

# Chapter IV: Environmental Consequences

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# Chapter IV: Environmental Consequences

## A. Introduction

This chapter describes the anticipated consequences or potential effects on the physical, biological, and human environment from implementation of the Alternatives described in Chapter II. An analysis of the environmental impacts associated with each of the Alternatives is required by BLM planning regulations and by the National Environmental Policy Act (NEPA). The analyses presented in this chapter provide an estimate of the environmental impacts associated with each plan alternative. As required by NEPA, direct, indirect, and cumulative effects are examined. The chapter first provides a summary of the methods and the approach used in the effects assessment, describes the type of effects analyzed, and summarizes the assumptions used during the analysis.

*Effects* are defined as modifications to the environment that are brought about by external actions or events. Effects may be beneficial or adverse, and may be a direct, indirect or cumulative causal effect of a Federal action. Effects are categorized by magnitude (measure of change), extent (size of change), and duration (length of time; e.g. temporary, short-term or long-term) to ascertain their affect on the environment. Generally, an effect that persists more than a few years is considered long-term. Effects that allow a resource to revert back to a pre-disturbance condition within a few years of the end of disturbance are considered short-term. The magnitude or extent of an effect depends on the current condition of the resource.

Chapter IV is organized into the following main sections:

- Introduction
- Assumptions and Methods
- Direct and Indirect Effects
- Cumulative Effects
- Irreversible and Irrecoverable Commitment of Resources
- Unavoidable Adverse Impacts

The Resources, Resource Uses, Special Designations, and Social and Economic sections of this chapter contain analyses of impacts by plan alternative. The order of these sections does not reflect their level of importance.

The sub-section under each heading entitled "Effects Common to All Alternatives" describes impacts that do not vary by alternative. This information is presented to avoid repetition in the Impacts by Alternative sections. Some sections may also include a sub-section entitled "Effects Common to All Action Alternatives (Alternatives B, C, and D);" this section is also intended to avoid repetition. Impacts discussed in either of these two sections will not be repeated. In some instances, the environmental consequences associated with a particular subject may be completely addressed in a discussion under "Effects Common to All Alternatives" – in this case the discussion will not be repeated and the subject may not be addressed again. Impacts that vary between alternatives are addressed under each alternative. Only impacts that arise under an alternative are discussed; conversely, if there are no impacts to a given resource under an alternative, there is no heading or discussion of the resource. Where the resulting impacts from several programs are very similar, they may be grouped under a single subheading (e.g., the Air Quality and Soil and Water Resources section).

Each resource specialist considered the following in their impact analyses: Air, Soil, Water, Vegetation, Fish and Wildlife, Special Status Species, Fire Management and Ecology, Cultural Resources, Paleontological Resources, Visual Resources, Wilderness Characteristics, Forest Products, Livestock Grazing, Minerals, Recreation, Travel Management, Renewable Energy, Lands and Realty Actions, Special Designations (including Areas of Critical Environmental Concern and Wild and Scenic Rivers), Public Safety, Social and Economic Conditions, and Subsistence. If no impacts were identified either by a resource specialist or by the public during scoping, the programs or topics are not discussed further. In cases where impacts may potentially occur, the impacted resource or impacting resource use is discussed in more detail.

Standard operating procedures developed from Federal laws, regulations, and policies are applicable under all alternatives. Standard operating procedures implement policy or management directives, and may result in projects being redesigned or dropped from consideration. Program limitations (e.g., staffing, increased processing times or costs) are not considered impacts and are not discussed in this document. ROPs and Oil and Gas Leasing Stips have been included in Alternatives B, C, and D as plan features in an attempt to eliminate or reduce anticipated impacts.

## B. Assumptions and Methods

Information from Chapter III, Affected Environment, was used to identify the effects under each plan alternative. The direct, indirect, and cumulative effects of each and the interplay of those effects with the effects of reasonably foreseeable use and development are analyzed and evaluated in this chapter. The analyses presented are influenced by institutional knowledge of the planning area's resources, information provided by staff and other agency experts, and relevant literature. There are no proposed project developments at the time of this writing.

### 1. Analytical Assumptions

Assumptions and estimates were made to facilitate analysis. These assumptions establish analytical guidelines and include a reasonably foreseeable (20-year) development model. Assumptions should not be interpreted as constraining or redefining management objectives and actions under the plan alternatives. If no assumptions were made regarding a resource, it is not discussed in the following sections.

- Sufficient funding and personnel would be available for implementation of the final decision.
- Implementation of actions under each plan alternative would be in compliance with State and Federal statutes and regulations, bureau policy, and other guidance and directives.
- The discussion of effects is based on the best available data. Knowledge of the planning area and institutional experience gained from observation and analysis of conditions and environmental responses in similar areas are used to infer environmental effects where data is limited.
- Changing climatic conditions may affect resources in the planning area. Appreciation of climate change may affect future resource management.
- Acreage figures and other numbers used in the analysis are estimates made for comparison and analytic purposes only.
- State and Native entitlements will be met within the next five to ten years. Satisfaction of entitlements will allow for identification of the remaining Federal estate. Resource management of the remaining Federal estate is the focus of this plan.
- State- and Native-selected lands are segregated from mineral entry, 43 *Code of Federal Regulations* (CFR) § 2627.4 (b) and 43 U.S.C. § 1610(a)(1).

- Once land is conveyed out of Federal ownership, resource management on the conveyed land is a prerogative of the new landowner, except fish and wildlife resources management. Per the Alaska Constitution, fish and wildlife management is retained by the State for the common good of all residents.
- Selected but unconveyed land will be managed under this plan, provided the selection is terminated and the land remains in Federal ownership.
- It is currently impossible to identify the location of selected lands that will remain in Federal ownership.
- Interim management (management between selection and conveyance or selection and termination of a selection) is custodial, 43 U.S.C. 1635 (k)(1) and 43 CFR § 2650.1.
- Discontiguous blocks of land present land and resource management challenges. Isolated parcels and parcels identified under the plan alternatives may be considered for exchange or disposal in an effort to consolidate the Federal estate into contiguous blocks of land.

## **2. Resource Assumptions**

### **a) Air Quality, Soil, and Water Resources**

#### **(1) Air Quality**

- The air in the planning area is believed to be relatively pristine. Increases in human population, consumption, recreation, tourism and development may affect air quality.
- The most likely causes of deterioration in air quality in the Bay planning area will be smoke and gases from wildland fire, dust from travel on unpaved roads, and dust and exhaust from new construction and development.

#### **(2) Soils**

- The majority of the soils present in the planning area are inceptisol (a soil so young that horizons have just begun to form: especially prevalent in tundra areas). Histosol (a worldwide soil type rich in organic matter, as peat, especially prevalent in wet, poorly drained areas) makes up a small percentage of the soils in the planning area. There is very little soil formation with either type, which may present erosion and reclamation challenges.
- Permafrost is found intermittently throughout the planning area. The warming trend is fostering major changes in soil moisture, organic matter, vegetation patterns, and weathering patterns. Changes will affect carbon and nitrogen cycles and gaseous emissions.
- Frost heave and slumping may affect soils.

#### **(3) Water Resources**

- Demand for clean water will increase in proportion to increases in population, recreation, and development. Water quality will be managed through implementation of Required Operating Procedures and compliance with applicable Federal and State laws and regulations.

### **b) Vegetation**

- Demand for healthy fish and wildlife habitat, particularly riparian; and wet and dry tundra habitats, will continue and may increase. Subsistence use of various vegetation types present in the planning area will also continue and may increase. Vegetation provides a rich habitat for fish and wildlife. Human use of vegetation includes the gathering of firewood and logs for home use and light construction, and subsistence gathering of berries and a variety of plants for food and crafts.
- Natural and human-caused fire events are expected to increase should the current drying trend and bark beetle infestation continue. In the past, this region had few fires due to the well-watered

nature of the area and the marine influence. Fire suppression efforts will continue in areas near villages and where wildland fire would produce undesirable resource effects.

### c) Wetland-Riparian

- It is preferred that wetlands and riparian zones be maintained in a proper functioning condition. Increases in human population, consumption, recreation, tourism and development may stress riparian zones and wetlands. Projects that pose a threat to the proper functioning condition of watersheds, riparian zones or wetlands will be subject to constraints developed through project-specific NEPA analysis. Placer mining will affect the proper functioning condition of watersheds, riparian zones and wetlands.

### d) Invasive Plant Management

- Vegetation in the planning area is predominantly pristine and free of invasive non-native plants. Inventory efforts will continue to identify specific occurrences of invasive plant species. Invasive plant species reduce habitat quality and quantity.

### e) Wildlife, Fisheries and Aquatic Habitats

#### (1) Wildlife

- BLM lands provide seasonal and year round habitats that help to sustain the diversity, abundance, productivity and distribution of wildlife populations in the planning area.
- Actions taken to benefit the habitat of a particular species of fish or wildlife may have beneficial or adverse affects on other species that are dependant on the same habitat.
- Demand for a sufficient amount of wildlife habitat, particularly game species habitat, may increase during the life of the plan.
- Wildlife populations will fluctuate in natural cycles during the life of the plan.
- Since wildlife moves freely, it is susceptible to impacts from actions taken by other landowners.
- Habitat disturbance may result in wildlife displacement.
- Climate change may stress some wildlife species. Changes in vegetative regimes will likely result in the displacement of some species while allowing for the immigration of others.

#### (2) Fisheries and Aquatic Habitats

- Increases in human population and consumption will result in increased pressure on fisheries.
- International and national trends to protect and manage wild fish stocks will continue.
- Increases in human population, consumption and development raise the potential of adverse impacts to aquatic habitat.
- BLM will continue to manage and protect important spawning, rearing, over wintering, and migratory fish habitat.
- BLM will cooperate with the Alaska Department of Fish and Game to preserve the genetic integrity of Alaska's wildstock of resident and anadromous fish populations.

### f) Special Status Plant and Animal Species

- Continuing current monitoring programs and adding new wildlife inventories and monitoring may identify additional Special Status Species on BLM lands, or may document the expansion of known ranges of species currently on the BLM Alaska's Special Status Species list.
- Nationally, there will be a continuing need to afford wildlife protection under the Endangered Species Act.

- There are two endangered species, one threatened species, one candidate species, and numerous sensitive species present in the planning area. One plant on BLM-Alaska's Special Status Species list has been documented on BLM lands in the planning area. The need to protect these species will increase as land use and resource development increases.

### **g) Wildland Fires and Fuels Management**

- Fire is an essential renewing force in interior forest (taiga) ecosystems. Fire releases nitrogen and other essential nutrients from woody vegetation back into the soil, allowing for new plant growth.
- Depending on the characteristics of the fire, a burn can alter the vegetation composition of forest communities from late successional species such as spruce, to early successional or pioneer species, such as alder and fireweed (nitrate-fixing plants) (USFS 2002). A well-managed fire implementation plan is beneficial to interior forests (taiga).
- Fire is not a usual or consistent change agent in the coastal temperate forest. However, with increasing temperature and drying, the fire regime in the planning area may change. Wildland fire frequency may increase as a result of climate change, human population growth and development.

### **h) Cultural Resources**

- Undertakings on BLM lands have the potential to damage cultural resources. Cultural resources are considered before any undertakings are authorized (Section 106 of the National Historic Preservation Act) and damage is avoided or mitigated before an undertaking is begun.
- All cultural resources are treated as potentially eligible to the National Register of Historic Places.
- Inventory efforts to identify cultural resources on BLM lands will continue, and cultural resources are evaluated for eligibility to the National Register of Historic Places.
- Uses of cultural resources include scientific research, interpretation, preservation for future research, and traditional cultural uses. These uses will continue into the future.

### **i) Paleontological Resources**

- Undertakings on BLM lands have the potential to damage paleontological resources (fossils). Significant paleontological resources will be avoided or otherwise mitigated whenever possible.
- Authorized use of fossils includes scientific research, interpretation and educational outreach and limited collection of non-vertebrate fossils by the general public.

### **j) Visual Resources**

- Scenic resources will remain in demand from local residents who want to maintain scenic quality, local businesses that depend on tourism and an increasing level of recreational users over the life of the plan. Increasing tourism will increase the value of scenic views, undeveloped landscapes and open spaces.

## **3. Resource Use Assumptions**

### **a) Forest Products**

There are few opportunities to utilize forest products for anything other than personal use, as there are few forests on BLM lands in the planning area, and the trees are not considered to be of commercial value. While forests are reportedly expanding due to the warming and drying climate

trend, the bark beetle infestation and other insect invasions are also spreading. The current situation for forestry is not expected to change during the life of the plan.

## b) Livestock Grazing

- No livestock grazing currently occurs under permit, nor has any interest been expressed in livestock grazing. The only anticipated grazing uses might be incidental use associated with recreational and commercial use of pack animals for hunting, fishing, and other back country recreation. Authorizations for grazing by pack animals will be examined on a case-by-case basis.
- No requests for reindeer grazing permits are anticipated. There are no current reindeer grazing authorizations within the planning area.

## c) Minerals

### (1) Leasable Minerals

- No leasable mineral development on BLM lands, with the exception of natural gas development, is anticipated to occur within the life of the plan.
- Oil and gas exploration would occur as described in the Reasonably Foreseeable Development (RFD) Scenario. The RFD predicts activity based on geologic potential as well as past exploration, accessibility, and lack of existing infrastructure. The following is reasonably foreseeable to occur within the planning area:
  - One seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected over the next 20 years. Short term disturbance would average one acre per mile; however, long term disturbance will be minimal. The seismic surveys would begin by collecting 2-D seismic lines through the use of shot-hole or Vibroseis. The crew size for this operation would be 20-50 (35-65 for 3-D seismic), and the job would be completed in 2-4 weeks. Support equipment would be barged either to Dillingham, Naknek, or Pederson Point. A central "base" would not be established, as individual staging areas (164' x 164' or 650' x 650') would be used. The entire operation would be accomplished during the winter months if conditions were favorable. The acquisition of 3-D seismic data is a key step in the exploration process. It is used to identify and map the prospects of interest. Successful and accurate interpretation results in more efficient drilling with fewer dry holes, better drill pad positioning and higher petroleum recoveries. For the purposes of analysis, it is assumed that the drilling of holes (shot holes) by off-road, track-mounted drills and the detonation of explosives (shots) placed in the shot holes would account for approximately 46% of the source points total. Heli-portable drill rigs would access approximately 44% of the source points on steeper terrain (slopes in excess of 20%). The vibroseis-mounted vehicles would access about 10% of the source points on off-road, less steep trails (less than or equal to 15% slopes). It is assumed that significant portions of the contract area are inaccessible for locating source and receiver points due to the steep topography.
  - Two exploratory gas wells would be drilled during the first five years of the plan. If possible, the operator will use nearby existing facilities for housing and feeding its crew. If the facilities are not available, a temporary camp of trailers may be placed on the pad. One of the two wells would have an appreciable gas show, resulting in drilling one field delineation well. The delineation/confirmation well is likely to be required before a commitment is made to develop the project and a contract is signed with the local utility company. It is assumed that the discovery field will comprise 1,280 acres and will produce from two wells located on two drill sites, one mile apart. Typically, after analyses of the data and subsequent geotechnical description of the reservoir, exploration wells are not used for production purposes. Under this scenario, however, both the exploration well and delineation well are used for production of natural gas since pipeline construction costs and additional well drilling costs render the project sub-economical.

- Given a 20-year plan life, it is assumed that a total of six exploration wells would be drilled. Low ground pressure vehicles in conjunction with helicopters would transport equipment and crews to the drill sites.
- One gravel staging area (six acres) would be developed to receive and store equipment for the winter exploration program.
- One gas field likely would be developed in the Koggiling Creek planning block (this planning block was picked due to its proximity to the Dillingham market). It is assumed that the field would contain 18 bcf of gas reserves. Production from this field would come from the discovery well and delineation well, spaced one mile apart. The drilling of each well would disturb six acres. There would be up to six gas exploration wells plus one additional gas delineation well.
- The gravel pads would be joined by a 35-foot wide, 5-foot thick gravel road (40,000 cubic yards per mile). The road would only link the drilling pads and one section would also serve as an airstrip. Gravel required for construction would likely be mined during winter months to reduce impacts. The source would likely come from the closest feasible gravel source to the gas field, using one or two separate gravel deposits (10-20 acres in size).
- A typical life of a producing gas well is 10 to 12 years. Therefore, one or both gas production wells may be plugged after the planning period. Field abandonment may take from 2 – 5 years after production ends.
- Natural reservoir pressure would be adequate to push the gas through the 3-inch transmission pipeline 40 miles to the Dillingham market. No compression facility would be needed. The pipeline would be constructed during the winter months to reduce impacts, dependent upon the presence of sufficient snow cover and sufficiently cold temperatures to freeze the ground.
- One of the production wells would serve as an in-field underground injection well (annular injection) to dispose of drilling waste, wastewater, spent fluids, chemicals and the produced water. The ability to dispose of fluid downhole is dependent on the existence of suitable subsurface formations, the formation fluid content, proximity to any hydrocarbon bearing zones and the availability of an annulus between the casing strings set in the well.
- When there is insufficient snow cover for oil and gas related operations, low ground pressure vehicles will be used in conjunction with air support.
- This level of development is assumed for the purposes of impact analysis in the EIS. Actual exploration, development, and production may vary considerably based on exploration results, price of oil and gas, and marketability. Additionally, to market the gas in Dillingham, the current diesel plant would need to be converted to gas. For this to be economical, funding would need to come from energy subsidies derived from the State of Alaska or the Federal Government.
- An ongoing joint State/Federal program to determine the feasibility of developing coal bed natural gas (CBNG) for the benefit of rural communities does not plan to explore the Bristol Bay area at this time. If CBNG were available close to a rural community, the development would occur on non-BLM lands. BLM lands in the planning area are not in proximity to the three largest communities – Dillingham, Naknek and King Salmon. Transportation costs associated with building a gas pipeline would render CBNG development uneconomical.

**(2) Locatable Minerals**

- Chapter III summarizes the activity levels in the planning area based on surface disturbance tabulated from mining plans and notices of mining operations submitted through the Annual Placer Mining Application and Permit process for both placer and hard rock operations. The RFD for locatable minerals (BLM 2006) summarizes the historic data characterizing mineral occurrences by commodity and genetic ore deposit modeling, as well as differentiating between placer and lode mining methods. Based on this information, a placer mine scenario was developed around a medium-scale (250 cubic yards per day) placer mine as the most likely mining activity to occur in the planning area in the reasonable future. The typical placer mine would result in a maximum of 1-5 acres of surface disturbance at any given point in time. Two similar lode mining scenarios have been dropped from further consideration as it was determined that due to the length of time needed to bring a lode deposit to production and the undeveloped

nature of the potential lode deposits, there would be no lode mining development, particularly on BLM lands, during the life of the plan.

- Placer Mining - Placer mining for gold and platinum is the most common type of mining that occurs in the planning area. Placer platinum is the most likely development target while placer gold is the most likely target for exploration and development. Mineral resource development in the planning area is occurring primarily on State, Native, and private lands. This can be attributed to the patenting of large numbers of Federal mining claims staked during the gold rush era and to the State and Native Corporations targeting mineral resources for selection under their respective entitlement statutes.
- Additional exploration should prove that development of placer properties in the Bonanza Creek, Goodnews Bay/Snow Gulch, Iliamna/Fog, Kijik Lake, Platinum, and Shotgun Hills areas within the planning area are feasible. These deposits would probably be developed either as a small surface open-cut sluice box operation or as a bucket-line dredge operation (Goodnews Bay Platinum Mine).
- Placer mining activity in the planning area is expected to occur in the Snow Gulch part of the Goodnews Bay/Snow Gulch area on BLM lands. There are expected to be 1 to 3 small scale placer operations employing 3 to 5 people at each location. Activity would most likely occur on Barnum Creek, Domingo Creek, Faro Creek, or on Jacksmith Creek. Table 4.1 provides information on anticipated new placer mines under each Alternative.

**Table 4.1 Anticipated New Placer Mines**

|   | <b>Alternative A</b> | <b>Alternative B</b> | <b>Alternative C</b> | <b>Alternative D</b> |
|---|----------------------|----------------------|----------------------|----------------------|
| Anticipated new placer mines on BLM Lands | 0                    | 1-3                  | 0                    | 1-3                  |

- Hard Rock Exploration and Development - Historic producers of hard rock for mercury operated on a small scale in the early part of the twentieth century. Today, development projects involve gold and copper from developing new and old prospects. Most of these are located on State and Native lands in the Iliamna/Kvichak area. Hard rock exploration is up in the region, generated by the increasing price of gold and increased interest in mineral occurrences on State and Native lands.
- Elsewhere around the State, exploration has focused on deposits of rare metals (nickel and platinum group metals [PGM]) that have occurred in the Broxson Gulch area north of the Denali Highway, East Central Alaska Range. Exploration results in this area indicate that there is potential for a significant discovery of these metals. This interest, coupled with the rising price of platinum, has sparked recent exploration efforts in Goodnews Bay along the Salmon River where platinum has historically been mined by placer methods.
- Additional exploration should prove that development of lode properties in the Bonanza Creek, Goodnews Bay/Snow Gulch, Iliamna/Fog, Iliamna/Kvichak, Kasma Creek, Kemuk Mountain, Kijik Lake, Pebble Copper, Platinum, Shotgun Hills, and Sleitat Mountain areas in the planning area are feasible. These deposits would probably be developed either as open pit or as cut and fill underground mines. Surface disturbance will vary depending on the mine design, construction of roads, power line corridors, selection of tailing disposal method, and other factors. An order of magnitude estimate would be in the range of 1,300-3,400 acres. Road building, airstrips, and associated material sites account for the largest surface disturbance followed by mine, mill, tailings disposal site,

and camp facilities. While most of these disturbances would occur on State or Native lands, some road construction or power lines could cross BLM land.

- The Pebble property, on State lands near Lake Iliamna, is currently in the pre-production phase of exploration and development. This plan is a hard rock, combination open pit and underground mine with a mill that combines free milling processes with floatation and vat chemical leach circuits to recover gold and copper. This mill could include ore from locations situated close by, such as the Pebble South and the Big Chunk (BC) properties. More than 100 employees would contribute to the Iliamna area economy and the mine mill complex could draw power from the Homer utility grid.
- Table 4.2 provides information about anticipated new locatable lode exploration projects under each Alternative. Anticipated locatable lode exploration activity in the planning area is expected to occur in the Snow Gulch part of the Goodnews Bay/Snow Gulch and Iliamna/Kvichak areas on BLM lands. There is expected to be 1 to 2 small scale open pit operations employing up to 275 people at each location. Open pit operations would most likely occur in the Faro Creek area on Figure Four and Island mountains. There is expected to be 1 to 2 small scale underground operations employing up to 300 people at each location. Underground operations would most likely occur in the Iliamna/Kvichak area in the vicinity of the Nushagak River and Klutuk Creek.

**Table 4.2 Anticipated New Locatable Lode Exploration Projects**

|   | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---------------|---------------|---------------|---------------|
| Anticipated locatable lode mines on BLM lands | 1             | 2-4           | 0             | 2-4           |

**(3) Salable Minerals (Mineral Materials)**

- Salable and industrial minerals including sand and gravel, building stone, pumice, clay, and limestone are common throughout the planning area.
- Active rock quarries are located on Native land near Dillingham, Platinum, and Goodnews Bay. Numerous sand and gravel pits exist near Dillingham and King Salmon, mostly located on private land. Most communities in the planning area have a small gravel pit for local use.
- No active mineral material contracts, community pits, or free-use permits issued by BLM exist within the planning area. Most of the sites in the planning area are roadside material sites owned by villages, the State, or private individuals.
- Mineral material sales would occur under Alternatives B and D in association with oil and gas development. These impacts are discussed under leasable minerals.
- Future sand and gravel needs for the planning area will be well supplied by the existing sources on private land.
- Expected future needs will be project driven, related to the development of mines, oil and gas exploration and production, roads, airstrips/airports, village improvements, and other infrastructure needs.

## d) Recreation

- Because much of the BLM land within the planning area consists of isolated parcels that are not accessible by road, recreational activity increases, if any, will be focused on hunting and fishing, recreational OHV use (including snowmachines), hiking, canoeing, and rafting.
- Currently, BLM manages six Special Recreation Permits (SRPs) within the planning area, with the majority operating on State- and Native-selected lands. Commercial recreation applications are predicted to increase from the current six to as many as ten applications in the next five years. These are anticipated to be for large game guided hunting operations in the Iliamna Lake area in the eastern planning area region.
- Local communities and businesses appreciate an economic benefit from professional guide service activities.
- A comprehensive trails and travel management plan is proposed to further assess potential impacts, conflicts, and use levels for SRPs and air transporters, to be completed within five years from plan approval.
- Public health and safety issues for visitors will receive priority consideration in the management of public lands. Demand for safe visits will increase with increasing numbers of public land users.
- Wilderness characteristics of naturalness, solitude, primitive and unconfined recreation are expected to remain in demand from local residents and those visitors who want to experience the primitive and unspoiled nature of the local landscape. Businesses that depend on natural landscapes for their excursions, such as ecotourism, guided hunting, and guided sport fishing, will favor an area that possesses wilderness characteristics. Recreationists who favor a backcountry experience for their activities will also seek lands that have wilderness characteristics (BLM 2005b).

## e) Travel Management

- The use of Off-Highway Vehicles (OHVs) for hunting and subsistence activities will remain stable or increase slightly. Recreational use of OHVs is expected to remain stable or increase slightly.
- Changes in OHV design and technology will continue, potentially contributing to reductions in resource impairment although enabling OHV users to range into areas that were once inaccessible.
- Future demand for roads to support mineral exploration and development or other resource developments on or across BLM lands may increase in proximity to villages and communities. Current demand for road development is limited due to the nature and location of the lands within the planning area.
- It is generally accepted practice that OHV designation starts at the “limited” classification.
- No transportation or utility corridors have been identified in this plan. BLM will entertain transportation and utility corridor requests through project-specific NEPA analyses.
- From public scoping input, there is community support to manage off-highway vehicle use while providing access to public lands.

- The amount and patterns of OHV use in the planning area is unknown. A comprehensive trails and travel management plan is proposed for completion within five years of approval of the Bay plan.
- The use of OHVs within the planning area is centered around existing villages and communities such as Dillingham, Goodnews Bay, and King Salmon.
- The need for access to public lands may increase slightly as Native corporation entitlements are met, and if restrictions on use of those private lands are implemented by the Native Corporations. The public easements reserved through Section 17(b) of ANCSA will become more important during the life of the plan. The need to identify and maintain these easements will increase.
- For the purposes of this document, OHVs include snowmachines. However, most impacts described in this analysis result from OHVs used during snow-free months. Where impacts are specific to snowmachines, they are described as such.

## f) Renewable Energy

- As the cost of fossil fuels rises, Federal, State, and local governments, private concerns and individuals in the planning area may seek alternative sources of renewable energy. However, BLM lands are not located in proximity to villages, and the probability of receiving applications for use of BLM land for renewable energy development is low.

## g) Lands and Realty Actions

- Disposal or Land Exchange – Land conveyance to the State and Native corporations will be completed within the life of the plan. BLM may consider land exchanges to resolve split estate issues. Land exchanges will not be pursued until State and Native entitlements are resolved. Isolated parcels of land in the Iliamna East and Iliamna West Blocks and two sections east of Aleknagik are identified in this RMP/EIS for potential exchange. Isolated parcels that remain in Federal ownership after all land conveyance is completed may also be considered for future exchange. Land exchange identified under Section 206 of the Federal Land Policy and Management Act (FLPMA)(1976) is the preferred method of land ownership adjustment, and will be used to consolidate the larger, discontinuous tracts of BLM lands. Disposals of land through sales will be considered on a case-by-case basis.
- Land Ownership Adjustment – State and Native corporation land entitlements will be met within the life of the plan. BLM may retain management of approximately 14% of lands currently selected by the State and Native corporations. Once land entitlements are resolved, there may be a need, both internally and externally, for land ownership adjustments to improve the manageability of Federal and non-Federal lands.
- ANCSA 17(d)(1) Withdrawals – Revocation of ANCSA 17(d)(1) withdrawals will open the affected lands to mineral entry. Recommendations for revocation of ANCSA 17(d)(1) withdrawals would be implemented as described in each Alternative. Should new withdrawals be proposed to take their place, existing withdrawals will be retained until new withdrawals are in place.
- Agency Withdrawals, (other than ANCSA 17(d)(1)(FLPMA Section 204)) – Other withdrawals identified in the planning area are for administrative sites, power sites, and military purposes. Two water power withdrawals, seven military withdrawals, and nine administrative site withdrawals, comprise approximately 38,500 acres within the planning area. Creating, modifying, renewing or revoking withdrawals for other Federal agencies is an ongoing function of BLM. As populations grow throughout the region, pressures placed on resources will continue to escalate, which may impact the number of requests from Federal agencies for withdrawals. Demands for

withdrawal review may increase from the state and local governments. As part of the land planning process, BLM will review existing withdrawals.

- ANILCA 906(e) "TOP FILINGS" by the State of Alaska would fall into place. Presently, State of Alaska "Top Filings" are BLM lands since the State selection is a future interest that has yet to attach. Upon revocation of ANCSA 17(d)(1) withdrawals, a State "Top Filing" will attach, the lands will become State-selected and subject to conveyance out of Federal ownership.
- Land Use Authorizations and Rights-of-Way. As the State and Native land entitlements are met, there will be a decreasing demand for land use authorizations under 43 CFR §2920 and 43 CFR §2800. The remaining Federal estate will require land use authorizations for permitted activities, rights-of-way, R&PP leases, and other realty actions. Demand will fluctuate with the degree of economic growth and infrastructure development occurring within and adjacent to the planning area.
- Energy Development – There may be a future demand for energy related rights-of way such as pipelines, electric power lines, energy development and distribution facilities, roads, and water facilities.
- ANCSA 17(b) Easements - BLM would continue to manage ANCSA Section 17(b) easements.
- ANCSA 17(b) easement management will be transferred to the National Park Service or the U.S. Fish and Wildlife Service for those easements that access lands administered by those agencies or those easements that are wholly within the boundaries of a park, preserve, Wild and Scenic River corridor, or refuge.
- BLM will continue to mark and verify ANCSA 17(b) easement locations as staffing and budgets allow.
- BLM reserves easements as ANCSA conveyances occur. BLM would continue to identify, sign, map, monitor use, and realign 17(b) easements, with priority based on:
  - Easements accessing lands that are permanently managed by BLM or are important to BLM programs.
  - Easements receiving high public use.
  - Easements required in implementing an activity or implementation plan.
  - Easements where landowners have made a request to work cooperatively (Often support of the landowner is essential to resolving signing issues, realignment, mitigating damage, and addressing other issues).
  - Easements where signing or education would mitigate environmental degradation.
- Access – BLM will continue to manage ANCSA 17(b) easements that access public lands. An effort will be made to transfer ANCSA 17(b) easements to other Federal agencies and consider agreements to transfer management to State and local entities on a case-by-case basis.
- ANCSA 17(b) access needs are not expected to diminish. BLM is able to transfer jurisdiction of a 17(b) easement to the State of Alaska or to a political subdivision if the State agrees to it.

## **4. *Special Designation Assumptions***

### **a) Areas of Critical Environmental Concern**

Areas designated as Areas of Critical Environmental Concern (ACECs) will be managed to maintain the values for which they were designated.

### **b) Wild and Scenic Rivers**

Recreational use of the river corridors being considered for proposed Wild and Scenic River (WSR) designation would increase. If the proposed corridors were designated, prescribed management would protect the Outstandingly Remarkable Value (ORV) for which the rivers were designated, requiring a mix of education and regulatory measures.

Rivers found to be suitable for addition to the National Wild and Scenic Rivers System with the publication of the Record of Decision will be managed to protect water quality, free-flowing nature, and Outstandingly Remarkable Values until such time as Congress acts on proposed designation legislation.

## **5. *Social and Economic Assumptions***

### **a) Public Safety**

Public health and safety issues will receive priority consideration in the management of public lands. Demand for safe visits will increase with increasing numbers of public land users.

### **b) Social and Economic Conditions**

While the population in some villages may decrease, overall the population in the Bay planning area is expected to increase during the life of this plan.

### **c) Tribal Treaty Rights**

As a government agency, BLM will maintain a government-to-government relationship with federally-recognized Indian Tribes. Residents of these areas utilize Native lands as well as BLM lands for traditional subsistence activities, and will continue to do so. Through this planning process, BLM has initiated consultation with different village entities. This consultation will continue throughout the life of the plan.

## **6. *Subsistence Assumptions***

BLM will continue to play a role in the management of subsistence resources on Federal public lands. Based on current trends, the demand for subsistence resources will stay the same or will increase during the life of the plan.

## C. Direct and Indirect Effects to Resources

### 1. Introduction

Direct, indirect, and cumulative impacts are considered in effects analyses, consistent with direction provided in 40 CFR 1502.16.

- **Direct effects** are caused by an action or by implementation of an Alternative and occur at the same time and place as that action or implementation.
- **Indirect effects** also result from an action or implementation of an Alternative, but usually occur later in time or are removed in distance from the action or implementation, but are still reasonably foreseeable.
- **Cumulative effects** result from individually minor but collectively significant actions over time. A cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency, entity (Federal or non-Federal), or individual undertakes such other actions (40 CFR 1508.7 and 1508.8).

Actions anticipated during the life of the plan on all lands in the planning area, including private, State, Native corporation, and Federal (FWS and NPS) lands, have been considered in the analysis to the extent reasonable and possible. Decisions about other actions occurring within the planning area could be made by many public and private entities, though the location, timing, and magnitude of these actions are not well known. Assumptions about actions outside of BLM's jurisdiction that are considered in the cumulative effects analysis include:

- ANCSA and State land entitlements will be fulfilled within the life of this plan.
- BLM will retain approximately 14% of the lands currently selected by the State or Native corporations, while approximately 86% will be conveyed.
- Land sales (settlement and remote settlement areas) will continue on State lands consistent with the Alaska Department of Natural Resources area plans.
- Mineral exploration and development will increase on State and Native lands.
- Mineral exploration and development will remain minimal in National Parks and Preserves within the planning area, and in the Wildlife Refuges.
- National Parks, Preserves, and Wild and Scenic Rivers within and adjacent to the planning area will continue to manage for remote, primitive recreation experiences. Access into parks will continue to be primarily by air and boat.
- National Wildlife Refuges within or adjacent to the planning area will continue to be managed for wildlife and compatible remote, primitive recreation experiences. Access into refuges will continue to be primarily by air and by boat.
- Road construction will increase on State and Native corporate lands in support of local communities, and mineral exploration and development.
- Communication site development will increase.

Irreversible or irretrievable commitment of resources and unavoidable adverse impacts are discussed after the Cumulative Impacts section.

- *Irreversible commitment of resources* results from actions in which resources are considered permanently changed.
- *Irretrievable commitment of resources* results from actions in which resources are considered permanently lost.

- *Unavoidable adverse impacts* are those that remain following the implementation of mitigation measures, and include impacts for which there is no mitigation.

