planning area, there may be secondary areas of influence, but they would be difficult to define due to the low intensity of social and economic influence in these areas. This document focuses on the primary area of influence, with some analysis related to individual communities within these regions.

3.5.2 Economics

3.5.2.1 Regional Economies

The economies within the Ring of Fire planning area vary greatly. From a statewide perspective, the petroleum, fisheries, and tourism industries are the largest components of the economy (Alaska Department of Labor & Workforce Development 2005). These sectors are also important in the Ring of Fire planning area. However, employment statistics indicate that other industry sectors are dominant within the boroughs and census areas in the planning area. The economic activity in the Ring of Fire planning area relates to income and employment statistics for the area, as discussed below.

Income and Employment

According to 2000 Census data, the median household income in the planning area varied from $36,442 in the LPB to $62,034 in the CBJ. The median household income for the State was $51,571, and the national statistic was $41,994. The mean household income varied from $42,634 in the LPB to $67,526 in the Aleutians West Census Area (AWCA). The mean household income in the State was $59,036, and in the nation was $50,046. Per capita income in the planning area ranged from $15,361 in the LPB to $26,719 in the CBJ. The per capita income for Alaska residents was $22,660, while the national per capita income was $21,587. Table 3.5-1 displays median household income, mean household income, and per capita income for all boroughs and census areas in the planning area.

The education, health and social services sector is the dominant employer in the planning area. Other important sectors in the planning area include agriculture, forestry, fishing and hunting, and mining; manufacturing; retail trade; arts, entertainment, recreation, accommodation and food services; and public administration (U.S. Census Bureau 1990). Table 3.5-2 displays employment by economic sector for all boroughs and census areas in the planning area. Table 3.5-3 displays average monthly employment and earnings for the planning area.

Economic Ties to BLM Lands

There are several natural resource-based economic enterprises that benefit from lands managed by BLM within the Ring of Fire planning area. There are 30 commercial recreation permits administered by the AFO, as well as six leases for recreation and public purposes. The AFO also administers six leases and four permits in the planning area under the authority of FLPMA and 43 CFR 2920, which provides for the management, protection, development, and enhancement of public lands. All of the above mentioned permits and leases are dispersed throughout the planning area. While locally important, they provide a relatively small contribution to the overall economy within the planning area.

Revenue Sources

The AWCA, Prince of Wales-Outer Ketchikan Census Area (PWOKCA), and Skagway-Hoonah-Angoon Census Area (SHACA) are not incorporated boroughs and lack taxing authority. The remaining boroughs and municipalities in the planning area have taxing authority and have implemented property taxes, sales taxes, and a variety of special taxes (such as bed taxes, fish taxes, and car rental taxes). Taxes for each borough in the Ring of Fire planning area are displayed in Table 3.5-4. The tax revenues collected in the planning area vary from

$342,034,768 in the MOA to $731,799 in the LPB (DCCED 2004c). On a per capita basis, the LPB collected the least tax ($450 per capita), and the CBJ collected the most tax ($1,999 per capita). Tax revenues and payments in lieu of taxes (PILT) for each borough and census area in the Ring of Fire planning area are displayed in Table 3.5-5.

Table 3.5-1 Regional Economic Statistics

Region	Borough/Census Area	Median Household Income	Mean Household Income	Per Capita Income
Alaska Peninsula/Aleutian Chain Region	AEB	47,875	58,127	18,421
	AWCA	61,406	67,526	24,037
	LPB	36,442	42,634	15,361
Kodiak Region	KIB	54,636	60,322	22,195
Southcentral Region	MOA	55,564	62,232	25,287
	KPB	46,397	51,932	20,949
	MSB	51,221	55,303	21,105
Southeast Region	Haines Borough	40,772	44,435	22,090
	CBJ	62,034	62,927	26,719
	KGB	51,344	56,806	23,994
	PWOKCA	40,636	43,837	18,395
	SCB	51,901	55,419	23,622
	SHACA	40,879	45,233	19,974
	YCB	46,786	49,262	22,579

Notes : AEB – Aleutions East Borough
AWCA – Aleutians West Census Area
CBJ – City and Borough of Juneau
KGB – Ketchikan Gateway Borough
KIB – Kodiak Island Borough
KPB – Kenai Peninsula Borough
LPB – Lake and Peninsula Borough
MOA – Municipality of Anchorage
MSB – Matanuska-Susitna Borough
PWOKCA – Prince of Wales-Outer Ketchikan Census Area
SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Source: (U.S. Census Bureau 1990)

Table 3.5-2. Regional Employment by Economic Sector

Region	Borough/ Census Area	Agriculture, forestry, fishing & hunting, mining	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing, and utilities	Information	Finance, insurance, real estate, and rental & leasing	Professional, scientific, mgmt, administrative, and waste mgmt services	Educational, health, and social services	Arts, entertainment, recreation, accommodation and food services	Other services (except public administration)	Public administration
Alaska Peninsula/ Aleutian Chain Region	AEB	104	30	487	34	36	95	5	10	21	109	51	33	71
	AWCA	439	184	1,031	192	137	275	44	53	99	230	198	86	284
	LPB	8	28	7	3	33	59	5	6	14	197	36	42	143
Kodiak Region	KIB	602	331	1,029	120	656	436	93	186	221	1072	400	312	673
Southcentral Region	MOA	3,886	7,995	2,542	4,428	15,327	11,809	4,097	7,654	12,845	24,532	11,342	7,156	12,142
	KPB	2,157	1,898	1,046	383	2,568	1,319	294	638	1,046	3,996	2,209	1,283	1,527
	MSB	1,413	2,841	594	606	3,217	2,046	977	924	1,659	5,312	2,059	1,348	1,985
Southeast Region	Haines Borough	57	131	28	11	113	71	30	31	57	171	145	74	73
	CBJ	854	1,035	199	174	1,689	1,072	417	723	1,339	3,383	1,162	755	3,735
	KGB	330	557	415	159	762	764	179	378	399	1,323	645	321	776
	PWOKCA	507	263	137	44	308	171	38	40	58	546	162	129	211
	SCB	407	253	189	54	476	245	72	148	191	1,414	354	292	257
	SHACA	213	130	77	7	132	207	8	37	52	271	187	34	116
	YCB	136	32	25	0	21	64	5	9	0	62	43	13	30

Notes : AEB – Aleutians East Borough
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SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Table 3.5-3. Average Monthly Employment and Earnings in 2002

Region	Borough/Census Area	Average Monthly Employment	Average Monthly Earnings
Alaska Peninsula/Aleutian Chain Region	AEB	1,710	$2,325
	AWCA	3,349	$2,944
	LPB	627	$1,945
Kodiak Region	KIB	5,616	$2,494
Southcentral Region	MOA	137,917	$3,242
	KPB	17,628	$2,798
	MSB	13,904	$2,426
Southeast Region	Haines Borough	893	$2,187
	CBJ	17,331	$2,874
	KGB	6,732	$2,683
	PWOKCA	1,818	$2,222
	SCB	4,302	$2,502
	SHACA	1,552	$2,396
	YCB	336	$2,386

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SCB – Sitka City and Borough
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YCB – Yakutat City and Borough

Source: (Alaska Department of Labor & Workforce Development 2005).

Table 3.5-4. 2004 Tax Types in Ring of Fire Municipalities

Region	Borough/ Census Area	Type of Municipality	Property Tax	Sales Tax	Special Taxes
Alaska Peninsula/ Aleutian Chain Region	AEB	Second Class Borough	No	No	2% Raw Fish Tax
	AWCA	Unincorporated	N/A	N/A	N/A
	LPB	Home Rule Borough	No	No	2% Raw Fish Tax/Guide Fees/6% Bed Tax
Kodiak Region	KIB	Second Class Borough	Yes	No	9.25 mill Severance Tax/5% Bed Tax
Southcentral Region	MOA	Unified Home Rule	Yes	No	8% Bed Tax & Car Rental/15% Tobacco Tax/Aircraft (flat)
	KPB	Second Class Borough	Yes	2%	No
	MSB	Second Class Borough	Yes	No	5% Bed Tax
Southeast Region	Haines Borough	Home Rule Borough	Yes	5.5%	4% Bed Tax/4% Tour Tax
	CBJ	Unified Home Rule	Yes	5%	7% Bed Tax/3% Liquor Tax/ $.30 per pack Tobacco Tax
	KGB	Second Class Borough	Yes	2%	4% Bed Tax
	PWOKCA	Unincorporated	N/A	N/A	N/A
	SCB	Unified Home Rule	Yes	5%/6%	6% Bed Tax/$.02 per gallon Fuel Tax
	SHACA	Unincorporated	N/A	N/A	N/A
	YCB	Home Rule Borough	Yes	4%	1% Raw Fish Tax/4% Bed & Car Rental Tax

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SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Table 3.5-5. Sources of Revenue in 2004

Region	Borough/ Census Area	Total Taxes	Population	Per Capita Tax Revenue	Payments in Lieu of Taxes	Total Acres
Alaska Peninsula/ Aleutian Chain Region	AEB	$2,807,902	2,688	$1,045	$236,137	2,680,250
	AWCA	0		0	$525,434	2,357,968
	LPB	$731,799	1,627	$450	$151,689	9,244,007
Kodiak Region	KIB	$9,434,273	13,797	$684	$808,739	2,821,130
Southcentral Region	MOA	$342,034,768	273,565	$1,250	$470,275	340,928
	KPB	$60,609,742	51,398	$1,179	$1,851,606	6,378,140
	MSB	$56,288,126	67,526	$834	$1,869,439	4,699,145
Southeast Region	Haines Borough	$3,760,991	2,319	$1,622	$217,246	1,189,512
	CBJ	$62,461,837	31,246	$1,999	$787,841	1,717,390
	KGB	$10,565,387	13,533	$781	$534,624	739,554
	PWOKCA	0		0	$525,434	4,312,387
	SCB	$11,869,264	8,897	$1,334	$340,793	1,796,925
	SHACA	0		0	$308,614	5,236,171
	YCB	$952,743	690	$1,381	$70,514	4,448,986

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SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Sources: (DCCED 2004c; BLM 2005r).

All of the boroughs and census areas in the Ring of Fire planning area receive PILT payments. These payments help local boroughs to offset loses in property taxes, as federal lands within their districts are generally not otherwise taxable. The payments are based on population in the area, the amount of federal land within the affected borough or census area, and the federal revenues generated in the area. PILT payments are in addition to other revenues (such as oil and gas leasing and timber harvesting) that the federal government transfers to the State. The PILT payments to boroughs and designated census areas within the planning area totaled $8,698,385 in 2004; the payments varied from $70,514 to the Yakutat City and Borough (YCB) to $1,869,439 to the MSB (BLM 2005r).

Alaska Peninsula/Aleutian Chain Region

According to the 2000 Census data, the income statistics for the Alaska Peninsula/Aleutian Chain region had a great disparity between the boroughs and census area. The LPB consistently had the lowest income levels by all measures; the median household was $36,442; the mean household income was $42,634; and the per capita income was reported to be $15,361. The AWCA had the highest income for all statistics: the median household income was $61,406; the mean household income was $67,526, and the per capita income was $24,037. The Aleutians East Borough (AEB) had a median household income of $47,875; the mean household income was $58,127; and the per capita income was $18,421 (US Census Borough 2000).

An estimated 44.8 percent of residents in the AEB were employed in the manufacturing sector; the education, health and social services sector employed the second greatest number of people (10 percent). The AWCA had the greatest number of employees in the manufacturing sector (31.7 percent), followed by the 13.5 percent of employees in the agriculture, forestry,

fishing and hunting, and mining sector. The LPB had over one third (33.9 percent) of its employees in the educational, health and social services sector. The public administration sector was the second greatest employer in the area (24.6 percent) (U.S. Census Bureau 1990).

Average monthly employment in 2002 for all economic sectors was 1,710 people in the AEB; 3,349 in the AWCA; and 627 in the LPB (Alaska Department of Labor & Workforce Development 2005). The same study recorded average monthly earnings as $2,325 in the AEB, $2,944 in the AWCA, and $1,945 in the LPB. Similar to other measures of income previously discussed, the LPB had the lowest average monthly earnings of all regions in the planning area.

The AWCA is not an incorporated borough and thus lacks taxing authority. However the AWCA collected $525,434 from federal PILT. The AEB is incorporated as a second-class borough and levies a two percent raw fish tax. In 2004, the AEB collected $2,807,902 in taxes and $236,137 from federal PILT. The LPB is a home rule borough, levying a two percent raw fish tax, guide fees, and a six percent bed tax. The LPB collected $731,799 in taxes in 2004 and $151,689 from federal PILT (DCCED 2004c; BLM 2005r).

Kodiak Region

The income statistics from the 2000 Census for the KIB showed good income levels in the region (US Census Borough 1990). The median household was $54,636, and the mean household income was $60,322; both statistics were higher than those for the State and nation. The per capita income was reported to be $22,195; this statistic was slightly lower than for the State, but higher than the national indicator.

The education, health and social services sector employed 17.5 percent of workers in the KIB, while the manufacturing sector provided 16.8 percent of jobs in the area (U.S. Census Bureau 1990).

The KIB is a second-class borough that levies a property tax, a 9.25 mill severance tax, and a five percent bed tax. The borough collected $9,434,273 in taxes in 2004 and $808,739 from federal PILT (DCCED 2004c; BLM 2005r).

Southcentral Region

In the Southcentral region, the MOA had income statistics that were higher than those in the State or nation, while the statistics for the KPB and the MSB were lower than the State and national measures. The median household income for the MOA was $55,564; the mean household income was $62,232; and the per capita income was reported to be $25,287. The KPB reported median household income of $46,397; the mean household income was $51,932, and the per capita income was $20,949. The MSB had a median household income of $51,221; the mean household income was $55,303; and the per capita income was $21,105 (US Census Borough 1990).

In all three southcentral boroughs the education, health and social services sector employed the greatest number of workers (19.5 percent in the MOA, 19.6 percent in the KPB, and 21.3 percent in the MSB). The retail trade sector was the second greatest employer in all three boroughs in the Southcentral region (12.2 percent in the MOA, 12.6 percent in the KPB, and 12.9 percent in the MSB) (US Census Borough 2000).

The MOA operates as a unified home rule entity. The municipality levies a property tax as well as an eight percent bed tax and car rental tax, a 15 percent tobacco tax, and a flat aircraft tax.

The municipality collected $342,034,786 in taxes in 2004 and $470,275 from federal PILT. The KPB is incorporated as a second-class borough, which levies a property tax as well as a two percent sales tax. The borough collected $60,609,742 in taxes in 2004 as well as $1,851,606 from federal PILT. The MSB is a second-class borough that levies a property tax and a five percent bed tax. In 2004, the MSB collected $56,288,126 in taxes, as well as $1,869,439 in federal PILT (DCCED 2004c; BLM 2005r).

Southeast Region

The largest employer in the Southeast region was the educational, health and social services sector; it was the largest employer in the Haines Borough (17.2 percent), KGB (18.9 percent), PWOKCA (20.9 percent), Sitka City and Borough (SCB) (32.5 percent), and the SHACA (18.4 percent). This sector was the second largest employer in the CBJ (20.5 percent) (US Census Borough 1990).

Public administration is an important employment sector in southeast Alaska. It was the greatest employer in the State's capitol in the CBJ (22.6 percent). It was the second largest employer in the KGB (11.1 percent) (US Census Borough 1990).

The agriculture, forestry, fishing and hunting, and mining sector was the largest employer in the YCB (30.9 percent), and the second largest employer in the PWOKCA (19.4 percent) and the SHACA (14.5 percent). Retail trade was the second largest employer in the SCB (10.9 percent), while the transportation and warehousing, and utilities sector was the second largest employer in the YCB (14.5 percent) (US Census Borough 1990).