## Treatment of BLM Critical Elements

BLM's National Environmental Policy Act (NEPA) Handbook, as supplemented with BLM Instruction Memorandum No. 99-178, identifies 14 "Critical Elements of the Human Environment" that must be addressed during environmental analysis (BLM 1988b; BLM 1999):

1. Air Quality (The Clean Air Act of 1955, as amended)
2. Areas of Critical Environmental Concern (ACECs) [Federal Land Policy and Management Act (FLPMA) of 1976]
3. Cultural Resources (National Historic Preservation Act of 1966, as amended)
4. Environmental Justice [Executive Order (E.O.) 12898]
5. Farm Lands, Prime or Unique (Surface Mining Control and Reclamation Act of 1977)
6. Floodplains (E.O. 11988, as amended)
7. Invasive, Non-native Species (Lacey Act, as amended, Federal Noxious Weed Act of 1974, as amended; Endangered Species Act of 1973, as amended; and E.O. 13112, Invasive Species, 02/03/99)
8. Native American Religious Concerns (American Indian Religious Freedom Act of 1978)
9. Subsistence [Alaska National Interest Lands Conservation Act (ANILCA) of 1980]
10. Threatened or Endangered Species (Endangered Species Act of 1973, as amended)
11. Wastes, Hazardous or Solid (Resource Conservation and Recovery Act of 1976, and Comprehensive Environmental Response, Compensation, and Liability Act of 1980)
12. Water Quality, Surface & Ground (Clean Water Act of 1987; Safe Drinking Water Act Amendments of 1996; E.O. 12088 amended by E.O. 12580, and E.O. 12372)
13. Wetlands/Riparian Zones (E.O. 11990)
14. Wild and Scenic Rivers (Wild and Scenic Rivers Act of 1968, as amended)
15. Wilderness (FLPMA of 1976 and Wilderness Act of 1964)

All of the above but one is addressed in this environmental impact statement. The missing element is Farm Lands. There are no Farm Lands, Prime or Unique, within the planning area.

No Prime or Unique Farmlands, designated Wild and Scenic Rivers, designated ACECs, or designated Wilderness currently exist on BLM lands in the planning area (NRCS 2006). Impacts related to proposed designations or findings are described. The remaining elements are identified and addressed in the relevant sections of Chapters III and IV.

## Availability of Data and Complete Information

The best available information relevant to the decisions to be made was used in development of the RMP. Considerable effort over a two-year period has been made to acquire and convert resource data into digital format for use in the plan. Data has been acquired from BLM sources and from outside sources such as the State of Alaska, U.S. Fish and Wildlife Service, and National Park Service.

Some information was unavailable for use in developing this plan, usually because inventories have not been conducted or are not complete. Specific data unavailable included:

- Inventory and assessment of trails
- Detailed soil surveys
- Recreation use information for waterways
- Definitive Special Status Species and habitat occurrence (plant and animal); delineation of identification and conservation measures
- Riparian assessments

- Certain key wildlife seasonal and life function habitat occurrences; use/concentration area identification and delineation
- Watershed assessments
- Cultural Resource inventories of uplands and smaller drainages

Because of these deficiencies, some impacts cannot be quantified. Impacts are projected in qualitative terms or in some cases are described as unknown. Subsequent project-level analysis will provide the opportunity to collect and examine site-specific inventory data necessary to determine the appropriate application of the RMP level guidance. In addition, inventory efforts identified in Chapter II will continue to update and refine the information used to implement this plan.

## **2. Resources with Effects Common to All Alternatives**

### **a) Air Resources**

Much of the planning area is designated as unclassifiable with regard to Air Resources (USEPA 2004a). Regardless of the selected Alternative, air resources in the Bay planning area will be affected. Although there will be varying degrees of effects throughout the planning area, it is expected that Alternative B may result in a greater magnitude of impacts due to potential mineral development or OHV activity. Due to the scattered nature of BLM lands and the low potential for reasonably foreseeable mineral development, the impacts on air resources would be minimal under all Alternatives. Impacts from OHV activity will be localized and would be expected to dissipate quickly.

### **b) Climate, Physiography, and Geology**

The proposed Alternatives would have little direct or indirect effect on climate in the planning area. There is a moderate likelihood of development associated with locatable and salable minerals, and a low to moderate likelihood of development associated with leasable minerals on BLM lands in the planning area. There is a small amount of OHV use on BLM lands in the eastern part of the planning area, but effects on the physiographic and geologic resources are expected to be negligible.

### **c) Floodplains**

The land management actions proposed under any Alternative would have minimal effects to floodplains. Alternative B has the potential to impact more areas due to mineral development and OHV activity. Impacts on floodplains under Alternative B would be greater in magnitude than under any of the other Alternatives. However, the scattered nature of BLM lands and low potential for reasonably foreseeable mineral development indicate that effects on floodplains would be minimal under all Alternatives.

The potential impacts from exploration and mining for locatable (metalliferous minerals) in floodplains under any of the Alternatives could include the destruction of the structure and stability of the floodplain. Impacts under all Alternatives would be reduced with the implementation of Required Operating Procedures and mitigation measures developed through project-specific NEPA analysis.

### **d) Wildlife and Special Status Species**

Some sensitive migratory bird species are subject to subsistence hunting by Alaska Natives. Recent changes in the Migratory Bird Treaty Act relative to subsistence taking of migratory birds refers to all migratory birds including waterfowl, shorebirds, and other species groups. These populations are monitored by the US Fish and Wildlife Service (USFWS). Spring and summer migratory bird harvests are managed under regulations implementing the Migratory Bird Treaty Act Amendments. BLM provides input as necessary to the USFWS regarding decisions on harvest regulations but has no direct role in managing the take of these species. BLM is involved indirectly in allowing access across its lands, but

these transportation routes and historic trails serve a multitude of purposes in addition to access for hunting. Activities on BLM lands that require permits are reviewed for consistency with applicable wildlife conservation laws such as the Bald Eagle Protection Act, Migratory Bird Treaty Act, and the Marine Mammal Protection Act.

Mitigation measures are developed through project-specific NEPA analysis to avoid listing BLM sensitive species under the Endangered Species Act.

Some Special Status Species are subject to subsistence hunts by Alaska Natives (e.g., Steller's eider, Steller sea lions), but the annual take is managed under provisions of the Marine Mammal Protection Act, and the Endangered Species Act (ESA), which provide exemptions for certain qualifying Alaska Native subsistence harvests. Because many marine species are susceptible to oil pollution, any activities on BLM lands that have the potential for accidental release of oil or other harmful materials into the marine and coastal environments receive careful scrutiny for prevention and mitigation during the permitting process under all Alternatives. These measures would protect T&E species from potential mortality as well as decreased reproductive rates. Other protective measures for T&E species and their habitats would also be considered under all Alternatives during the permitting process for other types of activities such as mineral and road development.

BLM is required by law and by its own policies to cooperate and coordinate with the USFWS and National Marine Fisheries Service (NMF) to develop and implement appropriate conservation measures for T&E species on BLM lands. This applies to all the Alternatives and all regions of the planning area. The policy common to all Alternatives is to be consistent with the ESA.

Critical habitats for Steller sea lions and Steller's eiders have been established, and critical habitat for other listed species has been designated by the USFWS and NMFS (no critical habitat has been identified on BLM lands in the planning area). Recovery plans have been established for Steller sea lions by the NMF and for Steller's eiders by the USFWS. BLM has not undertaken any specific monitoring or surveys for Special Status Species on its lands.

## **e) Visual Resources**

This analysis considers a range of alternatives for Visual Resource Management (VRM) Classification, as presented in Chapter II. All VRM class assignments are within classes III and IV. Assignment of these VRM classes does not preclude resource development, but assigns VRM objectives for protection of visual resources.

## **3. Direct and Indirect Effects to Air Quality, Soils, Vegetation, and Water Resources**

Air quality, soils, vegetation, and water resources have been grouped together within this analysis because impact to one resource is typically linked to impact to another resource. For example, vegetative removal results in the loss of protective cover for the soil, subsequently causing erosion by wind and water, resulting in impacts to air and water resources.

### **a) Effects Common to all Alternatives**

Proposed management of the following resources/resource uses/programs would have no anticipated impacts to air quality, soils, vegetation, or water resources: Cultural Resources, Paleontological Resources, Visual Resources, Renewable Energy, Social and Economic Conditions, and Subsistence.

### **(1) Effects to Soils, Vegetation, and Air from Climate Change (Common to All Alternatives)**

One aspect of environmental studies is to anticipate how soils will change with regional environmental warming. Changes will affect carbon and nitrogen cycles and gaseous emissions, including the release of greenhouse gases (Birkeland 1999; Lal et al., 1995) and the increased uptake of carbon dioxide and the production of oxygen. Major changes include: (1) changes in soil moisture, with wetter soils experiencing greater leaching, and drier soils accumulating salts, (2) changes in organic matter, which will reach equilibrium at new levels as a function of changing climate-vegetation patterns, and (3) greater weathering will release more nutrients, which could influence biomass production, impacts which will vary from place to place.

Climate change has the potential to impact air quality as soils may become drier resulting in increased erosion potential by wind, thus increasing dust and particulates. The warmer, drier climate may cause increased tree mortality resulting in increased fire frequency (USDA 2004; Juday 1996; Fleming and Volney 1995) in areas that to date have seen few fires (USDA 2004; UAF 1999). Smoke impacts local air quality with potential to provide regional impacts. Fire degrades or eliminates vegetation resulting in increased erosion potential of soil by wind.

### **(2) Effects to Soils, Water, Vegetation and Air from Vegetation Management (Common to All)**

Effective vegetation management will limit disturbance and thermokarst subsidence to permafrost soils, blowing dust and airborne particulates, and control sediment runoff into waterbodies.

### **(3) Effects to Soils, Water, Vegetation and Air Quality from Fire and Fire Management (Common to All Alternatives)**

Fire is recognized as an essential ecological process and natural agent of change in ecosystems. At the same time, it has impacts to air quality, soil, and water resources as described in detail in the Land Use Plan Amendment for Wildland Fire and Fuels Management for Alaska (BLM 2004d). Soils can be affected by fire in several ways. Fire can be beneficial in stimulating new vegetative growth, in helping maintain a mixture of vegetation types and age classes that provide soil stability, and in providing essential nutrients to the soil matrix. Implementation of various fire management options (Critical, Full, Modified, or Limited) in wildland fires and the level at which fire would be used to manipulate vegetation would directly affect the diversity of the habitats present in the planning area and the successional stages of the plant communities throughout. Fire can also strip soils completely of vegetation and make them vulnerable to erosion if heavy rains occur before vegetative re-growth takes place. Species such as willow and alder sprout quickly after a fire and bring soil stabilization. If the fire is sufficiently hot, it can sterilize the earth, precluding regeneration of the plant species that were present before the fire, and allowing introduction of new species. Wildland fires have not occurred in the planning area due to the marine influence on the region's climate and the wet tundra environment. Should the current warming and drying trend continue, the fire regime may change.

### **(4) Effects to Soils, Water, Vegetation and Air from Hazardous Materials Management (Common to All Alternatives)**

The BLM management actions under all Alternatives for hazardous or solid wastes may beneficially affect soil, water and air quality by ensuring adequate protection against pollution of soil, water and air by hazardous or solid wastes at current and future permitted sites. Clean-up of soils and water that have become polluted will be conducted, as those sites are discovered.

### **(5) Effects to Soils, Water, Vegetation, and Air from Forestry Management (Common to All Alternatives)**

There is no commercial use of timber and no associated road construction activity on BLM lands within the planning area. No commercial use of timber is anticipated due to the lack of commercial-grade timber

resources. A small amount of household use of timber takes place in the form of gathering firewood and house logs. Effects to soil, water, vegetation and air are expected to be minimal to nonexistent should the current pattern of use continue.

#### **(6) Effects to Soils, Water, Vegetation and Air from Locatable Minerals (Common to All Alternatives)**

Some mineral exploration and development could occur on BLM lands in the planning area, and on existing Federal claims under any Alternative. Where mining occurs, potential effects include disturbance and redistribution of gravel, overburden, and soils. Existing and future locatable mineral activities could unfavorably impact wetlands, stream, riparian and tundra vegetation by stripping away the vegetative mat as part of mining operations. This could increase the potential for the introduction and spread of invasive plant species. The structure of the soil profile and the stability of floodplains are destroyed on a temporary basis and can result in long-term, permanent changes. Removal of soil could also cause an increase in stream sedimentation and turbidity and a decrease in stream channel stability. Required Operating Procedures include separating organic overburden from mined gravels for future reclamation, backfilling all mining pits with tailings as mining progresses and spreading the remaining vegetation and overburden piles on the ground surface. Current soil storage handling stipulations do not prevent damage to soil health and viability and this reduces the soil's capability to support re-vegetation.

Impacts to water resources may be both short and long-term depending on the location of claims in relation to water resources and the activities performed. Short-term impacts to water resources may include drawdown of lakes and streams during active operations. Long-term impacts include alteration of instream flow regimes due to changes in stream channel geometry, compaction of soils, or removal of surrounding vegetation. Water quality may also be impacted by mining operations. The impact to water quality is highly dependant on several factors, including the type of operation, geology, soils, and use of chemicals on site. The duration of impacts may be short-term increases in turbidity during active mining operation or long-term impacts from persistent soil erosion or weathering of geologic materials (acid mine drainage).

The prevention of unnecessary or undue degradation of resources is addressed within 43 CFR 3809. In addition, ROPs have been developed to assist with the mitigation of impacts to resources that may result from locatable mineral activities.

#### **(7) Effects to Soils, Water, Vegetation and Air from Mineral Materials (Common to All Alternatives)**

Few mineral materials requests are anticipated due to the generally isolated and remote location of BLM lands and the activities that are anticipated during the life of the plan. Mineral materials would be needed to support oil and gas development. Oil and gas development on BLM lands may only be economically feasible in the Koggiling Creek planning block. Mineral material extraction can unfavorably impact vegetation by destroying vegetation growing on the site and by compacting and removing soils, hindering plant re-growth. Mineral materials extraction may degrade soil resources. Because soil development and vegetative growth is slow in this region, some sites may recover to the original vegetative cover very slowly or not at all. Soils removed of vegetation may be more easily eroded by wind resulting in minor localized degradation of air quality. Increased emissions from vehicle traffic and facilities may further result in localized impacts to air quality. Water quality may be impacted by increased siltation potential to local water bodies resulting from runoff or atmospheric deposition of soil particles. Increased vehicle traffic and facilities construction may also contribute to degradation of water quality. Impacts would be reduced under all action Alternatives with implementation of Required Operating Procedures. Additional mitigation measures, if necessary, could be developed during NEPA analysis of specific material site disposal actions.

#### **(8) Effects to Soils, Water, Vegetation and Air from Recreation and Travel Management (Common to All Alternatives)**

Recreational use of the land occurs throughout the planning area. Most of it is focused on guided and unguided sport hunting and fishing, which tends to make use of different areas in different months and

years as influenced by the movements and abundance of wildlife. Effects include impacts to vegetation and soils from temporary campsites, development of social trails, and aircraft landings. These may result in erosion should the vegetative cover be degraded, and/or through compaction of soils. Repeated scrambling up and down river and stream banks can degrade riparian vegetation, create bank erosion, and affect water quality.

Off-Highway Vehicles (OHVs) are used in proximity to villages. Under all Alternatives there would be some impacts to soils by OHV use, since no areas would be completely closed to OHV use. Impacts to wetlands would include the potential for loss of vegetative cover, soil erosion, soil compaction, thermokarst subsidence, water diversions, and ponding. Commercial and non-commercial recreational activities could cause effects to wetlands, stream, riparian and tundra vegetation. Temporary and repeated use of campsites and aircraft landings at remote sites are two common activities on BLM lands in the planning area that may have direct effects to riparian and tundra vegetation. Impacts could include trampled and broken vegetation, compacted and disturbed soil, and an increased potential for wildland fires. There would be a slight possibility of localized soil and water contamination from hydrocarbons or from lead-acid batteries. Where trails cross streams, riparian soil and vegetation may be altered or destroyed, increasing soil loss and sedimentation into aquatic habitats resulting in diminished water quality. Given the relatively low level of recreational use on the remote BLM lands, these impacts would be minimal overall and degradation of air quality, soil and water resources should not increase in the foreseeable future.

Off Highway Vehicle use in the planning area typically originates from population centers. Where invasive non-native plants occur, seeds can be carried in soil or mud in the tire tread. The potential exists for the spread of invasive non-native plant species from OHV travel across BLM lands.

#### **(9) Effects to Soils, Water, Vegetation and Air from Lands and Realty Management (Common to All Alternatives)**

There are minor impacts to air quality, soil, and water resources from lands and realty actions under all Alternatives. An exception would be a right-of-way that authorized road construction.

**Access (Rights-of-Way and Easements).** Construction of access roads, railroads, bridges, culverts, and gravel pads in easements may adversely affect soil in the region. Construction of roads has a major local impact, removing soils. Construction of bridges and culverts may create diversion of water and subsequent soil erosion at the site. Development of borrow pits for road construction impact soils through soil removal. Currently there are no development proposals. Should BLM receive proposals for road or gravel pad construction, impacts would be reduced under all action Alternatives by implementing Required Operating Procedures. Additional mitigation measures could be developed during project-specific NEPA analysis.

**Disposals and Acquisitions.** Disposal of BLM lands results in removal of the land from the public domain. Should lands be acquired by BLM, they would then be subject to BLM management directives.

**Withdrawals.** Impacts to soils due to Agency Withdrawals would be the same for all Alternatives. In the planning area these withdrawals include use by the Federal Energy Regulatory Commission or military. Impacts to soils may include localized compaction due to construction of facilities or minor erosion by wind or water due to localized removal of vegetation.

## **b) Effects to Soils, Water, Vegetation and Air Quality for Alternative A**

### **(1) Effects to Soils, Water, Vegetation and Air from Lands and Realty: ANCSA 17(d)(1) Withdrawals (Alternative A)**

In Alternative A, existing ANCSA 17(d)(1) withdrawals would be retained. Consequently, mineral development would remain at current levels and there would be fewer impacts to soils, water, vegetation, and air than under Alternatives B, C, or D.

### **(2) Effects to Soils, Water, and Air from Leasable, Locatable, and Salable Minerals (Alternative A)**

**Leasable Minerals.** Under Alternative A, BLM lands would be closed to fluid mineral leasing; however, BLM has the authority to lease lands where oil and gas are subject to drainage, this activity would have an impact to soils, water, vegetation or air on BLM lands.

**Locatable Minerals.** Under Alternative A, 138,627 acres of BLM lands within the planning area, acreage currently not withdrawn under ANCSA 17(d)(1), would be open to hard rock mineral exploration. Within the planning area, approximately 3,968 acres would remain withdrawn from mineral entry due to Federal Agency withdrawal. This alternative anticipates a total disturbance of 23 acres on State-selected and private (Federal claim) lands from mining activities at existing claims, mostly from placer mining (BLM 2006). Hard rock mineral exploration and development activities could adversely affect soils, water, vegetation, and air quality as described under Effects Common to All Alternatives. Effects of locatable mineral development could also include impacts to air quality from wind-blown particulates, smoke and exhaust. However, the impacts described are less likely to occur under Alternative A than under Alternatives B, C, or D because there would be less potential for mineral development.

**Salable Mineral Materials.** Due to the remote locations of most BLM lands, development of salable minerals is not expected to occur.

### **(3) Effects to Soils, Water, Vegetation, and Air from Travel Management (Alternative A)**

Under Alternative A, the planning area would remain undesignated and cross-country use of OHVs would be allowed throughout. This would result in impacts to soil, water, vegetation, and air as described under Effects Common to All Alternatives. These impacts would be greater than in Alternatives C and D. Sensitive habitat areas would not receive additional protection from OHV impacts.

### **(4) Effects to Soils, Water, Vegetation, and Air from Recreation (Alternative A)**

Recreation management under Alternative A would result in localized impacts as described under Effects Common to All Alternatives. These impacts would be expected to be greater under Alternative A than under Alternatives C or D due to less restrictive OHV use in the planning area.

### **(5) Effects to Soils, Water, Vegetation, and Air from ACEC Designations (Alternative A)**

Under Alternative A, there would be no ACEC designations. Because of the maintenance of ANCSA 17(d)(1) withdrawals in this alternative, there would be no effect to soils, water, vegetation, and air.

### **(6) Effects to Soils, Water, Vegetation, and Air from Wild and Scenic River Designations (Alternative A)**

Under Alternative A, there would be no Wild and Scenic River designations recommended. Because of the maintenance of ANCSA 17(d)(1) withdrawals in this alternative, there would be no effect to soils, water, vegetation, and air.

## **c) Effects to Soils, Water, Vegetation and Air Quality for Alternative B**

### **(1) Effects to Soils, Water, Vegetation and Air Quality from Lands & Realty Actions, ANCSA 17(d)(1) withdrawals (Alternative B)**

Impacts to air, soil, vegetation, and water resources for other lands and realty actions would be similar to those discussed under Effects Common to All Alternatives. Implementation of Required Operating Procedures would reduce the potential for impacts compared to Alternative A.

### **(2) Effects to Soils, Water, Air, and Vegetation from Leasable Minerals (Alternative B)**

Under Alternative B, all unencumbered lands (1,103,138 acres) would be open for fluid mineral leasing. Based on the Reasonably Foreseeable Development scenario, there is a low leasable mineral development potential for most of the planning area. There is however a medium potential for oil and gas development on the Alaska Peninsula and in the Bristol Bay Nushagak Basin. The Reasonably Foreseeable Development Scenario assumes exploration for gas in the Koggiling Creek planning block on BLM lands in the planning area. There has been no oil or gas exploration in the Bristol Bay Nushagak Basin. The region is remote and lacks infrastructure to deliver the product to market.

Resource Assumptions for Leasable Minerals were formulated using the Reasonably Foreseeable Development Scenario for the planning area. Based on that Scenario, the following effects could occur.

Long-term impacts to soil resources would not be widespread due to modern oil and gas construction and operation practices. Long-term impacts to soil resources include sterilization and contamination which would inhibit vegetative growth, ultimately leading to soil erosion. Modern operations have substantially decreased the footprint of drill pads, which now affect approximately two to four acres, from which the topsoil is removed and stockpiled. However, current soil storage handling stipulations do not prevent damage to soil health and viability and this reduces the soil's capability to support re-vegetation. An oil spill or natural gas blowout may adversely affect soil in the immediate areas by contamination; should compacted soil also be present, the amount of compacted soil could increase the affected area. Post-production oil and gas remediation measures include the removal of structures, including drill pads, redistribution of stockpiled topsoil over the disturbed area, and subsequent re-seeding, re-contouring, and drainage control (see Stipulations, Appendix A). The full magnitude of production effects is dependent upon the location, depth, size, and soil composition of the project area. No oil extraction is expected within the life of the plan, though development associated with gas extraction is expected in the Koggiling Creek planning block.

**Coal Bed Natural Gas.** This analysis assumes no coal bed natural gas development on BLM lands.

**Seismic Exploration.** Seismic surveys involve seasonal occupation and transport of seismic equipment and camps using sledge-drawn trailers at locations chosen for best transport, preferably at times when the snow cover accumulation is sufficient to insulate the tundra and after the ground, lakes, and rivers are frozen. In the planning area during the past 20 years, snow accumulations in some years have been insufficient to drive snowmachines across, and the timing of freeze-up has been uncertain with the regional warming trend.

Historically, the principal effect of seismic activities on soil and water resources has been diversions of shallow water tracks and ponding in places where track depression compresses the organic mat sufficiently to alter the thermal regime, melt surface ground ice, and alter the native vegetation (Emers and Jorgenson 1997). More recently, modern seismic lines, with newer low-ground pressure equipment have less impact on the tundra than older, outdated types, and impacts to the tundra are more likely to occur during camp moves (WesternGeco 2003). While extensive thermokarst erosion along recent winter seismic trails is seldom observed, impacts to vegetation and surficial compaction are still in evidence (Jorgenson et al. 2003). Adequate protection of the tundra requires a uniformly distributed snow pack with a hard surface crust. Often, less than ideal snow conditions exist in the planning area. Varying

levels of disturbance elsewhere have been documented even where the snow depth exceeded two feet (Felix et al. 1989).

Observations by BLM and others (NRC 2003) indicate that short-term transitory impacts, such as surficial compaction, diversions of shallow water tracks and limited ponding are estimated at about one percent of the proposed seismic lines per season, though newer, low ground pressure equipment could reduce this significantly. Since tundra vegetative mat has been shown to recover in 7 to 10 years where damage is not severe (Abele et al., 1984; Jorgenson et al. 2003), the long term impacts due to thermokarst erosion, such as permanent diversions of shallow water tracks and limited ponding, are estimated at only about 1% of the short-term impacts. These impacts are strongly influenced by snow depth and distribution and may only happen when seismic activities occur under less than ideal snow conditions (NRC 2003). Where disturbance does occur, it could take from several years to several decades for the effects to be ameliorated (Walker et al., 1987).

These types of impacts would be reduced by implementation of ROPs (Appendix A, ROP Veg-2d, e, f and g), including limiting most seismic exploration to those times during the winter when the ground is frozen and snow cover is adequate, or, those conditions lacking, utilization of alternative means of travel and transport, such as helicopter.

**Exploratory Drilling and Field Development.** Exploratory drilling in Alaska typically occurs in the winter when snow pack and frozen ground help minimize impacts from surface disturbing activities. Surface disturbance directly impacts plant communities through vegetation removal and mechanical damage to plants. Indirect impacts of surface disturbance on vegetation include soil compaction, erosion, changes in hydrology, and encroachment by invasive plant species. These indirect impacts can limit recovery or rehabilitation of vegetative communities following disturbance. Construction of gravel pads and in-field roads, and overland travel by low-ground-pressure vehicles would temporarily impact various vegetation regimes by soil compaction, damage or destruction of tussocks, disturbance to tundra wetlands, and acceleration of stream bank or lake shore erosion.

Most allowable uses have the potential to affect soil resources to some degree. Surface-disturbing actions would result in removal of vegetative cover, loosening the surface soil, formation of compacted layers, reduced infiltration, changes in physical and biological properties, reduction in organic matter content, and increased potential for accelerated erosion by exposing soil particles to wind and water. There also would be a loss of soil productivity through disruption of natural soil horizons and removal of vegetation for use by roads, well pads, and other facilities. Operating vehicles on moist soils, especially heavy equipment, is likely to cause compaction of the surface layer, decreased infiltration and aeration, and reduction of soil productivity by making it more difficult for plant roots to grow and obtain soil moisture and nutrients. Indirect impacts caused by disrupting soil stability, increased compaction, and reducing productivity include: (1) sedimentation of drainages and perennial water bodies primarily by wind or water erosion, (2) particulate matter affecting air quality through wind erosion, (3) reduced infiltration, (4) an increase in surface water runoff that could cause higher peak streamflows and possibly downstream flooding, and (5) changes in surface water quality caused by exposing soils or bedrock with undesirable chemical characteristics.

The extent of the impacts to water resources would depend on the location and the nature of the exploration area. Possible impacts include drainage disruption, sedimentation, water removal, gravel removal, and thermokarsting in areas where permafrost is present. An impact to riparian and wetland areas alters the physical, chemical, and biological components of an ecosystem. Activities that contribute to the decline in abundance, distribution, or functionality of riparian and wetland communities are considered adverse impacts. Direct impacts to riparian and wetland communities result from disturbing vegetation or ground surfaces. Indirect impacts to riparian and wetland communities result from actions within a watershed that cause a change in riparian and wetland functionality (e.g., increased rates of sediment loading into streams or increased surface runoff to streams), a change in water chemistry, or spread of invasive non-native plants. Changes in water chemistry, for example, can affect riparian and wetland areas primarily through changes in plant species composition, which could impact use of the area by wildlife. The extent of these impacts would depend on location of anticipated exploratory drilling

activities. This analysis assumes six exploratory wells over the 20-year life of the plan, each disturbing approximately six acres. Application of ROPs and Stipulations (Appendix A, ROP Water-1 Sequence and ROP Water-3i) would further minimize the extent of these impacts through riparian and wetland avoidance.

Inadequate design or placement of structures or culverts in association with gravel pads or associated roads can alter natural sediment transport and deposition, creating scour holes or channel bars. Improper placement or sizing of gravel fill can result in erosion from pads or roadbeds adjacent to streams or lakes. Natural drainage patterns can be disrupted when activities or structures divert, impede, or block flow in stream channels, lake currents, or shallow-water tracks. Blockages or diversions to areas with insufficient flow capacity can result in seasonal or permanent impoundments. Diverting stream flow or lake currents also can result in increased bank or shoreline erosion and sedimentation that degrades water quality. Proper location and adequate design capacity of culverts, pipelines, and other control structures would minimize drainage problems. Winter or low-water construction and transport activities and adequate armoring of fill would minimize erosion and sedimentation problems.

Short-term air quality impacts from leasable minerals development and production would occur from two primary sources: (1) combustive emissions (vehicle tailpipe and exhaust stack emissions) due to the operation of mobile and stationary source construction equipment, and (2) fugitive dust emissions (particulate matter less than 10 microns in diameter [PM10]) due to earth moving activities and the operation of vehicles on unpaved surfaces. Minerals production would generate long-term combustive and fugitive dust emissions from two sources: (1) stationary sources, such as natural gas flaring, natural gas-fired compressors, and storage and handling of equipment; and (2) mobile sources that access and service oil and gas facilities. The planning area is a large region with a maximum east-west extent of 280 miles and a north-south extent of about 150 miles. Given the good air quality that currently exists in the region and the expected separation of sources within the planning area, it is unlikely emissions from Alternative B activities would exceed national or State ambient air quality standards. There could be localized air quality impacts depending on the locations and emissions levels of proposed sources in the area, the surrounding topographical characteristics, and the site-specific meteorology.

Sources of hazardous air pollutants within the planning area would include fossil fuel combustion, fugitive volatile organic compounds, and emissions due to oil and gas production. The accidental release of sour natural gas rich in hydrogen sulfide (H<sub>2</sub>S) poses the main risk under Alternative B. Another source of H<sub>2</sub>S release is at oil and gas fields where secondary recovery operations are occurring. To mitigate H<sub>2</sub>S impacts, applications for permits to drill (APDs) in sour gas areas would include a contingency plan that may include requirements to monitor wind speed, wind direction, and atmospheric stability and to conduct dispersion modeling analyses. These requirements would apply to areas where public health and safety or important resource values are a concern, such as proposed well sites in proximity to residences. If the BLM determines after review of a contingency plan that additional data or safety precautions are needed, BLM would require these items as conditions of approval (COAs). The potential release of H<sub>2</sub>S during production operations in sour gas areas may be mitigated by health and safety plans.

The preferred and normal means of disposing of drilling wastes, including muds and cuttings, is re-injection into wells. Cuttings may be stored temporarily to facilitate re-injection and/or backhaul operations. Use of mud pits may be allowed by the Authorized Officer. If muds and cuttings are stored on the surface, sediments and other contaminants could be flushed into the watershed. However, requirements that wastes be stored in lined and bermed areas and disposed of before spring break-up would reduce the potential of sediments and other contaminants being flushed into the watershed. Adherence to the Required Operating Procedures, Stipulations (Appendix A, ROP OG-1b) and other preventative measures determined as project-specific requirements by all permitted operations would help prevent pollution to any stream or lake.

Consumptive water use in the summer seldom is a problem on the coastal Bristol Bay Plain, as water generally is abundant. Exceptions would be in small lakes and ponds, smaller coastal streams or most foothill streams during early summer when flow is low, and recently in summer if conditions are hot and dry. In these instances shallow pools might be pumped dry. Depending on the areas leased and number

of development wells drilled, annual water usage for development activities under Alternative B would vary considerably. Annual water use during development could be similar to that for exploration (i.e., use for dust abatement). Projects that require water extraction will be required to adhere to the Required Operating Procedures and Stipulations which will prevent unlimited drawdown while maintaining the health and availability of a natural fresh water resource. Water withdrawal and de-watering regimes are subject to constraints developed through project-specific NEPA analysis. Adherence to the Required Operating Procedures and Stipulations and project-specific stipulations for all permitted operations would prevent the unlimited drawdown of any stream or lake (Appendix A, ROP Water-2a).

While some of the gravel used for the construction of permanent facilities may be obtained from non-BLM lands, some of the material sites would probably be located on BLM lands in the planning area. Improper location of gravel-removal operations can result in alteration or destruction of soils, stream channel or lake configurations, stream-flow hydraulics or lake dynamics, erosion and sedimentation, and ice damming and aufeis formation. Locating gravel pits far enough away from streams and lakes to avoid break-up or storm flooding would greatly minimize these effects to water resources.

Under the potential development activities, spills and spill cleanup would involve both crude oil and refined petroleum products, probably from fuel-storage areas or handling operations. Storage of fuel in lined and bermed areas and the onsite availability of absorbents and removal equipment would help ensure that the size of any area affected by a spill and cleanup efforts is kept to a minimum. Small crude or diesel spills (<1 bbl and smaller) are projected to occur onshore. It is likely that all small fuel spills would occur on or near pads or roadbeds, though some fuel may possibly reach adjacent waters. In the case of a complete freeze up of the ground during the winter at the location of a spill, spill response likely would remove almost the entire spill from the frozen tundra prior to snowmelt. During that part of the year when the soil and vegetation are unfrozen, late May through around October 15, spills could reach and adversely impact tundra waters before oil spill response is initiated or completed. Storage of fuel in lined and bermed areas and the onsite availability of absorbents and removal equipment would help ensure that the size of any area affected by a spill and cleanup effort is kept to a minimum. Since most oil exploration and development activities, as well as pipeline and facilities construction, would occur during winter when the ground is frozen, it is likely that most anticipated small fuel spills would be largely contained and removed prior to reaching tundra waters. Application of hazardous material contract provisions (Appendix A, "Hazardous Material Use and Waste Management") would minimize the potential and the extent of spills occurring from anticipated gas exploration and development activities.

Spills of chemicals and saline waters would be rapidly diluted in a large lake or river. In small lakes, tundra ponds, and shallow water tracks, the impacts would be greater. Waters may remain toxic to sensitive species for several years. These spills could be pumped out of the water body, if confined or neutralized, and then diluted with uncontaminated fresh water. Seppi's (2006) work on lake water chemistry and productivity indicate that many Bristol Bay lakes are chemically sensitive; spills, dilution or neutralization may be detrimental or may create unwanted changes.

Air quality impacts may result from the emissions of hydrocarbons and gaseous byproducts of combustion (Hydrogen sulfide) or wind-borne particulates. Ambient air quality on the North Slope of Alaska, however, is relatively pristine even though oil and gas exploration, development, and production have been under way for more than 30 years. In the planning area, prevailing winds may blow these emissions and particulates to other areas of Alaska, where they might affect air quality. Arctic haze is a phenomenon resulting from elevated concentrations of fine particulate matter found over the Arctic, primarily in winter and spring. Scientists believe that most of the pollutants contributing to Arctic haze are from combustion sources in Europe and Asia. It is not known to what extent local sources in Alaska contribute to Arctic haze. However, the Arctic haze phenomenon was first observed in the 1950s, long before oil development started on the North Slope. Emissions from development resulting from Alternative B would be small compared to the emissions from North Slope oil production.

### **(3) Effects to Soils, Water, Air, and Vegetation Resources from Locatable Minerals and Salable Minerals (Alternative B)**

**Locatable Minerals.** Mining exploration could occur on existing Federal or State claims under any Alternative. However, under Alternative B, ANCSA 17(d)(1) withdrawals would be revoked, and BLM lands would be open to mineral entry. Additionally, mineral development on State- or Native-selected lands could occur where existing Federal claims are located. The type of mining most likely to occur is placer mining. Under Alternative B, this analysis anticipates 1 – 3 new placer mines and 2 – 4 new locatable lode exploration projects, all on State- or Native-selected lands. Overall, 115 acres of disturbance from mining are projected on BLM-managed lands. This development is projected to occur within the Goodnews Bay/Snow Gulch, Iliamna/Fog, Kasna Creek, Kijik Lake, and Platinum high locatable mineral occurrence potential areas (BLM 2006). Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. In addition to the effects described under Effects Common to All Alternatives, the range of potential impacts to soil resources includes disturbance and redistribution of gravel, overburden, and soils. The structure of the soil profile could be destroyed and may require decades to recover. Soil development in the Arctic is a slow process. Removal of vegetative cover and soil could cause an increase in erosion, stream sedimentation, and turbidity as well as a decrease in stream channel stability. Water could be contaminated by toxic materials introduced by the mining process. Denuded soil and contaminated soil particulates could become airborne. Some effects may be mitigated by utilizing Required Operating Procedures including separating vegetative cover and soil from mine tailings for future recovery, backfilling and replacing topsoil appropriately as mining progresses, and returning the stored soil to the ground surface upon completion of the mining project. Because of anticipated new development, the effects described here are more likely to occur and would occur to a greater extent under Alternative B than under any other Alternative.

**Salable Minerals.** Salable materials activities may degrade soil resources, and may cause erosion and an increase in stream sedimentation and turbidity. Sites may never passively recover native vegetative cover due to loss of soil from the site. Construction of access roads to the site may add to the impacts in terms of soil loss, soil compaction, and erosion. The degree of impact would depend on the type of soil present, the type of road, the terrain, and the presence or absence of permafrost. Because of the anticipated levels of locatable mineral development and leasable mineral development, this Alternative anticipates more mineral materials development, along with associated impacts, than any other alternative. However, the Reasonably Foreseeable Development Scenario for locatable minerals assumes little to no mineral material development on BLM lands, based on the assumption that most existing gravel pits are located on much more accessible, privately owned land.

### **(4) Effects to Soils, Water, Air, and Vegetation Resources from Recreation Management (Alternative B)**

Alternative B would manage recreation at the Roded Natural Recreation Opportunity Spectrum (ROS) class. Roded natural areas are characterized by a generally natural environment. However, this ROS class allows for primitive facility development. This facility development may result in some vegetation clearing. Consequently, impacts to air quality, soil, vegetation and water resources from recreation management as described under Effects Common to All Alternatives would be greater under Alternative B than under any other Alternative.

### **(5) Effects to Soils, Water, Air, and Vegetation Resources from Travel Management (Alternative B)**

Because all lands would be designated as “open” for OHVs, impacts to air quality, soil, vegetation, and water resources from OHV use and Travel Management would be similar to those discussed under Alternative A and more than those anticipated for Alternatives C and D.

**(6) Effects to Soils, Water, Air and Vegetation Resources from ACEC Designations (Alternative B)**

Under Alternative B, there would be no ACEC designations. Consequently, there would be fewer constraints on development activities.

**(7) Effects to Soils, Water, Vegetation, and Air from Wild and Scenic River designations (Alternative B)**

Under Alternative A, there would be no recommended national system Wild and Scenic River designations. Consequently, these areas would be open for mineral leasing or location, subject to ROPs and Stipulations.

**d) Effects to Soils, Water, Vegetation and Air Quality for Alternative C**

**(1) Effects to Soils, Water, Vegetation and Air Resources from Lands and Realty (Alternative C)**

In Alternative C, existing ANCSA 17(d)(1) withdrawals would be recommended for revocation. Those lands currently closed to mineral entry would be opened with the exception that ANCSA 17(d)(1) withdrawals would be retained at locations where Wild and Scenic Rivers are proposed and within the Carter Spit ACEC. Impacts to soils, air, vegetation and water from mineral entry would be greater than in Alternative A but slightly less than in Alternatives B and D.

Delineating Rights-of-Way avoidance areas within the two proposed ACECs would have a positive impact on soils because road or pipeline construction would likely not occur.

**(2) Effects to Soils, Water, Vegetation and Air from Leasable, Locatable, and Salable Minerals (Alternative C)**

**Leasable Minerals.** Under Alternative C, 1,063,129 acres of BLM lands would be open to fluid mineral leasing. This alternative anticipates similar levels of gas development as described under Alternative B (development of one gas field in the Koggiling Creek planning block). Impacts to soils, vegetation, water and air would be similar to impacts discussed under Alternative B though fewer acres would be available for leasable mineral activities under Alternative C. Comparatively, the magnitude of impacts could be greater under Alternative C than Alternative A, but less than Alternative B.

Alternative C implements a No Surface Occupancy 300-foot buffer on either side of the South East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek. Although this analysis does not anticipate leasable mineral activities at any of these locations, this buffer would protect riparian areas and soils adjacent to these sensitive riparian habitats. Additionally, no mineral leasing would occur on 12,210 acres of eligible/suitable Wild and Scenic River segments along BLM-managed portions of the Alagnak, Goodnews and Goodnews Middle Fork Rivers and within the Carter Spit ACEC (61,251 acres) due to retention of ANSCA 17(d)(1) withdrawals.

Soils, vegetation, water and air resources would benefit from Required Operating Procedures, Stipulations, and project-specific requirements. Because of the additional constraints described above, long term effects from leasable mineral activities would not be expected outside of the Koggiling Creek planning block during the life of this plan. Overall, less unencumbered BLM land is available for mineral leasing under Alternative C than under Alternatives B or D.

**Locatable Minerals.** Under Alternative C, 1,063,129 acres of unencumbered BLM lands within the planning area would be open to mineral entry. Within the planning area, approximately 3,968 acres would remain withdrawn from mineral entry due to Agency withdrawals, and ANCSA 17(d)(1) withdrawals would be retained on 12,210 acres of proposed Wild and Scenic Rivers, until Congress had an opportunity to act, and within the proposed Carter Spit ACEC (61,251 acres). Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The

lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Additionally, Required Operating Procedures provide a 300 foot buffer on either side of the East and South Fork Arolik River, Faro Creek, South Fork Goodnews River and Klutuk River (Appendix A, ROP FW-6a). This analysis anticipates no new placer or lode mining operations on BLM lands, due to retention of ANSCA 17(d)(1) withdrawals within the Carter Spit ACEC and ANILCA 906(e) Top Filed land occurring in an area of high mineral potential. Consequently, the amount of anticipated mining would be more than Alternative A, but less than Alternatives B or D due to the reduced acreage open to mineral entry.

**Salable Minerals.** Development of salable minerals on BLM-managed lands is not expected to occur during the life of this plan. Salable mineral exploration and development will not be permitted within the proposed Carter Spit or Bristol Bay ACECs.

### **(3) Effects to Soils, Water, Vegetation, and Air Resources from Recreation Management (Alternative C)**

Because BLM lands would be managed for a semi-primitive motorized experience, impacts to soil, water, vegetation, and air quality resources would be similar to those discussed within the "Common to All Alternatives" section. The scale of impacts would be similar to Alternatives A and D.

### **(4) Effects to Soils, Water, Vegetation, and Air Resources from Travel Management (Alternative C)**

Under Alternative C, impacts from OHV use and Travel Management would be less than in Alternatives A and B. The planning area would be designated as limited to existing trails by OHVs weighing 2,000 pounds or less Gross Vehicle Weight Rating (GVWR). Implementation of the Required Operating Procedures contained in Appendix A will prevent unnecessary or undue degradation resulting from OHV use associated with permitted activities. The fewest impacts from OHV use to soil, water, vegetation, and air resources would occur under Alternatives C and D.

### **(5) Effects to Soils, Water, Air, and Vegetation Resources from ACEC Designations (Alternative C)**

Under Alternative C, there would be two ACEC designations. Within the Carter Spit ACEC, ANSCA 17(d)(1) withdrawals would be retained prohibiting leasable and locatable mineral activities. Delineating Right-of-Way avoidance areas within the two proposed ACECs would have a positive impact on soils because road or pipeline construction would be subject to greater management constraints. ANSCA 17(d)(1) withdrawals would not be retained in the Bristol Bay ACEC, thereby allowing leasable mineral development to occur within the Koggiling Creek planning block. Impacts to soils, water, vegetation, and air resources would be less compared to impacts discussed in Alternative B because the Bristol Bay ACEC would be designated a right-of-way avoidance area and salable mineral activities would be prohibited. This would greatly reduce impacts attributable to road and salable mineral development.

### **(6) Effects to Soils, Water, Air, Vegetation Resources from Wild and Scenic River Designations (Alternative C)**

ANCSA 17(d)(1) withdrawals would be retained at locations where Wild and Scenic Rivers are proposed until Congress has had an opportunity to act. These areas would be closed to all mineral development.

## **e) Effects to Soils, Water, Vegetation and Air Quality for Alternative D**

### **(1) Effects to Soils, Water, Vegetation and Air Resources from Lands and Realty (Alternative D)**

In Alternative D, existing ANCSA 17(d)(1) withdrawals would be recommended for revocation. Once withdrawals are revoked, those lands currently closed to mineral entry would be open. As a result, degradation to soils, water, vegetation and air resources may occur from mineral exploration and

development. A more detailed description of impact to soils, water, vegetation and air resources resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. The amount of lands open to entry would be slightly less than under Alternative B but greater than under Alternatives A and C.

Delineating Right-of-Way avoidance areas within the proposed Carter Spit ACEC would prevent widespread impact to soils, water, vegetation, and air quality because road or pipeline construction would likely not occur. Prevented impacts, resulting from road or pipeline construction, include soil compaction, increased siltation of water bodies, vegetative removal, and degraded localized air quality resulting from dust and vehicle emissions.

**(2) Effects to Soils, Vegetation, Water, and Air from Leasable, Locatable, and Salable Minerals (Alternative D)**

**Leasable Minerals.** Under Alternative D, 1,101,304 acres of BLM lands would be open to fluid mineral leasing due to lifting of ANCSA 17(d)(1) withdrawals, including the withdrawals on the proposed Carter Spit ACEC. This Alternative anticipates the development of one gas field in the Koggiling Creek planning block, six exploratory wells over the 20-year life of the plan, each disturbing approximately six acres, and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected over the next 20 years. Impacts from that development would be the same as described under Alternative B. Soils, water, vegetation, and air resources would benefit from implementation of the Required Operating Procedures, and Oil and Gas Lease Stipulations contained in Appendix A and additional mitigation or preventative requirements as identified through project-specific NEPA analysis.

**Locatable Minerals.** Under Alternative D, 1,102,489 acres of BLM lands within the planning area would be open to mineral entry due to lifting of ANCSA 17(d)(1) withdrawals. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA Within the planning area, approximately 3,968 acres would remain withdrawn from mineral entry due to Agency withdrawals. Anticipated levels of mining and associated impacts to soils, water, air, and vegetation resources would be expected to be slightly less than those discussed under Alternative B. All proposed new load or placer mining would occur on State- or Native-selected lands due to ANILCA 906(e) Top Filings. Fewer impacts are expected because of the application of Required Operating Procedures under this Alternative, including 300-foot buffers on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek.

**Salable Minerals.** The development of salable minerals on BLM-managed lands is expected to occur in conjunction with leasable mineral activities within the Koggiling Creek planning block, with effects similar to those described under Alternative B. Salable mineral exploration and development will not be permitted within the proposed Carter Spit ACEC (36,220 acres).

**(3) Effects to Soils, Water, Vegetation, and Air Resources from Recreation Management (Alternative D)**

Because BLM lands would be managed for a semi-primitive motorized recreation experience, impacts to air quality, soils, vegetation, and water resources would be similar to Alternatives A and C.

**(4) Effects to Soils, Water, Vegetation, and Air Resources from Travel Management (Alternative D)**

Under Alternative D, impacts from OHV use and Travel Management would be less than in Alternatives A and B. The planning area would be designated as limited to existing trails by OHVs weighing 2,000 pounds or less Gross Vehicle Weight Rating (GVWR). Implementation of the Required Operating Procedures contained in Appendix A will prevent unnecessary or undue degradation resulting from OHV use associated with permitted activities. The fewest impacts from OHV use to soil, water, vegetation, and air resources would occur under Alternatives C and D.

#### **(5) Effects to Soils, Water, Air, and Vegetation Resources from ACEC Designations (Alternative D)**

Under Alternative D, there would be one ACEC designation (Carter Spit ACEC). The use of ROPs and Stipulations will reduce impacts to soils, water, vegetation and air resources due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals. A more detailed description of impact to soils, water, vegetation and air resources resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

Delineating Right-of-Way avoidance areas within the proposed ACEC would have a positive impact on soils because road or pipeline construction would likely not occur. Potential impacts, resulting from road or pipeline construction include; soil compaction, increased siltation of water bodies, vegetative removal, and degraded localized air quality resulting from dust and vehicle emissions. Avoiding Rights-of-way authorization will prevent degradation to Special Status Species habitat by preventing degradation to soils, water, vegetation and air resources in the ACEC.

#### **(6) Effects to Soils, Water, Air, Vegetation Resources from Wild and Scenic River Designations (Alternative D)**

Under this alternative, no WSR would be recommended for designation under the National System. Consequently, these areas would be open to mineral entry.

### ***4. Direct and Indirect Effects to Fisheries and Aquatic Habitats***

#### **a) Effects Common to All Alternatives**

Proposed management of the following resources/resource uses/programs would have no anticipated impacts to fisheries and aquatic habitats: Cultural Resources, Paleontological Resources, Visual Resources, Renewable Energy, and Subsistence.

#### **(1) Effects to Fisheries and Aquatic Habitat from Recreation and Travel Management (Common to All Alternatives)**

Recreation use of BLM lands occurs throughout the planning area. Most of it is focused on guided and unguided sport hunting and fishing, which tends to make use of different areas in different months and years, influenced by the movements and abundance of fish and wildlife. Effects to aquatic habitat may occur from temporary campsites or development of social trails resulting in degradation of riparian vegetation leading to increased erosion and sedimentation. Repeated scrambling up and down river and stream banks can destroy riparian vegetation and create bank erosion.

Off-Highway Vehicles (OHVs) are mostly used in proximity to villages. Under all Alternatives, there would be some impacts to aquatic habitat resulting from OHV use as no areas would be completely closed to OHV use. Where trails cross streams, riparian soil and vegetation may be altered or destroyed, increasing soil loss, and sedimentation into aquatic habitats and resulting in diminished water quality. General effects of sedimentation on fish and fish habitat are described on page 4-33 below. Given the relatively low level of recreational use on remote BLM lands, these impacts would be minimal overall and degradation of aquatic habitats should not increase in the foreseeable future.

## **(2) Effects to Fisheries and Aquatic Habitat from Hazardous or Solid Waste Management (Common to All Alternatives)**

The BLM management actions under all Alternatives for hazardous or solid wastes may have localized, beneficial effects on fish habitat through risk management stipulations and mitigation/reclamation of contaminated sites.

## **(3) Effects to Fisheries and Aquatic Habitat from Soil, Water, Vegetation and Air Quality Management (Common to All Alternatives)**

Beneficial effects to Fisheries and Aquatic Habitat from application of ROPs, Stipulations, and proper management of soils, water, and vegetation resources would occur. Implementation of ROPs and Stipulations to protect soil, water, and vegetation on a project-specific basis, particularly in riparian zones and watersheds, would reduce disturbance to fish habitats and would aid in the recovery of aquatic habitat from permitted uses. Improper management of soil, water, and vegetation resources can reduce the quality of the waters and the productive value of aquatic habitat.

## **(4) Effects to Fisheries and Aquatic Habitat from Fire and Fire Management (Common to All Alternatives)**

Fire effects which directly impact fish populations include increased siltation, altered water quality (dissolved oxygen, pH, suspended and dissolved solids, total hardness, turbidity), and water temperature changes. Indirectly, any alteration of the nutrient flow that adversely affects aquatic organisms or results in a reduction in emergent insect production would also affect fish populations, at least temporarily.

Fish species and aquatic fauna have been exposed to indirect effects of wildland fire for thousands of years. Fire can indirectly influence fish populations or their prey through the factors mentioned previously as well as changes in nutrient input to water systems and changes in permafrost status that can lead to altered hydrology. The extent of surface erosion after a fire largely depends on the topography and soil types of the immediate area, and the amount of ice-rich frozen ground within the active layer. Stream siltation is usually negligible from surface erosion on burned sites in interior Alaska due to its gentle topographical features. Siltation may be a factor where severe burns occur on steep slopes or even shallow slopes with ice-rich active layers, where fire has severely damaged riparian protection of bank soil's integrity or where heavy equipment is used in suppression activities. Lakes are also potentially vulnerable to fire effects of nutrient concentrations, sedimentation, and erosion of riparian protected shorelines from wave and wind action. Response of deciduous riparian foliage after a fire is related to already existing riparian vegetation. The impact of a fire is a change in age structure and short-term productivity.

Data on how fires affect stream temperatures and productivity are currently inadequate to accurately assess the effects of fire on anadromous or resident fish habitats. Much of the published work has focused on changes in lake systems (McEachern et al. 2000, St-Onge and Magnan 2000). Analyses of long-term fire effects on stream ecology are currently under way as part of Frostfire, a landscape-scale prescribed research burn in the boreal forest of Interior Alaska conducted in July 1999.

Fish populations have generally shown a positive response during the initial five-year period after wildland fire, where populations exhibit good connectivity with key refugia throughout the watershed (Gresswell 1999; Minshall et al. 1989). Fish will generally re-invade fire-affected areas rapidly where movement is not limited by barriers. These new colonists generally come from areas upstream of the affected area, from surrounding watersheds and from main stem rivers where migration is not limited. Fish population recovery generally tracks the increase in primary and secondary production that occurs in the early post-fire period. Where sediment is continually delivered into the stream, there could be short-term negative effects on fish and macro-invertebrate communities.

Fuels projects are designed and implemented in a “non-emergency” manner that minimizes impacts to aquatic resources. Although wildland fires may still occur in areas where hazardous fuel loads have been reduced, fires which may occur are expected to be predominately ground fires rather than crown fires. Ground fires are easier to control with lower-impact suppression methods (such as hand-built fire line) that are less likely to adversely affect aquatic resources. In contrast, the crown fires associated with heavier fuel loads often require suppression techniques likely to have greater adverse impacts to aquatic habitats and species.

Competent planning and implementation will minimize the adverse effects of fuels treatments. Some projects involve multiple treatments of the same area. Prescribed fires conducted in the spring (when drainage-bottoms are still snow covered) help to protect riparian vegetation and soils. The primary goal of these projects is to reduce the occurrence, risk, and impacts of wildland fires, not to restore the natural capacity of aquatic species to withstand the effects of natural fires.

Removal of vegetation to reduce future fuel loading may be accomplished with minimal impacts in some areas, but in others, sensitivity to ground disturbance from loss of vegetation can cause increased erosion, compacted soils, and a loss of nutrients (FS 2000, Beschta et al. 1995). To protect water quality and the diversity of habitats for fish, amphibians and other aquatic organisms, standard operating procedures are in place to protect the proper functioning condition of riparian area and stream characteristics.

Impacts to fisheries from fire and fuels management would be the same under all Alternatives. Most of the area within the planning region is in a Limited fire management option designation, which means that the standard response is to monitor fires and to only initiate suppression actions if necessary to protect identified values. In a worst case scenario, there may be some episodic events related to fire suppression that may affect fish and fish habitat. These effects would be from increased erosion and ground-based control, and alterations of water chemistry from aerial applications of fire retardant. Erosion impacts would likely be small in scale and localized, and could be minimized by rapid rehabilitation after the fire is under control, although improperly located bulldozer line firebreaks could greatly increase local stream sediment loads. The use of fire retardant in or near fish bearing streams is a serious threat to these aquatic ecosystems. The by-products of certain retardants are toxic to fish and will result in fish kills. To decrease the potential of affecting fish habitats and stream conditions, it is a standard operating procedure of the suppression agencies to avoid dropping retardant near or in water bodies.

#### **(5) Effects to Fisheries and Aquatic Habitat from Locatable, and Salable Minerals (Common to All Alternatives)**

Currently there are no new proposed projects for mineral activities on BLM lands in the planning area. However, under all Alternatives, some BLM lands open to mineral entry. In general, surface mining activities increase erosion and accelerated sediment production and input into nearby streams and lakes. Mining operations may also alter the natural input rate of organic matter and nutrients to aquatic systems. Mine sites can include open pits, heap and dump leaches, waste rock and overburden piles, tailings piles and dams, haul roads and access roads, ore stockpiles, vehicle and equipment maintenance areas, and exploration and reclamation areas. These areas are all major sources of erosion and sediment.

Surface mining operations may also disrupt surface and ground water flow patterns. Mining operations also have the potential to release pollutants to surface waters and ground water, deposition of contaminants into soils, and the eventual incorporation of pollutants into plant tissue. Both water and soil contamination may be harmful to riparian-wetland vegetation.

Naturally occurring substances in the ore may create a major source of pollutants. Mined ore not only contains the mineral being extracted but varying concentrations of a wide range of other minerals. Frequently, other minerals may be present at much higher concentrations and can be much more mobile than the target mineral. Depending on the local geology, the ore (and the surrounding waste rock and overburden) can include trace levels of aluminum, arsenic, asbestos, cadmium, chromium, copper, iron,

lead, manganese, mercury, nickel, silver, selenium, and zinc, as well as naturally occurring radioactive materials.

As with many surface disturbing activities, one of the most detrimental impacts associated with mining is increased sediment yield. Because of the potentially large area of land disturbed by mineral activities and the large quantities of earthen materials exposed at sites, erosion can be a major concern. Erosion may cause significant loadings of sediments to nearby water bodies and associated riparian-wetland areas, especially during severe storm events and high snow melt periods. Removing the vegetative cover, altering the natural topsoil, or changing the shape of the slope can increase the potential for erosion, increased runoff, and can create additional sediment in water bodies.

The main factors influencing erosion rate include the volume and velocity of runoff from precipitation, the rate of precipitation infiltration through the soil, the amount of plant cover, the slope length or the distance from the point of origin of overland flow to the point of deposition, and operational erosion control structures (EPA 1997). Accelerated erosion occurs whenever the soil surface is disturbed. Sediments created by accelerated erosion clog streams and fill lakes and impair their water-holding capacity. Erosion decreases the productive value of the soil; additionally, it reduces the quality of the waters that receive the sediment.

Significant increases in sediment yield can lead to alteration of stream channel morphology, substrate composition, and surface-ground water interaction; decreased survival of fish in the egg and young-of-the-year stages; changes in macro invertebrate community structure; and decreased primary production (Madison 1981, Van Nieuwenhuyse 1983, Weber and Post 1985, Bjerklie and LaPerriere 1985, Lloyd et al. 1987, Reynolds et al. 1989, Buhl and Hamilton 1990).

Stream channel instability occurs when excessive sediment deposition leads to destructive lateral erosion of stream banks and progressively wider and shallower stream channels (Elmore and Leonard 1998).

Accelerated runoff can trigger down cutting, which lowers the streambed, alters the water table, dries out the riparian area, destabilizes stream banks, increases erosion, and further accelerates runoff. Unless stopped by some form of intervention or a hard geologic formation, down cutting will migrate upstream and eventually disrupt the hydrologic functioning of the entire watershed (Chaney and others 1993).

These changes can lead to decreased survival of fish in the egg and alevin stages; decreased density, biomass, and diversity of aquatic insects the fish depend on for food; and decreased primary fish production (Cordone and Kelley 1961; Cooper 1965; Van Nieuwenhuyse 1983; Webber and Post 1985; Lloyd and others 1987; Buhl and Hamilton 1990).

Increased turbidity and sedimentation from erosion can inhibit feeding and spawning success. All members of the biotic community have the potential to be affected. Potential effects of sedimentation on benthic macro-invertebrates (which are prey species for fish) include interference with respiration, and interruption of filter-feeding insects' capability to secure food. A more important impact to benthic invertebrates would be smothering of the physical habitat by increased sediment loads. A loss of interstitial space in the substrate would be highly detrimental to burrowing species. A decrease in abundance could be expected in these situations. In Arctic environments, where fish depend on summer food sources to grow and reproduce, a reduced prey base may preclude fish from directing energy towards spawning.

Direct threats to fish from sediment include changes to physical habitat, subsequent decreased reproductive success, and loss of rearing habitat. Physical habitat changes from sediments are most often attributed to finer size particles. Developing eggs can be smothered and newly hatched fry can be killed by deposited sediment that prevents emergence from spawning gravels and interferes with respiration. Developing fish eggs and larvae need a constant supply of cold, oxygen rich water which flows through the interstitial spaces in stream gravels. Embedded sediments fill these interstitial spaces and also limit essential winter habitat used by juvenile fish for cover from predators, ice scour, and high-

velocity stream flows. The filling of pools with sediment further limits overwintering sites for juvenile and adult fish.

Placer mining inherently degrades or completely destroys channel features and riparian habitat, resulting in increased erosion and sedimentation.

During placer mining, streams are often diverted into bypass channels while the original channel is mined and then returned to a newly built channel once mining is complete. It has been common practice to construct stream bypasses and new channels with different geometry and physical characteristics (e.g. flood prone and bankfull widths, bankfull depth, sinuosity, slope, entrenchment, and substrate size) than that of the natural channel. This difference is often necessary because of the removal of streamside vegetation and other hard structural elements that help define the natural channel morphology. As a result, new channels are often straighter, have a higher gradient, and consequently have more energy than the natural channel. In addition, new channels often lack the diversity of habitats (pools, glides, riffles) and cover components (undercut bank, overhanging vegetation, and large woody debris) that enhance the quality of habitat in natural channels.

Mining activities, placer operations in particular, may lead to a loss of riparian-wetland vegetation. All vegetation within the active mining area is removed before and during mine development and operation. Vegetation immediately adjacent may be affected by the roads, water diversions or other development. Riparian-wetland vegetation has a significant influence on the stability of uplands and certain stream types. Changes in the composition, vigor, and density of riparian vegetation can result in changes in sediment input from uplands, stream shade, and protection from in-stream erosional processes, terrestrial insect habitat, and the contribution of detritus and structural components to the stream channel. Water quality and esthetic values are also affected by disturbance to riparian-wetlands (Rosgen 1996).

The altering of surface hydrology often results in stream conditions that are no longer suitable to species or life stages of fish and other aquatic organisms that occurred before disturbance. For example, increased stream flow may result in water velocities that: (1) cause involuntary downstream displacement and mortality of juveniles, (2) result in scour-related mortality of eggs and alevins, (3) accelerate stream bank erosion, and (4) over the long term, deplete large woody debris and organic material. The enlargement of stream channels may result in a shallow, slow water environment during periods of low flow. This new environment could result in crowding, loss of spawning habitat, reduced primary and secondary productivity, increased vulnerability to predation, and increased sedimentation (Swanston 1991; Hicks and others 1991; National Research Council 1992; Strouder and others 1997).

The removal of streamside riparian-wetland vegetation during mining would result in loss or degradation of aquatic habitat until proper functioning condition could be re-established. In general, the time required for riparian-wetland areas to attain proper functioning condition would be dictated by natural processes and may require decades to centuries before it approximates the structure and function of the original aquatic habitat (NCSU 1998; BLM and Montana Dept. of Environ. Quality 1996; BLM 1988).

The current state of knowledge about suction dredging and its impacts on aquatic resources suggests that the practice could be either detrimental or beneficial, depending on site-specific use by aquatic organisms and physical habitat limitations. In either case, evaluation of the location and timing of suction dredging activities would benefit aquatic resources.

Suction dredging has been shown to locally reduce benthic (bottom dwelling) invertebrates (Thomas 1985; Harvey 1986) and cause mortality to early life stages of fish due to entrainment by the dredging equipment (Griffith and Andrews 1981). Suction dredging may also destabilize spawning and incubation habitat, remove large roughness elements such as boulders and woody debris that are important for forming pool habitat and that can govern the location and deposition of spawning gravels (Harvey and Lisle 1998). Suction dredging may also increase suspended sediment, decreasing the feeding efficiency of sight-feeding fish (Barrett and others 1992); reducing living space by depositing fine sediment (Harvey 1986); and cause fish to avoid certain habitats because of their response to divers (Roelofs 1983).

On the other hand, suction dredging may temporarily improve fish habitat by creating deep pools or by creating more living space by stacking large unembedded substrate (Harvey and Lisle 1998). In general, invertebrates and periphyton all rapidly re-colonize small patches of new or disturbed substrate in streams as long as the area of disturbance is not so widespread as to limit the number of organisms to re-colonize (Griffith and Andrews 1981; Thomas 1985; Harvey 1986). In addition, dredge tailings may increase spawning sites in streams lacking spawning gravel or streams that are armored by substrate too large to be moved by fish (Kondolf and others 1991). In some cases the reduction in the feeding efficiency of fish may be offset by reduced visibility and the corresponding reduced risk of predation at moderate levels of suspended sediment (Gregory 1993).

Bridges, culverts, and low-flow crossings are integral features to road development associated with surface mining. These features can also interfere with stream bedload (substrate) movement, migrations to spawning, feeding, rearing, and overwintering sites if improperly designed. Current concerns related to surface mining and road placement include diverting or eliminating flow from small tributaries that connect lakes or connect lakes and rivers. Fish species found in the planning area that move between these habitat types are vulnerable to impact. Potential loss of migratory capacity could stress or kill these fish if they are unable to migrate to food-rich habitat in the summer, reach spawning areas, or move into overwintering habitat. Proper placement of these structures is critical in minimizing impacts to fish.

#### **(6) Effects to Fisheries and Aquatic Habitats from Forestry (Common to All Alternatives)**

Some minimal forestry activity generally occurs within the planning area each year, consisting of small-scale localized timber removal for personal use, including gathering firewood and house logs. While it is unlikely that any type of road construction will occur in conjunction with this activity, it is conceivable that short spur or temporary roads may be constructed to access parcels of timber in the future. Current concerns related to road placement include diverting or eliminating flow from small tributaries that connect lakes or connect lakes and rivers. Fish species found in the planning area that move between these habitat types are vulnerable to impact. Potential loss of migratory capacity could stress or kill these fish if they are unable to migrate to food-rich habitat in the summer, reach spawning areas, or move into overwintering habitat. Proper placement of these structures is critical in minimizing impacts to fish. Because of the application of ROPs and the low likelihood of road development in association with limited forestry activities, there would be no significant impacts to fisheries.

### **b) Effects to Fisheries and Aquatic Habitat for Alternative A**

#### **(1) Effects to Fisheries and Aquatic Habitat from Lands and Realty (Alternative A)**

**ANCSA 17(d)(1) Withdrawals.** Under Alternative A, no withdrawal review would take place and all ANCSA 17 (d)(1) withdrawals would remain in place. These withdrawals would protect fish habitat by excluding mineral leasing, and in some cases, mineral entry.

**Rights-of-Way.** Right-of-Way grants and easements may promote the construction of paved or unpaved access roads, gravel pads, railways, all of which may adversely affect fish habitat through runoff that may introduce sediment and contaminants into the water. Under Alternative A, avoidance or exclusion areas would be identified on a case-by-case basis.

Because of a low anticipated level of mineral development, Alternative A anticipates fewer Right-of-Way grants and easements than Alternatives B, C, and D.

#### **(2) Effects to Fisheries and Aquatic Habitat from Leasable, Locatable, and Salable Minerals (Alternative A)**

**Leasable Minerals.** Under Alternative A, no lands would be identified as open for fluid mineral leasing. This analysis anticipates no oil or gas development on BLM lands. Under this Alternative, impacts to fisheries and aquatic habitat would be minimal to non-existent.

**Locatable Minerals.** Alternative A anticipates continuance of mining operations on pre-ANSCA era Federal mining claims. According to the Reasonable Foreseeable Development Scenario for Locatable Minerals, a total surface disturbance of 23 acres (BLM 2006), mostly from placer mining activity is expected under Alternative A. Impacts to fish would be similar to those discussed under “Effects Common to All Alternatives” for mining activities, but would occur to a lesser degree than under Alternatives B, C, or D.

**Salable Minerals.** Due to the remote location of BLM land, salable mineral development is not expected to occur.

### **(3) Effects to Fisheries and Aquatic Habitat from Recreation (Alternative A)**

Under Alternative A, recreation management is custodial and impacts would be similar to those discussed under “Effects Common to All Alternatives”. There are no SRMAs that would set recreation objectives or develop visitor use limits. Unmanaged trail proliferation would continue with no guidance for proper construction and placement of new trails. Impacts from recreation would be similar to those anticipated to occur under Alternatives C and D, and less than anticipated impacts under Alternative B.

### **(4) Effects to Fisheries and Aquatic Habitat from Travel Management (Alternative A)**

Under Alternative A, BLM lands would remain undesignated and impacts would be similar to those discussed under “Effects Common to All Alternatives”. Areas of high OHV use and any correlations to areas that may include important fish habitat have not been identified. Unauthorized proliferation of trails would potentially increase under this Alternative with corresponding increase in erosion and sediment impacts. It has been documented in Alaska that multiple stream crossings by OHVs can cause alterations of stream bank structure and function, and may cause the introduction of sediment into the waterway (Weidmer 2002).

### **(5) Effects to Fisheries and Aquatic Habitat from ACEC designations (Alternative A)**

Under Alternative A, there would be no ACEC designations. ANSCA 17(d) (1) withdrawals would be retained under this Alternative.

### **(6) Effects to Fisheries and Aquatic Habitats from Wild and Scenic River Nominations (Alternative A)**

Under Alternative A, there would be no Wild and Scenic Rivers recommended for designation under the National System. ANSCA 17(d)(1) withdrawals would be retained under this Alternative. Consequently, there could be little likelihood of development and associated impacts on BLM lands.

## **c) Effects to Fisheries and Aquatic Habitat for Alternative B**

### **(1) Effects to Fisheries and Aquatic Habitat from Lands and Realty Actions (Alternative B)**

Alternative B would revoke all ANSCA 17(d)(1) withdrawals which could result in increased mineral exploration and development. Potential effects of mineral development on fish habitat under this Alternative are described under impacts “Common to All Alternatives”.

Disposal or exchange of BLM lands results in transfer of land out of Federal ownership. Alternative B identifies two parcels in the Iliamna East planning Block and one parcel in the Iliamna West planning Block for disposal or land exchange. Under Alternative B, the lands that are considered for disposal do not provide key fisheries habitat, and have a small influence on fishery resources. Should other BLM lands currently selected by the State or Native Corporations remain in Federal ownership, those lands may be considered for future exchange. Land disposal could result in impacts to valuable fish habitat, if subsequent development were to occur. Should BLM lands be transferred to or exchanged with other

Federal agencies (e.g., NPS or USFWS), fish resources would be managed under that agency's guidelines.

Right-of-Way grants and easements may promote the construction of paved or unpaved roads, gravel pads, or railways, all of which may adversely affect fish habitat through runoff that may introduce sediment and contaminants into water. An increase in Right-of-Way requests would be expected under this Alternative as a result of a greater opportunity for development.