The Haines Borough operates as a home rule borough that levies a property tax, a 5.5 percent sales tax, a four percent bed tax, and a four percent tour tax. The borough collected $3,760,991 in taxes in 2004 and $217,246 from federal PILT. The CBJ operates as a unified home rule entity that levies a property tax, a five percent sales tax, a seven percent bed tax, a three percent liquor tax, and a 30 cent per pack tobacco tax. The borough collected $62,461,837 in taxes in 2004 and $787,841 in federal PILT. The KGB is a second-class borough that levies a property tax, a two percent sales tax, and a four percent bed tax. The borough collected $10,565,387 in taxes in 2004 and $534,624 from federal PILT. The SCB operates as a unified home rule entity that levies a property tax, a five to six percent sales tax, a six percent bed tax, and a two-cent per gallon fuel tax. The SCB collected $11,869,264 in taxes in 2004 and $340,793 from federal PILT. The YCB operates as a home rule borough with a property tax, four percent sales tax, one percent raw fish tax, and a four percent bed and rental car tax. In 2004, the YCB collected $952,743 in taxes and $70,514 in federal PILT (DCCED 2004c; BLM 2005r).

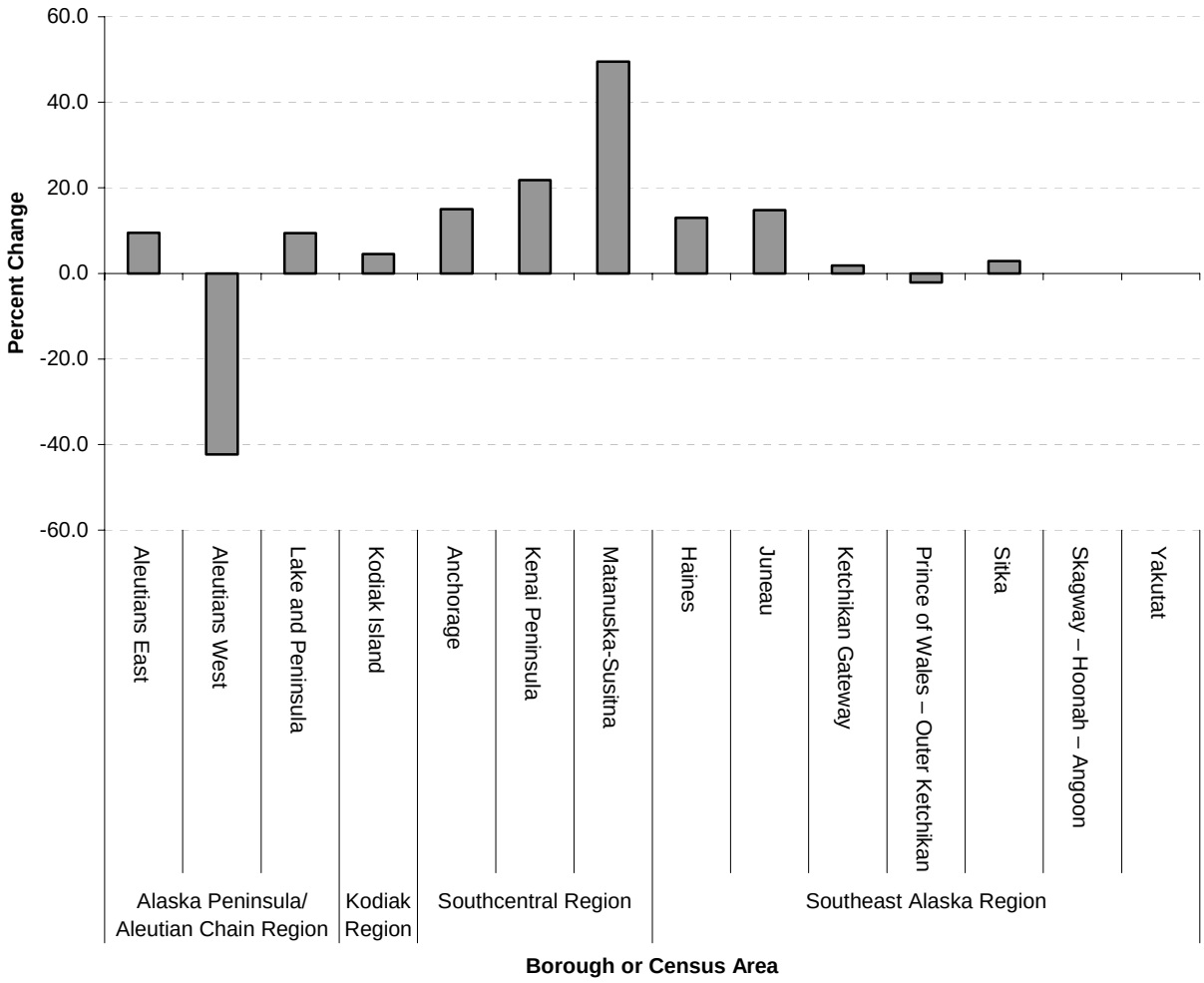
The PWOKCA and the SHACA are not incorporated boroughs and thus lack taxing authority. However, the PWOKCA collected $525,434 from federal PILT, and the SHACA collected $308,614 in 2004.

3.5.2.2 Population and Demographics

Population

According to the U.S. Census statistics (U.S. Census Bureau 1990; U.S. Census Bureau 2005), between 1990 and 2000, the population of the boroughs or census areas within the Ring of Fire planning area increased from 391,304 residents to 455,348, or approximately 17 percent (see Table 3.5-6). During the same time period, the Alaska population increased by 14 percent. While the overall statistics indicate strong growth in the planning area, the majority of the growth may be attributed to the Southcentral region, as indicated in the population analysis for each region. A comparison of population changes across the planning area is presented on Figure 3.5-1. Population fluctuations due to seasonal workers are not well captured in the census statistics.

Figure 3.5-1. Percent Change in Population from 1990 to 2000.



Source: (U.S. Census Bureau 2005).

Table 3.5-6. Population Trends

Region	Borough/Census Area	1990 Population	2000 Population	Percent Change
Alaska Peninsula/ Aleutian Chain Region	AEB	2,464	2,697	9.5
	AWCA	9,478	5,465	-42.3
	LPB	1,668	1,823	9.3
Kodiak Region	KIB	13,309	13,913	4.5
Southcentral Region	MOA	226,338	260,283	15.0
	KPB	40,802	49,691	21.8
	MSB	39,683	59,322	49.5
Southeast Region	Haines Borough	2,117	2,392	13.0
	CBJ	26,751	30,711	14.8
	KGB	13,828	14,070	1.8
	PWOKCA	6,278	6,146	-2.1
	SCB	8,588	8,835	2.9
	SHACA	N/A	3,436	N/A
	YCB	N/A	808	N/A

Notes : AEB – Aleutians East Borough
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Source: (U.S. Census Bureau 1990; U.S. Census Bureau 2000)

Ethnicity

The demographic statistics for the Ring of Fire planning area (U.S. Census Bureau 2000) indicate that the majority of the population is White (74.3 percent). The second largest ethnic group is American Indian and Alaska Native (9.3 percent). Other ethnic groups in the region include: two or more races (5.6 percent), Asian (4.8 percent), Black or African American (3.6 percent), some other race (1.8 percent), and Native Hawaiian or Pacific Islander (0.6 percent). Table 3.5-7 displays the regional ethnic profile for the planning area. The ethnic composition varies within the planning area, as indicated in the analysis for each region.

Age

According to the 2000 Census statistics, the median age in the planning area varies from a low of 29.2 in the LPB to a high of 40.7 in the Haines Borough (US Census Borough 2000). At that time, the median age in the State was 32.4 and 35.5 in the nation. A statistically young population can place high demands on education services. In communities with a high proportion of young residents, there also may be disproportionate demands on wage earners, contributing to higher incidences of poverty (US Census Borough 2000). The median ages for the boroughs and census areas within the Ring of Fire planning area are displayed in Table 3.5-8.

Table 3.5-7. Regional Ethnic Profile

Region	Borough/ Census Area	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Some other race	Two or more races
Alaska Peninsula/ Aleutian Chain Region	AEB	646 24.0%	45 1.7%	1,005 37.3%	715 26.5%	8 0.3%	199 7.4%	79 2.9%
	AWCA	2,188 40.0%	165 3.0%	1,145 21.0%	1,344 24.6%	34 0.6%	400 7.3%	189 3.5%
	LPB	342 18.8%	1 0.1%	1,340 73.5%	4 0.2%	3 0.2%	6 0.3%	127 7.0%
Kodiak Region	KIB	8,304 59.7%	134 1.0%	2,028 14.6%	2,232 16.0%	110 0.8%	387 2.8%	718 5.2%
Southcentral Region	MOA	188,009 72.2%	15,199 5.8%	18,941 7.3%	14,433 5.5%	2,423 0.9%	5,703 2.2%	15,575 6.0%
	KPB	42,841 86.2%	229 0.5%	3,713 7.5%	480 1.0%	86 0.2%	415 0.8%	1,927 3.9%
	MSB	51,938 87.6%	411 0.7%	3,264 5.5%	414 0.7%	74 0.1%	509 0.9%	2,712 4.6%
Southeast Region	Haines Borough	1,974 82.5%	3 0.1%	275 11.5%	17 0.7%	2 < 0.1%	10 0.4%	111 4.6%
	CBJ	22,969 74.8%	248 0.8%	3,496 11.4%	1,438 4.7%	116 0.4%	323 1.1%	2,121 6.9%
	KGB	10,460 74.3%	70 0.5%	2,109 15.0%	603 4.3%	22 0.2%	62 0.4%	744 5.3%
	PWOKCA	3,265 53.1%	9 0.1%	2,377 38.7%	22 0.4%	3 <0.1%	31 0.5%	439 7.1%
	SCB	6,052 68.5%	28 0.3%	1,641 18.6%	335 3.8%	31 0.4%	83 0.9%	665 7.5%
	SHACA	1,998 58.1%	5 0.1%	1,203 35.0%	13 0.4%	5 0.1%	33 1.0%	179 5.2%
	YCB	407 50.4%	1 0.1%	320 39.6%	10 1.2%	6 0.7%	0 0.0%	64 7.9%
Total for Ring of Fire Planning Area		341,393 74.3%	16,548 3.6%	42,857 9.3%	22,060 4.8%	2,923 0.6%	8,161 1.8%	25,650 5.6%
Total for Alaska		69.3%	3.5%	15.6%	4.0%	0.5%	1.6%	5.4%
Total for U.S.		75.1%	12.3%	0.9%	3.6%	0.1%	5.5%	2.4%

Notes : AEB – Aleutians East Borough
AWCA – Aleutians West Census Area
CBJ – City and Borough of Juneau
KGB – Ketchikan Gateway Borough
KIB – Kodiak Island Borough
KPB – Kenai Peninsula Borough
LPB – Lake and Peninsula Borough
MOA – Municipality of Anchorage
MSB – Matanuska-Susitna Borough
PWOKCA – Prince of Wales-Outer Ketchikan Census Area
SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Source: (U.S. Census Bureau 2000)

Migration

Many factors contribute to population mobility, including labor markets, cost of living, and other economic influences. The stability of the community indicates a degree of community cohesiveness and attachment to place. The U.S. Census (U.S. Census Bureau 2005) tracks an indicator of population migration: whether residents are living in the same house for over five years. The 2000 Census indicated that 46.2 percent of Alaska residents (aged five and older) were living in the same home in 1995 and 2000. The national rate was 54.1. In the Ring of Fire planning area, 51.1 percent of residents (aged five and older) were living in the same home in 1995 and 2000, thus residents in the Ring of Fire planning area were less mobile than the State and more mobile than the nation. The number of individuals in the Ring of Fire planning area who were living in the same home in 1995 and 2000 is presented in Table 3.5-8.

Poverty

The poverty rate broadly affects individual and community well-being. The 2000 Census (U.S. Census Bureau 2003) indicated that 9.4 percent of the individuals in Alaska were living below the poverty level, while 12.4 percent of individuals in the nation had that status. Approximately eight percent of individuals in the Ring of Fire planning area were reported to have incomes below the poverty level, less than in the State or nation. The highest regional poverty rate in the planning area was in the Alaska Peninsula/Aleutian Chain region, at 15.7 percent; the lowest rate was in the Kodiak region, at 6.6 percent. The number of individuals living below the poverty level in each borough or census area in the Ring of Fire planning area is presented in Table 3.5-8.

Table 3.5-8. Regional Socioeconomic Characteristics

Region	Borough/Census Area	Age	Migration – Individuals Living in the Same Home in 1990 and 2000		Individuals Below the Poverty Level	
		Median	Number	Percent	Number	Percent
Alaska Peninsula/ Aleutian Chain Region	AEB	37.0	1,461	56.5	588	21.8
	AWCA	36.1	1,999	38.3	642	11.9
	LPB	29.2	1,229	73.4	342	18.9
	Regional Summary	**N/A**	**4,689**	**47.0**	**1,572**	**15.74**
Kodiak Region	KIB	**31.6**	**4,911**	**39.1**	**901**	**6.6**
Southcentral Region	MOA	32.4	100,167	41.6	18,682	7.3
	KPB	36.3	24,957	53.8	4,861	10.0
	MSB	34.1	27,247	49.4	6,419	11.0
	Regional Summary	**N/A**	**152,371**	**41.3**	**29,962**	**8.4**
Southeast Region	Haines Borough	40.7	1,182	52.2	254	10.7
	CBJ	35.3	12,954	45.1	1,797	6.0
	KGB	36.0	6,393	48.7	900	6.5
	PWOKCA	34.7	3,134	54.9	736	12.1
	SCB	35.2	3,580	43.0	668	7.8
	SHACA	37.8	1,940	59.7	438	12.8
	YCB	37.2	412	47.6	107	13.5
	Regional Summary	**N/A**	**25,595**	**47.6**	**4,900**	**7.4**

Notes : AEB – Aleutians East Borough
AWCA – Aleutians West Census Area
CBJ – City and Borough of Juneau
KGB – Ketchikan Gateway Borough
KIB – Kodiak Island Borough
KPB – Kenai Peninsula Borough
LPB – Lake and Peninsula Borough
MOA – Municipality of Anchorage
MSB – Matanuska-Susitna Borough
PWOKCA – Prince of Wales-Outer Ketchikan Census Area
SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Source: (U.S. Census Bureau 2000)

Alaska Peninsula/Aleutian Chain Region

The population in the Alaska Peninsula/Aleutian Chain region decreased from 13,610 residents to 9,985 between 1990 and 2000. While the AEB and the LPB each increased in population by approximately nine percent, the AWCA experienced a 42 percent decrease in population (US Census Bureau 2000). This dramatic decrease in population may be attributed to the closure of military bases located in the region.

Three groups dominate the ethnic profile for the region: American Indian and Alaska Native (35.0 percent), White (31.8 percent), and Asian (20.7 percent). The other ethnic groups are small in comparison: some other race (6.1 percent), two or more races (4.0 percent), Black or African American (2.1 percent), and Native Hawaiian and other Pacific Islander (0.5 percent) (US Census 2000).

In the 2000 Census, the median age in the AEB was 37.0 and the AWCA had a median age of 36.1. However, the LPB had a median age of 29.2, the lowest median age in the Alaska Peninsula/Aleutian Chain region and in the Ring of Fire planning area.

The Alaska Peninsula/Aleutian Chain region had approximately 47 percent of its population (aged five and older) living in the same house in 1995 and 2000. However, there was great variance between the boroughs and census areas in this region. Approximately 57 percent of the residents in the AEB did not move in this time period. The LPB was even more stable, with approximately 73 percent of its residents living in the same home for the last five years. the AWCA households reported only 38 percent of its residents did not move in the past five years. Much of the mobility in this region could be attributed to the decommissioning of military bases in the census area.

The poverty rate for individuals in this region generally exceeds the State (9.4 percent) and national (12.4 percent) rates. The AEB experienced the highest poverty rates, at 21.8 percent, followed by the LPB at 18.9 percent. The AWCA had an 11.9 percent poverty rate, which is higher than the State statistic, but slightly lower than the national statistic.