## **(2) Effects to Fisheries and Aquatic Habitat from Leasable, Locatable, and Salable Minerals (Alternative B)**

**Fluid Leasable Minerals.** Alternative B advocates revocation of all ANCSA 17(d)(1) withdrawals and opening the land to mineral leasing. Under Alternative B, one gas field is anticipated within the Koggiling Creek planning block, six exploratory wells over the 20-year life of the plan, each disturbing approximately six acres, and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected over the next 20 years. Oil and gas operations could affect fisheries resources in several ways, as described below. ROPs and Stipulations (Appendix A) have been developed to minimize impacts associated with mineral development.

**Effects from Seismic Surveys.** Potential threats to overwintering fish from seismic surveys in the planning area would primarily stem from: 1) stress associated with acoustic energy pulses transmitted into the ground directly over overwintering pools, and 2) physical damage to overwintering habitat caused by seismic vehicles. Large overwintering pools might allow fish to flee the immediate area of intense stress whereas fish occupying small pools might not have that option. Depending on proximity, adult fish could suffer no more than temporary discomfort whereas intense acoustical pulses could be lethal to juveniles. Given that overwintering habitat represents a small percentage of the planning area, it is unlikely that seismic transmissions would occur directly over overwintering sites with any degree of regularity. Furthermore, seismic crews could avoid known overwintering areas. Overall, any effects to overwintering fish caused by winter seismic surveys would be localized and would likely have little effect on fish populations within the planning area.

**Effects from Water Demand.** Overwintering areas are limited to deep-water pools and channels in rivers and streams and to lakes deep enough to provide sufficient under-ice free water during winter. ROP Water 6a requires that water withdrawals be designed to maintain sufficient quantities of surface water, and contributing groundwater to support fish and wildlife and other beneficial uses.

Under Alternatives B, C, and D, greater levels of water withdrawal would be expected in correlation with the increased land available for exploration and development activities as compared to Alternative A.

**Effects from Exploratory Drilling.** Drilling operations require large amounts of water for blending into drilling muds. Operations also produce large amounts of rock cuttings. If an exploratory well were to be plugged and abandoned, drilling muds and cuttings would be re-injected into the bore hole. If the well were to go into production, muds and cuttings would be removed to an approved disposal site. Any chemical leaching into surrounding waters by cuttings temporarily being stored at the drill site could affect nearby fish habitat. Even though the anticipated development under Alternatives B, C and D would be greater than the development under Alternative A, the prevention of drilling in rivers and streams would provide fish with adequate protection (Appendix A, ROP FW-2f and Oil and Gas Stip-1). In general, it is not expected that exploratory drilling would have a measurable effect on fish populations in and adjacent to the planning area under this Alternative.

**Effects from Pad, Road, and Pipeline Construction.** Development of one gas field in the Koggiling Block would require the construction of a gravel road system linking the six exploration wells. Impacts from pad, road, and pipeline construction are mainly increased erosion and sedimentation, subsurface and surface flow disruption, and increased pollution in runoff.

**Effects of Spills.** Oil spills can have a range of effects on fish (Malins 1977; Hamilton et al. 1979; Starr et al. 1981). The specific effects depend on the concentration of petroleum present, the length of exposure, and the stage of fish development involved (eggs, larva, and juveniles are most sensitive). If lethal concentrations are encountered (or sub-lethal concentrations over a long enough period), fish mortality is likely to occur. Alternative B assumes the development of one gas field in the Koggiling Creek planning block. Some small-scale spills can be anticipated associated with fueling or storage, but these would be less than one barrel. Transport of crude oil (via pipelines or other modes of transport) would not occur associated with this development, nor is oil development and extraction expected to occur within the life of the plan.

**Locatable Minerals.** This Alternative allows for the greatest amount of exploration and development for locatable minerals through the revocation of all ANCSA 17(d)(1) withdrawals. According to the Reasonable Foreseeable Development Scenario for Locatable Minerals, development of both lode and placer mines may not occur on BLM lands because of the ANILCA 906(e) Top Filings in the Goodnews planning block. Surface disturbance of 115 acres (BLM 2006) is anticipated to occur on State- and Native-selected lands with 18 acres of disturbance on Federal mining claims. Roads or infrastructure in support of mineral development could affect BLM land. For general mining impacts to fisheries, see "Effects Common to All Alternatives." These impacts would occur to a greater degree under this Alternative than under Alternatives A or C and would be similar under Alternative D.

The ROPs (Appendix A) common to Alternatives B, C, and D are designed to minimize or prevent impacts from erosion, altered stream flow, stream crossings, and riparian impacts. Strict adherence to the ROPs would minimize effects to fish and fish habitat within the planning area. The protection provided to fish and fish habitat under Alternatives B, C, and D would be superior to that provided under Alternative A. ROP FW-6a, which applies a 300-foot buffer to specific rivers and streams on BLM lands, would not apply under this alternative.

**Salable Minerals.** Under Alternative B, salable mineral activities may occur. Under this Alternative and Alternatives C and D, Required Operating Procedures would minimize the effects of gravel extraction on fish by avoiding gravel extraction from active channels and anadromous streams. The protection provided to fish and fish habitat under Alternatives B, C, and D would be superior to that provided under Alternative A.

Gravel extraction from fish-bearing streams or tributaries can block and reroute stream channels and increase silt concentrations resulting in reduced primary production, loss of invertebrate prey species, and disruption of feeding patterns for sight dependent feeders (Branson and Batch 1971, Cooper 1965). This plan assumes little or no salable mineral activities will occur on BLM lands, except within the Koggiling Creek planning block in support of leasable mineral activities (BLM 2006). This assumption is based on the fact that most existing gravel pits are located on private land and are much closer to existing infrastructure than BLM lands.

### **(3) Effects to Fisheries and Aquatic Habitat from Recreation (Alternative B)**

This Alternative would allow areas currently managed for primitive or semi-primitive recreation opportunities to trend towards a Roded natural recreation opportunity. A Roded natural ROS class includes more roads and development though a generally natural setting is still provided. Development of recreation facilities and increased recreation use associated with a Roded natural recreation setting would result in potentially greater impacts to fisheries and aquatic habitat. This Alternative has more potential for impacts to fisheries and aquatic habitat than Alternatives A, C, or D.

### **(4) Effects to Fisheries and Aquatic Habitat from Travel Management (Alternative B)**

Under Alternative B, BLM-managed lands would be designated as "open" to OHV use, resulting in some continued localized impacts from erosion due mainly to unauthorized stream crossings. Locations that may include important fish habitat have not been identified. Inventoried OHV trails have authorized anadromous stream crossings with a permit from the State Department of Natural Resources. The

unauthorized and unmanaged proliferation of trails could increase under this Alternative with a resulting increase in erosion and sediment impacts. Potentially adverse effects to fish habitat from OHV use are discussed under “Effects Common to All Alternatives.”

**(5) Effects to Fisheries and Aquatic Habitat from ACEC designations (Alternative B)**

Under Alternative B, there would be no ACEC designations. Without ACECs, there would be fewer area-wide constraints on resource development and less resource-specific protective measures applied.

**(6) Effects to Fisheries and Aquatic Habitat from Wild and Scenic River Nominations (Alternative B)**

Under Alternative B, there would be no Wild and Scenic Rivers recommended for designation under the National System. Additional protections of fish habitat would be limited to those outlined in the ROPs and Stipulations and constraints developed through project-specific NEPA analysis.

**d) Effects to Fisheries and Aquatic Habitat for Alternative C**

**(1) Effects to Fisheries and Aquatic Habitats from Lands and Realty (Alternative C)**

**Disposal or Land Exchange.** Impacts are the same as those discussed under Alternative B.

**Withdrawals.** Alternative C would retain 17(d)(1) withdrawals for the proposed Wild River segments of Alagnak, Goodnews mainstem, and Goodnews Middle Fork (12,210 acres) and the Carter Spit ACEC (61,251 acres). The potential level of withdrawal retention would be greater under Alternatives A and C compared to Alternatives B and D. The protection provided to fish and fish habitat under Alternatives A and C would be superior to that provided under Alternative B and D.

**Rights-of-Way.** Under Alternative C, the proposed Bristol Bay ACEC (974,970 acres) and the proposed Carter Spit ACEC (61,251 acres) would be identified as avoidance areas for Rights-of-Way. The potential level of avoidance for Rights-of-Way would be greater under Alternatives C and D than under Alternatives A and B. The protection provided to fish and fish habitat under Alternative C would be superior to that provided under Alternative A, B, or D.

**(2) Effects to Fisheries and Aquatic Habitats from Leasable, Locatable, and Salable Minerals (Alternative C)**

**Fluid Leasable Minerals.** Alternative C would retain ANSCA 17(d)(1) withdrawals for proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork (12,210 acres) as an interim measure to provide an opportunity for Congressional action. Additionally, ANSCA 17(d)(1) withdrawals would be retained within the Carter Spit ACEC (61,25 acres). Retention of these ANSCA 17(d)(1) withdrawals would further minimize impacts to fish from what limited leasable mineral activity that might occur. There would also be a 300-foot area of No Surface Occupancy on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek (Appendix A, Stipulation 8). These constraints and protective measures would result in less land being available for mineral leasing than under Alternatives B and D. However, this Alternative still anticipates development of one gas field in the Koggiling Creek planning block. Potential effects to fisheries and aquatic habitats in the Koggiling Creek planning block would be similar to those described under Alternative B. The Koggiling Creek planning block is located within the proposed Bristol Bay ACEC which would be designated a rights-of-way avoidance area, resulting in limited road development in support of leasable mineral development. This avoidance area would reduce adverse impacts to Fisheries and Aquatic Habitats associated with road development.

**Locatable Minerals.** ANSCA 17(d)(1) withdrawals would be revoked and 1,064,313 acres of BLM land would be open to mineral entry. Upon revocation of ANSCA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral

entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA.

The anticipated level of locatable mineral activity under Alternative C would be similar to that identified under Alternative A. ANSCA 17(d)(1) withdrawals would be retained for proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork (12,210 acres) as an interim measure to provide an opportunity for Congressional action. The potential level of locatable mineral development could be slightly greater under Alternatives B and D than under Alternative C, but the protection provided to fish and fish habitat under Alternatives B and C would be superior to that provided under Alternative A due to the implementation of Required Operating Procedures.

**Salable Minerals.** Under Alternative C, the proposed Carter Spit ACEC (61,251 acres), the proposed Bristol Bay ACEC (974,970 acres); and the proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork (12,210 acres) would be closed to salable mineral development. Under Alternatives B, C, and D, Required Operating Procedures would minimize the effects of gravel extraction on fish by avoiding gravel extraction within active channels and anadromous streams. This alternative anticipates no development of salable minerals.

### **(3) Effects to Fisheries and Aquatic Habitat from Recreation (Alternative C)**

Because BLM-managed lands would be managed for a semi-primitive motorized recreation experience, effects to fisheries from recreation would be similar to those described under Alternative A.

### **(4) Effects to Fisheries and Aquatic Habitat from Travel Management (Alternative C)**

**Off-Highway Vehicles.** Under Alternative C, OHV use would be limited to existing roads and trails, providing less opportunity for potential impact to fisheries and aquatic habitat compared to Alternatives A or B. Under this Alternative, OHV trails would be managed with the objective of minimizing the proliferation of trails. Locations that may include important fish habitat have not been identified. OHV trails crossing anadromous streams will be authorized by permit from the State Department of Natural Resource. Potentially adverse effects to fish habitat from OHV use are discussed under "Effects Common to All Alternatives." These effects would occur to a lesser degree under Alternatives C and D than Alternatives A or B. Alternative C includes a vehicle weight restriction of 2,000 pounds gross vehicle weight rating (GVWR includes load capacity).

### **(5) Effects to Fisheries and Aquatic Habitat from ACEC designations (Alternative C)**

Alternative C would designate two ACECs, Carter Spit (61,251 acres) and the Bristol Bay (974,970 acres). Within the Carter Spit ACEC, ANSCA (d)(1) withdrawals would be maintained, thus prohibiting new leasing or locatable mineral development, providing continued protection to fisheries and aquatic habitat within the proposed ACEC.

Both ACECs will restrict salable mineral activities and be designated as right-of-way avoidance areas providing additional protection to fisheries and aquatic habitat. Designating Right-of-Way avoidance areas within the proposed ACECs would provide protection to natural resources because road or pipeline construction would likely not occur. Potential impacts to fisheries and aquatic resources, resulting from road or pipeline construction include; vegetative removal leading to increased siltation of water bodies.

The use of ROPs and Stipulations will reduce impacts to fisheries and aquatic habitat due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals in the proposed Bristol Bay ACEC. A more detailed description of impact to fisheries and aquatic habitat resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

## **(6) Effects to Fisheries and Aquatic Habitat from Wild and Scenic Rivers (Alternative C)**

Under Alternative C, BLM would propose Wild and Scenic River designation for the Alagnak River, Goodnews River mainstem, and Goodnews River Middle Fork river segments.

This proposal would provide protections from development and would provide a mechanism for management of the river's resources. Wild Rivers would allow unobtrusive development and activities, but typically do not allow motorized use. Because of the maintenance of ANCSA 17(d)(1) withdrawals, new mineral entry or leasing would not be permitted; only existing valid claims could be developed. Impacts to fisheries and aquatic habitat from recreation activities may be greater than Alternative A due to the anticipated increase in visitation due to WSR designation. Impacts from mining activities would be similar to Alternative A but less than Alternatives B and D.

## **e) Effects to Fisheries and Aquatic Habitat for Alternative D**

### **(1) Effects on Fisheries and Aquatic Habitat from Lands and Realty (Alternative D)**

**ANCSA 17(d)(1) withdrawals.** Same as Alternative B. ANCSA 17(d)(1) withdrawals would be recommended for revocation. This would open BLM lands to potential leasable and locatable mineral development. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands, selected under ANILCA 906(e), would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under ANILCA 906(e) of ANILCA. Fisheries and aquatic habitat on Top Filed lands would be afforded similar protection upon revocation of ANCSA 17(d)(1) withdrawals. Impacts to fisheries and aquatic habitat on BLM lands not Top Filed would be mitigated through the use of ROPs and Stipulations (Appendix A).

**Rights-of-Way.** Under Alternative D, the Carter Spit ACEC (36,220 acres) would be managed as a right-of-way avoidance area. In most cases, rights-of-way for roads, pipelines, or other developments would not be approved for this area, thus providing a degree of protection for fish and aquatic habitat in the area. Outside of the ACEC, applications for rights-of-way would be handled on a case-by-case basis but appropriate ROPs for protection of fish and aquatic habitat would be applied. Alternative D anticipates a higher level of development than Alternatives A or C and slightly less than B.

### **(2) Effects to Fisheries and Aquatic Habitat from Leasable, Locatable, and Salable Minerals (Alternative D)**

**Fluid Leasable Minerals.** Under Alternative D, ANCSA 17(d)(1) withdrawals would be recommended for revocation, thus making 1,101,304 acres of BLM land available for mineral leasing. This alternative designates an area of No Surface Occupancy 300 feet on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek (Appendix A, ROP FW-6a and Stipulation 8). However, this alternative still anticipates development of one gas field in the Koggiling Creek planning block, six exploratory wells (each disturbing approximately six acres) and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected, over the next 20 years. Potential effects to fisheries and aquatic habitats would be similar to those described under Alternative B.

**Locatable Minerals.** Under Alternative D, the anticipated level of locatable mineral development would be the same as identified under Alternative B, 115 acres, all on BLM, State- or Native-selected or Native (Federal Mining Claim) lands. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. All BLM lands would be subject to Required Operating Procedures (Appendix A). The potential for locatable mineral development is greater under Alternatives B and D compared to Alternatives A and C. Effects would be similar to those described under Alternative B.

**Salable Minerals.** The anticipated level of exploration and development for salable minerals under Alternative D would be similar to that described under Alternative B, but the proposed Carter Spit ACEC (36,220 acres) would be closed. This analysis assumes that there would be little to no mineral material development on BLM lands under this alternative (BLM 2006). According to the RFD for Leasable Mineral, gravel may be required to support gas development operations within the Koggiling Creek planning block.

### **(3) Effects to Fisheries and Aquatic Habitat from Recreation (Alternative D)**

Because BLM-managed lands would be managed for a semi-primitive motorized recreation experience, effects to fisheries from recreation would be similar to those described under Alternative A.

### **(4) Effects to Fisheries and Aquatic Habitat from Travel Management (Alternative D)**

Alternative D includes a limited designation and vehicle weight limit of 2,000 pounds gross vehicle weight rating (GVWR includes load capacity) for all BLM lands. OHV use under Alternative D would be restricted to existing roads and trails, resulting in fewer potential impacts to fish and fish habitat from stream crossings. Additionally, a Travel Management plan would be created (within 5 years of RMP acceptance) for BLM lands, including Carter Spit ACEC, which would designate specific trails for OHV use. This would minimize the proliferation of trails and unauthorized stream crossings in that area. Because of these proposed constraints, this Alternative is expected to result in fewer impacts from OHVs than Alternatives A or B but similar impacts compared the Alternative C.

### **(5) Effects to Fisheries and Aquatic Habitat from ACEC Designations (Alternative D)**

Alternative D would designate the Carter Spit ACEC (36,220 acres). Management within the ACEC would provide stronger protection to fisheries and aquatic habitat through the following measures:

- Requiring Plans of Operations for any mining operation.
- Managing the area as a right-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Developing a transportation plan that identifies specific designated trails for OHV use.

The ACEC will restrict salable mineral activities and be designated rights-of-way avoidance areas providing additional protection to fisheries and aquatic habitat. Designating Right-of-Way avoidance areas within the proposed ACECs would provide protection to natural resources because road or pipeline construction would likely not occur. Potential impacts to fisheries and aquatic resources, resulting from road or pipeline construction include; vegetative removal leading to increased siltation of water bodies.

The use of ROPs and Stipulations will reduce impacts to fisheries and aquatic habitat due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals in the proposed ACEC. A more detailed description of impact to fisheries and aquatic habitat resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

### **(6) Effects to Fisheries and Aquatic Habitat from Wild and Scenic Rivers (Alternative D)**

This Alternative would not recommend any rivers for inclusion in the National Wild and Scenic River system. ANCSA 17(d)(1) withdrawals would be recommended for revocation allowing for mineral entry.

## f) Essential Fish Habitat

Although there are no Federally-managed fisheries on BLM land in the planning area, the ranges of the five species of Pacific salmon found within the plan boundaries are under the jurisdiction of the North Pacific Fisheries Management Council. The Magnuson-Stevens Act calls for direct action to stop or reverse the continued loss of fish habitats for species that are under this jurisdiction. Essential Fish Habitat (EFH) is a specific classification term that only applies to the habitat of Pacific salmon and not to any other species in the planning area. EFH is defined as those waters and substrate necessary to salmon for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH, “waters” include aquatic areas that are used by fish and their associated physical, chemical, and biological properties and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ entire life cycle (National Marine Fisheries Service 2005).

For Alaska, freshwater EFH includes all streams, lakes, ponds, wetlands, and other waterbodies that have been historically accessible to salmon. A significant body of information exists on the life histories and general distribution of salmon in Alaska. The locations of many freshwater waterbodies used by salmon are described in documents organized and maintained by the Alaska Department of Fish and Game. Alaska Statute 16.05.870 requires ADF&G to identify the various streams that are important for spawning, rearing, or migration of anadromous fish. The agency met its statutory obligation with publication of the *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes* (ADF&G 1998a) and the *Atlas to the Catalog of Waters Important for Spawning, Returning or Migration of Anadromous Fishes* (ADF&G 1998b). The catalog lists waterbodies documented to be used by anadromous fish. The atlas shows locations of these waters and the species and life stages that use them. Maps 3.13 a-d show the location of these streams in the planning area.

Potential impacts to the salmon that inhabit the planning area would be the same as described for other fish. Consequently, impacts to salmon as part of EFH, have been evaluated in the general fish analysis above. For the reasons described under Alternatives B and D and through adherence to protective ROPs and Stips, EFH is likely to be largely unaffected under the proposed development activities probable during the life of this plan.

## 5. Direct and Indirect Effects to Wildlife and Wildlife Habitat

### a) Direct and Indirect Effects to Wildlife Common for All Alternatives

Proposed management of the following resources/resource uses/programs would have no anticipated impacts to wildlife management: Air Quality, Fisheries Management, Special Status Species, Cultural Resources, Paleontological Resources, Visual Resources, Forestry, and Subsistence.

#### (1) Effects to Wildlife from Soil, Water, and Vegetation and Air Management (Common to All Alternatives)

There would be beneficial effects to wildlife and wildlife habitat from proper management of soils, vegetation, and water resources. Implementation of ROPs and Stipulations to protect soil, water, vegetation, and air would reduce habitat disturbance and aid in the recovery of habitat from permitted uses.

## **(2) Effects to Wildlife from Fire and Fuels Management (Common to All Alternatives)**

A large percentage of the planning area is comprised of herbaceous or shrub habitats. Fire is less prevalent in these vegetation types compared to boreal forests; therefore, effects of fire on wildlife and habitats are lower in the planning area than for Interior Alaska.

Fire has both direct and indirect effects on wildlife and their habitats. These effects are described in detail in the Land Use Plan Amendment for Wildland Fire and Fuels Management for Alaska (BLM 2004). Generally, the effects on habitat are much greater than the effects on resident animals. Short-term negative impacts from fire on resident wildlife include displacement, disruption of reproductive activities, and occasional mortalities. However, populations of certain species can recover quickly if suitable habitat is available. Adverse effects to current individuals are generally offset by the advantages of beneficial habitat changes for future generations.

Fire helps maintain a mixture of vegetation types and age classes that provide habitat and forage for a variety of wildlife. Fire alters habitats and may improve habitat components for some species while degrading habitat for other species. Over time, as vegetation recovers from fire disturbance, various species of wildlife will benefit from various successional stages of vegetation. Herbivores are directly affected by the changes in vegetative cover and forage associated with fire, whereas predators respond to both changes in cover and abundance of prey.

Wildlife has evolved in the presence of fire and has adapted to it. Overall, a natural fire regime has a beneficial effect on maintaining a diversity of wildlife and wildlife habitats. Grasses, sedges and herbaceous plants that quickly re-sprout after fire, provide forage and cover for small mammals, wet and alpine tundra birds, and grazing species. Browsers such as moose, hares, and ptarmigan benefit from fire when trees and shrubs re-establish themselves. If fires are not too severe, sprouting of some shrub species will occur soon after burning.

Moose generally benefit from fire due to increased production of high quality browse for 23-30 years after fire (McCracken and Viereck 1990). Prescribed fires are a management tool used to increase moose habitat. Moose populations generally react in a strongly positive manner to areas with increased browse. The level of effect is variable, depending upon the health of the moose population prior to the fire and the amount of browse available. If browse is not a limiting factor on moose populations, then fire will have little impact on populations over the short-term (BLM 2004b).

The short-term effects of fire on caribou winter range are negative, and vary depending upon the severity of the burn. Lichens, which are primary winter forage for caribou, are highly susceptible to wildland fire. Impacts to habitat include reduced availability of forage lichens for up to 80 years after a fire (Klein 1982, Joly et al. 2003). On caribou summer ranges, forage quality of vascular plants is improved by fire. Fire also affects caribou movement patterns. Research has shown that caribou actively avoid burned areas for 35-50 years after a fire (Joly et al. 2003). Over the long-term, fire is likely beneficial to caribou as it helps maintain the ecological diversity of the habitat and may prevent mosses from out-competing forage lichens. Light fires may rejuvenate stands of lichen and replace old forest stands where lichen has been replaced by moss. Periodic fires create a mosaic of fuel types and fire conditions that naturally preclude large, extensive fires (BLM 2004b).

Fire is very rare in subalpine habitats used by Dall sheep. Fire may enhance sheep habitat by reducing encroachment of shrubs and spruce into subalpine habitats. Fire can also increase the amount or quality of herbaceous and graminoid forage available, and reduce cover used by bears and wolves when hunting sheep.

Fire has both beneficial and negative effects on bears. Beneficial effects include increasing the availability of forage plants such as berries, grasses and forbs. On the negative side, some forage species may be reduced or temporarily eliminated by fire. Moose calves are an important prey item for both black and grizzly bears. Early stages of plant succession due to fire tend to increase moose

production, resulting in more calves available for prey (BLM 2004b). Fire has little direct effect on grizzly bears as it is infrequent in tundra habitats, and tundra fires tend to be small.

The effects of fire on furbearers are variable, depending on the species. Carnivorous furbearers (e.g., coyote, fox, wolf, wolverine, lynx) respond to fire in a manner similar to their prey species, though there tends to be a lag period. If prey species benefit from fire, predators do as well. Snowshoe hares, voles, and other small mammals tend to respond positively to vigorous re-growth triggered by wild fires. Species such as marten and lynx tend to increase as well, tracking these prey species (Johnson et al. 1990). Fire is not common in the coastal habitats favored by Arctic foxes, and so they are minimally affected. Herbivorous furbearers (such as muskrats) may benefit from fire due to rejuvenation of forage plants and maintenance of open water. Beavers may be negatively affected by severe fires until forage species re-colonize the area.

Fire near wetlands can consume dead grass and sedges, opening up dense marsh vegetation to maintain habitat for waterfowl. Burning also stimulates new shoots that have greater forage value. Under the right conditions, fire may create new ponds or prevent old ponds from filling in with vegetation. Fire can have short-term negative effects on waterfowl when it occurs during nesting or molting periods, or when it eliminates woody vegetative cover (BLM 2004b).

### **(3) Effects to Wildlife from Hazardous Materials (Common to All Alternatives)**

Hazardous materials in the planning area have the potential to enter the food chain and contaminate wildlife species that are consumed by humans, causing negative health effects. This could occur in sport hunted species, and particularly in subsistence species where human consumption levels are higher. Hazardous materials may also directly and indirectly affect wildlife by causing direct mortality, reduced survival, and reduced productivity, thereby reducing species abundance.

The hazardous materials program could have a beneficial effect on wildlife by identifying and rehabilitating hazardous sites.

### **(4) Effects to Wildlife from Mineral Development (Common to All Alternatives)**

**Locatable Minerals.** Locatable mineral exploration and development may occur under every Alternative. Potential impacts to wildlife would include temporary displacement in localized areas, temporary and long term loss of habitat, long-term degradation of habitat, and possible direct mortality of small mammals or nestlings and brooding birds. Both direct and indirect impacts may be reduced under all Alternatives with implementation of the Required Operating Procedures (Appendix A).

**Salable Minerals.** Salable mineral activities have both direct and indirect impacts on wildlife and their habitat. Habitat is degraded or destroyed, depending upon the location of the material site. Some sites may recover to the original vegetation cover within a relatively short time frame. Other sites may never passively recover to the original vegetative cover due to loss of soil from the site. In some cases, disturbance to the site by mining of mineral materials may result in improved habitat for species which depend upon habitats in a low seral stage. Temporary displacement and disturbance impacts would occur to larger and more mobile animals. Direct mortality may result to smaller and less mobile animals such as lemmings, voles, or nestling birds. Both direct and indirect impacts may be reduced under all Alternatives with implementation of mitigation measures developed through project-specific NEPA analysis.

Impacts to wildlife from mineral materials mining on BLM lands would be minimal under all Alternatives. Sufficient material sources exist on private lands to meet the needs of most communities within the planning area (BLM 2006).

#### **(5) Effects to Wildlife from Recreation Management (Common to All Alternatives)**

There may be impacts to wildlife from both commercial and non-commercial recreation activities. The primary impacts may be temporary stress, displacement, or habitat abandonment of wildlife due to recreational activities, or to recreation associated access (aircraft overflight and landing in remote areas). In areas that are repeatedly used for camping sites, there may be minor, site-specific degradation of habitat. Special recreation permits for guiding and outfitting may result in population effects on caribou, moose, and bears.

#### **(6) Effects to Wildlife from Travel Management (Common to All Alternatives)**

The noise and activity associated with OHV use (including snowmachines) can adversely affect wildlife both directly and indirectly. Direct effects include stress and displacement of animals, possibly to less suitable habitats, especially in important seasonal habitats. Stress and displacement may result in reduced productivity (ADF&G 1990). Changes to traditional movement patterns and distribution and behavior of wildlife can result from exposure to OHVs. Wildlife are particularly vulnerable to disturbance at periods of time and in areas of concentration such as caribou calving grounds, or during stressful periods during their life cycle (i.e. caribou and moose calving, post calving aggregations, winter habitats, bear natal dens and foraging concentrations, bird nesting and staging areas). OHV use may result in habitat abandonment or changes in density or species population, age, and sex composition in the vicinity of trails.

Indirect effects include habitat degradation and alteration, and increased access into habitats. Remote areas will become more accessible over time as OHVs become more powerful and as the human population in the planning area increases. Improved technology and increased demand for resources may lead to increased harvest of wildlife. Snowmachine use compacts snow and may inhibit movement under the snow by small rodents. Fragile habitats such as wetlands and riparian areas may be degraded seasonally by OHV use.

#### **(7) Effects to Wildlife from Renewable Energy (Common to All Alternatives)**

Renewable energy sources such as wind could be developed on BLM lands within the planning area under all Alternatives. Should such development take place, there would be both direct and indirect impacts on wildlife. Direct impacts would include disturbance during construction and maintenance activities, mortality due to bird strikes on wind towers, and mortality of small, less mobile animals such as small mammals or nestling birds during construction and maintenance. Indirect impacts would include minor loss of habitat due to facility construction. Higher mortality may be expected if wind towers are sighted in bird movement corridors. To be most useful, these types of development need to be located near population centers. However, most land near villages is private. Due to the remoteness of BLM lands, little renewable energy development is anticipated. Actual impacts would be minimal and would not have population level effects. The increasing cost of fuel may make wind energy more cost effective in the future, including power for mineral development. At this time, solar energy technology options do not appear to have the potential for impact on wildlife on BLM lands. Limited opportunity for using available geothermal energy, and local, small scale opportunity for use of solar energy would result in insignificant impacts.

#### **(8) Effects to Wildlife from Climate Change (Common to All Alternatives)**

The climate within the Bay planning area is described as maritime near the coasts, and more transitional farther inland. Current scientific evidence suggests that climate warming in Alaska can be linked to changes occurring in the structure and function of terrestrial ecosystems throughout the state. These changes include the thawing of permafrost, the conversion of tundra to more shrub habitats, and the drying and decrease in areas of closed basin lakes, causing alteration and conversion of wildlife habitats. Climate change has also been linked to changes in disturbance regimes such as fire potential and insect outbreaks, further affecting ecosystem processes and causing habitat changes in some areas. Warming climates may be instrumental in the introduction of disease and parasites previously unknown in the

planning area. Current research suggests that these trends will continue, and will likely occur to a greater extent and magnitude at higher latitudes first. These climatic changes and subsequent habitat changes will impact wildlife by expanding habitats for some species, and limiting habitat for other species, thereby altering the distribution and abundance of some species, particularly those dependent on wetlands, tundra, shrub or closed forest habitats. BLM lands in the planning area will be subjected to these climate and habitat changes.

**(9) Effects to Wildlife from Lands and Realty Actions (Common to All Alternatives)**

There would be both direct and indirect impacts to wildlife from lands and realty actions under all Alternatives. Wildlife may be temporarily displaced or disturbed or movement patterns disrupted during activities authorized under this program. There may be direct mortality and/or habitat abandonment by wildlife species from activities authorized under permits or leases. Wildlife habitat may be destroyed, fragmented, or degraded. Acquisitions and exchanges may benefit wildlife by consolidating land ownership patterns and protecting important wildlife habitats. Disposal action may fragment Blocks of land, remove protections for wildlife habitats, and make them available for other uses detrimental to wildlife.

**(10) Effects to Wildlife from Forestry (Common to All Alternatives)**

Some minimal forestry activity generally occurs within the planning area each year, consisting of small-scale localized timber removal for personal use, including gathering firewood and house logs. While it is unlikely that any type of road construction will occur in conjunction with this activity, it is conceivable that short spurs or temporary roads may be constructed to access parcels of timber in the future. If roads were constructed, there could be localized impacts to habitat, migratory patterns, and wildlife abundance and distribution. Direct habitat loss may lead to wildlife displacement and habitat fragmentation. Surface disturbing activities may displace animals into lower quality habitat and increase competition for available resources with other species. Because of the application of ROPs and the low likelihood of road development in association with limited forestry activities, there would be no significant impacts to wildlife or wildlife habitat from forestry activities under any Alternative.

**b) Effects to Wildlife for Alternative A**

Under the current management system, Alternative A, compliance, monitoring, and mitigation requirements for wildlife are determined on a case-by-case basis during the permitting process.

**(1) Effects to Wildlife from Realty and Lands Actions (Alternative A)**

Impacts to wildlife would be the same as discussed under those Common to All Alternatives. Under this Alternative, no lands would be identified for disposal or land exchange and ANCSA 17(d)(1) withdrawals would be retained. The degree of impacts that would occur to wildlife and wildlife habitat under this Alternative would be less than under Alternatives B, C, or D. Avoidance or exclusion areas and specific mitigation requirements would be identified on a case-by-case basis for Rights-of-Way, including access and utility corridors and ancillary facilities.

**(2) Effects to Wildlife from Leasable, Locatable, and Salable Minerals (Alternative A)**

**Leasable Minerals.** Alternative A would retain all ANCSA 17(d)(1) withdrawals, thus preventing mineral leasing on most BLM lands. This analysis assumes no leasable mineral activities on BLM lands for the life of the plan.

**Locatable Minerals.** Under Alternative A, most BLM lands within the planning area would remain closed to mineral entry due to existing ANCSA 17(d)(1) withdrawals. However, some pre-ANSCA claims exist on BLM lands where some mining may take place or continue. These operations and any future proposals for locatable mineral exploration and development would be subject to review through Notice Level

Administration or administration of Plans of Operations. Measures to maintain the integrity of wildlife habitat in these areas would be developed through project-specific NEPA analysis. This analysis assumes disturbance of 23 acres of BLM and Native (Federal claims) lands under this Alternative, mostly from placer mining operations (BLM 2006). Effects from mining as described under “Effects Common to All Alternatives”. are less likely to occur than under any other Alternative.

**Salable Minerals.** Potential impacts to wildlife would be the same as under “Effects Common to All Alternatives.” No impacts would be expected in areas withdrawn from mineral entry and this analysis assumes no salable mineral activities on BLM lands (BLM 2006) due to the remote location of BLM lands in the planning area.

### **(3) Effects to Wildlife from Recreation Management (Alternative A)**

Under Alternative A, both commercial and non-commercial recreation would continue to be managed on a case-by-case basis. No areas would be identified for commercial or non-commercial use limits. No recreation facility construction would be considered. There may be localized habitat degradation at heavily-used and dispersed campsites. Impacts to wildlife would be the same as discussed under “Effects Common to All Alternatives.”

### **(4) Effects to Wildlife from Travel Management (Alternative A)**

Under Alternative A, there would be no OHV designations within the Bay planning area. No vehicle weight limit would be imposed, and there would be no route restrictions. Cross country travel would not be restricted. Impacts would be similar to those discussed in “Effects Common to All Alternatives.” The degree of potential impacts to wildlife and wildlife habitat from travel management would be greater than in Alternatives C or D.