Kodiak Region

The population in the KIB was fairly stable between 1990 and 2000, with a 4.5 percent growth rate. The ethnic composition of the borough is predominantly White (59.7 percent), followed by Asian (16.0 percent), American Indian and Alaska Native (14.6 percent), two or more races (5.2 percent), some other race (2.8 percent), Black or African American (1.0 percent), and Native Hawaiian and other Pacific Islander (0.8 percent).

In the 2000 Census, the median age in the KIB was 31.6; this median age was the second youngest within the Ring of Fire planning area, and was younger than the statewide or national statistics. The borough's population was also very mobile, with only 39.1 percent of its residents living in the same home for the past five years. The poverty rate in the KIB was the lowest in the Ring of Fire planning area, at 6.6 percent.

Southcentral Region

The population in the Southcentral region increased from 306,823 residents to 369,296 between 1990 and 2000. The MSB had the greatest increase in population, with a 49.5 percent growth rate. The KPB also experienced an increase in residents above the statewide average of 14 percent; the borough grew from 40,802 to 49,691 residents, or a 21.8 percent increase. The MOA increased in population by approximately 15 percent, similar to the statewide average.

Approximately three-quarters of the region is composed of Whites (76.6 percent). Other ethnic groups in the area include: American Indian and Alaska Native (7.0 percent), two or more races (5.5 percent), Black or African American (4.3 percent), Asian (4.2 percent), some other race (1.8 percent), and Native Hawaiian and other Pacific Islander (0.7 percent).

In the 2000 Census, the median age of the MOA was 32.4; this was the third youngest median age within the Ring of Fire planning area, but the same as the statewide median age. The KPB had a median age of 36.3 and the MSB had a median age of 34.1.

Migration in the Southcentral region was higher than in the State or the nation. Only 41.4 percent of southcentral residents lived in the same home for the past five years, while 46.2 percent of Alaska residents and 54.1 percent of U.S. residents did not move between 1995 and 2000. There was some variance between the region's boroughs: 41.6 percent of the MOA did not move, while 53.8 percent of the KPB residents and 49.4 percent of the MSB residents remained in the same home.

The poverty rate in the Southcentral region was approximately 8.4 percent, lower than the State and national averages of 9.4 percent and 12.4 percent, respectively. The MOA had the lowest incidence of poverty at 7.3 percent. The KPB (10.0 percent) and MSB (11.0 percent) exceeded the State's poverty rate, but were less than the national rate.

Southeast Region

The Southeast region had an eight percent increase in population, expanding from 57,562 residents in 1990 to 62,154 by 2000. The growth was more pronounced in the Haines Borough and the CBJ (13.0 and 14.8 percent increase, respectively), with the remaining boroughs and census areas experiencing little change. The population of the KGB increased by approximately 1.8 percent, while the SCB increased by 2.9 percent. The PWOKCA experienced a 2.1 percent decrease in population; the depressed timber market in the area may contribute to the decrease in population. The census areas for Angoon, Hoonah, Skagway, and Yakutat changed between 1990 and 2000, and are therefore not readily comparable. The YCB was formed in 1992 (DCCED 2005); the 2000 Census statistics are available for the YCB and for the SHACA.

The ethnic composition of the region is predominantly White (71.0 percent), followed by American Indian and Alaska Native (17.2 percent), two or more races (6.5 percent), Asian (3.7 percent), some other race (0.8 percent), Black or African American (0.5 percent), and Native Hawaiian and other Pacific Islander (0.3 percent).

The median ages in the Southeast region varied between 34.7 and 40.7, according to the 2000 Census data. The median age in the Haines Borough was 40.7, the highest in the Ring of Fire planning area. The median age in the SHACA was 37.8, and 37.2 in the YCB. The KGB reported a median age of 36.0 years. The CBJ and the SCB similarly reported median ages of 35.3 and 35.2, respectively. The PWOKCA had the youngest population, with a median age of 34.7, which was still well above the statewide median age of 32.4.

According to the 2000 Census, the Southeast region had slightly less migration than the State, but more mobility than the nation. Approximately 47.6 percent of the region's residents resided in the same home between 1995 and 2000. The SHACA had the highest number of residents who did not move (59.7 percent), followed by the PWOKCA (54.9 percent) and the Haines Borough (52.2 percent). Approximately 48.7 percent of the KGB did not move between 1995

and 2000, while 47.6 percent of the YCB, 45.1 percent of the CBJ, and 43 percent of the SCB remained in the same home.

The poverty rate in the Southeast region was 7.4 percent, lower than the State (9.4 percent) and national (12.4 percent) statistics. However the prevalence of poverty appeared to be greater in the more rural communities. The CBJ, KGB, and SCB had the lowest poverty rates at 6.0 percent, 6.5 percent, and 7.8 percent, respectively. There was a 10.7 percent poverty rate in the Haines Borough. The remaining areas experienced higher rates: PWOKCA was estimated to have 12.1 percent of individuals living in poverty, the SHACA had a 12.8 percent poverty rate, and the YCB had the highest poverty rate at 13.5 percent.

3.5.3 Social

3.5.3.1 Crime

Throughout the State, there were 34,970 reported arrests in 2000, with 25,037 of the arrests occurring in boroughs or census areas within the Ring of Fire planning area (FedStats 2004). Arrest information was not available for the LPB or the YCB. The SHACA had the lowest estimated number of arrests (83), with the MOA having the greatest number (16,101). Arrest statistics for all boroughs and census areas within the planning area are presented in Table 3.5-9.

3.5.3.2 Unemployment

The national unemployment rate in 2000 was 3.7 percent, while the State's unemployment rate was 6.1 percent (U.S. Census Bureau 2000). The unemployment rate in the Ring of Fire planning area during the same time varied between 3.4 percent in the KIB to 32.9 percent in the AEB. The high rate in the AEB may be attributed to the recent closings of local military bases. Unemployment statistics for all borough and census areas within the Ring of Fire planning area are presented in Table 3.5-9.

Unemployment rates in many of Alaska's rural communities may be under-reported. With a small economic base in many of these communities, there are few available jobs. Local residents typically do not continue to meet the definitions for actively seeking employment and lose status for unemployment statistics and benefits. This category of unemployed people may be referred to as discouraged workers. Thus, while unemployment rates in some rural regions of the planning area may be high, they could be higher due to the number of discouraged workers in the area.

3.5.3.3 Educational Attainment

According to the 2000 Census statistics, the CBJ had the highest educational attainment in the planning area. Over 93 percent of residents held a high school diploma or higher and over 36 percent of residents held a bachelor's degree or higher in 2000. The lowest levels of educational attainment were reported in the Alaska Peninsula/Aleutian Chain region, with approximately 72 percent of LPB residents holding a high school diploma or higher. Approximately five percent of the residents in the AEB held a bachelor's degree or higher. Educational attainment statistics for all the boroughs and census areas within the Ring of Fire planning area are presented in Table 3.5-9.

Approximately 88 percent of Alaska residents hold a high school diploma or higher while 80 percent of the nation's residents have reached the same educational attainment. The statistics for residents who held a bachelor's degree or higher were similar in the State and the nation, at 24.7 percent and 24.4 percent, respectively (U.S. Census Bureau 2000).

3.5.3.4 Community Resiliency and Quality of Life

Community stability, financial and facility capital, education and human capital, and systems that support health are examples of indicators of community resiliency (Prevention Institute 2005). Several of these indicators are touched upon in prior discussion, via migration, income and employment, educational attainment, and other socioeconomic indicators. The community

resiliency indicator focuses on a combination of these socioeconomic indicators to estimate local capacity to positively adapt to change and to overcome adverse circumstances. Community resiliency will be used only in the subregional analyses, which focus on individual communities. The diverse, expansive range of the Ring of Fire planning area does not lend itself to an analysis of community resiliency.

Quality of life indicators often overlap with community resiliency indicators. Quality of life can be described as the personal satisfaction (or dissatisfaction) with the non-economic attributes of the area in which one lives, including environmental, cultural, or intellectual conditions (Howe, McMahon et al. 1997; Webnox Corporation 2005). People frequently justify the location of their home due to the perceived quality of life the area provides. However, the factors that define the quality of life may vary for different locations, age groups, or other demographic variables. Factors such as community character, pace of life, community cohesiveness, recreation opportunities, and natural landscapes may serve as quality of life indicators.

Table 3.5-9. Social Statistics

Region	Borough/Census Area	Arrests[1]	Percent Unemployed[2]	Percent High School Graduate or Higher[2]	Percent Bachelor's Degree or Higher[2]
Alaska Peninsula/ Aleutian Chain Region	AEB	92*	32.9	74.7	4.9
	AWCA	441	10.2	78.5	11.0
	LPB	N/A	7.9	72.2	12.4
Kodiak Region	KIB	506	3.4	85.4	18.7
Southcentral Region	MOA	16,101	4.7	90.3	28.9
	KPB	1,276	7.2	88.5	20.3
	MSB	1,743	6.7	88.1	18.3
Southeast Region	Haines Borough	137	8.4	88.9	23.8
	CBJ	2,976*	4.0	93.2	36.0
	KGB	768*	5.5	89.6	20.2
	PWOKCA	474	10.3	84.1	14.2
	SCB	440	5.5	90.6	29.5
	SHACA	83*	10.4	84.4	21.6
	YCB	N/A	8.0	84.3	17.6

Notes : * Crime statistics are estimates; other community arrests are based on reported data.
N/A indicates that no data were available for the borough or census area.
AEB – Aleutians East Brough
AWCA – Aleutians West Census Area
CBJ – City and Borough of Juneau
KGB – Ketchikan Gateway Borough
KIB – Kodiak Island Borough
KPB – Kenai Peninsula Borough
LPB – Lake and Peninsula Borough
MOA – Municipality of Anchorage
MSB – Matanuska-Susitna Borough
PWOKCA – Prince of Wales-Outer Ketchikan Census Area
SCB – Sitka City and Borough
SHACA – Skagway-Hoonah-Angoon Census Area
YCB – Yakutat City and Borough

Sources: [1](FedStats 2000)
[2](U.S. Census Bureau 2000)

3.5.4 Socioeconomic Sub-Regional Analysis

Several communities are near large tracts of land managed by BLM or could be affected by actions that occur on these lands. The communities in the Ring of Fire planning area included in this sub-regional analysis are:

- Butte, Eklutna, Palmer, and Tyonek, located in the Southcentral region of the planning area.
- Haines and Skagway, located in the Southeast region of the planning area.

Socioeconomic indicators used for the sub-regional analysis include: population, ethnicity, age, migration, income and employment, unemployment, and educational attainment (refer to Tables 3.5-10 through 3.5-14).

Table 3.5-10. Sub-Regional Economic Statistics

Region	Community	Median Household Income	Mean Household Income	Per Capita Income	Average Employment	Percent Unemployed
Southcentral Region	Butte	$55,573	$60,116	$22,522	1,115	5.8%
	Eklutna	$77,355	N/A	$29,375	203	5.8%
	Palmer	$45,571	$49,260	$17,203	1,869	6.8%
	Tyonek	$26,667	$25,410	$11,261	64	16.7%
Southeast Region	Haines	$39,926	$45,152	$22,505	772	8.8%
	Skagway	$49,375	$53,477	$27,700	478	11.1%

Note: N/A – Data not available. Eklutna is part of the MOA and some statistics are not calculated for the Eklutna area.

Source: (U.S. Census Bureau 2000; DCCED 2005)

Table 3.5-11. Population Trends in Selected Communities

Region	Community	1960 Population	1970 Population	1980 Population	1990 Population	2000 Population
Southcentral Region	Butte	559	448	988	2,039	2,561
	Eklutna	50	25	0	381	394
	Palmer	1,181	1,140	2,141	2,866	4,533
	Tyonek	187	232	239	154	193
Southeast Region	Haines	392	463	993	1,238	1,811
	Skagway	659	675	814	692	682

Source: (DCCED 2005)

Table 3.5-12. Ethnic Profile of Selected Communities

Region	Community	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Some other race	Two or more races
Southcentral Region	Butte	2,369 92.5%	13 0.5%	74 2.9%	3 0.1%	2 0.1%	13 0.5%	87 3.4%
	Eklutna	309 78.4%	9 2.3%	33 8.4%	8 2.0%	0 0%	5 1.3%	30 7.6%
	Palmer	3,669 80.9%	93 2.1%	371 8.2%	48 1.1%	15 0.3%	52 1.1%	285 6.3%
	Tyonek	9 4.7%	0 0%	184 95.3%	0 0%	0 0%	0 0%	0 0%
Southeast Region	Haines	1,442 79.6%	3 0.2%	251 13.9%	17 0.7%	2 0.1%	8 0.4%	93 5.1%
	Skagway	796 92.3%	0 0%	26 3.0%	5 0.6%	2 0.2%	7 0.8%	26 3.0

Source: (U.S. Census Bureau 2000)

Table 3.5-13. Sub-Regional Socioeconomic Characteristics

Region	Community	Age	Migration – Individuals Living in the Same Home in 1995 and 2000		Individuals Below the Poverty Level	
		Median	Number	Percent	Number	Percent
Southcentral Region	Butte	36.2	1,313	56.7	241	9.8
	Eklutna	38.3	N/A	N/A	9	2.4
	Palmer	28.8	1,589	38.1	552	12.7
	Tyonek	28.3	116	64.8	29	13.9
Southeast Region	Haines	40.2	835	49.4	141	7.9
	Skagway	39.2	346	41.7	32	3.7

Note: N/A – Data not available. Eklutna is part of the MOA and some statistics are not calculated for the Eklutna area.

Source: (U.S. Census Bureau 2000; DCCED 2005)

Table 3.5-14. Sub-Regional Social Statistics

Region	Community	Percent High School Graduate or Higher	Percent Bachelor's Degree or Higher
Southcentral Region	Butte	87.2	14.9
	Eklutna	N/A	N/A
	Palmer	87.5	14.5
	Tyonek	70.7	4.9
Southeast Region	Haines	87.8	20.0
	Skagway	90.1	25.0

Notes: N/A – Data not available. Eklutna is part of the MOA and some statistics are not calculated for the Eklutna area.
* Crime statistics are estimates; other community arrests are based on reported data.

Source: (U.S. Census Bureau 2000; DCCED 2005)

3.5.5 Environmental Justice

EO 12898 (1994) requires that proposed projects be evaluated for "disproportionately high and adverse human health and environmental effects …on minority populations and low income populations." The three principles of environmental justice are:

- Promote fair treatment of all people, including minority and low-income populations;
- Ensure opportunities for all affected communities to participate in the decision-making process; and
- Ensure receipt of benefits by minority and low-income populations and avoid disproportionately high adverse effects on these populations.

3.5.5.1 Affected Populations

The Ring of Fire planning area is expansive; however, there are few communities closely associated with BLM lands. There are over 50 communities within the Ring of Fire planning area that are the seasonal or year-round home of a federally recognized tribe (refer to Table 3.5-15). Due to the nature of the planning area, profiles were not assembled for each community, but for boroughs and census areas within the Ring of Fire planning area. In addition, a subregional analysis was conducted for Butte, Eklutna, Haines, Palmer, Skagway, and Tyonek.

The regional ethnic profile presented in Table 3.5-7 may provide a useful overview of the planning area. As indicated in the table and discussed previously, the ethnic composition of the planning area closely resembles the ethnic profile for the State. There is a higher percentage of Whites in the planning area (74.3 percent) than in the State (69.3 percent), and fewer American Indian and Alaska Natives (9.3 percent in the planning area, compared to 15.6 percent in the State). All other ethnic categories compare closely with the State's statistics.

Income statistics were presented in the socioeconomic section; mean and median household income, as well as per capita income was presented in Table 3.5-1. Poverty statistics for each region and census area were presented in Table 3.5-8.