### **(5) Effects to Wildlife from ACEC Designations (Alternative A)**

Under Alternative A, no Areas of Critical Environmental Concern would be recommended in the planning area. BLM would manage wildlife habitat and would address concerns on a case-by-case basis during the review of permits. ANCSA 17(d)(1) withdrawals would be retained resulting in little impact differential from that which would occur under an ACEC designation.

### **(6) Effects to Wildlife from Wild and Scenic River Nominations (Alternative A)**

Under Alternative A, no Wild and Scenic Rivers would be recommended in the planning area. These areas would be open to all multiple use activities permitted on BLM lands except mineral entry due to retention of ANCSA 17(d)(1) withdrawals.

## **c) Effects to Wildlife for Alternative B**

### **(1) Effects to Wildlife from Lands and Realty Actions (Alternative B)**

**Land Exchanges.** Large blocks of BLM lands would be retained in Federal ownership, reducing the potential for habitat fragmentation. Small isolated parcels identified in Alternative B for disposal could result in privatization of some tracts and could increase levels of access and human activity in wildlife habitat. Wildlife may be displaced from preferred habitats, and habitat may be destroyed or degraded. Exchanges could result in larger, contiguous blocks of BLM lands that are of high wildlife value.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be recommended for revocation under this Alternative. Because of the constraints currently in place under these withdrawals, revocation of the withdrawals could increase potential resource development and wildlife and habitat disturbing activities. Associated impacts to wildlife and wildlife habitat would be expected from minerals activities. Activity level proposals

would be handled on a case-by-case basis, and would be subject to Required Operating Procedures and Stipulations (Appendix A) and constraints developed through project-specific NEPA analysis.

**Rights-of-Way.** This Alternative anticipates the most applications for rights-of-way associated with resource development activities. These would include roads or pipelines associated with mineral development. Effects to wildlife from these activities are described under “Effects Common to All Alternatives”. More effects to wildlife from rights-of-way would be expected under this Alternative than under Alternatives A, C, or D.

## **(2) Effects to Wildlife from Leasable, Locatable, and Salable Minerals (Alternative B)**

### **Fluid Leasable Minerals**

Under Alternative B, ANCSA 17(d)(1) withdrawals would be revoked. Because of the constraints currently in place under these withdrawals, removal of the withdrawals could increase resource development and wildlife and habitat disturbing activities. This analysis assumes the development of one gas field in the Koggiling Block, six exploratory wells (each disturbing approximately six acres) and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected, over the next 20 years. Impacts to wildlife from leasable minerals development could come from several activities:

**Seismic Exploration.** Seismic exploration would have direct impacts on wildlife, including temporary disturbance or stress on wildlife. In one study, seismic activities within 1.15 miles of a grizzly bear den caused changes in heart rate and movement of the female bear and cubs (Reynolds et al. 1986). The investigators suggest that seismic testing activities within approximately 600 feet of the den may cause abandonment of the den.

For approximately the past 15 years, the Mulchatna Caribou Herd has been inconsistent and unpredictable in its choice of overwintering and calving areas within the larger herd range (Hinkes et al. 2005). In spring 2006, there were two large calving groups, one located near Lime Village and the other located south of Koliganek in a generalized area that includes BLM lands. Planning for seismic exploration on BLM lands in the planning area for a time when caribou are not present could prove challenging with such unpredictable behavior (Appendix A, ROP FW-3b).

The National Research Council's report, Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope (2003), suggests that the optimum time to conduct seismic activities in caribou winter range and primary calving areas is in summer when caribou are not present. However, even in winter on winter range, the Committee believed that direct effects on caribou in the National Petroleum Reserve – Alaska in the 1970s and 1980s from low intensity two-dimensional (2-D) surveys with low seismic line density were temporary and minor (NRC 2003). Wintering bands of caribou tend to be small and often widely dispersed, so few caribou would have come in contact with seismic activities at the same time. Additionally, Roby (1978, NRC 2003) suggests that caribou appear least sensitive to human induced disturbance during winter.

Dyer and others (2001) suggest that avoidance of seismic lines and the attendant human activity could reduce caribou's ability to avoid areas of deep snow. Bradshaw and others (1998) propose that the energy costs of multiple encounters with seismic disturbance could increase winter weight loss and reduce calf production and survival (NRC 2003). Under Alternative B, Oil and Gas Lease Stipulations 5 and 6 (Appendix A) would not apply. These Stipulations provide for timing constraints on oil and gas exploration and development activities, including seismic work. Without the application of these timing constraints, the effects described above could be more pronounced under this Alternative.

Information about the effects of noise on moose was gathered for the Mackenzie Gas Project in Canada (AMEC 2005). In a 1974 study recording the response of moose in the Richardson Mountains to fixed-wing aircraft, McCourt and others found that of 46 observations, moose reacted visibly to aircraft overflights of less than 60 meters of altitude 55% of the time, and to overflights of 60 meters to 180

meters 37.5% of the time. Moose are known to avoid roads, pipelines and seismic lines (Horesji 1979, Rolley and Keith 1980, Morgantini 1984, Rudd and Irwin 1985, Singer and Beattie 1986, Jalkotzy et al. 1997). Horesji (1979) also reported that moose were less likely to be found within 1 km of seismic lines while seismic operations were underway.

Based on data from prior studies, caribou, moose, and bears can all be hazed away from their habitats by seismic testing. The following factors would be essential in the degree of effects:

- The timing and location of tests and whether caribou, moose, or bears are present or absent.
- The number of seismic lines involved, the amount of temporary infrastructure developed, and the amount of ancillary human activity accompanying the testing, including helicopter activities.
- The total duration and intensity of the project or cumulative projects in a specific area.
- The type of testing, subsurface or above ground; 2-D or 3-D procedures.

Seismic camps may provide additional food sources for foxes and bears at dumpster sites near the galley and dining halls and at dump sites (Eberhardt et al. 1982, Rodrigues et al. 1994). However, seismic crews are required by to incinerate and remove waste materials from BLM lands (Appendix A, Section D). This activity is not expected to enhance the survival of foxes. Bears would generally be hibernating during seismic exploration because it is carried out in winter, and would not be expected to be affected by human sources of food. Testing by helicopter-supported ground crews could easily be done in summer months (which has been the case in the past) and so would also be expected not to be a source of impacts.

Small mammals (lemmings, voles) and their predators would be affected locally at camps and along seismic lines by direct mortality and loss of habitat. The numbers lost would be insignificant in the greater population.

Should seismic surveys occur during winter months, many birds are absent from the region. Overwintering birds, including ravens, ptarmigan, and gyrfalcons, could be temporarily displaced by seismic activities. In the unlikely event that a seismic operation extended into May, disturbance of early breeding season activities of some species could occur. Because the campsites and survey areas are occupied for relatively brief periods and most of the birds are dispersed in relatively low numbers over a large area, the duration of disturbance incidents is likely to be brief and infrequent. Stipulations, Required Operating Procedures, and project-specific requirements such as those describing seasonal activities and buffers would minimize potential impacts.

Indirect impacts to wildlife from seismic operation may include degradation of habitat (impacts to soil and vegetation) due to seismic exploration. These types of impacts would be reduced by implementation of the Required Operating Procedures (Appendix A), including limiting seismic surveys to the winter when the ground is frozen and covered with snow.

**Exploratory Drilling.** Effects to wildlife from exploratory drilling for oil and gas would be similar to those discussed under seismic exploration. As exploratory drilling should occur during winter, potential disturbance would come primarily from aircraft, surface traffic, and activities associated with road and drill pad construction. Numerous studies show that wildlife such as caribou react to low flying aircraft by exhibiting various behaviors from panic to strong escape responses (Calef et al. 1976). Disturbance reactions to each incident with aircraft would be brief, lasting only minutes to less than one hour; however, effects of cumulative incidents must also be considered. Wildlife may be temporarily disturbed from ground traffic and activities associated with ice road construction. Wildlife may temporarily avoid the local area but would reoccupy the area after exploration activities were complete. Small and less mobile animals such as lemmings and voles may suffer direct mortality during ice road or pad construction. This analysis anticipates the drilling of six exploration wells over a 20 year period, each disturbing approximately six acres. Given the small scale of this development and small area of disturbance, the described impacts should not result in population level effects for any species.

**Development.** Under the Reasonably Foreseeable Development Scenario, one site in the Koggiling Creek planning block of BLM lands is explored and potentially developed for natural gas, and a pipeline is constructed to Dillingham. Using this scenario, the following effects could occur.

Although initial construction could occur primarily during winter, development of leasable mineral resources would bring year-round facilities and activities to wildlife habitat on BLM lands in the southern part of the Nushagak – Kvichak drainages. Potential effects of development activities include direct habitat loss for bears, caribou, moose, waterfowl, small mammals and their predators, and other animals from gravel extraction and oil field facilities. Indirect habitat loss may occur through (habitat fragmentation) reduced access caused by physical or behavioral barriers created by roads, pipelines, and other ancillary facilities, and by road and air traffic. Depending on location and season, leasable mineral activities could result in increased disturbance and mortality to individual animals from routine aircraft operations, gravel-extraction operations, presence of gravel pads and facilities, and associated improved human access for vehicle and foot traffic from both workers and the general public.

For example, the National Research Council (2003) found that intensive oil and gas development on the North Slope has altered the distribution of female caribou during the summer insect season, and that elsewhere a network of roads, pipelines, and facilities has interfered with caribou movements between coastal insect relief and inland feeding areas. Radio-collared female caribou west of the Sagavanirktok River shifted their calving concentration area from developed areas near the coast to undeveloped areas inland, to an area of lower green-plant biomass. During a six year period, parturition rates of radio-collared females in regular contact with oil-field infrastructure were lower than those of undisturbed females, exacerbated by intense insect harassment during the period. Possible consequences of these disturbances include reduced nutrient acquisition and retention throughout the calving and midsummer periods, poorer condition in autumn, and a lowered probability of producing a calf the following spring (NRC 2003). While these impacts have occurred on more intensive oil and gas development, this level of development is not predicted for BLM lands in this area, based on findings presented in the Reasonably Foreseeable Development Scenario for Fluid Minerals (BLM 2006).

Disturbance and stress impacts would be similar to those discussed under Seismic Exploration, but would be more extensive and long term due to yearlong exposure. Various species could be affected to some extent by disturbance events such as passage of aircraft, although most incidents are expected to result in negligible effects from which individuals would recover within hours to a day. However, the cumulative effect of repeated disturbance could extend for longer periods and potentially may adversely affect physiological condition, reproductive success, productivity, and the use of key seasonal and life function habitats.

Disturbance impacts to grizzly bears would be similar to those discussed under seismic impacts. A similar effect could occur from construction activities within 600 feet of dens. The National Research Council (2003) found that oil and gas activities on Alaska's North Slope had changed the demographics of the grizzly bear population. Harding and Nagy (1980) found that grizzly bears initially avoid human settlements because of the noise and disturbance, but if the area includes an important food source, some bears are likely to habituate to the noise and human presence, leading to an increase in encounters and mortalities.

Fox populations also increase, primarily because of the availability of human food sources. One concern is that increasing fox populations could affect regional populations of some bird species.

Development of infrastructure in the region may introduce injury or mortality factors such as vehicle collisions. Contaminated food, hydrogen sulfide gas poisoning, and other oil-development related sources could contribute to increased wildlife mortality. Defense of life and property mortality for brown bears could increase with increase in human residence and increased presence of human food.

Other effects on birds observed at other oil and gas sites in Alaska include shifts in nesting distribution of shorebirds and artificially high densities of ravens and gulls (NRC 2003).

**Locatable Minerals.** Under Alternative B, ANCSA 17(d)(1) withdrawals would be revoked and 1,102,489 acres of BLM land would be open to mineral entry. Dependent on gold prices, existing locatable mining operations may continue and a moderate increase in small placer operations on BLM lands could occur during the life of this plan. This analysis predicts a total of 115 acres of surface disturbance on BLM lands from locatable mineral activities for Alternative B (BLM 2006). Large operations could be possible, but would most likely occur on State or Native lands (BLM 2006). Roads or infrastructure necessary for those operations, however, could cross BLM lands.

Approximately 3,968 acres would remain withdrawn due to Agency withdrawals. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Existing mining operations and any future proposals for locatable mineral exploration and development would be subject to review and Required Operating Procedures (Appendix A). Measures to maintain the integrity of wildlife habitat in these areas would be implemented.

The Required Operating Procedures common to Alternatives B, C, and D are designed to minimize or prevent impacts to wildlife and wildlife habitats. Strict adherence to the ROPs would minimize effects to wildlife and wildlife habitat within the planning area. Effects described under “Effects Common to All Alternatives” would have a greater potential to occur under this Alternative than under Alternatives A and C.

**Salable Minerals.** If mineral material development occurred in support of leasable mineral activity, the effects would be similar to those described under “Effects Common to All Alternatives.” This analysis anticipates little to no development of mineral material sites on BLM lands (BLM 2006).

### **(3) Effects to Wildlife from Recreation (Alternative B)**

Under Alternative B, lands would be managed as Rodeo Natural under the Recreation Opportunity Spectrum. This ROS setting is characterized by a generally natural environment with moderate evidence of sights and sounds from humans. Resource modification and utilization practices are evident and concentration of users can be moderate. Consequently, the effects to wildlife described under “Effects Common to All Alternatives” would occur to a greater degree than under Alternatives A, C, or D.

### **(4) Effects to Wildlife from Off-highway Vehicles (Alternative B)**

Under Alternative B, all lands would be open to OHV use and there would be no route restrictions. Lack of restrictions in this Alternative would mean that cross country travel would be allowed everywhere on BLM lands within the planning area. An increase in habitat degradation would continue at the current rate due to unrestricted OHV access. Adverse impacts to fisheries resulting from OHVs crossings streambeds may impact terrestrial predators and scavengers by altering availability, seasonal abundance, and distribution of important fish-related food resources.

### **(5) Effects to Wildlife from Designations of Areas of Critical Environmental Concern (Alternative B)**

There would be no ACECs designated under this Alternative. This would result in fewer constraints to resource development and more lands available to resource development.

### **(6) Effects to Wildlife from Wild and Scenic River Nominations (Alternative B)**

Under Alternative B, there would be no Wild and Scenic River nominations and any ANCSA 17(d)(1) withdrawals associated with the rivers would be recommended for revocation. This would result in fewer constraints to resource development and more lands available to resource development.

## d) Effects to Wildlife for Alternative C

### (1) Effects to Wildlife from Realty and Lands Actions (Alternative C)

**Land Exchanges.** Impacts to wildlife from land exchanges and acquisitions would be the same as described for Alternative A.

**Withdrawals.** Under this alternative, ANCSA 17(d)(1) withdrawals would be maintained on proposed wild river segments on the Alagnak, Goodnews mainstem and Goodnews Middle Fork (12,210 acres) and within the Carter Spit ACEC (61,251 acres). This would be beneficial for wildlife habitat because it would prohibit mineral entry or leasing and potential mineral development.

**Rights-of-Way.** Impacts to wildlife from Rights-of-Way would be the same as described under “Effects Common to All Alternatives.” However, the proposed Bristol Bay and Carter Spit ACECs would be identified as avoidance areas. This would provide additional protection to wildlife habitats by restricting Right-of-Way development which may degrade or fragment habitat.

### (2) Effects to Wildlife from Leasable, Locatable, and Salable Minerals (Alternative C)

**Leasable Minerals.** Under Alternative C, ANCSA 17(d)(1) withdrawals would be revoked, opening 1,063,129 acres of BLM lands within the planning area to mineral entry. ANCSA 17(d)(1) withdrawals would be retained on eligible/suitable Wild Rivers (12,210 acres) including the Alagnak, Goodnews and Goodnews Middle Fork Rivers and within the proposed Carter Spit ACEC (61,251 acres). The retention of these withdrawals would prohibit mineral leasing within these areas. There would be No Surface Occupancy within 300 feet of the East and South Fork Arolik River, Faro Creek, South Fork Goodnews River and Klutuk Creek. This analysis predicts the development of one gas field in the Koggiling Creek planning block, six exploratory wells (each disturbing approximately six acres) and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected, over the next 20 years. Potential impacts to wildlife from such a development are the same as those discussed under Alternative B. However, under this alternative there is less land available for mineral leasing compared to Alternatives B or D.

**Locatable Minerals.** The effects to wildlife from locatable mineral activities would be the same as those in Alternative B, except segments of eligible/suitable Wild Rivers (12,210 acres) including the Alagnak, Goodnews and Goodnews Middle Fork Rivers of the Alagnak River, the mainstem of the Goodnews River, and the Goodnews Middle Fork, and the proposed Carter Spit ACEC, (61,251 acres) would retain ANCSA 17(d)(1) withdrawals precluding mineral entry in these areas. Conservation of these areas would benefit by protecting important habitats. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Under Alternative C, there is less land available for mineral leasing compared to Alternatives B or D.

**Salable Minerals.** Impacts to wildlife would be similar to those in Alternative B except the proposed Carter Spit ACEC, the proposed Bristol Bay ACEC, and segments of the Alagnak, Goodnews mainstem and Goodnews Middle Fork River proposed for Wild and Scenic River designation would be closed to salable mineral activities. The closure of the Bristol Bay ACEC would restrict salable mineral activities in conjunction with leasable mineral activities in the Koggiling Creek planning block. This Alternative would provide the highest protection to wildlife populations and habitat from salable mineral activities because less acreage would be available.

### (3) Effects to Wildlife from Recreation (Alternative C)

Under Alternative C, the entire recreation area setting would be managed for ROS classes semi-primitive motorized. No facilities would be constructed and vegetation and soils are predominantly natural but

localized areas of disturbance may exist (Table 2.9). Impacts to wildlife would be the same as those described under Alternative A.

#### **(4) Effects to Wildlife from Off-highway Vehicles (Alternative C)**

Under Alternative C, all lands would receive a “limited” designation for OHV use, which would require vehicles to stay on existing trails whenever possible. A vehicle weight limit of 2000 pounds would be proposed. These restrictions would benefit wildlife by reducing the proliferation of trails and degradation of habitats, and would reduce the indirect impacts to wildlife created by noise and disturbance.

#### **(5) Effects to Wildlife from Wild and Scenic Rivers Nominations (Alternative C)**

Under Alternative C, segments of the Alagnak, Goodnews mainstem and Middle Fork Goodnews Rivers would be proposed for inclusion to the National WSR system. ANSCA 17(d)(1) withdrawals would be retained, closing these river corridors to mineral activities. These actions would be beneficial to wildlife by protecting riparian habitats from disturbance, from resource development activities, and by providing undisturbed wildlife habitats to riparian species. A Wild and Scenic River nomination or subsequent designation could have the effect of increasing visitation on the river. This could increase recreation impacts such as bank trampling, campsite impacts, and litter. Impacts to associated wildlife habitat would be very limited.

#### **(6) Effects to Wildlife from designation of Areas of Critical Environmental Concern (Alternative C)**

Under Alternative C, the Carter Spit ACEC (61,251 acres) and the Bristol Bay ACEC (974,970 acres) would be proposed. These designations would benefit wildlife habitat through the following actions:

- Requiring Plans of Operations for any mining operation, even those less than five acres.
- Managing the area as a rights-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Seasonal constraints to protect the Steller's eider would be developed in the Carter Spit ACEC (Appendix A, ROP SS-1a).

Both ACECs will restrict salable mineral activities and be designated as rights-of-way avoidance areas providing additional protection to fisheries and aquatic habitat. Designating Right-of-Way avoidance areas in the proposed ACECs would provide protection to natural resources because road or pipeline construction would likely not occur. Potential impacts to wildlife, resulting from road or pipeline construction may include; removal of vegetative leading to habitat degradation, increased stress to wildlife from increased human presence, or habitat abandonment.

The use of ROPs and Stipulations will reduce impacts to wildlife due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals in the proposed Bristol Bay ACEC. A more detailed description of impacts to wildlife resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

### **e) Effects to Wildlife for Alternative D**

#### **(1) Effects to Wildlife from Realty and Lands Actions (Alternative D)**

**Land Exchanges.** Impacts to wildlife habitat would be the same as those discussed for Alternative B.

**Withdrawals.** Impacts to wildlife habitats from removing ANSCA 17(d)(1) withdrawals would be the same as those in Alternative B.

**Rights-of-Way.** Impacts to wildlife from Rights-of-Way would be the same as those for Alternative B; however, the proposed Carter Spit ACEC would be identified as a right-of-way avoidance area. This would benefit wildlife habitat by reducing the potential for road or pipeline development in the area.

**(2) Effects to Wildlife from Mineral Development (Alternative D)**

**Leasable Minerals.** Under Alternative D, ANCSA 17(d)(1) withdrawals would be revoked and 1,101,304 acres of BLM lands would be open to leasable miner activities. A 300-foot No Surface Occupancy area on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek would be proposed (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8). There would be slightly less land available for mineral leasing compared to Alternative B, but more than Alternatives A and C. However, this analysis predicts the development of one gas field in the Koggiling Creek planning block, six exploratory wells (each disturbing approximately six acres) and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected, over the next 20 years under all action Alternatives. Potential impacts to wildlife from such a development are the same as those discussed under Alternative B, with the exception that under Alternative D, stipulations that contain seasonal constraints in areas of caribou calving or high concentration would be applied (Appendix A, ROP FW-3b and Oil and Gas Lease Stipulations 5 and 6).

**Locatable Minerals.** This analysis predicts locatable mining activities to occur on 115 acres State-selected and Native (Federal mining claim) lands (BLM 2006). These anticipated activities would not occur on unencumbered BLM lands because upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. If these lands were to remain in Federal ownership, impacts to wildlife from this level of development would be the same as for Alternative B. At this level of anticipated development and with the application of ROPs in mining Plans of Operations, impacts to wildlife habitat would not be significant at a population level for any species. Within the Carter Spit ACEC, Plans of Operation would be required for any operation (even those less than five acres). This would have the effect of minimizing small-scale exploratory or development activities and would enable BLM to work with the operator in the Plan of Operation to apply ROPs (Appendix A) for protection of resources.

**Salable Materials (Mineral Materials).** Impacts to wildlife would be the same as for Alternative B, except the Carter Spit ACEC (36,220 acres) would be closed to salable mineral activities. This Alternative would benefit wildlife populations by protecting important riparian and coastal habitats located within the ACEC boundary. Salable mineral activities would be expected to occur in support of leasable mineral activities in the Koggiling Creek planning block. Impacts to wildlife and wildlife habitat would similar to those discussed in Alternative B.

**(3) Effects to Wildlife from Recreation (Alternative D)**

Because BLM lands would be managed for a semi-primitive motorized experience, impacts to wildlife would be the same as those discussed in Alternative A.

**(4) Effects to Wildlife from Off-highway Vehicles (Alternative D)**

Under Alternative D, impacts to wildlife from OHV use would be the same as those discussed in Alternative C.

**(5) Effects to Wildlife from Wild and Scenic River Nominations (Alternative D)**

There would be no Wild and Scenic River nominations under this alternative. This would result in more acres available for resource development. Effects to wildlife from anticipated resource development under this alternative are discussed in the topics above.

**(6) Effects to Wildlife from designation of Areas of Critical Environmental Concern (Alternative D)**

Under Alternative D, the Carter Spit ACEC (36, 220 acres) would be designated. This would benefit wildlife habitat in this area by the following measures:

- Requiring Plans of Operations for any mining operation, even those less than five acres.
- Managing the area as a right-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Seasonal constraints to protect federally-listed migratory bird species would be developed. (Appendix A, ROP SS-1a and 1b).

Under Alternative D, there would be one ACEC designation (Carter Spit ACEC). The use of ROPs and Stipulations will reduce impacts to wildlife due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals. A more detailed description of impact to wildlife resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

## **6. Direct and Indirect Effects for Special Status Species: Fish, Wildlife, and Vegetation Species**

### **Direct and Indirect Effects for Special Status Fish Species**

There are no known Special Status fish species in the Bay planning area.

### **Direct and Indirect Effects for Special Status Wildlife Species**

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Special Status Animal Species: Cultural Resources, Paleontological Resources, Visual Resources, Forest Products, Fisheries Management, Wild and Scenic Rivers, and Social and Economic Conditions.

#### **a) Direct and Indirect Effects to Special Status Wildlife Species Common to All Alternatives**

##### **(1) Listed Species (Common to All Alternatives)**

There are four special status species present or potentially present in or adjacent to the planning area. The Eskimo curlew (*Numenius borealis*), listed as endangered under the Threatened and Endangered Species Act, historically nested in the bay planning area, but is currently thought to be extinct in Alaska. The Steller sea lion (*Eumetopias jubatus*), listed as threatened under the Act, is found near shore waters in Bristol Bay and Kuskokwim Bay areas. It may come ashore on the coastal fringes of BLM lands in those areas, alone or in small numbers. The Steller's eider (*Polysticta stelleri*), listed as threatened under the Act, is a sea duck that is found staging during spring and fall migration and molting during the breeding season in coastal tide flats adjacent to BLM lands in the Goodnews Block. The Carter Spit area and the adjacent spits and coastal mudflats are an important spring staging area for Steller's eiders, as birds move to breeding areas on the North Slope (Larned 1998). They provide important molting area for non-breeding birds in summer (Seppi 1997, Shaw et al. 2005). Kittlitz's murrelets (*Brachyrhamphus brevirostris*), a candidate species, have been observed on BLM lands in the Carter Spit area. Kittlitz's murrelets likely breed on talus slopes found in the coastal mountains of the Carter Spit area (Day et al 198x).

**(2) Effects to Special Status Wildlife Species from Soils, Water, Air, and Vegetation (Common to All Alternatives)**

Wildlife Special Status Species would benefit from proper management of soil, water, air and vegetation resources in the planning area. Implementation of mitigation measures to protect these resources on a project-specific basis would reduce disturbance to habitat of special status wildlife and would facilitate the recovery of habitat from permitted uses.

**(3) Effects to Special Status Wildlife Species from Fire and Fire Management (Common to All Alternatives)**

**Listed Species.** Effects on Steller’s eiders are described in more detail in the Land Use Plan Amendment for Wildland Fire and Fuels Management for Alaska Environmental Assessment (BLM 2004). Steller’s eiders are federally-listed as threatened. This species migrates and stages on coastal mudflats and uses near shore waters, but does not breed on BLM lands.

Fire within the breeding habitat of eider species could have negative effects on the breeding population. However, fire frequency in the wet tundra habitat of the coastal planning area is very low, and the threat of wildland fires to the breeding population of Steller’s eider and it’s habitat is negligible. Since fire frequency is so low in these habitats, no fire suppression activity would be likely to occur on BLM lands and there would be no impacts from suppression activities to eiders or their habitat. There is no designated critical habitat within the planning area.

**Candidate Species.** Fire within the breeding habitat of Kittlitz’s murrelet, which uses talus slopes of high mountain habitats for nesting, could have negative effects on the breeding populations. However, fire is rare in these mountainous habitats, and there is rarely adequate vegetation to burn on unstable rock falls and talus slopes. The threat of wildland fire to breeding Kittlitz’s murrelet is negligible. Since fire frequency is so low in these habitats, no fire suppression activity would be likely to occur and there would be no impacts from suppression activities. Other than nesting, this bird inhabits ocean waters and bays, and so would not otherwise be impacted by fire or fire suppression activities.

**BLM Sensitive Species.** Some sensitive species would benefit from fire suppression that minimizes loss of individuals, populations, or habitats. However, fire suppression activities can also affect sensitive species through mortality, disturbance, displacement, and damage or alteration of key habitat components (BLM 2004b).

It is difficult to generalize impacts of fire on passerine birds due to the great variety of habitat requirements. Shrub communities often support the greatest number and diversity of passerine birds (Spindler and Kessel 1980, Kessel 1989). Shrub communities are maintained by periodic fires. Within forested areas, fire creates openings in the forest and provides snags used for nesting, perching, and foraging. Fire may cause direct impacts to birds when it occurs during the nesting season, killing nestlings and destroying nests. Raptors may benefit from fire due to increased populations of small mammals and birds in response to vegetative changes after fire. The timing of the benefit varies, depending upon the type of prey favored by the raptor. Over the short-term, fires reduce cover available for prey species, making them more visible to hunting raptors and other predators.

Fire suppression activities also cause both direct and indirect impacts to wildlife. Wildlife habitat may be destroyed, fragmented, or degraded due to construction of fire breaks or use of OHVs. Small mammals may be killed by the use of mechanized equipment. Mitigation measures designed to reduce the impacts of suppression activities include limitations on the use of tracked, or off-road vehicles; measures to prevent the introduction of invasive or noxious plant species; establishment of riparian buffer zones; and rehabilitation of fire and dozer lines. These types of impacts are expected to be minimal within the planning area as most BLM lands are well removed from the road system, minimizing the potential for the use of mechanized equipment.

Potential direct and indirect effects from fire management include:

- Mortality or injury of adult birds, young, or eggs from smoke inhalation, or crushing by vehicles or equipment used during fire management activities.
- Disturbance or displacement of individuals from smoke, noise, and other human activities associated with fire management operations. This disturbance or displacement may affect foraging, roosting, or reproductive behavior.
- Nest abandonment or mortality of young, resulting in the loss of one year's recruitment.
- Loss or conversion of key habitat components needed for nesting, foraging, roosting, or cover.
- Creation of key habitat components.
- Increased risk of predation associated with removal of cover.
- Changes in the quantity or quality of available forage and prey species.
- Long-term changes in habitat quality or quantity for nesting, roosting, foraging, or cover that affects the ability of a species continuing to occupy an area or facilitating the return of a species to its historic range.

#### **(4) Effects to Special Status Wildlife Species from Livestock Grazing (Common to all Alternatives)**

Special status wildlife species that are found or that have the potential to be found in the planning area are birds, which are present during spring and fall migration for feeding or molting and brooding, generally in the Goodnews Block of BLM lands. Currently there are no livestock grazing or reindeer herding operations in the planning area, and no interest has been expressed or is anticipated within the life of the plan. Requests for grazing permits will be analyzed on a case-by-case basis. Should such activities take place, potential impacts might include trampling of vegetation, cratering and exposure of mineral soils by grazing animals, potential direct mortality of nestling birds or eggs of ground nesting species due to trampling by grazing animals, or by OHVs used in association with herding activities.

#### **(5) Effects to Special Status Wildlife Species from Minerals (Common to all Alternatives)**

**Locatable Minerals.** Some mining exploration and development activity could occur under any Alternative. Potential impacts to special status wildlife would include temporary disturbance or displacement in localized areas, temporary loss of habitat, long-term degradation and loss of habitat, and possible direct mortality of nestling birds or eggs. These impacts would be minimal due to the low level of activity anticipated.

**Salable Materials.** Impacts from salable material acquisition and disposal to special status wildlife would include temporary disturbance or displacement in localized areas, temporary loss of habitat, long-term degradation of habitat, and possible direct mortality of nestling birds or eggs. These impacts would be minimal due to the low level of activity anticipated.

Sufficient salable material sources exist on State and private lands located nearer to most communities than BLM lands.

#### **(6) Effects to Special Status Wildlife Species from Travel Management (Common to all Alternatives)**

The noise and activity associated with OHV use can adversely affect special status wildlife both directly and indirectly. Direct effects include stress and displacement of animals, possibly to less suitable habitats. Stress and displacement may result in reduced productivity (ADF&G 1990). Changes to traditional movement patterns and distribution and behavior of special status wildlife can result from exposure to OHVs. OHV use may result in habitat abandonment or changes in density or species population, age, and sex composition in the vicinity of the trail. Air traffic has the potential for aircraft strikes, resulting in serious injury or mortality to individual special status birds.

Indirect effects include habitat degradation and alteration, and increased access into habitats. Remote areas will become more accessible over time as OHVs become more powerful and as the human

population in the planning area increases. Snowmachine use compacts snow and may inhibit movement under the snow resulting in habitat abandonment or increased mortality of small rodents, used as a food source by special status bird species. Fragile habitats such as wetlands and riparian areas may be degraded seasonally by OHV use.

Impacts to special status wildlife from travel management should not result in population level implication under any Alternative.

**(7) Effects to Special Status Wildlife Species from Recreation (Common to All Alternatives)**

Minor impacts to special status wildlife could occur from both commercial and non-commercial recreation activities under all Alternatives. The primary impacts would be temporary stress and displacement of individual animals due to recreational activities, or to recreation associated access such as aircraft overflight and landing in remote areas. In areas that are repeatedly used for camping sites, there may be minor, site-specific degradation of habitat. OHV use associated with commercial recreational activities could occasionally result in mortality of nestlings and the eggs of ground nesting birds. Given the low to moderate level of recreational use on most BLM lands within the planning area, these impacts would be minimal and would not have population level effects.

**(8) Effects to Special Status Wildlife Species from Renewable Energy (Common to All Alternatives)**

Impacts to special status wildlife would be the same as those described under wildlife, common to all Alternatives. There is a potential for bird mortality due to collisions with wind turbines. Some of the avian mortality could involve Special Status Species, particularly if wind-generating facilities were located within breeding habitats for these species. Since BLM lands in the planning area are fairly remote from villages, use of BLM lands for development of such projects is unlikely during the life of this plan.

**(9) Effects to Special Status Wildlife Species from Lands and Realty Actions (Common to All Alternatives)**

Upon completion of conveying BLM-selected lands to the State and Native Corporations, anticipated by 2010, only approximately 5% of lands in the planning area will remain in Federal ownership. These lands are generally remote, and the numbers and kinds of Realty actions that will be required would be limited under any Alternative. While there would be both direct and indirect impacts to Special Status Wildlife under all Alternatives, including temporary displacement and disturbance during activities authorized under this program, those impacts would be expected to be low, and to affect a very small percentage of BLM land in the planning area. Impacts would vary among species depending on the proposal, the species' range, life history, and habitat preferences.

**(10) Effects to Special Status Wildlife Species from Subsistence activities (Common to All Alternatives)**

Some Special Status Species are subject to subsistence hunts by Alaska Natives (e.g. Steller's eider, Stellar sea lions), but the numbers killed each year are managed under the terms of the Marine Mammal Protection Act, and the Endangered Species Act, which provide exemptions for certain qualifying Alaska Native subsistence harvests. Harvests are closely monitored so that species populations are sustained.

**b) Effects to Special Status Wildlife Species for Alternative A**

### **(1) Effects to Special Status Wildlife Species from Minerals (Alternative A)**

**Leasable Minerals.** No impacts to special status wildlife under this Alternative would occur because all BLM lands in the planning area would remain withdrawn from Leasable Mineral entry under ANCSA 17(d)(1).

**Locatable Minerals:** Though most of the BLM lands in the planning area would remain withdrawn from locatable mineral entry under ANCSA 17(d)(1) some pre-ANCSA claims exist allowing for mineral development. According to the RFD for locatable minerals, under Alternative A 23 acres of disturbance is expected to occur on State-selected or Native (Federal mining claim) lands. On these 23 acres, impacts to special status species would be similar to those described in Effects Common to All Alternatives. This alternative anticipates less locatable mineral development and consequently fewer impacts to special status species than alternatives B or D.

**Salable Minerals.** No salable mineral activities are expected due to the location of BLM lands away from population centers and the retention of ANCSA 17(d)(1) withdrawals precluding salable mineral activities. Under this Alternative, impacts to special status wildlife from salable minerals activities is expected to be less than Alternatives B, C, and D.

### **(3) Effects to Special Status Wildlife Species from Recreation Management (Alternative A)**

Under Alternative A, effects to special status wildlife from Recreation Management would be the same as that described in effects Common to All Alternatives. This is attributed to the remote location of BLM lands within the planning area. Effects to special status wildlife from Recreation Management are expected to be similar to Alternatives C and D.