3.5.5.2 Opportunities for Public Participation

Public meetings were held in seven communities throughout the Ring of Fire planning area in April and May of 2003: Juneau, Skagway, Haines, Palmer, Kenai, Kodiak, and Anchorage. The meetings generally consisted of three parts. They opened with an informal open house from 6:00 to 7:00 in the evening. From approximately 7:00 to 7:20 there was a brief presentation that provided an overview of the plan purpose, objectives, and schedule. From approximately 7:20 to 9:00 there was a question, answer, and comment session.

There were a variety of opportunities for providing written public comment. Comment forms were provided during the public meetings. In April 2003, a newsletter was distributed that contained a comment form. The project website was also launched in April 2003; a comment form was available on the website from April 2003 through spring of 2005.

A detailed description of public participation and analysis of comments is contained in the *Ring of Fire Scoping Report* which is available in the project's administrative record, and in the Comment Analysis Report (Chapter 6). Comments from Native communities received during scoping are summarized in the *Ring of Fire Scoping Report*.

Table 3.5-15. Communities in the Ring of Fire Planning Area with Federally Recognized Tribes

Region	Borough/Census Area	Community
Alaska Peninsula/ Aleutian Chain Region	Aleutians East Borough	Akutan
		False Pass
		King Cove
		Nelson Lagoon
		Pauloff Harbor
		Sand Point
		Unga
	Aleutians West Census Area	Atka
		Nikolski
		Unalaska
	Lake and Peninsula Borough	Chignik
		Chignik Lake
		Chignik lagoon
		Ivanof Bay
		Perryville
		Egegik
		Pilot Point
		Port Heiden
		Ugashik
Kodiak Region	Kodiak Island Borough	Afognak
		Akhiok
		Kaguyak
		Kanatak
		Karluk
		Kodiak
		Larsen Bay
		Leisnoi Village
		Old Harbor
		Ouzinkie
		Port lions
Southcentral Region	Municipality of Anchorage	Eklutna
	Kenai Peninsula Borough	Chenega Bay
		Kenai
Southcentral Region	Kenai Peninsula Borough	Nanwalek
		Ninilchik
		Port Graham
		Salamatof
		Seldovia
		Tyonek
	Matanuska-Susitna Borough	Chickaloon
		Knik-Fairview

Table 3.5-15 (continued). Communities in the Ring of Fire Planning Area with Federally Recognized Tribes

Region	Borough/Census Area	Community
Southeast Region	Haines Borough	Haines
		Klukwan
	City and Borough of Juneau	Douglas
		Juneau
	Ketchikan Gateway Borough	Ketchikan
		Saxman
	Prince of Wales-Outer Ketchikan Census Area	Craig
		Hydaburg
		Kasaan
		Klawock
		Kake
		Petersburg
		Wrangell
	Sitka City and Borough	Sitka
	Skagway-Hoonah-Angoon Census Area	Angoon
		Hoonah
		Skagway
	Yakutat City and Borough	Yakutat

Source: (DCCED 2005)

Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula/Aleutian Chain region has the highest percentage of American Indians and Alaska Natives in the planning area (35 percent). It has generally low median ages, low income levels, and high poverty rates, with the exception of the statistics from the AWCA.

Kodiak Region

The Asian population is the largest minority population (16.0 percent) in the Kodiak region, followed by American Indian and Alaska Native (14.6 percent). The region had the lowest poverty rate in the planning area, but had a young median age and high mobility. The area had a high mean household income.

Southcentral Region

The largest minority populations in the Southcentral region are the American Indian and Alaska Native population (7.0 percent), Black or African American (4.3 percent), and Asian (4.2 percent). Approximately 5.5 percent of the population is comprised of individuals with two or more races. The poverty rate in the region was lower than the State or national averages. Income levels varied in the region, with strong indicators in the MOA, but weaker statistics for the other boroughs.

Southeast Region

The largest minority populations in the Southeast region are the American Indian and Alaska Native population (17.2 percent) and Asian (3.7 percent). Approximately 6.5 percent of the population is comprised of individuals with two or more races. The poverty rate in the Southeast region was lower than the State or national averages, but the unincorporated areas PWOKCA and SHACA, and the YCB had high poverty rates. Income levels in the region varied similarly.

3.5.6 Subsistence

3.5.6.1 Introduction

The subsistence study area includes the regions as well as those communities whose residents utilize the Ring of Fire planning area for the harvest of subsistence resources. These communities and subsistence activities for each region are listed in their respective sections.

3.5.6.2 Definitions of Subsistence

The Ring of Fire planning area is comprised of private, State, and federal lands, and different legal frameworks govern subsistence management on lands of different status. On federal public lands, the Federal Subsistence Board regulates federal subsistence hunting and fishing under the terms of Title VIII of ANILCA. The Federal Subsistence Board implements a priority for subsistence uses by rural residents over other consumptive uses on federal public lands (USDOI and USFWS 1992) (see Section 2.5.9). State- and Native-selected lands are not within the jurisdiction of the federal subsistence management program, except when those selected, but not conveyed lands, fall within federal CSUs, such as parks, refuges, and forests. Title VIII of ANILCA 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; for the making and selling of handicraft articles out of inedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing for personal or family consumption; and for customary trade" (16 U.S.C. § 3113).

The Federal Subsistence Boards also manages subsistence fisheries on Federal public lands in Alaska, including the navigable waters of rivers and lakes within and adjacent to federal CSUs. The federal subsistence priority is also implemented on marine waters in a small set of pre-statehood withdrawals, including Woman's Bay outside of Kodiak. State hunting and fishing regulations generally continue to apply on federal public lands unless specifically superseded by federal regulations. Subsistence activities occurring in offshore federal waters are not subject to ANILCA and are subject to the Marine Mammal Protection Act (16 U.S.C. 1361-1407; 50 CFR 18; 50 CFR 216), the ESA, the Migratory Bird Treaty Act (16 U.S.C. 703-712; 50 CFR 10; 50 CFR 20; 50 CFR 21), and the Migratory Waterfowl Hunting and Conservation Stamp Act (16 U.S.C. 718-718h) in offshore waters, as well as on federal land within the State of Alaska. The Marine Mammal Protection Act and the ESA essentially forbid the harvest of marine mammals and endangered species except by Native Americans for non-wasteful subsistence purposes.

The State of Alaska manages hunting and fishing on private, State, and unless superseded, federal lands, including general hunting (also referred to as State subsistence hunting), non-resident and guided hunting, commercial fisheries, personal use fisheries, sport fisheries, and State subsistence fisheries. Under State law, subsistence uses are defined without reference to rural residency, in contrast to the federal law. All Alaska residents are eligible for state general, resident, or subsistence hunts, and for subsistence fishing. The State does not differentiate among Alaskans on the basis of their rural or non-rural residence in the management of these harvests.

For Alaska Natives, subsistence is more than the harvesting, processing, sharing, and trading of marine and land mammals, fish, and plants. Subsistence embodies cultural, social, and spiritual

values that are the essence of Alaska Native cultures. The Alaska Federation of Natives (Alaska Federation of Natives 2002) describes subsistence as:

> "…the hunting, fishing, and gathering activities which traditionally constituted the economic base of life for Alaska's Native peoples and which continue to flourish in many areas of the State today…. Subsistence is a way of life in rural Alaska that is vital to the preservation of communities, tribal cultures, and economies. Subsistence resources have great nutritional, economical, cultural, and spiritual importance in the lives of rural Alaskans…. Subsistence, being integral to our worldview and among the strongest remaining ties to our ancient cultures, is as much spiritual and cultural, as it is physical."

Subsistence resources are highly valued and central to the customs and traditions of many cultural groups in Alaska. These customs and traditions encompass sharing and distribution networks, cooperative hunting, fishing, gathering, and ceremonial activities. Subsistence fishing, hunting, and gathering are important sources of nutrition and non-traditional employment in almost all rural communities. ADF&G estimated that the annual wild food harvest in the southwest-Aleutian region of Alaska was approximately 5,114,522 pounds or 373 pounds per person per year; the annual wild food harvest in the Kodiak region of Alaska was approximately 2,061,607 pounds or 155 pounds per person per year; the annual wild food harvest in the Southeast region of Alaska was approximately 5,064,509 pounds or 178 pounds per person per year; and the annual wild food harvest in the Southcentral region of Alaska was approximately 1,688,467 pounds or 153 pounds per person per year (ADF&G 2000b). Subsistence harvest levels vary widely from one community to the next and from year to year. Sharing of subsistence foods is common in rural Alaska.

Subsistence is part of a rural economic system, called a mixed, subsistence-market economy, wherein families invest money into small-scale, efficient technologies to harvest wild foods (ADF&G 2000b). Fishing, hunting, and gathering subsistence resources provide a reliable economic base for many rural regions. Domestic family groups who have invested in gill nets, motorized skiffs, and snowmobiles conduct these important activities. Subsistence is not primarily oriented toward sales, profits, or capital accumulation (commercial market production), but is focused toward meeting the self-limiting needs of families and small communities. Participants in this mixed economy in rural Alaska augment their subsistence production by cash employment. Cash (from commercial fishing, trapping, and/or wages from public sector employment, construction, fire fighting, oil and gas industry, or other services) provides the means to purchase the equipment, supplies, and gas used in subsistence activities. The combination of subsistence and commercial-wage activities provides the economic basis for the way of life so highly valued in rural communities (Wolfe and Walker 1987).

Full-time year-round wage employment has positively and negatively affected the pursuit of subsistence resources. It has positively affected subsistence users by providing cash for snowmachines, boats, motors, fuel, equipment, and ammunition required for subsistence activities. Full-time year-round employment limits the time a subsistence user can spend harvesting resources to after work hours. Employment away from the communities further limits the pursuit of subsistence resources, as users may be away working at the best times for harvesting certain resources. During midwinter, this time window is further limited by waning daylight. In summer, extensive hunting, fishing, gathering activities, and other subsistence activities can be pursued after work without any light limitation.

3.5.6.3 Alaska Peninsula/Aleutian Chain Region

The Alaska Peninsula/Aleutian Chain region includes the Alaska Peninsula south of Cape Douglas and all of the Aleutian Chain to Attu Island. Communities located in the Alaska Peninsula/Aleutian Chain region and included in the following analysis are listed in Table 3.5-16. The Alaska Peninsula/Aleutian Chain region is located in a maritime climate zone and is an important area for many resources, including migratory waterfowl, fish, and sea mammals. The BLM manages approximately 111,687 acres of land in the Alaska Peninsula/Aleutian Chain region, of which only approximately 28,100 acres are unencumbered federally managed public lands and subject to the federal subsistence priority.

Table 3.5-16. Communities in the Alaska Peninsula/Aleutian Chain Region

Adak[1]	Chignik Lake*	Nelson Lagoon*	Port Moller
Akutan*	Cold Bay	Nikolski*	Sand Point*
Atka*	Egegik*	Perryville*	Ugashik*
Attu	False Pass*	Pilot Point*	Unalaska/Dutch Harbor*
Chignik Bay*	Ivanof Bay*	Port Heiden*	Unga
Chignik Lagoon*	King Cove*		

Notes: [1]Federal Non-Rural Area
*Harvest data available (ADF&G 2001b)

Historic Subsistence Use Patterns

Based on the archaeological record, Aleuts occupied the Aleutian Chain for thousands of years before the Russians arrived (Veltre and Veltre 1982). By 1772, the Russians had established a permanent settlement at Unalaska. In 1787, the Shelikhov-Golikov Company forcibly relocated 80 Aleut hunters and their families to the Pribilof Islands to work in the fur seal harvest (Black 2004). After the formation of the Russian American Company in 1799, Unalaska became the administrative center for the eastern Aleutian region (Veltre and Veltre 1982). Following the incorporation of the Russian American Company as a monopoly, the Aleuts associated with the Russians began to benefit and were given education and positions of responsibility in the Company (Black 2004). In the second half of the nineteenth century, commercial whalers passed through the Aleutians on their way to whaling grounds north of the Bering Strait, picking up some Aleut as crew. Following the sale of Alaska to the U.S. in 1867, many Aleut returned to the Aleutians or to Russia. Those who remained on the Aleutians continued fur seal hunting and began fox farming and sheep ranching as a source of cash. World War II brought an influx of military personnel and materials, as well as a removal of the Aleut population. The U.S. government relocated nearly all of the Aleuts to camps in southeast Alaska for the duration of World War II and did not return them to the Aleutians until after 1944.

The Alutiiq occupy the Alaska Peninsula portion of the region. The first human settlement in the upper Alaska Peninsula occurred more than 6,000 years ago (Clark 1984b; Maschner 2002). Alutiiq villages in the region include the upper Alaska Peninsula villages of Egegik, Pilot Point, and Ugashik, as well as Port Heiden, Chignik Bay, Ivanof Bay, and Perryville. Russian fur traders and explorers visited the area periodically following the Bering and Chirikov voyages in 1741, establishing relations in 1768 from a base on Unimak Island. Captain Cook visited the area in 1778. At the time of contact, the Alutiiq people utilized salmon, caribou, seals, and whales. The Lebedev Lastochkin Company, which controlled the Iliamna Lake area until the 1790s, claimed the Alaska Peninsula area. By 1790, Bocharov had crossed the peninsula and mapped several routes to the Bristol Bay-Bering Sea side from Shelikhov Strait for the

competing Shelikhov Golikov Company. This route across the peninsula saved time and was safer than sailing around the peninsula (Solovjova and Vovnyanko 2002). For further discussion of the Russian Fur Trade era, refer to the discussion of historic subsistence use patterns in the Kodiak region (Section 3.5.6.4). The Russians established bases at Katmai and at several other locations and staffed these bases with Aleutian Islanders tasked with hunting sea otters and pursuing the fur trade in the areas. These portage routes were of continued importance through the sale of Alaska to the U.S. The early focus of the Americans on the upper Alaska Peninsula was on trapping and commercial fishing, but American commercial effort was minimal until the late 1800s. The historic Alutiiq subsistence patterns on the upper Alaska Peninsula included hunting, trapping, gathering, and fishing in the fall, winter and early spring as well as fish camps for salmon in the summer.

Contemporary Subsistence Use Patterns

Resources Harvested

The Alaska Peninsula/Aleutian Chain region offers an abundant diversity of marine mammals, terrestrial mammals, fish, birds, and other resources. Subsistence resources on the upper Alaska Peninsula include the caribou from the Northern Alaska Peninsula caribou herd, moose, brown bears, small mammals (e.g., porcupine, red fox, beavers, wolves, wolverines, lynx, hares, and river otters), sea mammals (e.g., harbor seals, Steller sea lions, and sea otters), migratory waterfowl, salmon, and freshwater fish (e.g., rainbow trout, Dolly Varden, grayling, and lake trout). Based on subsistence harvest data collected by ADF&G (2001b), subsistence users in the Alaska Peninsula/Aleutian Chain region use more than 130 subsistence resources (Table 3.5-17). Included among these resources are five species of salmon, 25 species of non-salmon fish, 17 species of marine invertebrates, 10 species of large land mammals, 12 species of small land mammals, 11 species of marine mammals, 23 species of migratory birds, nine species of seabirds, two species of upland game birds, 15 species of eggs, and four kinds of vegetation.