### **(4) Effects to Special Status Wildlife Species from Travel Management (Alternative A)**

The planning area would remain undesignated with regard to OHV use, and so the impacts would remain similar to current conditions, with some possible increase in intensity should the population increase. Currently, impacts from OHV use on BLM land, is limited to areas immediately adjacent to villages, areas between the Alagnak River and Lake Iliamna, and to portions of the Goodnews Block. Most access to BLM land is by aircraft or by boat. No vehicle weight limits would be recommended which may provide a greater level of impact to special status wildlife habitat in some areas compared to Alternatives B, C, or D. However, effects under Alternative A to special status wildlife from Travel Management are presumed to be less than all other Alternatives. This assumption is made because the retention of ANCSA 17(d)(1) withdrawals could reduce aircraft traffic associated mineral activities. This includes low level flights, associated with take-off and landing, which may impact special status bird species due to increased noise and potential aircraft strikes.

### **(5) Effects to Special Status Wildlife from Wild and Scenic River Nominations (Alternative A)**

There would be no Wild and Scenic River (WSR) nominations under this alternative. Impacts associated with no WSR nominations on special status wildlife is minimal due to retention of ANCSA 17 (d)(1) withdrawals.

### **(6) Effects to Special Status Wildlife from designation of Areas of Critical Environmental Concern (Alternative A)**

There would be no ACEC nominations under this alternative. Impacts associated with no ACEC designations on special status wildlife is minimal due to retention of ANCSA 17 (d)(1) withdrawals.

## **c) Effects to Special Status Wildlife Species for Alternative B**

## (1) Effects to Special Status Wildlife Species from Minerals (Alternative B)

**Leasable Minerals.** Under this Alternative, ANCSA 17(d)(1) withdrawals would be removed, and all BLM lands and any land released from State or Native-selection would be open for mineral leasing. Potential impacts include:

**Seismic Exploration.** Seismic exploration would only occur in the Koggiling Creek planning block, in the south central portion of the planning area, during the life of this plan based on the Reasonable Foreseeable Development Scenario. This area includes habitat for the trumpeter swan, gray-cheeked thrush, olive-sided flycatcher and blackpoll warbler. In the event that seismic exploration occurs during the winter months, there would be no effect on these species, as they are not present in the planning area at this time.

However, summer geophysical work including field sampling, would involve helicopter support and could have negative effects on these species, depending on the location of the work in relation to their habitat. Summer seismic work, including aircraft overflights, would have temporary and non-lethal effects on special status wildlife, the effects probably lasting less than an hour (BLM 2003b). Elevated activity and air traffic in the vicinity of large summer camps could result in minor impacts on both local and regional populations of these species. The Steller's eider and trumpeter swan are ground nesters in tundra habitats. The eggs and the nestlings could be susceptible to trampling or crushing. Depending on the nature of the effects and the nature and duration of behavioral changes caused by disturbance, such effects could be considered a "taking" under the Endangered Species Act for the listed species.

It is not known if lynx, a sensitive species, inhabit the Koggiling Creek planning block, which is largely a tundra environment. Isolated patches of forest along drainages may provide sufficient habitat for lynx, who seek boreal forest settings. Lynx have been observed at Brooks River in Katmai National Park, for example. Lynx may be temporarily disturbed or displaced by seismic activities, with reoccupation of the area after the exploration activities are complete.

Indirect impacts to special status wildlife, from seismic operations may include degradation of habitat through impacts to soil and vegetation. These types of impacts would be minimized by implementation of the Stipulations and Required Operating Procedures (Appendix A). Under Alternative B, effects to special status wildlife, from foreseeable seismic exploration for leasable minerals would be greater than Alternative A but equal to Alternatives C and D.

**Exploratory Drilling.** Based on the Reasonable Foreseeable Development Scenario for oil and gas, exploratory drilling would only be expected to occur in the Koggiling Creek planning block, which may be utilized seasonally by migratory waterfowl, and by a number of sensitive migratory waterfowl species, including the trumpeter swan, the king eider, the long-tailed duck, the black scoter, the surf scoter, and the red-throated loon. Other migratory waterfowl on the sensitive species list would be considered to be rare or accidental visitors to the Koggiling Creek planning block. Sensitive species of land birds that may be found in the Koggiling Creek planning block include the rusty blackbird, the gray-cheeked thrush, the olive-sided flycatcher, and the blackpoll warbler. The American peregrine falcon and the Arctic peregrine falcon, two sensitive species, might also be present in the Koggiling Creek planning block. All of these birds, if present, are in this area during spring through fall. Exploratory drilling if carried out in the winter would not affect these species. Under Alternative B, effects to special status wildlife from foreseeable exploratory drilling for leasable minerals would be greater than Alternative A but similar to that discussed in Alternatives C and D.

**Leasable Mineral Development.** Although construction would occur primarily during winter, development would bring year-round facilities and activities to the Koggiling Creek planning block, which includes seasonal habitat for migratory waterfowl, including trumpeter swans (whose summer concentrations tend to be northeast of Koggiling Creek planning block), the king eider, the long-tailed duck, the black scoter, the surf scoter, and the red-throated loon. Other migratory waterfowl on the sensitive species list would be considered to be rare or accidental visitors to the Koggiling Creek planning block. Sensitive species of land birds that may be found in the Koggiling Creek planning block include the

gray-cheeked thrush, the olive-sided flycatcher, and the blackpoll warbler. The American peregrine falcon and the Arctic peregrine falcon, two sensitive species, might also be present. All of these birds, if present, are in this area during spring through fall. Natural gas development would have the potential to affect these species directly and indirectly. Potential sources of disturbance would be ground vehicles, humans on foot, and low-flying aircraft associated with leasable mineral development. Potential effects would include direct and indirect habitat loss. Direct loss of habitat would result from gravel mining and gravel deposition on the tundra for roads, pads, and airstrips. Under the development scenario used for this analysis, this habitat loss would be limited to 36 acres for the gas wells, plus acreage associated with gravel roads. Indirect habitat loss could occur through reduced access caused by physical or behavioral barriers created by roads, pipelines, and other facilities.

The gravel mining and placement, activities associated with leasable mineral activities, would provide the greatest potential for causing loss of habitat (BLM 2005b). Roads and pads are constructed using gravel, and tundra covered by gravel would no longer be available for nesting, brood-rearing, or foraging for those tundra-nesting threatened and sensitive migratory waterfowl species listed above and others that use this habitat. This loss of habitat would continue for as long as the proposed development was in operation. If abandonment plans called for allowing gravel pads and roads to "bed" naturally, loss of habitat might extend considerably longer than the end of the operational life of the field. Under this Alternative, approximately 20 acres of habitat would be lost to gravel roads. Because of the density of migratory waterfowl use of this area, this potential loss of breeding, feeding and staging habitat for most species would be unlikely to result in some population effects. Under Alternative B, effects to Special Status Wildlife Species from foreseeable leasable mineral development would be greater than Alternative A but similar to that discussed in Alternatives C and D.

**Locatable Minerals.** Impacts would be similar to those discussed under Effects Common to All Alternatives. However, under Alternative B, ANCSA 17(d)(1) withdrawals would be removed and 1,102,489 acres of BLM lands would be open to locatable mineral activities. Based on the Reasonable Foreseeable Development Scenario for Locatable Minerals (RFD), two types of mining activity could take place in the planning area, lode mineral exploration and development and placer mining. Should locatable mineral activity occur on every existing operation, an estimated total of 115 acres could potentially be disturbed on BLM lands in the planning area. Potential impacts to special status wildlife on these acres would include temporary disturbance or displacement in localized areas, temporary loss of habitat, long-term degradation and loss of habitat, and possible direct mortality of nestling birds or eggs. All 115 acres would occur on State-selected or Native (Federal mining claim) lands due ANILCA 906(e) Top Filings. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA.

While removal of the ANCSA 17(d)(1) withdrawals would open BLM lands to potential mineral exploration and development, it is most likely that should any placer mining projects occur they would occur at sites of existing operations, at locations where mineral deposits are already known to exist. According to the RFD for locatable minerals, much of the Goodnews Bay/Snow Gulch area is considered to have high mineral potential including the Arolik River, Barnum Creek, Butte Creek, Domingo Creek, Faro Creek, Fox Gulch, and Jacksmith Creek tributaries. Though currently unencumbered BLM lands, a large portion of this area becomes priority State-selected lands once the ANCSA 17(d)(1) withdrawal is revoked (top-filed) which then precludes these lands from mineral entry. Under Alternative B, effects to special status species from locatable mineral activities would potentially be greater than Alternative A and C and equal in potential effects to Alternative D because more lands would be made available for activities.

**Lode Mineral Activities.** Lode mineral activities in the Goodnews Bay area are projected to occur at Tatlignagepeke Mountain and at Mitlak Mountain within the life of this plan. The RFD suggests that the platinum group elements (PGE) content of Tatlignagepeke Mountain might be explored during the life of this plan. Though currently unencumbered BLM lands, a large portion of this area becomes priority State-selected lands once the ANCSA 17(d)(1) withdrawal is revoked due to ANILCA 906(e) Top Filings which then precludes these lands from mineral entry.

Additionally, lode activities could occur on Native-selected lands at the Wattamuse-Granite Lode property, in the Kasna Creek area at South Current Creek and Upper South Current Creek properties, in the Kijik Lake area at the Dicks Lode, Gull, and Kijik Mountain properties, and in the Pebble Copper area at Hill 1759. On State-selected lands, lode operations could occur in the Iliamna/Fog area at the Dutton, Easy, Karen, and Meadow properties.

While migratory waterfowl move through the Goodnews Bay corridor in very large numbers during migratory seasons, and many of the species listed above can be found nesting on BLM lands in the Goodnews Block, they are unlikely to be found in these mountainous areas. However, BLM sensitive species that might seek out this kind of habitat during breeding and nesting season are the rare Kittlitz's murrelet, the marbled murrelet and the harlequin duck, all of which are sea birds that nest inland at higher elevations. The sensitive American peregrine falcon and the arctic peregrine falcon might also be found in these areas.

Overall, the majority of projected new lode mineral activities on BLM lands in the Goodnews Bay area are not likely to occur due to the lifting of ANSCA 17(d)(1) withdrawals and the subsequent conversion of unencumbered BLM land status to State-selected. Under Alternative B, effects to special status species from lode mineral activities would potentially be greater than Alternative A and C and equal in potential to Alternative D because more lands would be made available for activities.

**Placer Mineral Activities.** According to the RFD for locatable minerals, placer mineral activities in the Goodnews Bay area could occur at the Barnum Creek, Domingo Creek, Faro Creek, and Jacksmith Creek Tributary which could result in surface disturbance to a total of 14 acres. Though currently unencumbered BLM lands, a large portion of this area becomes priority State-selected lands, due to ANILCA 906(e) Top Filings once the ANSCA 17(d)(1) withdrawal are revoked which then precludes these lands from mineral entry. Portions of Jacksmith Creek are not included in this Top Filing and would remain unencumbered BLM lands and would be open to locatable mineral activities. Placer activities on selected lands include Slate Creek, which could result in disturbance to a total of 36 acres on selected land. Placer activities on the Arolik River, Malaria Creek, Snow Gulch, Tyrone Creek, and Wattamuse Creek in the Goodnews area, and lands in the Iliamna/Fog area and unnamed property west of Chekok on selected land could impact up to 47 acres of selected land. An additional 18 acres of active Federal claims on Native land could be disturbed on the Salmon River.

All locatable mineral related activities occurring on BLM land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to have an approved Plan of Operations or Notice of Operations. All operations are required to meet applicable Federal and State air and water quality standards for permitting. Placer mineral activities are not expected to have population-level effects on any BLM Special Status animal species during the life of this plan.

Under Alternative B, effects to special status species from placer mineral activities would potentially be greater than Alternative A, C and, D because more lands would be made available for activities including the Jacksmith Creek which is located near the coastal area used by migratory birds, including Steller's eiders.

**Salable Minerals (Mineral Materials).** Salable material activities on BLM lands are available unless specifically closed by Public Land Order.

As discussed in a previous section, sand and gravel would be needed for the construction of access roads and gravel pads should leasable mineral activities proceed in the Koggiling Creek planning block. With the exception of these activities, extraction of salable materials is more likely to occur on State or Native lands due to the closer proximity of these lands to villages compared to BLM lands.

Should they occur, mineral materials projects would require an approved permit containing Required Operating Procedures based on site-specific resource concerns and would be subject to all State and Federal laws and regulations.

Under Alternative B, effects to special status species from salable mineral activities would be similar to those discussed in “Effects Common to All Alternatives.” These impacts may potentially be more widespread compared to Alternative A, C and, D because more lands would be made available, though expectations of development are low for the life of the plan.

### **(3) Effects to Special Status Wildlife Species from Recreation Management (Alternative B)**

Under this Alternative recreation within the planning area would be managed as Roaded Natural. Though not expected within the life of the plan, increased rustic development to provide convenience and safety for recreational users, and improved road maintenance may occur. These improvements may provide greater access and result in more frequent human and wildlife encounters, including Special Status Wildlife. The potentially increased recreation may result in greater stress to special status wildlife and prey, possibly leading to habitat abandonment in excessive situations. Under Alternative B, effects to special status wildlife may be greater than Alternatives A, C and D.

### **(4) Effects to Special Status Wildlife Species from Travel Management (Alternative B)**

Travel Management would be designated as open on BLM lands within the entire planning area, providing access to all areas by OHVs. No OHV weight restrictions would be established allowing any and all vehicles types to access lands. Impacts to special status wildlife include temporary displacement from habitat and short-term degradation of habitat. In areas of high OHV use, long term habitat degradation and abandonment may occur though unlikely due to the remote locations of BLM lands. On unencumbered BLM lands and selected lands in close proximity to unencumbered lands, due to lifting of ANSCA 17(d)(1) withdrawals, the potential for increased air travel may be experienced due to increased mineral exploration, development, inspection, and monitoring activities. Noise from low flying aircraft, predominantly take-off and landing aircraft, may disturb special status wildlife. The potential for aircraft strikes may impact special status bird species. These effects would be greater than Alternative A and less than Alternatives C and D. The potential impacts from increased air traffic under Alternative B would be greater than Alternative A and similar to Alternatives C and D.

### **(5) Effects to Wildlife from Wild and Scenic River Nominations (Alternative B)**

There would be no Wild and Scenic River (WSR) nominations under this alternative.

### **(6) Effects to Wildlife Effects to Wildlife from designation of Areas of Critical Environmental Concern (Alternative B)**

There would be no ACECs proposed under this alternative.

## **d) Effects to Special Status Wildlife Species for Alternative C**

### **(1) Effects to Special Status Wildlife Species from Minerals (Alternative C)**

**Leasable Minerals.** Under Alternative B, 1,103,138 acres of BLM lands would be open to leasable mineral activities. Based on the Reasonable Foreseeable Development Scenario, leasable mineral activities would consist of one gas field in the Koggiling Creek planning block, six exploratory wells (each disturbing approximately six acres) and one seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected, over the next 20 years. Impacts to special status wildlife from leasable mineral activities would be similar to those in Alternative B though fewer acres would be available for leasable mineral activities.

ANSCA 17(d)(1) withdrawals would be lifted except 12,210 acres of proposed Wild and Scenic Rivers, until Congress has had an opportunity to act, and within the proposed Carter Spit ACEC (61,251 acres). Within the Bay area, approximately 3,968 acres would remain withdrawn from mineral entry due to

Agency withdrawals. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA.

Under Alternative C, less acreage would be available for leasable mineral development compared to Alternative B or D.

**Locatable Minerals.** Under Alternative C, 1,064,313 acres of BLM lands within the planning area would be open to locatable mineral activities. Because of constraints associated with ACECs, Wild and Scenic River suitability, and ANILCA 906(e) top-filings, this analysis assumes no new lode or placer mining activities. Consequently, impacts as described under Effects Common to All Alternatives would only occur on existing mining claims. ANCSA 17(d)(1) withdrawals would be removed and BLM lands would be open to locatable mineral activities. ANCSA 17(d)(1) withdrawals would be retained for proposed WSR segments (12,210 acres) which may provide protection to special status wildlife within the established WSR corridors and the proposed Carter Spit.

According to the RFD for locatable minerals, much of the Snow Gulch area is considered to have high mineral potential including the Arolik River, Barnum Creek, Butte Creek, Domingo Creek, Faro Creek, Fox Gulch, and Jacksmith Creek tributaries. Though currently unencumbered BLM lands, a large portion of this area becomes priority State-selected lands once the ANCSA 17(d)(1) withdrawals are revoked due to ANILCA 906(e) Top Filings, precluding these lands from mineral entry.

Under Alternative C, effects to special status wildlife from locatable mineral activities would be less than Alternatives B and D and greater than Alternative A. ROPs have been developed to protect special status wildlife (Appendix A, ROPs part 4, Special Status Species).

**Salable Materials.** Impacts would be similar to those discussed under Effects Common to All Alternatives, but very limited salable mineral activity is anticipated under this alternative. The Carter Spit ACEC, Bristol Bay ACEC, and proposed WSR corridors would be closed to salable minerals activities. . The closure of the Bristol Bay ACEC would restrict salable mineral activities in conjunction with leasable mineral activities in the Koggiling Creek planning block.

Under Alternative C, impacts to special status wildlife from salable material activities would be greater compared to Alternatives A but less than Alternatives B and D due to the reduced amount of land available for salable material activities.

### **(3) Effects to Special Status Wildlife Species from Recreation Management (Alternative C)**

Under Alternative C, impacts to special status wildlife would be the same as discussed under effects Common to All Alternatives. An increase of recreational visitors may be expected in the planning area due to designation of "Wild" rivers. Increased air traffic due to increased tourism, guides and outfitters may cause short-term stress to special status wildlife from noise, temporary displacement from landing areas, and possible mortality due to aircraft strikes. Overall, increased visitation may cause seasonal stress to special status wildlife felt throughout the WSR corridor. These effects are expected to be short-term and not felt throughout the population of any special status wildlife within the planning area.

### **(4) Effects to Special Status Wildlife Species from Travel Management (Alternative C)**

Under Alternative C, BLM lands would be designated as limited, which requires OHVs to stay on existing trails. Vehicle weight limits for OHVs of 2,000 pounds gross vehicle weight rating (GVWR) would be enforced.

Travel management restrictions within the planning area, including eligible/suitable WSRs and the proposed Bristol Bay and Carter Spit ACECs, would be defined through the development of a comprehensive trails and travel management plan within five years of signing the ROD.

Under Alternative C, impacts to special status wildlife from travel management use would be similar to that discussed in “Effects Common to All Alternatives” but because the planning area would be designated as “limited” to designated roads and trails the intensity and total anticipated area of impacts would be reduced.

#### **(5) Effects to Wildlife from Wild and Scenic River Nominations (Alternative C)**

Determining three river segments as suitable for inclusion into the National System may potentially attract more visitors to the area for recreation activities. This may include increased boating, camping, air traffic, and increased special recreation permits for various outfitters and guides. Boating noise may provide short-term impacts to special status wildlife that inhabit cliffs along river cutbanks or riparian areas. Increased air traffic due to increased eco-tourism, guides and outfitters may cause short-term stress to special status wildlife from noise, temporary displacement from landing areas, and possible mortality due to aircraft strikes. Overall, increased visitation may cause seasonal stress to special status wildlife felt throughout the WSR corridor. These effects are expected to be short-term and not felt throughout the population of any special status wildlife within the planning area.

Under Alternative C, effects to special status wildlife from WSR designation would be mostly beneficial because potentially large surface disturbing activities associated with leasable and locatable mineral activities would be prohibited. Increased recreation from WSR designation would have localized short-term negative impacts to special status wildlife.

#### **(6) Effects to Wildlife Effects to Wildlife from designation of Areas of Critical Environmental Concern (Alternative C)**

Designation of two ACECs would provide additional protection to special status wildlife from certain surface disturbing activities. The Carter Spit ACEC would retain ANSCA 17(d)(1) withdrawals, preventing new leasable and locatable mineral activities within this area to protect federally-listed migratory birds. In addition, the Carter Spit and Bristol Bay ACECs would be an avoidance areas for rights-of-ways. This would reduce stress described in Alternative B for leasable and locatable mineral activities to special status wildlife within these areas. ANSCA 17(d)(1) withdrawals would be lifted within the Bristol Bay ACEC but salable mineral activities would be prohibited and resources utilized by Special Status Wildlife would be protected during leasable and locatable activities by ROPs and Stipulations (Appendix A, ROPs, Part 4. Special Status Species).

### **e) Effects to Special Status Wildlife Species for Alternative D**

#### **(1) Effects to Special Status Wildlife Species from Minerals (Alternative D)**

**Leasable Minerals.** Impacts to special status wildlife from leasable mineral activities would be the same as discussed under Alternative B, except NSO would be authorized within 300-feet of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River, and Klutuk Creek to protect riparian areas and soils adjacent to sensitive habitat for salmon and freshwater fish (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8). No Bristol Bay ACEC would be proposed. No WSRs would be found suitable, and ANSCA 17(d)(1) withdrawals would be lifted from the proposed Carter Spit ACEC (36,220 acres), opening the area to leasable mineral activities. This analysis anticipates the development of one gas field in the Koggiling block. Impacts to Special Status Wildlife species from that activity are discussed under Alternative B.

**Locatable Minerals.** Impacts to special status wildlife from locatable mineral activities would be the same as discussed under Alternative B. No Bristol Bay ACEC would be proposed. No WSRs would be found suitable, and ANSCA 17(d)(1) withdrawals would be lifted from the proposed Carter Spit ACEC (36,220 acres), opening the area to locatable mineral activities. ROPs would be used to provide added protection to special status wildlife (Appendix A, ROPs Part 4. Special Status Species).

**Salable Minerals.** Impacts to special status wildlife from salable mineral activities would be the same as discussed under Alternative B, except the proposed Carter Spit ACEC would be closed to salable mineral activities. No Bristol Bay ACEC would be proposed, opening the area to salable mineral activities, including the Koggiling Creek planning block, subject to Required Operating Procedures (Appendix A).

**(2) Effects to Special Status Wildlife Species from Recreation Management (Alternative D)**

Impacts to special status wildlife from Recreation Management would be the same as discussed in Alternative A. No Bristol Bay ACEC or WSR segments would be proposed, ROPs (Appendix A) would apply to all permissible activities.

**(3) Effects to Special Status Wildlife Species from Travel Management (Alternative D)**

Impacts to special status wildlife from Travel Management would be the same as discussed in Alternative C. ROPs (Appendix A) would apply to all permissible activities.

**(4) Effects to Wildlife from Wild and Scenic River Nominations (Alternative D)**

No river segments would be found suitable for inclusion into the National system. Negative impacts associated with increased recreational visitors may be avoided but eligible river segments would not have protection from development other than ROPs and Stipulations (Appendix A).

**(5) Effects to Special Status Wildlife Species from designation of Areas of Critical Environmental Concern (Alternative D)**

Alternative D would designate the Carter Spit ACEC (36,220 acres). Management within the ACEC would provide stronger protection to special status wildlife species through the following measures:

- Requiring Plans of Operations for any mining operation, even those less than five acres (CFR 43 CFR 3809.11).
- Managing the area as a right-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Developing a transportation plan that identifies specific designated trails for OHV use, thus preventing unauthorized stream crossings and associated negative impacts.
- The area would be closed to salable mineral development, thus eliminating any potential for negative impacts associated with gravel extraction.

Under Alternative D, there would be one ACEC designation (Carter Spit ACEC). The use of ROPs and Stipulations will reduce impacts to special status wildlife species due to mineral development and exploration resulting from revocation of ANSCA 17(d)(1) withdrawals. A more detailed description of impact to special status wildlife species resulting from mineral exploration and development is contained in the discussion on effects from leasable, locatable, and salable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

Delineating Right-of-Way avoidance areas within the proposed ACEC would have a positive impact on special status species because road or pipeline construction would likely not occur. Potential impacts, resulting from road or pipeline construction include; degradation or alternations of habitat and disturbance. Avoiding Rights-of-way authorization will prevent degradation to Special Status Species habitat by preventing degradation to soils, water, vegetation and air resources in the ACEC.

## Direct and Indirect Effects for Special Status Vegetation and Rare Vegetation Species

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Special Status Plants: Cultural Resources, Paleontological Resources, Visual Resources, Forest Products, Renewable Energy, Lands and Realty Actions, Wildlife and Wildlife Habitat, Fisheries Management, Wild and Scenic Rivers, Social and Economic Conditions, and Subsistence.

### a) Direct and Indirect Effects to Special Status Vegetation Species Common to All Alternatives

One BLM Sensitive Species of plant is located within the planning area, the pear-fruited smelowskia (*Smelowskia pyriformis*). It has been located in the western Alaska Range north of the planning area and in the southernmost Kuskokwim Mountains in the Goodnews Bay region (Drury and Rollins 1952; Hultén 1968; Murray 1981; Murray and Lipkin 1987; Parker 1994; Rollins 1993; Welsh 1974).

#### (1) Effects to Special Status Vegetation Species from Soils, Water, Air, and Vegetation Management (Common to All Alternatives)

Special status vegetation species would benefit from proper management of soil, water, air and vegetation resources in the planning area. Project requests in habitat of special status vegetation found within the planning area are unlikely during the life of the plan because of the undesirable terrain. Identification of special status vegetation habitat and implementation of protection measures would be addressed through project-specific NEPA analysis.

#### (2) Effects to Special Status Vegetation Species from Leasable and Salable Minerals Activities (Common to All Alternatives)

**Leasable Minerals.** Oil, gas, and coalbed natural gas activities are not expected to impact special status vegetation on BLM lands within the planning area during the life of this plan. Under all alternatives leaseable mineral activities is either restricted or not expected to occur in areas having special status vegetation.

**Locatable Minerals.** Existing and future locatable mineral activities have the potential to unfavorably impact special status plants and their habitat by stripping away the vegetation as part of mine site overburden, trampling vegetation, and compacting soils throughout the mine site. This is done by the development of trails, roads, camp buildings, airstrips, and other temporary or semi-permanent mine associated infrastructure. Site-specific mitigation measures would be identified through project-specific NEPA analysis. Only one area of BLM lands, Tatignagpeke Mountain in the Goodnews Bay region, has both habitat for the smelowskia and known lode mineral occurrences, with elevations at or above 2,500 feet. Other locations in the Goodnews Bay region with potential habitat but no known mineral resources include Twin Mountain and Figure Four Mountain in the proposed Carter Spit ACEC, and the southern half of Figure Four Mountain, located just south of the proposed ACEC. An area of BLM lands in the northeast Bristol Bay region with potential habitat but no known mineral resources, is the Chekok Creek area, with elevations to 4,000 feet.

**Salable Minerals.** In a region of glacial deposits, large quantities of materials, including sand and gravel, are available throughout the planning area at low elevations. Due to the remote location of BLM lands, it is doubtful salable materials would be sought from BLM lands within the planning area throughout the life of the plan, especially from locations in the difficult terrain where the smelowskia would be located.

### **3) Effects to Special Status Vegetation Species from Fire and Fire Management (Common to All Alternatives)**

It is unlikely that fire would have an effect on the smelowskia. The known plants' habitat consists of isolated, steep, sparsely vegetated, unstable alpine screes from 2,000 to 5,500 feet in elevation. Wildland fires are uncommon in the planning area, and fire is not likely to burn well on this type of unvegetated scree.

### **(4) Effects to Special Status Vegetation Species from Livestock Grazing (Common to All Alternatives)**

Although there is currently no form of livestock grazing in the planning area, livestock grazing could be permitted on a case-by-case basis under all Alternatives. It is unlikely that livestock grazing would have any impact to the smelowskia, considering it is found on isolated, steep, sparsely vegetated, unstable alpine screes from 2,000 to 5,500 feet in elevation. These areas are typically unsuitable for grazing.

### **(5) Effects to Special Status Vegetation Species from Recreation Management (Common to All Alternatives)**

The sources of impacts to vegetation from commercial and non-commercial recreation activities would include hiking, aircraft landings at remote sites, occasional or repeated use of remote camp sites and associated social trails. Potential effects might include trampling and crushing of plants and disturbance or compaction of the soil. Potential impacts to the smelowskia are likely to occur from hiking activities only. However, the potential location of the plant on steep unconsolidated scree-covered slopes would present a hazard to hikers, who might elect other more favorable areas. These plants also appear to inhabit areas as isolated, scattered individual plants. The likelihood of impacts from recreational activities in this lightly-populated, lightly-used region would be low, and would not have population level effects.

### **(6) Effects to Special Status Vegetation Species from Travel Management (Common to All Alternatives)**

Direct and indirect impacts to vegetation could occur from Travel Management and OHV use, including the potential to destroy the vegetation mat, compact soils, accelerate permafrost melt, and contribute to soil erosion. Higher, rockier terrain in remote areas, where the smelowskia and its habitat might be located, are becoming more accessible over time as OHVs become more sophisticated and powerful. However, the population and visitation in the planning area in the more mountainous regions is low.

### **(7) Effects to Special Status Vegetation Species from Locatable Minerals**

#### **a) Effects to Special Status Vegetation from Locatable Minerals (Alternative A)**

Under Alternative A, most BLM lands in the planning area would be withdrawn from exploration and development under ANCSA 17 (d)(1). No pre-ANCSA claims exist in the Tatignagpeke Mountain area. Under Alternative A, effects to special status vegetation from locatable minerals would be less compared to Alternatives B, C, and D because of the reduced acreage available for development.

#### **b) Effects to Special Status Vegetation from Locatable Minerals (All Action Alternatives B, C and D)**

Under Alternative B, ANCSA 17(d)(1) withdrawals would be lifted and BLM lands would be open to locatable mineral activities. Upon lifting of ANCSA 17(d)(1) withdrawals, ANILCA 906(e) Top Filings land would become State-selected and new locatable mineral activities would not be authorized through Federal mining claims. These top-filed lands include the high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, including the Tatignagpeke Mountain area. If this area is relinquished from State-selection, then locatable mineral development may occur. This may potentially impact special

status vegetation. Under Alternatives B, C and D, impacts to special status vegetation from locatable minerals would be similar to that discussed in effects Common to All Alternatives. Impacts to special status vegetation under Alternatives B may potentially be more wide-spread compared to Alternatives A, C, and D because of the increased acreage available for development.

## **7. Direct and Indirect Effects for Cultural and Paleontological Resources**

### **a) Direct and Indirect Effects to Cultural and Paleontological Resources Common to All Alternatives**

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Cultural Resources: Soils, Water, Air, and Vegetation Management. Visual Resources, Forest Products, Renewable Energy, Wildlife and Wildlife Habitat, Fisheries Management, Wild and Scenic Rivers, Social and Economic Conditions, and Subsistence.

Both Federal undertakings and unauthorized uses have the potential to cause irreversible harm to cultural and Paleontological resources. Impacts may include trampling, breakage, or unearthing by livestock, foot traffic, or mechanized equipment from fire suppression activities, mining activities, recreation activities, and OHV use. These BLM authorized undertakings will avoid impacts to cultural and Paleontological resources through project re-design or alternative siting. Unavoidable impacts from undertakings will be mitigated through data recovery investigations in accordance with the National Cultural Programmatic Agreement and the Alaska Protocol for Managing Cultural Resources. Unauthorized impacts will be addressed as feasible through monitoring, law enforcement investigation, and public education efforts.

All undertakings occurring on BLM land are evaluated by a qualified cultural resource specialist. Because of budget, personnel, and seasonal constraints, Level I inventories (literature searches) are a common practice. Level III (Class III) inventory (intensive on the ground survey) occurs when the potential for cultural resources are considered to be high or surface disturbance is likely. This is due to funding and accessibility issues as well as low resource development in this area. Therefore, the exact number, kind, and variability of cultural resources within the planning area are unknown. New cultural resources will continue to be found and evaluated for eligibility to the National Register of Historic Places as future inventories are completed. If significant sites are found, they will be appropriately mitigated under Federal law and policy

#### **(1) Effects to Cultural and Paleontological Resources from Minerals Activities (Common to All Alternatives)**

**Leasable.** Mineral leasing has the potential to affect cultural resources through exploration and development related activities. Access to areas open to leasing for exploration purposes may impact cultural resources through overland travel by OHVs as well as through ground disturbance associated with the drilling of exploration wells. Development of oil or gas production wells would require the additional construction of logistic support facilities such as roads and camps, which could affect cultural resources through their construction. The additional construction of associated transmission pipelines and compression/gas plants would also have the potential to affect cultural resources. Any ground disturbing activity has the potential for eroding or excavating buried archaeological resources and for damaging surface resources. The stipulations contained in the standard lease would minimize impacts and ensure pre-construction cultural compliance with the National Historic Preservation Act.

**Locatable.** Some lode or placer mining is predicted for each alternative. Mining could affect cultural resources through both exploration and development by eroding or excavating buried archaeological resources, damaging surface resources, or by causing adverse effects to places that have religious or

cultural importance to indigenous peoples. Additional impacts to cultural resources and necessary mitigation measures will be evaluated through the NEPA process for each specific Plan of Operation.

**(2) Effects to Cultural and Paleontological Resources from Recreation (Common to All Alternatives)**

Under all alternatives, the predominant recreation use is dispersed. No alternative proposes development of recreation facilities. Impacts to cultural and paleontological resources associated with dispersed recreation are mostly related to access (e.g. use of OHVs or aircraft to access recreation opportunities). Impacts from OHV use are discussed under Travel Management. Other impacts associated with dispersed recreation use include trampling and compaction of soil and vegetation associated with social trails or campsites. At the level of recreation use in the planning area, any impacts to cultural or paleontological resources from casual recreation use is insignificant. Any commercial recreation activity is handled through issuance of a Special Recreation Permit, subject to site-specific NEPA analysis and stipulations to protect cultural or paleontological resources.

**(3) Effects to Cultural and Paleontological Resources from Fire (Common to All Alternatives)**

Surface historic structures are subject to severe effects from fire itself. Organic materials used in construction are likely to be damaged or destroyed as a result of burning. Subsurface resources are much less likely to be significantly affected by fire. In a severe fire, organic material such as bone, ivory, and wood that is present in the soil matrix will be destroyed.

Intense heat is also likely to fracture and otherwise damage non-organic material such as ceramics and chipped stone. Because of well-developed vegetation mats and generally moist soils, fire in this region does not usually burn extensive areas to mineral soil. Therefore, severe impacts to subsurface cultural resources are very unlikely.

**Effects of Fire Suppression.** The possibility of damage to surface cultural resources from fire suppression activities is relatively slight. This is particularly true of standing historic structures which can be easily observed, even by untrained individuals. Consequently it is likely that most suppression activities such as fireline and camp construction can be located so as to prevent impacts to surface cultural resources. Surface sites such as lithic scatters will be disturbed by fireline construction and similar ground disturbing activities.

Subsurface cultural resources are more likely to be damaged by suppression activities, particularly fireline construction. Such resources are difficult to observe, particularly where well-developed vegetation mats obscure them, increasing the likelihood that such sites will not be discovered until after they have been disturbed.

**(4) Effects to Cultural and Paleontological Resources from Livestock Grazing (Common to All Alternatives)**

Currently there is no livestock grazing nor is any expected in the planning area within the life of the plan. Livestock grazing could be permitted on a case-by-case basis under all Alternatives. Livestock grazing at high stocking rates can result in removal of protective vegetation, compaction of soil, damage to historic sites (through rubbing or trampling), and breakage of scattered surface lithics. However, livestock grazing at these intensities will not occur on BLM lands in the planning area.

**(5) Effects to Cultural and Paleontological Resources from Lands and Realty Actions (Common to All Alternatives)**

**ANCSA 17(d)(1) withdrawal review.** The three action alternatives recommend revocation of ANCSA 17(d)(1) withdrawals to varying degrees. These actions affect cultural and paleontological resources indirectly by opening some lands to mineral leasing and location and potential mineral development.

Direct effects to cultural and paleontological resources from mineral development are described elsewhere in this section.

**Use authorizations.** The issuance of rights-of-way, particularly those related to road or pipeline construction, would have the most potential for ground-disturbance and potential negative impacts to cultural resources. Alternatives B and D anticipate more rights-of-way in support of mineral development than Alternatives A and C. All permitted activities and use authorizations (including rights-of-way) are subject to site-specific stipulations and cultural clearance to comply with the National Historic Preservation Act.

#### **(6) Effects to Cultural and Paleontological Resources from Travel Management (Common to All Alternatives)**

Off Highway Vehicle use can result in vegetation compaction and removal and soil compaction and erosion. On areas underlain by permafrost, removal of the vegetative mat will result in melting of the permafrost and soil subsidence, resulting in boggy and wet areas. Trails often braid around these areas, sometimes becoming wide. These impacts to soils and vegetation can also impact cultural resources, if they are present. Erosion or compaction of soils can expose buried pre-historic sites and expose them to breakage or vandalism. Increased unmanaged access can result in damage or vandalism at historic sites.

### **b) Direct and Indirect Effects to Cultural Resources for Alternative A**

#### **(1) Effects to Cultural Resources from Minerals Activities (Alternative A)**

**Leasable.** ANSCA 17(d)(1) withdrawals would prevent leasable mineral activities from occurring on BLM lands within the planning area.

**Locatable.** Under Alternative A, effects to cultural and paleontological resources from locatable mineral activities would be similar to “Effects Common to All Alternative.” Under this alternative, these effects are only anticipated to occur on 23 acres of BLM lands. Existing mining activities have the potential to unfavorably impact cultural and paleontological resources. Existing pre-ANSCA mining claims are located on BLM lands within the planning area. According to the RFD for Locatable Minerals, no surface disturbance is expected to occur on claims that currently have no mining activity within the life of the plan, under Alternative A. ANSCA 17(d)(1) withdrawals would prevent new mining claims from being staked. Potential impacts to cultural resources and necessary mitigation measures will be evaluated through the NEPA process and Plans of Operations for each specific activity. Effects to cultural and paleontological resources from locatable mineral activities would be less than that under Alternatives B, C, and D.

**Salable.** ANSCA 17(d)(1) withdrawals would prevent salable mineral activities from occurring on BLM lands within the planning area.

#### **(2) Effects to Cultural and Paleontological Resources from Travel Management (Alternative A)**

Under Alternative A, effects to cultural and paleontological resources from locatable mineral activities would be similar to “Effects Common to All Alternative”. BLM lands would be undesignated to OHV use with no weight restrictions, and as a result, negative impacts to cultural resources may be more common and severe compared to Alternatives B, C, and D.

### **c) Direct and Indirect Effects to Cultural Resources for Alternative B**

#### **(1) Effects to Cultural Resources from Minerals Activities (Alternative B)**

**Leasable.** Under Alternative B, ANSCA 17(d)(1) withdrawals would be lifted and leasable mineral activities would occur on BLM lands. Effects to cultural and paleontological resources from leasable

mineral activities would include trampling or unearthing of cultural resources leading to breakage or decomposition. Though only exploration activities are expected within the life of the plan, likely leasable mineral development could occur within the Koggiling Creek Planning Block, with impacts as described above under Effects Common to All Alternatives. Potential impacts to cultural and paleontological resources and necessary mitigation measures will be evaluated through the NEPA process for each specific activity. Negative impacts to cultural resources from leasable mineral activities may be greater under Alternative B compared to Alternatives A and C but similar to impacts of Alternative D.

**Locatable.** Under Alternative B, effects to cultural and paleontological resources from locatable mineral activities would be similar to “Effects Common to All Alternative” but effects would have the potential to be more widespread compared to Alternatives A, C, and D. ANSCA 17(d)(1) withdrawals would be lifted and increased locatable mineral activities would occur, according to the RFD for Locatable Minerals. Existing pre-ANSCA mining claims would be able to increase in size, and new claims could be staked on BLM lands. Potential impacts to cultural and paleontological resources and necessary mitigation measures will be evaluated through the NEPA process and Plans of Operations for each specific activity.

**Salable.** ANSCA 17(d)(1) withdrawals would be lifted and salable mineral activities could occur on BLM lands. Due to the remote location of BLM lands within the planning area, it is unlikely that salable mineral activities would occur, except in conjunction with leasable mineral activities within the Koggiling Creek Planning Block. Impacts to cultural and paleontological resources from salable mineral extraction are similar to those described for locatable minerals. The impact occurs from excavation and destruction of cultural sites. Negative impacts to cultural resources from salable mineral activities may be greater under Alternative B, due to the larger acreages available for salable mineral activities, compared to Alternatives A, C, and D.

## (2) Effects to Cultural and Paleontological Resources from Travel Management (Alternatives B)

Impacts to cultural and paleontological resources from Travel Management would be similar to that discussed in Alternative A.

## d) Direct and Indirect Effects to Cultural Resources for Alternative C

### (1) Effects to Cultural Resources from Minerals Activities (Alternative C)

**Leasable.** Under Alternative C ANSCA 17(d)(1) withdrawals would be lifted and leasable mineral activities would occur on unencumbered BLM lands, including exploration and possible resources development within the Koggiling Creek planning block. ANSCA 17(d)(1) withdrawals would be maintained for the Carter Spit ACEC (61,251 acres) and all eligible river segments found suitable for inclusion to the National WSR system, preventing leasable mineral activities. NSO restrictions would further restrict leasable mineral activities within 300 feet of the East and South Fork Arolik River, Faro Creek, South Fork Goodnews River, and Klutuk Creek (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8). Effects to cultural and paleontological resources from leasable mineral activities would include trampling or unearthing of cultural and paleontological resources leading to breakage or decomposition. Potential impacts to cultural resources and necessary mitigation measures will be evaluated through the NEPA process for each specific activity. Under Alternative C, negative impacts to cultural and paleontological resources from leasable mineral activities would be less than Alternatives B and D and greater than Alternative A.

**Locatable.** Under Alternative C, effects to cultural and paleontological resources from locatable mineral activities would be similar to those described under Effects Common to All Alternatives in the immediate area of disturbance. However, plan wide, less potential would exist due to the reduction of acres available for locatable mineral activities. ANSCA 17(d)(1) withdrawals would be lifted and increased locatable mineral activities would occur, according to the RFD for Locatable Minerals. ANSCA 17(d)(1) withdrawals would be maintained for the Carter Spit ACEC (61,251 acres) and all eligible river segments found suitable for inclusion to the National WSR system, preventing locatable mineral activities. Existing

pre-ANSCA mining claims would be able to increase in size and new claims could be staked on BLM lands. Potential impacts to cultural and paleontological resources and necessary mitigation measures will be evaluated through the NEPA process and Plans of Operations for each specific activity.

**Salable.** Under Alternative C, effects to cultural and paleontological resources from salable mineral activities would be similar to Alternative B in the immediate area of disturbance. However, plan wide, less potential would exist due to the reduction of acres available for salable mineral activities. ANSCA 17(d)(1) withdrawals would be lifted allowing mineral activities to occur on BLM lands. ANSCA 17(d)(1) withdrawals would be retained in the proposed Carter Spit ACEC (61,251 acres) and all eligible river segments found suitable for inclusion to the National WSR system, restricting salable mineral activities. In addition, salable mineral activities would be restricted from the proposed 974,970 acre Bristol Bay ACEC preventing leasable mineral activities from occurring within the Koggiling Creek planning block in conjunction with leasable mineral activities.

Due to the remote location of BLM lands within the planning area, it is unlikely that salable mineral activities would occur.

## **(2) Effects to Cultural and Paleontological Resources from Travel Management (Alternatives C)**

Under Alternative C, all BLM lands would be designated as "limited" for OHV use and a 2,000-lb GVWR weight restriction would be enforced. Negative impacts to cultural and paleontological resources may be reduced compared to current management practices because OHV use would be restricted to specific trails under a limited designation. OHV weight limitations may reduce the severity of impacts to cultural and paleontological resources should they occur. The intensity of negative impacts as described under Effects Common to All Alternatives from Travel Management under Alternatives C would be less compared to Alternatives A and B.

## **e) Direct and Indirect Effects to Cultural Resources for Alternative D**

### **(1) Effects to Cultural Resources from Minerals Activities (Alternative D)**

**Leasable.** Under Alternative D, effects to cultural and paleontological resources from leasable mineral activities would be similar to Alternative B in the immediate area of disturbance. However, plan wide, less potential would exist due to the reduction of acres available for leasable mineral activities. ANSCA 17(d)(1) withdrawals would be lifted and leasable mineral activities would occur on BLM lands, including exploration and possible resources development within the Koggiling Creek planning block. ANSCA 17(d)(1) withdrawals would be lifted from the proposed Carter Spit ACEC (36,220 acres), allowing leasable mineral activities subject to ROPs and Stipulations. NSO restrictions would restrict leasable mineral activities within 300 feet of the East and South Fork Arolik River, Faro Creek, South Fork Goodnews River, and Klutuk Creek (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8). Effects to cultural resources from leasable mineral activities would include trampling or unearthing of cultural resources leading to breakage or decomposition. Potential impacts to cultural resources and necessary mitigation measures will be evaluated through the NEPA process for each specific activity. Under Alternative C, negative impacts to cultural and paleontological resources from leasable mineral activities would be less than Alternatives B and D and greater than Alternative A.

**Locatable.** Under Alternative D, effects to cultural and paleontological resources from locatable mineral activities would be similar to Alternative B. ANSCA 17(d)(1) withdrawals would be lifted and increased locatable mineral activities would occur according to the RFD for Locatable Minerals. ANSCA 17(d)(1) withdrawals would be lifted from the proposed Carter Spit ACEC (36,220 acres) and locatable mineral activities would be permitted upon approval of Plans of Operations. Existing pre-ANSCA mining claims would be able to increase in size and new claims could be staked on BLM lands, subject to ROPs (Appendix A). Potential impacts to cultural and paleontological resources and necessary mitigation measures will be evaluated through the NEPA process and Plans of Operations for each specific activity.

**Salable.** Under Alternative D, effects to cultural and paleontological resources from salable mineral activities would be similar to Alternative B in the immediate area of disturbance. However, plan wide, less potential would exist due to the reduction of acres available for salable mineral activities. ANSCA 17(d)(1) withdrawals would be lifted and salable mineral activities could occur on BLM lands. Due to the remote location of BLM lands within the planning area, it is unlikely that salable mineral activities would occur, except in conjunction with leasable mineral activities within the Koggiling Creek planning block. Salable mineral activities would be restricted from the proposed Carter Spit ACEC (36,220 acres). Under Alternative D, negative impacts to cultural and paleontological resources from salable mineral activities may be greater than Alternatives A and C but less than Alternative B.

**(2) Effects to Cultural and Paleontological Resources from Travel Management (Alternatives D)**

Under Alternative C, all BLM lands would be designated as “limited” for OHV use and a 2,000-lb GVWR weight restriction would be enforced. Impacts would be similar to that discussed in Alternative C.

**8. Direct and Indirect Effects for Visual Resource Management**

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Visual Resource Management (VRM): Cultural Resources, Paleontological Resources, Fisheries Management, Wild and Scenic Rivers, Social and Economic Conditions, and Subsistence.

**a) Effects to Visual Resource Management Common to All Alternatives**

In order to maintain the scenic values of public lands, BLM has been utilizing a Visual Resources Management (VRM) system that uses adaptive management to manage different levels of scenic values. Determining visual effects can be a subjective process. For this plan, assessments were collected from past VRM inventory reports. The inventory process is described in detail in BLM Handbook 8410-1 (BLM 1984).

**(1) Effects to Visual Resources Management from Soils, Water, Air, and Vegetation management (Common to All Alternatives)**

Visual resources would benefit from proper management of soil, water, air, and vegetation resources in the planning area. Cumulatively, each of these resources contributes to the scenic quality of the planning area. Identification and implementation of protection measures to prevent unnecessary or undue degradation of these resources would be addressed through project-specific NEPA analysis and through application of ROPs and Stips described in Appendix A.

**(2) Effects to Visual Resource Management from Wildlife Management (Common to All Alternatives)**

Critical Habitat Areas for listed species across Alaska have been, or are in the process of being determined for USFWS and NFMS T&E species. Critical Habitat Area designation may provide additional protection for visual resources by restricting development, which could obstruct viewing of natural features or degrade soil, water, air, and vegetative resources, ultimately impacting visual resources.

**(3) Effects to Visual Resource Management from Fires and Fuels Management (Common to All Alternatives)**

Ninety-two percent of Alaska BLM lands statewide are designated as Limited and Modified fire management option areas, meaning that naturally occurring fires are desired, but do have some

constraints. Although direct loss of vegetation would occur from wildland fires, mechanical or manual treatments, and prescribed burns, the change to the existing landscape character would be considered relatively short-term. Wildland fires are uncommon in the planning area and impacts of wildland fire and fuels management will be minimal within the planning area.

#### **(4) Effects to Visual Resource Management from Forestry Management (Common to All Alternatives)**

Commercial forestry practices could have long-term impacts to visual resources. No commercial forestry is carried out within the planning area, nor is any activity anticipated within the life of the plan. Therefore, no impacts to Visual Resource Management are anticipated within the foreseeable future.

#### **(5) Effects to Visual Resource Management from Lands and Realty Management (Common to All Alternatives)**

**Conveyance.** BLM is working to complete the conveyance of Native and State-selected lands by 2010. Land conveyance may have negative impacts to VRM should the new land managers allow increased development on lands adjacent to BLM lands. Should BLM lands be relinquished from State or Native-selection, the visual resources of those lands would likely be maintained at the VRM class described in Chapter II of this plan.

**Use Authorizations.** Issuance of Rights-of-Way could provide minimal to excessive negative impacts to visual resources depending on the scale of the proposed project. Most rights-of-way for activities such as roads or pipelines are linear features that do not necessarily blend with the natural landscape. This analysis anticipates more rights-of-way associated with mineral development for Alternatives B and D.

**ANCSA 17(b)(1) withdrawals.** The three action alternatives recommend revocation of ANCSA 17(d)(1) withdrawals to varying degrees. These actions affect visual resources indirectly by opening some lands to mineral leasing and location and potential mineral development. Direct effects to visual resources from mineral development are described elsewhere in this section.

#### **(6) Effects to Visual Resource Management from Locatable Minerals Activities (Common to All Alternatives)**

Locatable mineral activities may have adverse effects on the visual resources. Denuding of landscape, development of tailing piles, altered water ways and constructed facilities could have long-term impacts to the quality of visual resources in the immediate area of locatable mineral activities. The development of roads associated with locatable mineral activities may provide localized and large scale negative impacts on the visual resources, depending on access requirements.

#### **(7) Effects to Visual Resource Management from Renewable Energy (Common to All Alternatives)**

Under all Alternatives, lands available for potential renewable energy program sites would be evaluated on a case-by-case basis. Effects to visual resources associated with renewable energy programs are generally less severe in magnitude and extent relative to other development activities.

Wind, hydroelectric, and solar power projects would affect visual resources by obstructing views, vegetative removal, soil erosion, or altering waterbodies. These effects would largely result from construction activities, such as the creation of new utility corridors, access roads, and transmission lines, creating access opportunities to new visual resources, or modifying the existing landscape character. The magnitude and extent of these effects would vary for each project. Due to the remote locations of most BLM lands, large scale renewable energy projects are not expected to occur within the life of the plan.

**(8) Effects to Visual Resource Management from Socioeconomics (Common to All Alternatives)**

The lives of many Alaskan residents are tied to the natural environment. While many of the BLM lands within the planning area are difficult to access and not located in proximity to communities, visual resources are utilized and valued in varying degrees by residents within the planning area, as well as tourists. As the population within the planning area continues to increase, there would be increasing pressure on the ability to maintain visual resources that can be closely tied to regional economies, recreational opportunities, employment, and quality of life issues for residents. In addition, maintenance of a natural, visual quality condition would be expected to sustain a high quality habitat for subsistence wildlife and plant species. This ability to acquire subsistence resources may be the greatest factor in socioeconomics plan wide. It is expected that the current condition of socioeconomics within the planning area would have a positive impact on visual resources.

**b) Effects to Visual Resources for Alternative A**

No VRM classes are established under this Alternative.

**(1) Effects to Visual Resources from Lands and Realty (Alternative A)**

**Access (Rights of Way).** There are no avoidance or exclusion areas identified within the planning area under this Alternative. Rights-of-Way (ROW) are typically used for communication sites, utility corridors, or for access to mining claims and usually remain under BLM management. As growth and development continues in the planning area, the need for ROWs for transportation and utility corridors would increase. Potentially new access routes may change the existing form, line, color, and texture of the visual landscape. However, few annual ROW applications for the planning area have been received. This alternative anticipates the least amount of mineral development and consequently would expect few ROW applications.

**Withdrawals.** ANSCA 17(d)(1) withdrawals would be retained under this Alternative. Because of the constraints in place under these withdrawals, there would be less potential for resource development and activities that would alter the visual landscape.

**(2) Effects to Visual Resources from Leasable, Locatable, and Salable Minerals (Alternative A)**

**Leasable Minerals.** 17(d)(1) withdrawals would be retained on BLM lands within the planning area, prohibiting leasable mineral activities.

**Locatable Minerals.** Impacts to visual resources from locatable mineral activities would be similar to that discussed under Effects Common to All Alternatives. BLM lands in the planning area may be subject to localized adverse effects on visual resources from existing mineral claims. Under this Alternative, 23 acres of disturbance may occur from pre-ANSCA mining claims on BLM and Native (Federal mining claim) lands in the Goodnews Bay/Snow Gulch area (Arolik River, Barnum Creek, Butte Creek, Domingo Creek, Faro Creek, Fox Gulch, and Jacksmith Creek tributaries).

**Salable Minerals.** 17(d)(1) withdrawals would be retained on BLM lands within the planning area, prohibiting salable mineral activities.

**(3) Effects to Visual Resources from Travel Management (Alternative A)**

All lands within the Bay planning area would remain open for OHV use. The number of OHV trails throughout the planning area may stay the same or increase slightly within the life of the plan. These trails fragment the natural landscape, creating varying degrees of change to the existing visual character of the area. Braided trail sections more than 200 feet wide have been documented in Alaska (Meyer 2004). Important viewpoints and visual resources that may have been previously inaccessible may

become part of an expanding network of OHV trails, especially in areas of established moderate use, such as in the north and east Goodnews Bay area.

#### **(4) Effects to Visual Resources from Wild and Scenic Rivers (Alternative A)**

There is no Wild and Scenic Rivers recommended for designation to the National System under Alternative B. Thus, the scenic quality of river segments within the planning area would not be afforded additional protections.

#### **(6) Effects to Visual Resources from designation of Areas of Critical Environmental Concern (Alternative A)**

Under Alternative A, there are no ACECs proposed.

### **c) Effects to Visual Resource Management for Alternative B**

All lands under Alternative B would be managed as VRM Class IV, which would allow actions that make major modifications to the existing character of the landscape.

#### **(1) Effects to Visual Resources from Lands and Realty (Alternative B)**

**Exchanges.** Several parcels have been identified for exchange under this Alternative. Impacts to visual resources would depend on specific projects authorized by the new land manager. However, due to the small, scattered nature of these parcels, any development or alterations in the visual landscape resulting from their sale would be minimal.

**Acquisitions.** Under Alternative B, the acquisition of lands and easements from willing landowners would be considered on a case-by-case basis. Easements provide access to lands managed by the NPS, USFS, or USFWS, and once lands are conveyed, the easement is managed by the respective agency. The visual quality of these easements would likely be maintained.

**Access (Rights of Way).** There are no avoidance or exclusion areas identified within the planning area under this Alternative. Rights-of-Way (ROW) are typically used for communication sites, utility corridors, or for access to mining claims, and usually remain under BLM management. As growth and development continue in the planning area, the need for ROWs for transportation and utility corridors would increase. Potentially new access routes may change the existing form, line, color, and texture of the visual landscape. This alternative anticipates more Rights-of-way application in association with mineral exploration and development than any other alternative.

#### **(2) Effects to Visual Resources from Leasable, Locatable, and Salable Minerals (Alternative B)**

**Leasable Minerals.** ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening 1,103,138 acres to potential leasable mineral activities. Impacts to visual resources from leasable mineral activities may include, removal of vegetation and facilities construction, resulting in impacts to color, line, and texture of developed areas, with the removal of vegetative cover creating color contrast between the greens of vegetation and the browns of soils. Gas production wells, pads, and associated roads would create linear features that would not blend with the natural landscape. These impacts may be long-term but small in scale, isolated to the Koggiling Creek planning block. Impacts to visual resources from leasable mineral activities under Alternative B would be similar in scale to the impacts discussed under Alternative D and less in scale compared to Alternatives A and C because fewer lands would be available for leasable mineral activities.

**Locatable Minerals.** Where mining occurs, impacts to visual resources would be similar to those discussed under Effects Common to All Alternatives. ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area. These lands may be subjected to localized adverse effects on visual

resources from existing and increased locatable mineral claims. According to the Reasonable Foreseeable Development Scenario for the plan, expected locatable mineral development is to occur on 115 acres within the entire planning area under Alternative B. Upon lifting of ANCSA 17(d)(1) withdrawals, Top Filed land would become State-selected and new locatable mineral activities would not be authorized through Federal mining claims. These Top Filed lands include the high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch. Impacts to visual resources from locatable mineral activities under Alternative B would be similar in scale to the impacts discussed under Alternative D and greater in scale compared to Alternatives A and C.

**Salable Minerals.** ANCSA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential salable mineral activities. Impacts to visual resources from salable mineral activities may be long-term but small in scale, isolated to the Koggiling Creek planning block, in support of leasable mineral activities. Impacts to visual resources from salable mineral activities under Alternative B would be greater than Alternatives A, C, and D because fewer lands would be available for salable mineral activities.

### **(3) Effects to Visual Resources from Travel Management (Alternative B)**

All lands within the planning area would be designated as “Open” under Alternative B. Because OHV use on BLM lands is currently unrestricted, this management action would have similar effects to Alternative A. Increasing OHV trail creation and widening causes change to the existing form, line, color, and texture of the visual landscape. Important viewpoints and visual resources that may have been previously inaccessible may become part of an expanding network of OHV trails, especially in areas of established moderate use such as Goodnews Bay. Under Alternative B, impacts to visual resources from travel management may be greater in scale compared to Alternatives A, C, and D because the potential increase in mineral development may contribute to more vehicle traffic in remote areas.

### **(4) Effects to Visual Resources from Wild and Scenic Rivers (Alternative B)**

There would be no Wild and Scenic Rivers recommended for designation to the National System under Alternative B. Thus, the scenic quality of river segments within the planning area would not be afforded additional protections, other than those outlined in the Stipulations and Required Operating Procedures (Appendix A).

### **(5) Effects to Visual Resources from designation of Areas of Critical Environmental Concern (Alternative B)**

Under Alternative A, there are no ACECs proposed. With less area-wide constraints, more resource development might occur in these areas, with impacts to visual resources as described above.

## **d) Effects to Visual Resources from Alternative C**

### **(1) Effects to Visual Resources from Lands and Realty (Alternative C)**

Access (Rights of Way) – The proposed Carter Spit ACEC and Bristol Bay ACEC would be identified as avoidance areas for ROWs. Authorization of ROWs within these areas would be limited in scale. Impacts to visual resource management from ROW authorization include changes to the existing form, line, color, and texture of the visual landscape. However, few annual ROW applications for the planning area have been received. Under Alternative C, impacts to visual resources from ROW authorizations would be less in scale compared to Alternatives B and D because of ROW avoidance areas.

### **(2) Effects to Visual Resources from Leasable, Locatable, and Salable Minerals (Alternative C)**

**Leasable Minerals.** ANCSA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential leasable mineral activities. Impacts to visual resources from

leasable mineral activities may be long-term but small in scale, isolated to the Koggiling Creek planning block. Impacts to visual resources from leasable mineral activities under Alternative C would be similar in scale to the impacts discussed under Alternatives B and D and greater in scale compared to Alternative A.

**Locatable Minerals.** Where mining occurs, impacts to visual resources from locatable mineral activities would be similar to those discussed under Effects Common to All Alternatives. Under this alternative, ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, except in the Carter Spit ACEC (61,251 acres) and river segments recommended for inclusion to the National WSR system (12,210 acres). Lands open to locatable mineral activities may be subjected to localized adverse effects on visual resources from existing and increased locatable mineral claims. According to the Reasonable Foreseeable Development Scenario for the plan, expected locatable mineral development is to occur on 43 acres of BLM State-selected and Native (Federal mining claims) lands due to ANILCA 906(e) Top Filings. Impacts to visual resources from locatable mineral activities under Alternative C would be similar in scale to the impacts discussed under Alternative A and reduced in scale compared to Alternatives B and D.

**Salable Minerals.** ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential salable mineral activities. Impacts to visual resources from salable mineral activities may be long-term but small in scale. Salable mineral activities would be restricted from occurring within the boundaries of the proposed Bristol Bay and Carter Spit ACECs. This would prevent salable mineral activities from occurring within the Koggiling Creek planning block in support of leasable mineral activities. Impacts to visual resources from salable mineral activities under Alternative C would be greater than Alternative A but less than Alternatives B and D because fewer lands would be available for salable mineral activities.

### **(3) Effects to Visual Resources from Travel Management (Alternative C)**

BLM lands would be designated as limited to OHV use and a 2,000-lb GVWR restriction would be enforced. Limiting use within the planning area may reduce adverse effects to visual resources relative to the current level of effects. An area of low to moderate OHV use, the Goodnews Bay area may feel the highest level of beneficial effects towards changing the existing landscape character. Impacts to visual resources from Travel Management would be less than Alternatives A and B and similar to Alternative D.

### **(4) Effects to Visual Resources from Wild and Scenic Rivers (Alternative C)**

Under Alternative C, BLM would recommend three river segments for Wild and Scenic River designation (Alagnak River, Goodnews River mainstem and Middle Fork Goodnews River). These river segments would be designated a VRM class III within five miles of the full visible foreground of main river travel routes. Alternative C would provide greater protection to visual resources within the immediate areas of designated Wild and Scenic Rivers by restricting development and surface disturbance within the WSR corridors and the five mile buffer of VRM III. Under Alternative C, visual resources would be provided greater protection, due to increased acreage of VRM III, compared to Alternatives B and D. Under Alternative C, the retention of ANSCA 17(d)(1) withdrawals in these areas may provide greater protection to visual resources, though VRM designation would not be applied.

### **(5) Effects to Visual Resources from designation of Areas of Critical Environmental Concern (Alternative C)**

Under Alternative C, the Bristol Bay (974,970 acres) and Carter Spit (61,251 acres) ACECs would be proposed. Each of these areas would be managed at VRM Class III, applying additional mitigating measures to development activities to protect visual resources. Under Alternative C, visual resources would be provided greater protection, due to increased acreage of VRM III, compared to Alternatives B and D. Under Alternative A, the retention of ANSCA 17(d)(1) withdrawals in these areas may provide greater protection to visual resources, though VRM designation would not be applied.

## e) Effects to Visual Resources for Alternative D

### (1) Effects to Visual Resources from Lands and Realty (Alternative D)

**Access (Rights-of-Way).** The proposed Carter Spit ACEC (36,220) would be identified as an avoidance area for Rights-of-Way. Projects within the ACEC boundary would be designed to reduce impacts to biological resources. Impacts to the current visual landscape in this area would be minimized through Stipulations and Required Operating Procedures (Appendix A). Other areas requiring avoidance on a local level for impacts on visual resource management would be identified on a case-by-case basis.

### (2) Effects to Visual Resources from Leasable, Locatable, and Salable Minerals (Alternative D)

Under Alternative D, effects would be the same as discussed under Alternative B, except the Carter Spit ACEC (36,220 acres) would not be available for salable mineral activities. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Any effects to visual resources occurring on those lands would continue at or slightly above current levels.

### (3) Effects to Visual Resources from Travel Management (Alternative D)

Under Alternative D, OHV use on BLM lands would be managed as described under Alternative C, designated as “limited” and a 2,000-lb GVWR restriction would be enforced on OHV use on all BLM lands within the planning area. Because OHV use on BLM managed lands is currently unrestricted (open), this management action would likely reduce OHV effects to the existing landscape.

### (4) Effects to Visual Resources from Wild and Scenic Rivers (Alternative D)

There would be no Wild and Scenic Rivers recommended for designation to the National System under Alternative D. Protection of scenic resources associated with the Alagnak River, Goodnews River mainstem, and Goodnews River Middle Fork River segments would be accomplished through Stipulations and Required Operating Procedures (Appendix A, ROPs Part 8).

### (5) Effects to Visual Resources from designation of Areas of Critical Environmental Concern (Alternative D)

Under Alternative D, the Carter Spit (61,251 acres) ACECs would be proposed. This area would be managed at VRM Class III, applying additional mitigating measures to development activities to protect visual resources.

## **D. Resource Uses**

### **1. Resources Use Assumptions**

#### ***Climate Change***

Activities occurring on BLM-managed lands may contribute to climate change by emitting greenhouse gases. Though greenhouse gases are vital to maintaining global ambient temperatures suitable for life on earth excess greenhouse gas in the atmosphere may contribute to global climate change (DOE, 2003). Activities that may occur on BLM-managed lands with the potential to emit greenhouse gases include some leasable mineral activities described in Chapter III, section B.C.3.a, recreation activities using motor vehicles, or prescribed burning.

#### **2. Forest Products**

Currently, there are no forest product programs on BLM lands in the planning area. Due to a lack of available timber suitable for commercial use or sale, no forest product projects are anticipated within the life of this plan. Commercial logging is not likely to occur in the reasonably foreseeable future in the planning area due to low timber volume, low productivity, unsuitability of the timber for commercial use or sale, scattered locations of timber stands, and long distances involved in timber transport. Consequently, proposed management of other resources or resource uses would have little to no impact on forest products.

#### **3. Livestock and Reindeer Grazing**

There are no authorized livestock grazing operations within the planning area. There have been no requests for permits nor are any expected within the life of the plan. Livestock, reindeer, or pack animal grazing, if requested, would occur by permit only. Requests would be carefully considered, and grazing would not be permitted where it is incompatible with wildlife populations, habitats, and where landscape conditions would become less stable, (i.e. high erosion areas). Effects to livestock and reindeer grazing would be the same under all Alternatives.

#### **4. Direct and Indirect Effects for Recreation Management**

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Recreation: Visual Resources, Forest Products, Renewable Energy, Economic Conditions, and Subsistence.

##### **a) Effects to Recreation (Common to All Alternatives)**

###### **(1) Effects to Recreation from Soils, Water, Air, and Vegetation Management (Common to All Alternatives)**

Soil, water, air, and vegetation management may provide restriction to recreation if these resources become excessively degraded by recreation uses. Though uncommon within the planning area due to the remote location of BLM lands, restriction would be short-term and apply only to localized areas.

**(2) Effects to Recreation from Fish and Wildlife Management (Common to All Alternatives)**

Management of fish and wildlife habitats to provide environments to support viable populations of fish and wildlife will have a direct impact on recreation. By enhancing or altering wildlife habitats, the animals used for recreational hunting, fishing, and trapping would be either increased or decreased. Viewing opportunities of wildlife may be increased or decreased as well. Recreation could be enhanced through the introduction of sought after big game animals if habitat would support such introduction.

**(3) Effects to Recreation from Fire and Fire Management (Common to All Alternatives)**

Fire promotes vegetation and wildlife diversity, which can enhance recreation opportunities in both the short- and long-term. Vegetative diversity provides variation in vegetation types, providing variation in form, texture, and color and enhancing scenic qualities. Long-term opportunities for wildlife viewing or hunting may be enhanced by new vegetation growth (willow moose browse) and improved habitat quality. Wildland or prescribed fire may be used to improve wildlife habitat thereby increasing wildlife numbers to the benefit of recreational users. Negative effects of fire on recreation are generally short-term and are directly related to fire's effects on specific resources used in recreation, such as recreation facilities.

Effects on visual and cultural resources, wildlife, and vegetation would have immediate and direct effects on use of these resources for camping, sightseeing, hunting, and other activities. Recreation users are generally mobile, thus, if recreation is precluded by fire in one area, they generally can find an alternate area in which a similar recreational activity can be pursued. However, smoke thick enough to limit aircraft flights could result in impacts on recreational and commercial activities. Existing and future BLM structures and facilities will be protected to the benefit of recreational users.

**(4) Effects to Recreation from Lands and Realty Management (Common to All Alternatives)**

BLM is working to complete the conveyance of Native and State-selected lands by 2010. Land conveyance may have negative impacts to recreation should the new land managers allow increased development or greater restrictions on recreational uses on lands adjacent to BLM lands.

**(5) Impacts to Recreation from Cultural and Paleontological Resources (Common to All Alternatives)**

Protection and possible interpretation of these resources would enhance recreation opportunities and experiences for those seeking these types of experiences.

**(6) Effects to Recreation from Locatable Minerals (Common to All Alternatives)**

Existing mining operations have provided secondary access to recreational opportunities. Often these operations provide remote air landing strips and localized trails. Large-scale mining operations with associated infrastructure (such as roads and powerlines) are not anticipated within the life of the plan.

Mineral development has the potential to create impacts to recreation, particularly if development occurs in areas that provide primitive or semi-primitive recreation experiences. Mineral development has the potential to impact the viewshed. Public access into areas of development would have secondary effects on adjacent areas by increasing visitor use and may lead to the development of additional dispersed campsites and trails.

**(7) Effects to Recreation from Recreation Management (Common to All Alternatives)**

Currently, only four special recreation permits (SRP) are issued on BLM lands within the planning area. Within the life of the plan 10 SRPs are expected to be issued at any one time. This is attributed to the remote location of most BLM land. In response to the anticipated low number of SRPs and the dispersed

nature of recreational activities in the planning area, no Special Recreation Management Areas (SRMA) would be designated on BLM lands within the planning area.

## **b) Direct and Indirect Effects to Recreation from Alternative A**

### **(1) Effects to Recreation from Lands and Realty (Alternative A)**

**Access (Rights of Way).** There are no avoidance or exclusion areas identified within the planning area under this Alternative. Rights-of-Way are typically used for communication sites, utility corridors, or for access to mining claims, and usually remain under BLM management. Because of the retention of most ANCSA 17(d)(1) withdrawals, this alternative anticipates very little new resource development and associated applications for rights-of-way.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be retained under this Alternative. Most BLM lands would continue to be closed to mineral entry. Because of the lack of resource development expected under this alternative, recreation opportunities would remain as described under current conditions: primitive, semi-primitive, and semi-primitive motorized.