Table 3.5-17. Subsistence Resources Used by Residents of the Alaska Peninsula/Aleutian Chain Region

Fish	**Large Land Mammals**	**Ducks (cont'd.)**	**Bird Eggs (cont'd.)**
Salmon	Reindeer - Feral	Northern Pintail	Tern Eggs
Chinook Salmon	Dall Sheep	Northern Shoveler	Shorebird Eggs
Chum Salmon	Wolf	Scaup	Black Oystercatcher Eggs
Coho Salmon	**Small Land Mammals**	Scoter	Common Snipe Eggs
Pink Salmon	Beaver	Redhead Duck	Swan Eggs
Sockeye Salmon	Fox (Red)	Teal	**Marine Invertebrates**
Non-Salmon Fish	Hare	Widgeon	Chitons
Burbot	River Otter	Geese	Black Chitons
Char/Dolly Varden	Lynx	Brant	Red Chitons
Cod	Mink	Cacklers	Clams
Flounder	Muskrat	Canada Geese	Butter Clams
Grayling	Porcupine	Emperor Geese	Horse Clams (Gaper)
Greenling	Rabbit - Feral	Snow Geese	Pacific Littleneck Clams
Greenling Roe	Squirrel	White-fronted Geese	Pinkneck Clams
Halibut	Weasel	Shorebirds	Razor Clams
Herring	Wolverine	Common Snipe	Softshell Clams
Herring Roe/Capelin	**Marine Mammals**	Black Oystercatcher	Cockles
Perch	Sea Otter	Swan	Crabs
Pike	Fur Seal	**Seabirds & Loons**	Dungeness Crab
Prowfish	Harbor Seal	Auklet	Hair Crab
Rockfish	Ringed Seal	Cormorants	King Crab
Sablefish (Black cod)	Steller Sea Lion	Grebe	Korean Horse Hair Crab
Sculpin	Walrus	Gulls	Tanner Crab (Bairdi)
Sheefish	Belukha Whale	Loons	Eel
Skates	Bowhead Whale	Murre	Jingles (Rock)
Smelt	Gray Whale	Murrelet	Limpets
Sole (Yellowfin)	Minke (bottlenose)	Parakeet Auklet	Mussels (Blue/Brown)
Swordfish	Sei Whale	Puffins	Octopus
Trout	**Birds and Eggs**	**Upland Game Birds**	Oyster
Tuna/Mackerel	**Migratory Birds**	Grouse	Scallops
Whitefish	Crane	Ptarmigan	Sea Anemone
Wrymouth	Ducks	Bird Eggs	Sea Cucumber
Land Mammals	Bufflehead	Duck Eggs	Sea Urchin
Large Land Mammals	Canvasback	Geese Eggs	Shrimp
Bison	Eider	Seabird & Loon Eggs	Snails
Black Bear	Gadwall	Cormorant Eggs	Squid
Brown Bear	Goldeneye	Guillemots Eggs	**Vegetation**
Caribou	Harlequin	Gull Eggs	Berries
Cattle - Feral	Long-tailed Duck	Murre Eggs	Plants/Greens/Mushrooms
Deer	Mallard	Murrelet Eggs	Seaweed/Kelp (Bull)
Moose	Merganser	Puffin Eggs	Wood

Note: Includes data for 17 Alaska Peninsula/Aleutian Chain region communities for all ADF&G harvest study years (see Table 3.5-16).
A list of reports by subregion used in the Community Profile Database (CPDB) can be found on ADF&G, Division of Subsistence's website at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/techpap.cfm.

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001.
Stephen R. Braund & Associates, 2005.

Harvest Estimates

Table 3.5-18 presents subsistence harvest data for 17 communities in the Alaska Peninsula/Aleutian Chain region for which harvest data was available (ADF&G 2001b). Subsistence activities are important to subsistence users in the Alaska Peninsula/Aleutian Chain region based on high participation rate averages. As seen in Table 3.5-18, a large percentage of households use (100 percent), try to harvest (98 percent), harvest (96 percent), and share (86 percent) subsistence resources. Fish, both salmon and non-salmon species, are important to subsistence users as most use (99 percent), try to harvest (90 percent), harvest (88 percent), and share (76 percent) fish, especially salmon. Most residents also use vegetation (85 percent), birds and eggs (82 percent), marine invertebrates (83 percent), and large land mammals (75 percent). Small land mammals are the least used (28 percent) and shared (nine percent) resource, while salmon is the most used (98 percent) and shared (64 percent) resource on average. In addition, salmon comprises the greatest mean household (293) and per capita (102) pounds, while small mammals comprise the smallest mean household (one) and per capita (less than one) pounds.

Table 3.5-18. Alaska Peninsula/Aleutian Chain Region Subsistence Harvests by Major Resource Category

Resource	Percentage of Households (Average)					Estimated Harvest			
	Use	Try to Harvest	Harvest	Receive	Give	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
All Resources	100	98	96	94	86	1,106,519	783	271	100%
Fish	99	90	88	75	76	691,495	489	169	62%
Salmon	98	84	83	64	64	414,655	293	102	37%
Non-Salmon	92	78	76	65	57	276,837	196	68	25%
Land Mammals	87	55	50	71	46	197,058	139	48	18%
Large Land Mammals	75	47	41	61	37	150,671	107	37	14%
Small Land Mammals	28	25	24	7	9	1,808	1	<1	<1%
Feral Animals	46	19	18	37	19	44,580	32	11	4%
Marine Mammals	45	26	23	38	22	60,980	43	15	6%
Birds and Eggs	82	67	65	55	48	25,905	18	6	2%
Marine Invertebrates	83	65	63	69	50	92,747	66	23	8%
Vegetation	85	83	81	39	40	38,330	27	9	3%

Note: Includes data for 17 Alaska Peninsula/Aleutian Chain region communities for ADF&G's most representative year (see Table 3.5-16).

HH – household

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001.
Stephen R. Braund & Associates, 2005.

Seasonal Round

Much of the seasonal round in the Alaska Peninsula/Aleutian Chain region is focused on the availability of fish, primarily salmon. Most resources harvested by subsistence harvesters in the Alaska Peninsula/Aleutian Chain region are available year-round, with the exception of a few species such as salmon and migratory waterfowl. In general, the seasonal round for both areas is affected by the availability of resources, harvesters' available time, and regulatory restrictions.

The seasonal round for the Alaska Peninsula and the Aleutian Chain are different due to types of resources available to subsistence hunters and the timing of resource availability. For example, caribou and moose are not available to subsistence hunters on the Aleutian Islands. Tables 3.5-19 and 3.5-20 depict the annual cycle of subsistence activities for two subregions within the Alaska Peninsula/Aleutian Chain region: Alaska Peninsula and Aleutian Islands, respectively.

Table 3.5-19. Annual Cycle of Selected Subsistence Activities – Alaska Peninsula Subregion

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Sockeye Salmon																								
Chinook Salmon																								
Coho Salmon																								
Pink Salmon																								
Chum Salmon																								
Dolly Varden																								
Steelhead																								
Pike																								
Whitefish																								
Smelt																								
Halibut																								
Cod																								
Bass																								
Rainbow Trout																								
Lake Trout																								
Herring																								
Eulachon																								
Caribou																								
Moose																								
Brown Bear																								
Harbor seal																								
Sea Lion																								
Hare																								
Fox																								
River Otter																								
Beaver																								
Porcupine																								
Lynx																								
Mink																								
Wolverine																								
Ducks/Geese																								
Ptarmigan																								
Bird eggs																								
Butter Clams																								
Mussel																								
Octopus																								
King Crab																								
Sea Urchin																								
Berries																								

Table 3.5-19 (continued). Annual Cycle of Selected Subsistence Activities – Alaska Peninsula Subregion

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Wild Celery							▨	▨	▨	▨		
Petrouski					▨	▨	▨	▨	▨	▨		
Firewood							■	■	■	■	■	■

▨ Occasional Harvest
■ Usual Harvest

Source: (Wright, Morris et al. 1985; Schroeder, Anderson et al. 1987)
Stephen R. Braund & Associates, 2005.

Table 3.5-20. Annual Cycle of Selected Subsistence Activities – Aleutian Islands Subregion

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Sockeye Salmon							■	■	■	■	▨	
Chinook Salmon	■	■	■	■	■	▨	▨	▨	▨	▨	▨	▨
Coho Salmon	■	■								■	■	■
Pink Salmon							■	■	■	■	▨	▨
Chum Salmon	■							■	■	■	■	■
Halibut						■	■	■	■	■	■	▨
Cod							■	■	■	▨	▨	▨
Dolly Varden	■	■						■	■	■	■	■
Greenling						■	▨					
Greenling Eggs							■	▨				
Sea Lion	■	■	■	■	■	■						■
Harbor Seal	■	■	■	■	■	■	■	■	■	■	■	■
Fox				■	■	■	▨					
Ducks	■	■	■		■	■	■				■	■
Geese					■	■	■	■	■	■		
Bird Eggs							■	■	▨			
Clams	■	■	■	■	■	■	■	■	■	■	■	■
Mussel					■	■	■	▨				
Crabs								■	■	■	■	■
Sea Urchin	■	■	■	■	■	■	■	■	■	■	■	■
Berries									■	■	■	■

▨ Occasional Harvest
■ Usual Harvest

Source: (Veltre and Veltre 1982; Schroeder, Anderson et al. 1987)
Stephen R. Braund & Associates, 2005.

Subsistence Use Areas

Residents of the Alaska Peninsula/Aleutian Chain utilize most of the region for subsistence harvests. The concentration of resources within the region reduces the need to travel for long distances from the communities to acquire subsistence resources. The nearshore and coastal waters including the bays and outer islands are important resource harvest areas for a variety of marine mammals and fish. On the Alaska Peninsula, salmon spawning in streams support bears and man, and the tundra areas host a herd of caribou. The lakes and grassy swamps conceal migrating flocks of birds including ducks, geese, and cranes heading north and south in the spring and fall. Figure 3.5-2 depicts an aggregate subsistence use area for 13 communities in

the region for which mapped data is available. Some communities outside of the region use the area for subsistence harvests (e.g., Naknek, King Salmon, and South Naknek), in particular for caribou and waterfowl.

While subsistence users in the Alaska Peninsula/Aleutian Chain region harvest resources on State and federal lands and waters, the federal subsistence priority only applies to approximately 28,100 acres of unencumbered federally-managed public lands out of the approximately 111,687 acres of BLM-managed land in the Alaska Peninsula/Aleutian Chain region. Based on available subsistence harvest data, it is not possible to determine the importance of the federally-managed, unencumbered lands in the overall subsistence harvest patterns due to a lack of subsistence harvest data specific to the unencumbered lands in the Alaska Peninsula/Aleutian Chain region; however, these lands represent a small portion of lands available for subsistence harvests.

3.5.6.4 Kodiak Region

The Kodiak region consists of 5,000 square miles and is limited to all land within the Kodiak Archipelago, excluding the Alaska Peninsula portion of the KIB. The Kodiak Archipelago is located in the Gulf of Alaska, east of the Alaska Peninsula. Kodiak Island, the largest in the archipelago, is surrounded by other smaller islands that lie within the region, including the Afognak, Shuyak, Sitkalidak, Sitkinak, Barren, and Tugidak islands. Communities in the Kodiak region are listed in Table 3.5-21. A damp maritime climate with frequent fog and cloud cover characterizes the region, with rare freezing temperatures and thus no winter ice. Marine mammals, salmon, non-salmon fish, and some species of land mammals are the primary available subsistence resources on Kodiak and the surrounding islands (Clark 1984b). The BLM manages approximately 16,525 acres of land in the Kodiak region; however, the federal subsistence priority applies only on unencumbered federally-managed public lands, or approximately 2,729 acres.

Table 3.5-21. Communities in the Kodiak Region

Afognak	Kodiak City*	Ouzinkie*
Akhiok*	Larsen Bay*	Port Lions*
Chiniak*	Old Harbor*	Women's Bay
Karluk*		

Notes: *Harvest data available (ADF&G 2001b)

<u>Historic Subsistence Use Patterns</u>

The Kodiak region has been occupied for over 8,000 years by successive Pacific Eskimo cultures. Upon European contact in 1763, the Eskimo-speaking Koniag (more recently termed Alutiiq) lived in the region. The Koniag settled along the coast to pursue a largely maritime economy, with the hunting of marine mammals (especially seals and whales) a primary subsistence activity, supplemented by saltwater fishing and the harvesting of shellfish and plants. Salmon fishing was an important summer activity. Land animal harvests such as brown bears, foxes, and river otters were also part of the Koniag subsistence economy (Dumond 1987).

Carl Heinrich Merck, a naturalist with the Russian Scientific Expedition, provided an account of the annual cycle of subsistence activities in his journal in the late 1700s. The account indicates active sea mammal hunting from February through October, although February and March were

limited to the taking of fur seals. A fact that could have been influenced by the Russian fur trade. Harbor seals, porpoise, and sea lions were hunted primarily from April until October, and salmon from May through September (Clark 1984b).

The arrival of Russian fur traders, or promyshlenniki, in the late 18th century initiated an ongoing period of social, cultural, and economic change for the Koniag people. In the 1780s, Grigorii Shelikhov and sailors in his employ began a military-style campaign to establish bases in the Kodiak Archipelago as well as in PWS, the Alaska Peninsula, and outer Cook Inlet. Shelikhov sought to establish a de facto monopoly over trade in Alaska while avoiding government scrutiny for violating Russian laws. He also pursued a charter for the establishment of a de jure monopoly after the fashion of the Hudson Bay Company, a British Crown chartered monopoly. To this end, a model community was established at Three Saint's Bay and fortified outposts were established at Karluk and Afognak (Black 2004).

The Russian government chartered the Russian America Company and granted a monopoly over the fur trade in all colonized regions (Dumond 1987). Kodiak Island was the center of this industry, and the Koniag supplied many employees. During this time, Native men were sometimes taken away from their families to work in other areas of Russian influence, while others became involved in the industry, becoming indebted to the Russian America Company (Endter-Wada, Mason et al. 1993). The more indebted Natives were to the company, the greater their presumed dependence on European supplies. This dependent relationship was encouraged by the Russian America Company to focus Alaska Native hunting efforts towards furbearers (VanStone 1984). Involvement of the Koniag in the Russian fur trade led to changes in their historic subsistence patterns. Hunting efforts focused on furbearers, leaving less time to pursue other subsistence resources. Koniag workers and their families increasingly relied on Russian and imported products to supplement their subsistence diets. Koniag men hunting furbearers from ships elsewhere along the Pacific Rim were unable to provide subsistence foods for their families, which changed the emphases of subsistence pursuits for the families of hunters who remained behind.

American sailors had been trading in Alaska since the late 18th century. They were hired by the Russian America Company to conduct hunts and trade on the company's behalf, and began commercial whaling off Kodiak by 1835 (Black 2004). The first commercial salmon cannery was built on Karluk Spit in 1882, and more canneries followed throughout the late 1800s. The exploitation of Kodiak salmon led to a dramatic reduction in salmon numbers. The industry then expanded into canning non-salmon fish such as halibut, herring, and cod (Endter-Wada, Mason et al. 1993). Despite setbacks, including the eruption of Mt. Katmai in 1912, the destruction wrought by the Good Friday Earthquake of 1964, and the 1989 *ExxonValdez* oil spill, the commercial seafood industry has remained an economic force in the Kodiak region (Mishler, Mason et al. 1995).

Commercial fishing brought changes to the Native subsistence lifestyle. Wage labor and trade became a staple of the local economy, and the industry had a determinative effect on settlement patterns and the availability of subsistence resources (Davis 1984). Koniag people continued "to integrate subsistence pursuits with increasing involvement in commercial fishing", by combining subsistence and commercial fishing and using fishing boats to travel to harvest locations for other resources (Endter-Wada, Mason et al. 1993). Other smaller industries were introduced to the Kodiak region during late 19th and early 20th centuries, including fox farming, trapping, mining, and tourism. A cattle ranch started by the U.S. government was only marginally

successful due to brown bear predation; however, cattle ranches remain in operation today and residents continue to harvest feral cattle (Mishler, Mason et al. 1995).

The population of Kodiak increased with the establishment of a Navy base during World War II and public services, including a hospital, police and fire protection, and utilities were provided. While the economy of the region boomed, most Koniag people mainly had access to temporary and sporadic employment. The post-war economy was steady, and the commercial fishing industry expanded to include shellfish in the 1950s and crabbing in the 1960s. Natives participated in a mixed economy, with dependence on subsistence resources fluctuating in response to the health of the commercial fishing industry. Primary subsistence resources include salmon, non-salmon fish, marine mammals (primarily seal and sea lion), marine invertebrates, and land mammals (Endter-Wada, Mason et al. 1993).

Contemporary Subsistence Use Patterns

Resources Harvested

Based on subsistence harvest data collected by ADF&G (ADF&G 2001b), subsistence users in the Kodiak region utilized 97 resources, including five species of salmon, 21 species of non-salmon fish, 10 species of large land mammals, eight species of small land mammals, five species of marine mammals, 23 species of birds, seven species of bird eggs, 15 species of marine invertebrates, and three types of vegetation (Table 3.5-22). Table 3.5-22 provides a list of subsistence resources used by subsistence harvesters in the Kodiak region.

As in the past, residents of the Kodiak region continue to rely mainly on resources provided by the surrounding marine environment. Based on ADF&G subsistence harvest data, important subsistence resources harvested by residents in the Kodiak region include salmon, halibut, cod, stellar sea lion, harbor seals, and marine invertebrates such as clams, crabs, octopi, chitons, and sea urchins. Land mammal harvests are dominated by the hunting of deer; however, brown bear, caribou (not harvested in the Kodiak region), elk, and some small land mammals are also harvested (ADF&G 2001b). Vegetation, especially berries, provides for a substantial portion of the Native subsistence diet. Kodiak subsistence users harvested birds and eggs in fewer quantities as compared to other resources, but these are still significant resources and include various species of ducks, geese, sea birds, and game birds.

Table 3.5-22. Subsistence Resources Used by Residents of the Kodiak Region

Fish	**Large Land Mammals (cont'd.)**	**Ducks (cont'd.)**	**Bird Eggs (cont'd.)**
Salmon	Black Bear	Gadwall	Gull Eggs
Chinook Salmon	Brown Bear	Goldeneye	Kittiwake Eggs
Chum Salmon	Caribou	Harlequin	Tern Eggs
Coho Salmon	Dall Sheep	Long-tailed Duck (Oldsquaw)	Shorebird Eggs
Pink Salmon	Deer	Mallard	**Marine Invertebrates**
Sockeye Salmon	Elk	Merganser	Chitons (bidarkis, gumboots)
Non-Salmon Fish	Goat	Northern Pintail	Clams
Bass	Moose	Redhead Duck	Butter Clams
Char	Reindeer - Feral	Scaup	Horse Clams (Gaper)
Cod	**Small Land Mammals**	Scoter	Pacific Littleneck Clams
Eel	Beaver	Teal	Pinkneck Clams
Flounder	Fox	Wigeon	Razor Clams
Grayling	Hare	Geese	Cockles
Greenling	River Otter	Brant	Crabs
Halibut	Marten	Canada Geese	Dungeness Crab
Herring	Rabbit - Feral	Emperor Geese	King Crab
Herring Roe	Squirrel	Snow Geese	Tanner Crab
Perch	Weasel	White-fronted Geese	Geoducks
Pike	**Marine Mammals**	**Seabirds & Loons**	Jingles
Rockfish	Porpoise	Auklet	Limpets
Sablefish (black cod)	Sea Otter	Gulls	Mussels
Sculpin	Harbor Seal	Puffins	Octopus
Shark	Steller Sea Lion	**Other Birds**	Scallops
Skates	Black Fin Whale	Shorebirds	Sea Cucumber
Smelt	Bowhead Whale	Common Snipe	Sea Urchin
Sole	Humpback Whale	**Upland Game Birds**	Shrimp
Trout	**Birds and Eggs**	Grouse	Snails
Whitefish	**Migratory Birds**	Ptarmigan	Squid
Wolffish	**Ducks**	**Bird Eggs**	**Vegetation**
Land Mammals	Bufflehead	Duck Eggs	Berries
Large Land Mammals	Canvasback	Seabird & Loon Eggs	Plants/Greens/Mushrooms
Bison	Eider	Black Oystercatcher Eggs	Seaweed/Kelp

Note: Includes data for 10 Kodiak region communities for all ADF&G harvest study years (see Table 3.5-21).
A list of reports by subregion used in the CPDB can be found on ADF&G, Division of Subsistence's website at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/techpap.cfm

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001 (2001b).
Stephen R. Braund & Associates, 2005.

Harvest Estimates

The aggregate subsistence harvest for the 10 communities in the Kodiak region for ADF&G's most representative year is 2,104,608 pounds, amounting to 171 pounds of yearly harvest per capita. As seen in Table 3.5-23, a large percentage of households use (99 percent), try to harvest (97 percent), harvest (97 percent), and share (84 percent) subsistence resources. Fish account for 72 percent of the annual harvest, while land mammals (primarily large land mammals) are the second most harvested resource, at 327,146 pounds, or approximately 15 percent of the total annual harvest (Table 3.5-23). Marine invertebrates, vegetation, marine mammals, and birds and eggs account for smaller but substantial portions of the harvest. It is important to note that subsistence uses vary widely within the Kodiak region. While average regional fish harvests are divided almost equally between salmon and non-salmon fish, this trend is not necessarily indicative of patterns in individual areas. Harvest data for individual Koniag villages show that salmon generally account for a considerably larger portion of annual fish harvests than non-salmon fish, while the reverse is often true in more populated areas, such as Kodiak City and the Kodiak Coast Guard Station (ADF&G 2001b). Similarly, marine

mammals account for a much larger portion, up to 14 percent, of annual harvest in Koniag villages than in Kodiak City and the surrounding areas; the average regional harvest for marine mammals accounts for only one percent of all resources (Table 3.5-23).

Table 3.5-23. Kodiak Region Subsistence Harvests by Major Resource Category

Resource	Percentage of Households (Ave.)					Estimated Harvest			
	Use	Try to Harvest	Harvest	Receive	Give	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
All Resources	99	97	97	93	84	2,104,608	556	171	100%
Fish	99	88	88	79	75	1,499,919	397	122	72%
Salmon	97	87	85	62	67	749,793	198	61	36%
Non-Salmon	93	75	76	63	54	750,126	198	61	36%
Land Mammals	83	62	56	56	43	327,146	87	27	15%
Large Land Mammals	81	59	52	54	40	317,459	84	26	15%
Small Land Mammals	21	21	18	4	8	9,082	2	1	<1%
Feral Animals	3	1	1	2	1	603	0	0	<1%
Marine Mammals	37	22	17	31	19	21,401	6	2	1%
Birds and Eggs	47	37	35	24	23	14,152	4	1	<1%
Marine Invertebrates	82	62	65	64	44	166,464	44	14	8%
Vegetation	88	85	86	38	44	100,728	27	8	4%

Note: Includes data for 10 Kodiak region communities for ADF&G's most representative year (see Table 3.5-21).

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001 (2001b).
Stephen R. Braund & Associates, 2005.

Seasonal Round

The annual seasonal round for the Kodiak region depends on the availability of resources and subsistence regulations. Salmon runs, usually between the months of June and October, are an important harvest event during that period. Halibut are usually harvested in the earlier months of summer, before the height of the salmon season. Due to Kodiak's mild maritime climate, most saltwater fish are available year-round, as are numerous marine invertebrates, marine mammals, and game birds. Migratory birds and their eggs are taken seasonally (Fall and Walker 1993). Deer, harbor seals, and sea lions are harvested year-round; however, some villages focus on harvesting these resources around the salmon run, during the spring and winter months (Schroeder, Anderson et al. 1987). Table 3.5-24 depicts the annual cycle of subsistence activities for the Kodiak region.

Table 3.5-24. Annual Cycle of Selected Subsistence Activities – Kodiak Region

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Sockeye Salmon														■	■	■	■	■	■	■	■	▨	▨	▨
Chinook Salmon															■	■	■	▨	▨	▨	▨	▨		
Coho Salmon	■	■																		■	■	■	■	■
Pink Salmon																	■	■	■	■	■	▨	▨	▨
Chum Salmon																	■	■	■	■	■	■	■	▨
Halibut	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dolly Varden	■							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Steelhead	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Deer	■	■	■	■	■	■													■	■	■	■	■	■
Harbor seal	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Sea lion	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Duck	■	■	■	■	■	■	■	■	■	■													■	■
Geese	■										■	■											■	■
Ptarmigan	■	■	■	■	■	■	■	■	■	■	▨	▨									▨	▨	▨	▨
Hare	■	■	■	■	■	■	■	■	■	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Butter Clam	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Crab	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

▨ Occasional Harvest
■ Usual Harvest

Source: (Schroeder, Anderson et al. 1987)
Stephen R. Braund & Associates, 2005

Subsistence Use Areas

The coastal areas of Kodiak, including the coastal streams that bring spawning salmon, the inlets that provide quick access to a number of marine resources, and the open water surrounding the Kodiak Archipelago, are the primary subsistence use areas for the Kodiak region. The uplands also house a number of land mammals and birds that are relied upon for subsistence. Residents travel to nearby beaches and rocky coastal areas to hunt seals, sea lions, deer, and waterfowl. Depending on the availability of resources, they may also travel by boat to further removed coastal areas or to the surrounding uninhabited islands.

For those that live in and around Kodiak City, subsistence use areas tend to be those accessible by road or open skiff. Many of these use areas are federally managed lands or waters, primarily within the Kodiak NWR, on which the Federal Subsistence Board implements the federal subsistence priority. On non-federally managed lands and waters the State of Alaska manages harvests according to State regulations (Schroeder, Anderson et al. 1987). State regulations apply to subsistence and other resource harvests except where federal regulations establish a rural preference. Much of the land used for subsistence on Kodiak Island lies within the Kodiak NWR, while the Alaska Maritime NWR, consisting of the Barren and Semidi islands in this region, may also be used for subsistence resource harvests (USFWS 2005a). The State of Alaska manages subsistence resource harvests on Native and other private lands (Endter-Wada, Mason et al. 1993). Figure 3.5-2 depicts the subsistence use area for the Kodiak region, aggregated for all communities for which data are available.

Subsistence users in the Kodiak region harvest resources on State and federal lands and waters; however, the federal subsistence priority only applies to approximately 2,729 acres of unencumbered lands out of the approximately 16,525 acres of federally managed public land in the Kodiak region that the BLM manages. Based on available subsistence harvest data, it is not

possible to determine the importance of the federally managed, unencumbered lands in the overall Kodiak region subsistence harvest patterns; however, these unencumbered lands represent a small portion of lands available for subsistence harvests.

3.5.6.5 Southcentral Region

The Southcentral region consists of coastal coniferous forests and muskegs on alluvial fans with steep mountains, glacially carved valleys and numerous fjords and bays. The cold silty waters of Cook Inlet are affected by extreme tides and strong winds, while the glaciated mountains of the Chugach and Alaska ranges rise steeply from the water or adjacent alluvial deposits along the coasts. Large salmon runs, non-salmon marine and freshwater fish, marine mammals, and intertidal invertebrates provide a steady background for subsistence. Terrestrial mammals such as moose, caribou, deer, bear, and mountain sheep and goats supplement these resources. Chugach Alutiiq and Dena'ina people have thrived in the region for thousands of years. Communities located in the Southcentral region are listed in Table 3.5-25. The Southcentral region includes approximately 835,754 acres managed by BLM. Of these BLM-managed lands, approximately 382,614 acres are subject to State and ANCSA corporation selection and are outside the federal subsistence program. The remaining approximate 453,140 acres are unencumbered and subject to the federal subsistence priority administered by the BLM.

Table 3.5-25. Communities in the Southcentral Region

Anchor Point[1,2]	Hope[1]*	Nikiski[1,2]	Skwentna
Anchorage[1,2]	Houston[1,2]	Nikolaevesk[1]*	Soldotna[1,2]
Big Lake[1,2]	Kachemak[1]	Ninilchik[1]*	Sutton[1,2]
Chenega Bay*	Kalifornsky[1,2]	Palmer[1,2]	Talkeetna[1]*
Chickaloon[1]*	Kasilof[1,2]	Petersville[1]*	Trapper Creek[1]*
Clam Gulch[1,2]	Kenai[1,2]	Port Graham*	Tyonek
Cooper Landing[1]*	Knik (Knik-Fairview)[1,2]	Salamatof[1,2]	Wasilla[1,2]
Eklutna[1,2]	Moose Pass[1,2]	Seldovia*	Whittier[1]*
Homer[1,2]	Nanwalek*	Seward[1,2]	Willow [1]

Notes: [1]State of Alaska Non-Subsistence Area
[2]Federal Non-Rural Area
*Harvest data available (ADF&G 2001b)

Historic Subsistence Use Patterns

The Dena'ina, an Athabaskan language-speaking people, are the only subgroup of Athabaskan speakers to live on the coast and harvest marine species. Subsistence in the yearly round of these highly mobile people began and ended with the spawning runs of salmon in area rivers and creeks. Harvested, processed, and stored, these fish provided an important subsistence base for the Dena'ina people. Caribou, moose, mountain goats, and sheep were hunted in the late summer and fall at remote camps, and small mammals and birds were harvested as available. The Dena'ina also harvested seals and beluga whales, the latter from special platforms near the mouths of salmon streams and using harpoons similar to those of the Alutiiq (Fall 1981).

During the historic period, trapping became part of subsistence practices in two ways. Sea otter pelts could be traded for money or credit to buy new foods that were adopted following contact, in particular tea, flour, and sugar. Later, the high value of beaver encouraged greater harvests for both beaver pelts and meat harvested during the winter and spring. Increased human populations and competition for land and resources resulted in the establishment of

management programs that differed significantly from indigenous practices, forcing the Dena'ina to adapt to the new management systems (Fall 1981).

The Chugach Alutiiq speak an Eskimo language similar to Yup'ik, but different enough to be recognized as a separate language, Suqpiaq. Like the Dena'ina, the Chugach depended upon seasonal salmon runs for their subsistence food. Skilled at hunting from kayaks, they also hunted seals, sea lions, and beluga whales in the sharply incised coastal waters of outer Cook Inlet and PWS. On land, they harvested deer, mountain sheep and goats, and occasionally moose (Stratton and Chisum 1986).

Following the Chirikov expedition of 1741, independent Russian fur traders made trips to coastal southcentral Alaska trading for pelts and indenturing skilled Native hunters to harvest sea otters and fur seals for commercial sale to China. In exchange, the hunters were paid with trade goods that sometimes included tea, tobacco, flour, hard bread, and sugar. As the Russians established a network of bases throughout coastal Alaska, they targeted areas amenable to agriculture, experimenting with Russian crops adapted to the cold climate. Successful crops include cabbage, turnips, parsnips, potatoes, carrots, and rhubarb. In this region only Kenai was successful in growing potatoes and other root crops, leaving the Russians dependent upon purchase of subsistence resources from local natives, semi-annual resupply ships from abroad, and what they could hunt themselves (Black 2004).

Following the 1867 purchase of Alaska by the U.S., the fur trade continued and a greater variety of imported foods could be purchased. Prices changed and quality generally improved due to new food preservation techniques, but supply was sometimes intermittent, and people adapted to the varied availability. Following the collapse of the Western Fur and Trading Company, the Alaska Commercial Company became a de facto monopoly and initiated a policy of strict credit repayment from indebted fur trappers, increasing prices and discouraging many fur hunters from participating. Chugach people traded pelts for some food items, particularly tea, sugar, and flour, as well as for tobacco and other imported goods (Znamenski 2003).

In the 1880s, commercial fishing became a growing concern fed by a demand for inexpensive food on the rapidly developing West Coast. A new method of food preservation, the safety sealed tin coated steel can was used. Clams and salmon were canned on the Kenai Peninsula, and small packing houses were built all over the coastal waters of the region. Native people sometimes participated in commercial fishing and canning, with participation increasing more recently with the availability of capital for the purchase of modern commercial fishing boats. Fur farming undertaken in the 20th century and peaking in the 1920s required a greater harvest of fish and marine mammals for feeding the foxes and other furbearers raised for commercial sale (Lethcoe and Lethcoe 1994). Later economic developments, including the Alaska Railroad, World War II, and the Cold War, added opportunities for Dena'ina and Chugach people to include wages and profits in their suite of potentially harvestable resources. These developments displaced Native residents away from traditional harvest use areas near the growing centers of Anchorage and Kenai.

Commercial fishing continues to be considered a culturally appropriate pursuit for Alaska Native peoples (Stanek 1982; Stratton and Chisum 1986; Stratton 1990). The variation in price and availability of salmon for harvest has been a challenge for Native fishermen who combine subsistence harvests with commercial fishing. Even greater issues for subsistence fishermen resulted from the *ExxonValdez* oil spill in 1989, which spread widely throughout the waters of southcentral Alaska. Tar balls and other materials may linger in the marine environment. The

harvests of many species have not recovered, and there are profound concerns about the health effects of eating contaminated subsistence foods. The effects of this event on the subsistence and commercial lives of the Chugach and Dena'ina are of ongoing concern to the people of the area (Fall and Utermohle 1999).

Contemporary Subsistence Use Patterns

Resources Harvested

Based on subsistence harvest data collected by ADF&G (ADF&G 2001b), subsistence users in the Southcentral region utilized 110 resources, including five species of salmon, 22 species of non-salmon fish, 11 species of large land mammals, 12 species of small land mammals, four species of marine mammals, 29 species of birds, seven species of bird eggs, 16 species of marine invertebrates, and four types of vegetation (Table 3.5-26). Table 3.5-26 provides a list of subsistence resources used by residents of the Southcentral region based on all ADF&G harvest study years for 13 communities with available harvest data in the Southcentral region. Salmon continue to be a major component of subsistence resource use, as are non-salmon fish species. The Dena'ina people use a variety of land mammals, while the Alutiiq people tend to use fewer land mammal species. Both groups use marine mammals including harbor seals and beluga whales, with the Alutiiq using sea otters and sea lions. One marine mammal resource used by southcentral residents, which is not found in the region but may be obtained through trade, gift, or hunting in other regions, is the bowhead whale (ADF&G 2001b). The Dena'ina and Alutiiq peoples harvest a number of migratory bird species including ducks, geese, and cranes. Clams and mollusks are an important year-round resource for both groups.

Table 3.5-26. Subsistence Resources Used by Residents of the Southcentral Region

Fish	Large Land Mammals (cont'd.)	Ducks (cont'd.)	Bird Eggs (cont'd.)
Salmon	Caribou	Goldeneye	Puffin Eggs
Chinook Salmon	Coyote	Harlequin	Tern Eggs
Chum Salmon	Dall Sheep	Bufflehead	Shorebird Eggs
Coho Salmon	Deer	Eider	Black Oystercatcher Eggs
Pink Salmon	Goat	Gadwall	**Marine Invertebrates**
Sockeye Salmon	Elk	Goldeneye	Chitons (bidarkis, gumboots)
Non-Salmon Fish	Moose	Harlequin	Clams
Bass	Wolf	Long-tailed Duck (Oldsquaw)	Butter Clams
Burbot	**Small Land Mammals**	Mallard	Horse Clams (Gaper)
Char	Beaver	Merganser	Pacific Littleneck Clams
Cod	Fox	Northern Pintail	Pinkneck Clams
Eel	River Otter	Northern Shoveler	Razor Clams
Flounder	Lynx	Scaup	Cockles
Grayling	Marmot	Scoter	Crabs
Greenling	Marten	Teal	Dungeness Crab
Halibut	Mink	Wigeon	King Crab
Herring	Muskrat	Geese	Tanner Crab
Herring Roe	Porcupine	Brant	Geoducks
Pike	Squirrel	Canada Geese	Limpets
Rockfish	Weasel	Snow Geese	Mussels
Sablefish (black cod)	Wolverine	White-fronted Geese	Octopus
Sculpin	**Marine Mammals**	Swan	Oyster
Shark	Sea Otter	**Other Birds**	Scallops
Sheefish	Harbor Seal	**Seabirds & Loons**	Sea Cucumber
Skates	Steller Sea Lion	Great Blue Heron	Sea Urchin
Smelt	Belukha Whale	Gulls	Shrimp
Sole	Bowhead Whale	Loons	Snails
Trout	**Birds and Eggs**	Puffins	Squid
Whitefish	**Migratory Birds**	**Upland Game Birds**	Whelk
Wolffish	Crane	Grouse	**Vegetation**
Land Mammals	Sandhill Crane	Ptarmigan	Berries
Large Land Mammals	**Ducks**	**Bird Eggs**	Plants/Greens/Mushrooms
Bison	Bufflehead	Duck Eggs	Seaweed/Kelp
Black Bear	Eider	Seabird & Loon Eggs	Wood
Brown Bear	Gadwall	Gull Eggs	

Note: Includes data for 13 southcentral communities in the Alaska region for all ADF&G subsistence harvest study years (see Table 3.5-25).
A list of reports by subregion used in the CPDB can be found on ADF&G, Division of Subsistence's website at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/techpap.cfm

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001 (2001b).
Stephen R. Braund & Associates, 2005.

Harvest Estimates

The resource categories for subsistence users in most representative years for the Southcentral region ranked by percent of total harvest are salmon (38 percent), non-salmon fish (23 percent), large land mammals (24 percent), marine invertebrates (seven percent), vegetation (five percent), and marine mammals (two percent) (Table 3.5-27). As seen in Table 3.5-27, a large percentage of households use (99 percent), try to harvest (94 percent), harvest (93 percent), and share (71 percent) subsistence resources. For subsistence resource users in the Southcentral region outside urban areas, salmon (38 percent) was the largest contributing resource category to the total household and per capita pounds harvested with 153 pounds per household and 54 pounds per capita for the most representative years for 13 subsistence communities based on available harvest data (Table 3.5-27). Non-salmon fish and large land mammals contributed 32 and 34 per capita pounds and 90 and 96 mean household pounds for the data years, respectively. Halibut, rockfish, and cod are the main non-salmon fish harvested, and large land mammals may include deer, mountain goats, mountain sheep, and moose. Marine invertebrates contributed 10 per capita pounds and 27 mean household pounds, with other categories contributing less than 10 per capita pounds and less than 20 household pounds. Marine mammals are more important to specific communities and may be underrepresented in the aggregate due to varying cultural preferences, concerns about the *ExxonValdez* oil spill, and reduced availability (Fall and Utermohle 1999).

Table 3.5-27. Southcentral Region Subsistence Harvests by Major Resource Category

Resource	Percentage of Households (Ave.)					Estimated Harvest			
	Use	Try to Harvest	Harvest	Receive	Give	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
All Resources	99	94	93	87	71	530,374	400	140	100%
Fish	95	82	79	75	58	322,300	243	85	61%
Salmon	90	76	70	63	46	202,855	153	54	38%
Non-Salmon	85	66	64	61	45	119,445	90	32	23%
Land Mammals	65	39	27	54	22	131,729	99	35	24%
Large Land Mammals	61	36	22	53	21	127,754	96	34	24%
Small Land Mammals	13	12	13	2	3	3,975	3	1	<1%
Marine Mammals	22	11	9	20	11	9,783	7	3	2%
Birds and Eggs	40	32	32	15	12	5,713	4	2	1%
Marine Invertebrates	49	38	35	38	29	36,407	27	10	7%
Vegetation	87	86	84	37	42	24,439	18	6	5%

Note: Includes data for 13 southcentral communities for ADF&G's most representative year (see Table 3.5-25).

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001 (2001b).
Stephen R. Braund & Associates, 2005.

Seasonal Round

The Southcentral region includes Alaska's largest urban areas as well as rural, predominantly Native Alaskan communities that rely heavily on subsistence foods. The Native population in PWS communities is predominantly Alutiiq, while Cook Inlet Native populations are predominantly Dena'ina Athabaskan. Communities located on PWS and the shores and fjords of the coast rely on a suite of resources similar to those used by residents of Cook Inlet, but harvested at different times and with different emphases in resources and efforts. Tables 3.5-28

and 3.5-29 depict the annual cycles of subsistence activities for two subregions within the Southcentral region: Cook Inlet and PWS.

Table 3.5-28. Annual Cycle of Selected Subsistence Activities – Cook Inlet Subregion

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Chinook Salmon													■	■	■	■								
Sockeye Salmon																	■	■	■	■				
Coho Salmon																	■	■	■	■	■	■	■	■
Chum Salmon																	■	■	■	■	■	■		
Pink Salmon																	■	■	■	■				
Rainbow Trout	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dolly Varden					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Herring												■	■	■	■									
Eulachon												■	■	■	■									
Black Bear																			■	■	■	■	■	■
Brown Bear																					■	■		
Moose																					■	■	▨	▨
Beaver			■	■	■	■	■	■	■	■									▨	▨	▨	▨	▨	▨
Otter			■	■	■	■	■	■	■															
Mink			■	■	■	■																		
Fox			■	■	■	■																		
Harbor Seal													■	■	■	■	■	■	■	■	■	■		
Belukha													■	■	■	■	■	■	■	■	■	■		
Ducks & Geese																					■	■	■	■
Clams													■	■	■									
Plants & Berries															■	■	■	■	■	■	■	■		

▨ Occasional Harvest
■ Usual Harvest

Source: (Foster 1982)

Subsistence Use Areas

Subsistence use areas for the Southcentral region include the coastal waters of PWS and Cook Inlet, and the Matanuska, Susitna, and numerous other rivers that drain into them from mountains and inland lakes. The marine environment hosts both anadromous and saltwater fish, as well as marine mammals, which may be harvested in the water or at island haulouts. The rivers attract spawning salmon and provide habitat for freshwater fish as well as beaver, river otters, and other small mammals. Inland lakes like Tustumena and Skilak host freshwater fish and sockeye salmon spawning runs. The uplands and mountains of the Chugach and Alaska ranges and the Kenai Peninsula harbor caribou, moose, and Dall sheep, as well as several small land mammals used for subsistence. The subsistence use area for the Southcentral region, aggregated for all communities for which data are available, is depicted in Figure 3.5-3.

Table 3.5-29. Annual Cycle of Selected Subsistence Activities – PWS Subregion

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Chinook Salmon											■	■	■	■	■	■	■	■	▨	▨	▨	▨	▨	▨
Sockeye Salmon													■	■	■	■	■	■	■	■				
Coho Salmon																					■	■	■	■
Chum Salmon																	■	■	■	■	▨	▨		
Pink Salmon																■	■	■	■	■				
Halibut	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dolly Varden													■	■	▨	▨	▨	▨	▨	▨	▨	▨		
Lake Trout													■	■	■	■	■	■	■	■	■	■		
Black/Gray Cod	■	■	■	■							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lingcod	■	■	■	■							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Herring											■	■	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Roe-on-Kelp											■	■	■											
Smelt/Eulachon					■	■	■	■	■	■														
Rockfish	■	■	■	■									■	■	■	■	■	■	■	■	■	■	■	■
Deer	■	■	■	■															■	■	■	■	■	■
Black Bear													■	■	■	■					■	■		
Moose																					■	■	■	■
Goat	■	■	■	■	■	■															■	■	■	■
Coyote		■	■	■	■	■	■	■	■	■														
River Otter		■	■	■	■	■	■																	
Marten/Mink		■	■	■	■	■	■	▨	▨															
Weasel		■	■	■	■	■	■	▨	▨															
Harbor Seal	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Porpoise													▨	▨	▨	▨	▨	▨	▨	▨				
Sea Lion	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Sea Otter	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Ducks & Geese	■	■							■	■	■	■	■	■							■	■	■	■
Grouse	■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■
Ptarmigan	■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■
Bird Eggs											■	■	■	■	■	■	■							
Chitons	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Razor Clam											■	■	■	■	■	■	■	■	■	■	■	■		
Other Clams													■	■	■	■	■	■	■	■	■	■		

▨ Occasional Harvest
■ Usual Harvest

Source: (Stratton 1990)
Stephen R. Braund & Associates, 2005.

Southcentral region subsistence users harvest resources on State and federal lands and waters in the Southcentral region; however, the federal subsistence priority only applies to approximately 453,140 acres of unencumbered federally-managed public lands out of the approximately 835,754 acres of BLM-managed land in the Southcentral region. The importance of the federally-managed, unencumbered lands in the overall subsistence harvest patterns is unknown due to a lack of data regarding subsistence harvests on BLM-managed lands in the Southcentral region. However, these unencumbered lands represent a small portion of lands available for subsistence harvests, and subsistence users are not likely to utilize much of these lands for subsistence harvests because they are inhospitable or inaccessible.

Special Use Areas

Neacola Mountains

Tyonek residents historically used resources in the vicinity of Chakachamna Lake and the Neacola Mountains. This area represented a key route through the mountains to interior Dena'ina communities past and present, for whom the Tyonek people once served as middlemen in trading goods and pelts to Russian and American fur traders (Fall 1981; Fall, Foster et al. 1984). The area was used for harvesting large and small land mammals and trapping, and may also have been used for freshwater fishing. The significance of the Neacola Mountains in relation to the contemporary Tyonek use patterns is uncertain, but household survey data in the from the 1980s no longer indicated active use of this area. A portion of the Neacola Mountains is State selected, and the subsistence priority does not apply on these selected lands (Figure 2.3-3).

3.5.6.6 Southeast Region

The Southeast region includes the southeast panhandle of Alaska, an area of steep mountains and numerous islands formed by the collision of tectonic plates and carved by glaciers. The area has been in use for thousands of years by the Tlingit, Haida, and Tsimshian peoples and their predecessors. Large runs of five salmon species, nearshore and offshore fishing for salmon and non-salmon fish, marine mammals like seals and sea lions, intertidal resources like clams, crabs, seaweeds, and octopus and upland resources such as bear and deer were and continue to be the main subsistence resources for area residents. The Southeast region is bounded by the State border to the north, south, and east; the Gulf of Alaska to the west; and ends to the northwest at Yakutat Bay. Communities in the Southeast region are listed in Table 3.5-30. The BLM manages approximately 320,363 acres of land in this region including a large block of State selected land in the Haines Block. The federal subsistence priority applies only on unencumbered federally managed public lands, which applies to approximately 1,933 acres in the Southeast region.

Historic Subsistence Use Patterns

The Tlingit people occupied the region from long before contact in 1741 to the present. In addition, the Tlingit developed a complex social and political system that divided the land and resources of the area into 12 districts, or *kwaans*, each of which contained several houses belonging to clans aligned with one of two moieties (tribal subdivisions). Each house owned and defended certain resource harvest areas or traded them in payment of debt to other houses. Of particular importance were areas at the mouths of salmon streams, where the Tlingit constructed a variety of fish weirs and traps to harvest spawning salmon. Other resource harvest areas, such as deer and bear harvesting areas, berry patches, and clam beds, were important, but not as strictly defended (De Laguna 1990; Olson 1991).

Table 3.5-30. Communities in the Southeast Region

Angoon*	Haines*	Ketchikan[1,2]	Sitka*
Coffman Cove*	Hollis*	Klawok*	Skagway*
Craig*	Hoonah*	Klukwan*	Tenakee Springs*
Douglas[1,2]	Hydaburg*	Metlakatla[3]*	Thorne Bay*
Edna Bay*	Indian Village	Meyers Chuck*	Whale Pass*
Elfin Cove*	Juneau[1,2]	Petersburg*	Wrangell*
Goddard	Kake*	Port Alexander*	Yakutat*
Gustavus*	Kasaan*	Saxman[2]*	

Notes: [1]State of Alaska Non-Subsistence Area
[2]Federal Non-Rural Area
[3]Reservation
*Harvest data available (ADF&G 2001b)

The Haida moved across Dixon Entrance from the Queen Charlotte Islands sometime prior to contact and occupied places formerly used by the Tlingit, retaining the Tlingit names in many cases. The Haida share many similarities in material culture and subsistence resource use. However, they are linguistically distinct and have a distinct artistic style similar to, but identifiably different from other peoples of the area. Like the Tlingit, the Haida clan groups in their territory owned salmon fishing locations and claimed hunting, berry picking, and clam beds as owned property (Blackman 1990; Stearns 1990).

The Tsimshian in Alaska moved to Annette Island in 1887 with Reverend Duncan from the Canadian mainland in order to form a religiously based community. Among the goals of this community were self-sufficiency, adherence to somewhat strict religious tenets, and the adoption of Euroamerican lifestyles. As the Tsimshian had only moved from the nearby Canadian Mainland to Annette Island, a similar ecosystem, they continued to use wild foods as part of their diet (Dunn and Booth 1990).

The Russians first encountered the Tlingit in 1741 when Chirikov lost both of his ships' boats and members of his crew sending them ashore for freshwater in Tlingit occupied areas. In 1794, a colony was built near Yakutat. In 1800, the Russians sought to establish a post near contemporary Sitka. The Tlingit destroyed both posts in response to perceived Russian provocations and Tlingit concerns regarding the implications of the Russian presence. After a brief battle in 1804, the Russian America Company, with the help of the Russian Navy, established New Archangel in what is now Sitka, and established other posts in the area soon after (Black 2004). The Tlingit and Haida people held an uneasy peace with the Russians, encouraged by the fact that the Russians were dependent upon the wild game and later agricultural products produced by the Native people. The Tlingit were growing vegetables and produce near Sitka for sale, and purchasing flour, sugar, tea, and other imported foods from Russians and other traders passing through (Gibson 1976).

In the meantime, the British were consolidating their hold on New Caledonia, later the province of British Columbia. Through the chartered Hudson Bay Company, the British were competing with the Russians, Spanish, and independent American traders vying for sea otter pelts along the coast. At times, the Russian monopoly allied with and against various players in the North Pacific fur trade, leasing Wrangell to the British for a time, hiring American ships to mount fur hunting expeditions, and trading for grain and workers with the Spanish in California (Gibson 1976). Once commercial whaling began in the Bering Sea; however, a flood of American ships with crews from around the world inundated the North Pacific, interfering with monopoly trade patterns and beginning the impetus for the sale of Alaska to the U.S. These ships brought food

supplies alcohol and other products from America to trade with the Russians, which in turn were sold to the Tlingit (Black 2004).

By the time the U.S. approved the purchase of Alaska from Russia in 1867, California and the Oregon territory were firmly in U.S. hands, the 1849 Russian River Gold Rush had spurred the rise of San Francisco, and the transcontinental railroad was two years from completion, linking east and west by train. Reconstruction from the Civil War delayed U.S. exploration and settlement in Alaska, but commercial fishing and canning, logging, mineral prospecting, and tourism drew people north by the end of the 19th century. The Klondike Gold Rush, which sent thousands of people through the Inside Passage and over Chilkoot and White passes to the interior and thence the Yukon, marked the end of the early American administration (Brooks 1973).

The flood of new preserved foods and innovative packaging made a number of opportunities possible for the Tlingit and Haida peoples. Local canning of locally harvested products continued to be important, but of greater importance was serving the Klondike Gold Rush through packing, floating, and feeding the multitude of prospectors. Canadian regulations required that a year's worth of supplies be carried into the country, and packing those supplies required labor. Each miner was required to bring one ton of food and supplies. New products like crystallized eggs, canned bacon, and tinned milk made available an entirely different set of foodways to people in southeast Alaska (Brooks 1973). Easy access by water to British Columbia, Washington, Oregon, and California reduced the costs of imported foods. The rush for gold petered out quickly, and commercial fishing and canning continued as the main economic pursuits of area residents.

Contemporary Subsistence Use Patterns

Resources Harvested

Based on subsistence harvest data collected by ADF&G (ADF&G 2001b), subsistence users in the Southeast region use at least 99 subsistence resources including five species of salmon, 24 species of non-salmon fish, 12 species of large land mammals, 13 species of small land mammals, five species of marine mammals, 19 species of birds, four species of bird eggs, 16 species of marine invertebrates, and four types of vegetation (Table 3.5-31). Table 3.5-31 provides a list of subsistence resources used by residents of the Southeast region based on all ADF&G harvest study years for 26 communities with available harvest data in the Southeast region (Table 3.5-30). Subsistence in the Southeast region includes marine and riverine resources such as salmon, halibut, herring roe, eulachon, rockfish, and harbor seals. Intertidal invertebrates provide a reliable source of protein year-round. Land mammals include deer, bear, and occasional mountain goats. Other land mammals used by residents of the Southeast region include muskox, caribou, and bison, but these resources are harvested outside the region (ADF&G 2001b). Vegetation used for food includes seaweeds and kelp, berries, and some vegetables derived from local plants like horsetails, wild onions, and fiddleheads.

Table 3.5-31. Subsistence Resources Used by Residents of the Southeast Region

Fish	**Large Land Mammals (cont'd.)**	Crane	**Bird Eggs (cont'd.)**
Salmon	Bison	Sandhill Crane	Upland Game Bird Eggs
Chinook Salmon	Black Bear	**Ducks**	**Marine Invertebrates**
Chum Salmon	Brown Bear	Bufflehead	Abalone
Coho Salmon	Caribou	Goldeneye	Chitons (bidarkis, gumboots)
Pink Salmon	Coyote	Harlequin	Clams
Sockeye Salmon	Dall Sheep	Long-tailed Duck (Oldsquaw)	Butter Clams
Non-Salmon Fish	Deer	Mallard	Horse Clams (Gaper)
Bass	Elk	Merganser	Pacific Littleneck Clams
Burbot	Goat	Northern Pintail	Razor Clams
Char/Dolly Varden	Moose	Scaup	Cockles
Cod	Muskox	Teal	Basket Cockles
Eel	Wolf	Wigeon	Heart Cockles
Flounder	**Small Land Mammals**	Geese	Crabs
Grayling	Beaver	Brant	Box Crab
Greenling	Fox	Emperor Geese	Dungeness Crab
Halibut	Hare	Canada Geese	King Crab
Herring	River Otter	Snow Geese	Tanner Crab
Herring Roe	Lynx	White-fronted Geese	Geoducks
Perch	Mink	Swan	Limpets
Pike	Marmot	Tundra Swan (whistling)	Mussels
Rockfish	Marten	**Other Birds**	Octopus
Sablefish (black cod)	Muskrat	**Seabirds & Loons**	Oyster
Sculpin	Porcupine	**Shorebirds**	Scallops
Shark	Squirrel	Common Snipe	Sea Cucumber
Sheefish	Weasel	Upland Game Birds	Sea Urchin
Skates	Wolverine	Grouse	Shrimp
Smelt	**Marine Mammals**	Ptarmigan	Squid
Sole	Sea Otter	Rock Ptarmigan	Starfish
Sturgeon	Harbor Seal	Willow Ptarmigan	**Vegetation**
Trout	Steller Sea Lion	**Bird Eggs**	Berries
Tuna/Mackerel	Walrus	Duck Eggs	Plants/Greens/Mushrooms
Whitefish	Bowhead Whale	Seabird & Loon Eggs	Seaweed/Kelp
Land Mammals	**Birds and Eggs**	Gull Eggs	Wood
Large Land Mammals	**Migratory Birds**	Tern Eggs	Coal

Note: Includes data for 26 southeast communities for all ADF&G harvest study years (see Table 3.5-30).
A list of reports by subregion used in the CPDB can be found on ADF&G, Division of Subsistence's website at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/techpap.cfm

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001.(ADF&G 2001b)
Stephen R. Braund & Associates, 2005.

Harvest Estimates

The resource categories for subsistence users in most representative years for the Southeast region ranked by percent of total harvest are salmon (29 percent), non-salmon fish (26 percent), large land mammals (22 percent), marine invertebrates (15 percent), vegetation (five percent), and marine mammals (three percent) (Table 3.5-32). As seen in Table 3.5-32, a large percentage of households use (98 percent), try to harvest (94 percent), harvest (92 percent), and share (71 percent) subsistence resources. Salmon contributed 59 pounds per capita or 174 pounds per household, followed closely by non-salmon fish including halibut, trout, herring, char, rockfish, and cod, which contributed 54 pounds per capita or 160 pounds per household per year. Large land mammals are primarily deer in this region, and contributed 45 pounds per capita or 132 pounds per household. Marine invertebrates included several clam species, abalone, brussels, and other intertidal species, and added 31 pounds per person and 90 pounds per household per year. Vegetation included a number of berry species as well as marine and terrestrial vegetable foods such as kelp, Devil's club, mushrooms, and fiddleheads and these

contributed 10 per capita pounds or 30 household pounds. Marine mammals harvested in this region are primarily harbor seals, and contributed seven per capita pounds or 20 household pounds.

Table 3.5-32. Southeast Region Subsistence Harvests by Major Resource Category

Resource	Percentage of Households (Ave.)					Estimated Harvest			
	Use	Try to Harvest	Harvest	Receive	Give	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
All Resources	98	94	92	91	71	5,599,712	610	207	100%
All Fish	96	79	77	76	57	3,073,351	335	113	55%
Salmon	90	72	68	57	43	1,601,205	174	59	29%
Non-Salmon	90	69	67	66	43	1,472,144	160	54	26%
All Land Mammals	76	60	46	51	28	1,209,582	132	45	22%
Large Land Mammals	74	60	44	51	27	1,207,738	132	45	22%
Small Land Mammals	8	6	7	2	1	1,844	0	0	0%
Marine Mammals	16	10	7	12	6	181,612	20	7	3%
Birds & Eggs	18	10	17	8	6	35,192	4	1	<1%
Marine Invertebrates	83	54	55	68	35	827,654	90	31	15%
Vegetation	85	79	79	42	39	274,629	30	10	5%

Note: Includes data for 26 southeast communities for ADF&G's most representative year (see Table 3.5-30).

Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001 (ADF&G 2001b).
Stephen R. Braund & Associates, 2005.

Seasonal Round

Marine resources are an important part of southeast Alaska subsistence pursuits, in addition to terrestrial mammals, plants, and berries. Two seasonal rounds for resources harvested in the Southeast region were developed based on ADF&G subsistence reports for riverine and coastal southeast Alaska communities (Mills 1982; Mills, Sumida et al. 1984; Ellanna and Sherrod 1986; Kookesh and Leghorn 1986; Mills and Firman 1986; Cohen 1988; George and Bosworth 1988; Firman and Bosworth 1990; Schroeder and Kookesh 1990; Betts 1994) (Tables 3.5-33 and 3.5-34). The two seasonal rounds for the riverine and coastal regions of the Southeast region reflect the differing resource availability (presence and absence of species) and timing. Resources that are harvested year-round, or nearly so, include halibut, herring, chitons, rockfish, and Devil's club in coastal communities, as well as harbor seals in both coastal and riverine communities. Salmon are available seasonally, and some communities in coastal areas harvest king salmon year-round and harvest other species as they head north along the coast and through the fjords and bays of southeast Alaska from May through November. Residents of coastal communities in the Southeast region harvest Dolly Varden in the spring and harvest black cod in the summer and fall. Most plants are harvested in the spring and summer, and berries are picked and stored in the summer and fall. Mountain goats (primarily riverine communities), deer, and black bears are harvested in the late summer and fall, especially from August through December. Coastal communities primarily harvest black bears in the spring.

Table 3.5-33. Annual Cycle of Selected Subsistence Activities – Coastal Subregion

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Chinook Salmon	■	■	■	■	■	■	■	■	■	■	■	■
Sockeye Salmon							■	■	■	■	■	
Coho Salmon								■	■	■	■	■
Chum Salmon	■							■	■	■	■	■
Halibut	■	■	■	■	■	■	■	■	■	■	■	■
Steelhead					■	■	■					
Dolly Varden						■	■					
Black/Gray Cod	■							■	■	■	■	■
Lingcod	■							■	■	■	■	■
Herring	■	■	■	■	■	■	■	■	■	■	■	■
Roe-on-Kelp					■	■	■					
Rockfish	■	■	■	■	■	■	■	■	■	■	■	■
Harbor Seal	■	■	■	■	■					■	■	■
Deer	■	■	■	■						■	■	■
Black Bear					■	■						
River Otter		■	■	■								
Marten/Mink		■	■	■								
Weasel		■	■	■								
Beaver		■	■	■								
Ducks & Geese										■	■	▨
Grouse					■	■				■		■
Chitons	■	■	■	■	■	■	■			■	■	■
Sea Cucumber						■	▨					
Sea Urchin					■	■	■					
Shrimp				■	■							
Octopus	■	■	■	■						■	■	■
Berries									■	■	■	
Devil's Club	■	■	■	■	■	■	■	■	■	■	■	■
Seaweed						■	■					
Other Greens							■	■				

▨ Occasional Harvest
■ Usual Harvest

Source: (Firman and Bosworth 1990)
Stephen R. Braund & Associates, 2005.

Table 3.5-34. Annual Cycle of Selected Subsistence Activities – Riverine Subregion

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Chinook Salmon						■	■	■	■			
Sockeye Salmon								■	■	■	■	
Coho Salmon	■										■	■
Pink Salmon										■	■	
Chum Salmon	■										■	■
Halibut							■	■				
Trout	■	■	■	■	■						■	■
Eulachon				■	■		■					
Deer	■	■								■	■	■
Black Bear	■	■	■			■	■					■
Moose											■	
Mountain Goat										■	■	■
Mink/Marten			■	■	■							
River Otter			■	■	■							
Hare			■	■	■							
Harbor Seal	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Ducks & Geese	■	■	■								■	■
Grouse						■	■	■				
Berries								■	■	■	■	■
Roots							■	■				■
Mushrooms							■	■			■	■
Seaweed						■	■	■				

▨ Occasional Harvest
■ Usual Harvest

Source: (Mills, Sumida et al. 1984)
Stephen R. Braund & Associates, 2005.

Subsistence Use Area

Subsistence hunters in the Southeast region use marine, riverine, and terrestrial areas for the harvest of subsistence resources. The numerous island archipelagoes host deer, bear, mountain goats, as well as a variety of vegetable foods such as berries, fiddleheads, and Devil's club. The rivers leading to the interior are seasonal gathering areas for the harvest of spawning eulachon and salmon. In marine waters, salmon, halibut, rockfish, and cod are fished while the intertidal zone provides mollusks and seaweed. Sea mammals such as harbor seals and sea lions may also be hunted in the marine and nearshore environment. Subsistence use areas for the Tlingit and Haida were traditionally owned with strict rules for their use, and were traded as assets to satisfy debts. The southeast subsistence use area, aggregated for all communities for which data are available, is depicted in Figure 3.5-4.

While subsistence users in the Southeast region harvest resources on State and federal lands and waters, the federal subsistence priority only applies to approximately 1,933 acres of unencumbered federally managed public lands out of the 320,363 acres of land in the Southeast region that the BLM manages. Based on available subsistence harvest data, it is not possible to determine the importance of the federally-managed, unencumbered lands in the overall subsistence harvest patterns; however, these unencumbered lands represent a small portion of lands available for subsistence harvests.

Special Use Area

Haines Block

Parcels in this area include lands used for subsistence by residents of Haines and Klukwan; however, most of the lands in this block have been selected by the State of Alaska and are not subject to the federal subsistence priority (Figures 2.3-4 and 1.2-4). Resources harvested in these parcels may include anadromous and freshwater fish, terrestrial mammals, and vegetation. Fish species harvested in the rivers include sockeye, chum, king, and coho salmon, and trout (Mills 1982; ADF&G 2001b). Resource users include the primarily Tlingit residents of Klukwan at the confluence of the Tsirku and Chilkat rivers, and the primarily non-Native residents of Haines and a number of residents living along the highway (Mills, Sumida et al. 1984; Betts 1994). Mixed subsistence-cash economies prevail in both communities, with Klukwan residents harvesting 170 per capita pounds in 1983, 239 per capita pounds in 1987, and 608 per capita pounds in 1996, and Haines residents harvesting 126, 104, and 196 per capita pounds in 1983, 1987, and 1996 respectively. In 1996, the most representative year for both communities, the subsistence harvest was 85 percent salmon and non-salmon fish (44 and 41 percent respectively), seven percent vegetation, five percent large land mammals, and two percent marine invertebrates in Klukwan. In Haines, 71 percent was salmon and non-salmon fish (30 and 41 percent respectively), 15 percent large land mammals, seven percent vegetation, five percent marine invertebrates, and one percent each birds and eggs and marine mammals (Betts 1994; ADF&G 2001b).