**Disposal and Acquisition.** No lands have been identified for disposal under this alternative. There would be no impact to recreation if land disposal does not occur.

Under Alternative A, acquisitions would continue to be considered on a case-by-case basis as opportunities arise. Where acquisitions of private inholdings occur, particularly in heavy use recreation areas, there would be a benefit to the recreation program by eliminating the potential for private development or limitations on access.

### **(2) Effects to Recreation from Minerals (Alternative A)**

**Leasable.** ANCSA 17(d)(1) withdrawals would be maintained under this alternative and no mineral leasing is anticipated.

**Locatable.** Because of the retention of ANCSA 17(d)(1) withdrawals, no new mining activity is anticipated and development on existing claims would be limited to 23 acres on BLM lands. In the immediate area of the mineral development, recreation opportunities may be enhanced by the access provided (either through roads, trails, or remote airstrips). However, the development would detract from recreation opportunities through alteration of the natural landscape and degradation of the scenic quality. Increased access can also mean increased visitation and motorized use, with recreation experiences trending from primitive, semi-primitive, or semi-primitive motorized towards roaded natural.

**Salable.** No activity is anticipated under this alternative.

### **(3) Impacts to Recreation from Recreation Management (Alternative A)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. No SRMAs would be designated under Alternative A. No facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) would be added to the range of recreational experiences currently available. This would have negative impacts on recreational users preferring some rustic facilities. Recreational opportunities would be primarily limited to independent remote backcountry experiences and through guided tours.

### **(4) Impacts to Recreation from Travel Management (Alternative A)**

All BLM lands in the planning area are designated as open and no weight restrictions apply to OHV use. Under this Alternative recreational use of OHV would have the least restrictions but may result in short and long term degradation to resources because of the potential wide-spread use of OHVs. Unmanaged

OHV use can result in proliferation of OHV trails, with recreation experiences trending from primitive or semi-primitive towards semi-primitive motorized or roaded natural.

**(5) Impacts to Recreation from Areas of Critical Environmental Concern (Alternative A)**

No ACECs which provide measures for the protection of specific resource values, would be designated under this alternative. In general, resource values would be afforded less protection and wildlife viewing, hunting and fishing opportunities and other recreational use may decrease without the protective measures offered by these designations.

**(6) Impacts to Recreation from Wild and Scenic River designation**

No Wild and Scenic River segments would be recommended under this Alternative. With the retention of ANCSA 17(d)(1) withdrawals, this would have little effect on recreation. No resource development would be expected in these river areas.

**c) Effects to Recreation from Alternative B**

**(1) Effects to Recreation from Lands and Realty (Alternative B)**

**Access (Rights of Way).** This alternative anticipates the most resource development and associated rights-of-way applications than any other alternative. Rights-of-way, particularly those use for roads, can provide access to recreation opportunities. However, increased access will alter existing recreation opportunities by increasing the level of visitor use and by detracting from the natural setting, trending from primitive or semi-primitive towards semi-primitive motorized or roaded natural.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be revoked. This would indirectly effect recreation by allowing resource development. Direct effects of development are discussed elsewhere in this section.

**Disposal and Acquisition.** Some parcels would be identified for land exchange. If disposal was to occur, development on private lands may bring a heavy concentration of recreational users which may negatively impact adjacent BLM land or recreational users on adjacent BLM lands. Private landowners may limit access for recreational users to adjacent BLM lands.

**(2) Impacts to Recreation from Minerals (Alternative B)**

**Leasable.** This alternative recommends revocation of all ANCSA 17(d)(1) withdrawals and makes more lands available for mineral leasing than any other alternative. However, because of low potential and inaccessibility, this analysis anticipates the development of only one natural gas field, in the Koggiling block. In the immediate vicinity of the development, access would be increased for recreational users. However, the production wells, gravel pads, gravel roads, and maintenance traffic would detract from the primitive and semi-primitive setting that currently exists. Some recreational users may be displaced. Outside of the Koggiling block, no mineral leasing is anticipated and no effects to recreation would occur.

**Locatable.** Because of the revocation of ANCSA 17(d)(1) withdrawals and the lack of any area-wide constraints, this alternative anticipates some level of new mineral development (115 acres). Increased infrastructure providing access to these developments could provide access for recreation users that does not currently exist. In the immediate area of the mining development, most users would be displaced because of the activity, noise, and alteration of the natural setting.

**Salable.** This alternative anticipates more development of salable minerals, particularly gravel, than any other alternative. Because these developments would mostly be connected to leasable or locatable mineral development, effects to recreation would be the same as described above under Leasable and Locatable.

### **(3) Impacts to Recreation from Recreation Management (Alternative B)**

The Recreation Opportunity Spectrum (ROS) classification will be **Roaded Natural** under this alternative. Facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) may be added to the range of recreational experiences currently available. The construction of rustic facilities may appeal to some recreation users. Recreational opportunities would be primarily limited to independent remote backcountry experiences and through guided tours.

### **(4) Impacts to Recreation from Travel Management (Alternative B)**

All BLM lands in the planning area would be designated as open and no weight restrictions would apply to OHV use. Impacts would be similar to those discussed in Alternative A.

### **(5) Impacts to Recreation from Areas of Critical Environmental Concern (ACEC) (Alternative B)**

No ACECs would be designated under this alternative. Consequently, ACEC resource protection constraints would not apply and more resource development is anticipated. Effects of increased development on recreation under this alternative are discussed under Impacts to Recreation from Minerals and Impacts to Recreation from Travel Management.

### **(6) Impacts to Recreation from Wild and Scenic River designation (Alternative B)**

No Wild and Scenic River segments would be recommended under this Alternative. Several effects to recreation might take place. On one hand, the protective constraints associated with Wild and Scenic river suitability would not occur, thus making these river areas open for potential mineral development and associated impacts to recreation. On the other hand, based on experience with other Alaskan rivers, Wild and Scenic river designation comes with increased visitation and associated impacts to the existing recreation experience. Under this alternative, that would not occur.

## **d) Effects to Recreation from Alternative C**

### **(1) Effects to Recreation from Lands and Realty (Alternative C)**

**Access (Rights of Way).** This alternative would designate two ACECs (Carter Spit and Bristol Bay). Those ACECs are identified as avoidance areas for rights-of-way. Consequently, because of the constraints identified, very little resource development and associated rights-of-way applications are anticipated under this alternative.

**Withdrawals.** Most ANCSA 17(d)(1) withdrawals would be revoked. However, ANCSA 17(d)(1) withdrawals would be retained in the Carter Spit ACEC and in river corridors considered as suitable for inclusion as Wild and Scenic Rivers. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Consequently, very little mineral development (43 acres) is expected on BLM lands.

**Disposal and Acquisition.** No parcels have been identified for exchange. Impact would be similar to Alternative A.

### **(2) Effects to Recreation from Minerals (Alternative C)**

**Leasing.** This alternative would revoke most existing ANCSA 17(d)(1) withdrawals but retain them in the Carter Spit ACEC and in river corridors considered as suitable for inclusion as Wild and Scenic Rivers. Consequently, less acreage would be available for leasing under this alternative than under alternatives B and D, but more than under A. However, this analysis anticipates the development of one natural gas

field in the Koggiling block. Effects of that development on recreation are the same as described under Alternative B.

**Locatable.** Because of constraints associated with ACECs and Wild and Scenic River suitability and the effect of Top Filings, this alternative anticipates only 43 acres of mineral development. Effects to recreation in the immediate area of those 43 acres are as described under alternatives A and B. Because of the limited amount of development, changes to the overall recreation opportunity spectrum would be insignificant on BLM lands.

**Salable.** Very limited salable mineral development is anticipated under this alternative. Any development would be associated with leasable or locatable mineral development, with effects as described above.

**(3) Impacts to Recreation from Recreation Management (Alternative C)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. Impacts would be similar to Alternative A.

**(4) Impacts to Recreation from Travel Management (Alternative C)**

BLM lands would be designated as limited to OHV use and a 2,000-lb GVWR restriction would be enforced. Limiting OHV use within the planning area may reduce recreation opportunities for some groups, while the added protection to renewable resources may reduce the potential for area closures to OHV/recreation use. Limiting unmanaged proliferation of OHV use would have the effect of maintaining primitive and semi-primitive recreation experiences, rather than those experiences trending towards semi-primitive motorized.

**(5) Effects to Recreation from Wild and Scenic Rivers (Alternative C)**

Under Alternative C, BLM would recommend three river segments for Wild and Scenic River designation (Alagnak River, Goodnews River mainstem and Middle Fork Goodnews River). Under Alternative C, increased opportunities for recreation may result from WSR designation. This may include increased access opportunities by air travel and increased opportunity for fishing, float trips, and camping. Increased visitation on these rivers could result in increased impacts associated with recreation use along rivers, including campsite impacts, litter, human waste, and development of social trails. These effects over time will move a primitive experience to semi-primitive.

**(6) Effects to Recreation from designation of Areas of Critical Environmental Concern (Alternative C)**

Under Alternative C, the Bristol Bay (974,970 acres) and Carter Spit (61,251 acres) ACECs would be proposed. These areas would not benefit recreation because designation is for added protection of wildlife and habitat rather than for recreational purposes. Constraints associated with these ACECs could limit some resource development and associated impacts on recreation.

**e) Effects to Recreation from Alternative D**

**(1) Effects to Recreation from Lands and Realty (Alternative D)**

**Access (Rights of Way).** An avoidance area is recommended for the Carter Spit ACEC (36,220 acres). This may reduce access to this area for recreation but will also maintain the area in a mostly undeveloped and natural setting.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be revoked. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral

occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA.

**Disposal and Acquisition.** No parcels have been identified for exchange. Impact would be similar to Alternative A.

## **(2) Effects to Recreation from Minerals (Alternative D)**

**Leasable.** Effects to recreation would be the same as those described for Alternative B.

**Locatable.** Effects to recreation would be the same as those described for Alternative B.

**Salable.** Effects to recreation would be the same as those described for Alternative B.

## **(3) Impacts to Recreation from Recreation Management (Alternative D)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. Impact would be similar to Alternative A.

## **(4) Impacts to Recreation from Travel Management (Alternative D)**

BLM lands would be designated as limited to OHV use and a 2,000-lb GVWR restriction would be enforced. Limiting OHV use within the planning area may reduce recreation opportunities for some groups, while the added protection to renewable resources may reduce the potential for area closures to OHV/recreation use. Impacts to recreation would be similar to that discussed in Alternative C.

## **(5) Effects to Recreation from Wild and Scenic Rivers (Alternative D)**

No river segments for Wild and Scenic River designation would be recommended under Alternative D. Impacts to recreation would be similar to that discussed in Alternative B.

## **(6) Effects to Recreation from designation of Areas of Critical Environmental Concern (Alternative D)**

Under Alternative D, the Carter Spit ACEC (36,220 acres) would be proposed. This would be designated a right-of-way avoidance area, possibly reducing access for recreation purposes. These areas would not benefit recreation because designation is for added protection of wildlife and habitat rather than for recreational purposes. However, constraints associated with these ACECs could limit some resource development and associated impacts on recreation.

# ***5. Direct and Indirect Effects for Travel Management***

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Travel Management: Visual Resources, Forest Products, Renewable Energy, Wildlife and Wildlife Habitat, Fisheries Management, Wild and Scenic Rivers, Leasable, Locatable, and Salable Minerals, Social and Economic Conditions, and Subsistence.

## **a) Direct and Indirect Effects for Travel Management (Common to all Alternatives)**

### **(1) Effects to Travel Management from Soils, Water, Air, and Vegetation Management (Common to All Alternatives)**

Soil, water, air, and vegetation management may result in travel restrictions if these resources become excessively degraded. Rehabilitation efforts may close portions of trails. Though uncommon within the planning area due to the remote location of BLM lands, restriction would be short-term and apply only to localized areas.

### **(2) Impacts to Travel Management from Mineral Activities (Common to All Alternatives)**

**Locatable Minerals.** Pre-ANSCA mining claims exist on BLM lands in planning area. If development continues on these claims increased OHV access and increased air traffic and resulting infrastructure may occur.

**Salable Minerals.** Some BLM lands are available for salable mineral development, though activities are not expected to occur due to the remote location of BLM lands and the availability of materials on State and private lands. If salable mineral activities were to occur, increased OHV access may be created resulting from the mine area and associated infrastructure necessary to transport mined materials.

### **(3) Impacts to Travel Management from Special Status Species (Common to All Alternatives)**

Travel can be impacted through specific limits on OHV use or on trail development within areas that contain Special Status Species. Proposed or permitted uses such as trail construction or designation would be analyzed and mitigation measures would be developed to minimize impacts. If it is determined that OHV use or trail construction may negatively affect a Special Status Species, the use may be limited to seasons when the species is not present, or the trail relocated to areas where the species is unlikely to be encountered.

### **(4) Impacts to Travel Management from Travel Management (Common to All Alternatives)**

Fixed wing and helicopter access will remain largely unregulated on all BLM lands.

Consistent with ANCSA, the BLM would continue to administer 17(b) easements that access public lands across Native lands. Where 17(b) easements access non-BLM-managed public lands, BLM would attempt to transfer management responsibility of the easement to the appropriate agency. Easement relocation and/or termination would be subject to public involvement. To ensure maintenance of access to public lands as ANCSA conveyances take place 17(b) easements would be extended or new easements reserved as needed. There would be little to no decrease in access currently provided by 17(b) easements under any alternative.

There is no foreseeable road construction unless economically viable resource development (minerals primarily) takes place or the State proposes specific roads for public access in the planning area across BLM lands. A request for road proposal would be acted upon on a case by case basis. If roads were developed, access opportunities for OHV users would increase.

## **b) Direct and Indirect Effects for Travel Management for Alternative A**

Under Alternative A, BLM lands would be designated as “open” for OHV use. No travel restrictions would exist and no weight restrictions would be placed on OHVs.

### **(1) Effects to Travel Management from Lands and Realty (Alternative A)**

**Access (Rights of Way).** Rights-of-Way are typically used for communication sites, utility corridors, or for access to mining claims, timber resources, and conservation areas, and usually remain under BLM management. Because of retention of ANCSA 17(d)(1) withdrawals, this alternative anticipates very little resource development and associated applications for rights-of-way. Under this Alternative travel management and the amount of travel is expected to remain at current levels.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be retained under this Alternative. Most BLM lands would continue to be closed to mineral entry. Travel requirements and infrastructure to support air travel across and to BLM lands is expected to maintain at current levels due to reduced development.

**Disposal and Acquisition.** No lands have been identified for disposal under this alternative. There would be no impact to travel and travel management. Under Alternative A, acquisitions would continue to be considered on a case-by-case basis as opportunities arise.

### **(2) Effects to Travel Management from Mineral Activities (Alternative A)**

**Leasable minerals.** ANCSA 17(d)(1) withdrawals would be retained on BLM lands precluding leaseable mineral activities. Travel by OHV and aircraft support of leasable mineral activities would not increase under Alternative A.

**Locatable Minerals.** ANCSA 17(d)(1) withdrawals would be retained on BLM lands precluding new locatable mineral activities. Impacts to travel management would be similar to that discussed in Effects Common to All Alternatives.

**Salable Minerals.** ANCSA 17(d)(1) withdrawals would be retained on BLM lands precluding new salable mineral activities. There would be no impacts to travel management.

### **(3) Effects to Travel Management from Travel Management (Alternative A)**

All BLM lands in the planning area are designated as open and no weight restrictions apply to OHV use. Under this Alternative recreational use of OHV would have the least restrictions but may result in short and long term degradation to resources because of the potential wide-spread use of OHVs. This degradation could lead to area closures to OHV use, allowing natural rehabilitation of the landscape.

### **(4) Effects to Travel Management from Recreation Management (Alternative A)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. No facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) would be added to support OHV use. This may inhibit increased OHV use by groups or individuals requiring these facilities. Air traffic in support of recreational uses is not expected to increase under this Alternative.

### **(5) Effects to Travel Management from Areas of Critical Environmental Concern (ACEC) (Alternative A)**

No ACECs would be designated under this alternative. No access would be restricted.

### **(6) Effects to Travel Management from Wild and Scenic River designation (Alternative A)**

No Wild and Scenic River segments would be recommended under this Alternative. No access would be restricted.

## c) Direct and Indirect Effects for Travel Management for Alternative B

Under Alternative B, BLM lands would be designated as “open” for OHV use.

### (1) Effects to Travel Management from Lands and Realty (Alternative B)

**Access (Rights of Way).** There are no avoidance or exclusion areas identified within the planning area under this Alternative. Rights-of-Way are typically used for communication sites, utility corridors, or for access to mining claims, and usually remain under BLM management. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Under this Alternative, the use of OHVs and aircraft could increase slightly due to increased development and associated rights-of-way..

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be revoked under this Alternative. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Some BLM lands would continue to be closed to mineral entry due to Agency withdrawals. However, this alternative anticipates more resource development than any other alternative. Travel requirements and infrastructure to support air travel across and to BLM lands is expected to increase due to increased development.

**Disposal and Acquisition.** Parcels of land have been identified for disposal under this alternative. Impact to travel and travel management would be dependant on access restrictions by the new land manager. Disposals may create discontinuous routes for OHV users.

### (2) Effects to Travel Management from Mineral Activities (Alternative B)

**Leasable minerals.** Under Alternative B, ANCSA 17(d)(1) withdrawals would be revoked and 1,103,138 acres of BLM lands within the planning area would be open to leasable mineral activities. Travel by OHV and aircraft in support of leasable mineral activities would increase primarily in the Koggiling Creek planning block. Leasable mineral activity has the potential to create impacts to travel management and OHV use, particularly if development occurs in areas that may provide access created by improved infrastructure. Increased air traffic may result from leasable mineral activities. Construction of winter roads, pipelines, powerlines, and other necessary infrastructure would create improved access. Public access into areas of development would have secondary effects on adjacent areas by increasing visitor use and may lead to other developments. Required Operating Procedures have been developed regarding altitude restrictions for aircraft flights to protect wildlife and special status species wildlife (Appendix A).

**Locatable Minerals.** ANCSA 17(d)(1) withdrawals would be revoked opening 1,102,489 acres of BLM lands to locatable mineral activities. Roads or infrastructure necessary for those operations may cross BLM land. Increased air traffic may result from locatable mineral activities. Increased trails and remote airstrip development would be likely under this alternative. Road development is likely if mineral development takes place. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Though ANCSA 17(d)(1) withdrawals would be lifted, impacts to travel management under Alternative B may increase slightly due to ANILCA 906(e) Top Filings. Required Operating Procedures have been developed regarding altitude restrictions for aircraft flights to protect wildlife and special status species wildlife (Appendix A).

**Salable Minerals.** ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential salable mineral activities. Impacts to travel management from salable mineral activities would be similar to that discussed in Effects Common to All Alternatives. These impacts may be long-term but small in scale, isolated to the Koggiling Creek planning block, in support of leasable mineral activities. Impacts to travel management from salable mineral activities under Alternative B could be greater than Alternatives A, C, and D because more lands would be available for salable mineral activities.

### **(3) Effects to Travel Management from Travel Management (Alternative B)**

All BLM lands in the planning area would be designated as open and no weight restrictions would apply to OHV use. Under this Alternative recreational use of OHVs would have the least restrictions but may result in short and long term degradation to resources because of the potential wide-spread use of OHVs. This degradation could lead to area closures to OHV use, allowing natural rehabilitation of the landscape.

### **(4) Effects to Travel Management from Recreation Management (Alternative B)**

The Recreation Opportunity Spectrum (ROS) classification would be designated as **Roaded Natural**. Facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) may be added to the range of recreational experiences currently available. The construction of rustic facilities may appeal to some recreation users, while maintenance of roads may provide for improved access to areas within the planning area. The improvements made as **Roaded Natural** ROS classification may provide for increased OHV use. Air travel is not expected to increase due to recreation management.

### **(5) Effects to Travel Management from Area of Critical Environmental Concern (ACEC) (Alternative B)**

No ACECs would be designated under this alternative. There would be no limitations to OHV use.

### **(6) Effects to Travel Management from Wild and Scenic River designation (Alternative B)**

No Wild and Scenic River segments would be recommended under this Alternative. There would be no access restrictions in these river areas.

## **d) Direct and Indirect Effects for Travel Management for Alternative C**

Under Alternative C, BLM lands would be designated as "limited" for OHV use. OHV access would be by designated trails only. A 2,000-lb GVWR weight restriction would be placed on OHVs.

### **(1) Effects to Travel Management from Lands and Realty (Alternative C)**

**Access (Rights-of-Way).** The Carter Spit and Bristol Bay ACECs would be proposed. These areas would be designated as Right-of-Way avoidance areas, which could restrict OHV access across these lands.

**Withdrawals.** ANSCA 17(d)(1) withdrawals would be revoked under this Alternative. Upon revocation of ANSCA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Some BLM lands would continue to be closed to mineral entry due to Agency withdrawals.

**Disposal and Acquisition.** No lands are identified for disposal or land exchange. Impacts would be similar to that discussed under Alternative A.

**(2) Effects to Travel Management from Mineral Activities (Alternative C)**

**Leasable minerals.** Under Alternative B, ANSCA 17(d)(1) withdrawals would be revoked and 1,063,129 acres of BLM lands within the planning area would be open to leasable mineral activities. Travel by OHV and aircraft in support of leasable mineral activities would increase primarily in the Koggiling Creek planning block. Leasable mineral activities have the potential to create impacts to travel management and OHV use, particularly if development occurs in areas that may provide access created by improved infrastructure. Construction of winter roads, pipelines, powerlines, and other necessary infrastructure would create improved access. Public access into areas of development would have secondary effects on adjacent areas by increasing visitor use and may lead to other developments.

**Locatable Minerals.** ANSCA 17(d)(1) withdrawals would be revoked opening 1,102,489 acres of BLM lands to locatable mineral activities. Impacts to travel management would be similar to that discussed in Effects Common to All Alternatives. Upon revocation of ANSCA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Impacts to travel management under Alternative C may increase slightly due to lifting of ANSCA 17 (d)(1) withdrawals.

**Salable Minerals.** ANSCA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential salable mineral activities. Impacts to travel management from salable mineral activities would be similar to that discussed in Effects Common to All Alternatives. These impacts may be long-term but small in scale, isolated to the Koggiling Creek planning block, in support of leasable mineral activities. Impacts to travel management from salable mineral activities under Alternative B could be greater than Alternatives A, C, and D because more lands would be available for salable mineral activities.

**(3) Effects to Travel Management from Travel Management (Alternative C)**

Under this alternative, all BLM lands would be classified as limited to OHVs and there would be a 2,000 lb. GVWR applied to OHVs. OHVs would be limited to existing trails and in some areas (such as ACECs) trails would be designated. These measures, while not limiting access on existing routes, would prevent unlimited access and cross-country travel.

**(4) Effects to Travel Management from Recreation Management (Alternative C)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. No facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) would be added to support OHV use. Impacts would be similar to that discussed under Alternative A.

**(5) Effects to Travel Management from Areas of Critical Environmental Concern (ACEC) (Alternative C)**

Under Alternative C, the Bristol Bay (974,970 acres) and Carter Spit (61,251 acres) ACEC would be proposed. This area would be designated as a right-of-way avoidance area which may prevent or restrict access through the use of special stipulations. A travel management plan would be done for these ACECs, identifying existing routes and designating OHV trails in order to protect relevant resource values. These measures, while not limiting access on existing routes, would prevent unlimited access and cross-country travel.

**(6) Effects to Travel Management from Wild and Scenic River designation (Alternative C)**

Under Alternative C, BLM would recommend three river segments for Wild and Scenic River designation (Alagnak River, Goodnews River mainstem and Middle Fork Goodnews River). Under Alternative C, increased opportunities for recreation may result from WSR designation. This may include increased

access opportunities by air travel. Required Operating Procedures have been developed regarding altitude restrictions for aircraft flights to protect wildlife and special status species wildlife (Appendix A).

## e) Direct and Indirect Effects for Travel Management for Alternative D

Under Alternative D, BLM lands would be designated as “limited” for OHV use. OHV access would be by designated trails only. A 2,000-lb GVWR weight restriction would be placed on OHVs.

### (1) Effects to Travel Management from Lands and Realty (Alternative D)

**Access (Rights-of-Way).** The Carter Spit ACECs would be proposed. This area would be designated as a Right-of-Way avoidance area, which could restrict OHV access within the boundary of the ACEC.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be revoked under this Alternative. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Some BLM lands would continue to be closed to mineral entry due to Agency withdrawals. Travel requirements and infrastructure to support air travel across and to BLM lands is expected to increase due to increased development opportunities.

**Disposal and Acquisition.** No lands are identified for disposal or land exchange. Impacts would be similar to those discussed under Alternative A.

### (2) Effects to Travel Management from Mineral Activities (Alternative D)

**Leasable minerals.** Under Alternative D, ANCSA 17(d)(1) withdrawals would be revoked and 1,101,304 acres of BLM lands within the planning area would be open to leasable mineral activities. Travel by OHV and aircraft in support of leasable mineral activities would increase primarily in the Koggiling Creek planning block. Leasable mineral activities have the potential to create impacts to travel management and OHV use, particularly if development occurs in areas that may provide access created by improved infrastructure. Construction of winter roads, pipelines, powerlines, and other necessary infrastructure would create improved access. Public access into areas of development would have secondary effects on adjacent areas by increasing visitor use and may lead to other developments.

**Locatable Minerals.** ANCSA 17(d)(1) withdrawals would be revoked opening 1,102,489 acres of BLM lands to locatable mineral activities. Impacts to travel management would be similar to that discussed in Effects Common to All Alternatives. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Impacts to travel management under Alternative D may increase slightly due to lifting of ANCSA 17 (d)(1) withdrawals.

**Salable Minerals.** ANCSA 17(d)(1) withdrawals would be lifted from BLM lands within the planning area, opening these lands to potential salable mineral activities. Impacts to travel management from salable mineral activities would be similar to that discussed in Effects Common to All Alternatives. These impacts may be long-term but small in scale, isolated to the Koggiling Creek planning block, in support of leasable mineral activities.

### (3) Effects to Travel Management from Travel Management (Alternative D)

Under this alternative, all BLM lands would be classified as limited to OHVs and there would be a 2,000-lb GVWR applied to OHVs. OHVs would be limited to existing trails and in some areas (such as ACECs) trails would be designated. These measures, while not limiting access on existing routes, would prevent unlimited access and cross-country travel.

**(4) Effects to Travel Management from Recreation Management (Alternative D)**

The Recreation Opportunity Spectrum (ROS) classification will continue as Semi-Primitive Motorized. No facilities enhancement (such as the addition of public use cabins, trails or interpretive panels) would be added to support OHV use. Impacts would be similar to that discussed under Alternative A.

**(5) Effects to Travel Management from Areas of Critical Environmental Concern (ACEC) (Alternative D)**

Under Alternative D, the Carter Spit (36,220 acres) ACEC would be proposed. This area would be designated as a right-of-way avoidance area which may prevent or restrict access through the use of special stipulations. Few impacts to travel management would result from ACEC designation compared to the current condition.

**(6) Effects to Travel Management from Wild and Scenic River designation (Alternative D)**

No Wild and Scenic River segments would be recommended under this Alternative. There would be no restrictions to access in these river areas other than the limited OHV classification and the 2,000 lb. weight limit.

**6. Direct and Indirect Effects to Minerals**

**Leasable Minerals**

**a) Effects to Leasable Minerals for all Action Alternatives**

- Oil and gas exploration would occur as described in the Reasonably Foreseeable Development (RFD) Scenario. The following is reasonably foreseeable to occur within the planning area:
  - One seismic survey would occur every five years covering 63 linear miles with a total of 250 miles collected over the next 20 years.
  - Two exploratory gas wells would be drilled during the first five years of the plan. One of the two wells would have an appreciable gas show, resulting in drilling one field delineation well. It is assumed that the discovery field will comprise 1,280 acres and will produce from two wells located on two drill sites, one mile apart.
  - Given a 20-year plan life, it is assumed that a total of six exploration wells would be drilled.
  - One gravel staging area (six acres) would be developed to receive and store equipment for the winter exploration program.
  - One gas field likely would be developed in the Koggiling Creek planning block (this planning block was picked due to its proximity to the Dillingham market). Production from this field would come from the discovery well and delineation well, spaced one mile apart. The drilling of each well would disturb six acres. There would be up to six gas exploration wells plus one additional gas delineation well.
  - The gravel pads would be joined by a 35-foot wide, 5-foot thick gravel road (40,000 cubic yards per mile). The road would only link the drilling pads and one section would also serve as an airstrip. Gravel required for construction would likely be mined during winter months to reduce impacts. The source would likely come from the closest feasible gravel source to the gas field, using one or two separate gravel deposits (10-20 acres in size).
  - A typical life of a producing gas well is 10 to 12 years. Therefore, one or both gas production wells may be plugged after the planning period. Field abandonment may take from 2 – 5 years after production ends.
  - Natural reservoir pressure would be adequate to push the gas through the 3-inch transmission pipeline 40 miles to the Dillingham market. No compression facility would

- be needed. The pipeline would be constructed during the winter months to reduce impacts, dependent upon the presence of sufficient snow cover and sufficiently cold temperatures to freeze the ground.
- One of the production wells would serve as an in-field underground injection well (annular injection) to dispose of drilling waste, wastewater, spent fluids, chemicals and the produced water.
  - When there is insufficient snow cover for oil and gas related operations, low ground pressure vehicles will be used in conjunction with air support.
- This level of development is assumed for the purposes of impact analysis in the EIS. Actual exploration, development, and production may vary considerably based on exploration results, price of oil and gas, and marketability. Additionally, to market the gas in Dillingham, the current diesel plant would need to be converted to gas. For this to be economical, funding would need to come from energy subsidies derived from the State of Alaska or the Federal Government.
  - An ongoing joint State/Federal program to determine the feasibility of developing coal bed natural gas (CBNG) for the benefit of rural communities does not plan to explore the Bristol Bay area at this time. If CBNG were available close to a rural community, the development would occur on non-BLM lands. BLM lands in the planning area are not in proximity to the three largest communities – Dillingham, Naknek and King Salmon. Transportation costs associated with building a gas pipeline would render CBNG development uneconomical.

## **b) Effects to Leasable Minerals for Alternative A**

There are no active oil and gas leases in the planning area and no oil and gas leasing would occur under Alternative A. BLM lands within the planning area would remain closed to leasable mineral activities due to current withdrawals described in ANSCA 17(d)(1). Leasing may take place in the event of drainage of oil and gas resources from adjacent development. Therefore, under this Alternative, no oil and gas exploration and development would occur, rendering these resources unavailable during the life of the plan. The RFD for leasable minerals anticipates leasable miner development to occur only in the Koggiling Creek planning block. Alternative A would provide the most restriction to leasable mineral activities, compared to Alternatives B, C, and D, because leasable mineral activities are restricted in the Koggiling Creek planning block.

## **c) Effects to Leasable Minerals for Alternative B**

Under Alternative B, all existing ANSCA 17(d)(1) withdrawals would be revoked. Approximately 1,103,138 acres of BLM lands and any State-selected or Native-selected lands whose selection is relinquished or revoked, would be open to mineral entry subject to Stipulations and ROPs (Appendix A). There would be no restriction under this Alternative for seasonal closures or no surface occupancy. Additionally, Oil and Gas Lease Stipulations #5, #6, and #8 would not be applicable under this Alternative. Agency withdrawals would close approximately 3,318 acres to leasing, as described within specific PLOs. Closing this acreage would preclude oil and gas exploration and development, rendering these resources unavailable during the life of the plan. Alternative B would provide fewer restrictions to leasable mineral activities compared to Alternatives A, C, and D. Other than provided in ROPs and Stipulations, Alternative B provides no restrictions to leasable mineral development in the Koggiling Creek planning block. Because leasable mineral development is anticipated in the Koggiling Creek planning block only, impacts to leasable mineral activities resulting from Alternative B would be similar to that discussed in the Effects Common to All Action Alternatives section.

## d) Effects to Leasable Minerals for Alternative C

Approximately 1,063,129 acres of BLM lands and any State or Native-selected lands (785,341 acres) whose selection is relinquished or revoked, would be open to leasable mineral activities subject to ROPs and Stipulations (Appendix A).

Two ACECs (Carter Spit 61,251 acres and Bristol Bay 974,970 acres) would be proposed. ANSCA 17(d)(1) withdrawals would only be retained within the proposed Carter Spit ACEC to provide added protection to federally-listed migratory bird species. Leasable mineral activities are not expected to occur in the Goodnews Bay planning block according to the Reasonable Foreseeable Development scenario. The Bristol Bay ACEC would be open to leasable mineral activities subject to seasonal constraints to protect caribou habitat on identified aggregation areas. As a result leasable mineral activities will be closed from May 20 through August 15 (Appendix A, Oil and Gas Lease Stipulation 6). An additional closure to protect calving caribou will restrict exploration and development activities from May 1 through June 15 (Appendix A, Oil and Gas Lease Stipulation 5). Lands under seasonal closure will be dependant upon the location of the caribou aggregations.

Existing ANCSA 17(d)(1) withdrawals totaling 12,210 acres would be retained on proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork until Congressional action could be completed. None of these river segments are located in the Koggiling Creek Planning block where leasable mineral activities are projected to occur. Additional Agency withdrawals (3,318 acres) would exclude leasable mining development. The acreage closed to leasable mineral activities would render these resources unavailable during the life of the plan.

Approximately 1,910 acres of the planning area would be open to leasing, subject to major No Surface Occupancy (NSO) constraints. Areas subject to NSO include a 300 foot buffer on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River, and Klutuk Creek (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8). These rivers are located within the Goodnews and Klutuk Creek planning blocks. According to the RFD for Leasable Minerals, neither the Goodnews nor Klutuk Creek planning blocks are expected to have leasable mineral development. Oil and gas development in an NSO area could require directional drilling to extract hydrocarbon resources. Should areas with major constraints occur beyond the technically feasible reach for directional drilling, some hydrocarbon resources may be rendered unrecoverable. Product price fluctuations may require premature abandonment that would decrease the recoverability of the leasable resource. An NSO buffer of any width could potentially limit exploration and development. For example, if an exploration target was determined to be within the NSO zone, the added cost of directional drilling could render the project uneconomical, and therefore miss the discovery. Additionally, if a shallow target pool were previously defined through geophysical exploration, it could be technically unfeasible for an operator to directionally drill such a reservoir. Consequently, these resources would be unavailable during the life of the plan. Alternative C would provide more restrictions to leasable mineral activities compared to Alternatives B and D but fewer restrictions compared to Alternative A. Other than provided in ROPs and Stipulations, Alternative C provides no restrictions to leasable mineral development in the Koggiling Creek planning block. Because leasable mineral development is anticipated in the Koggiling Creek planning block only, impacts to leasable mineral activities resulting from Alternative C would be similar to that discussed in the Effects Common to All Action Alternatives section.

## e) Effects to Leasable Minerals for Alternative D

Approximately 1,101,304 acres of BLM lands and any State- or Native-selected lands (817,464 acres selected) whose selection is relinquished or revoked would be open to mineral entry subject to Stipulations and Required Operating Procedures (ROPs).

Existing ANCSA 17(d)(1) withdrawals would be revoked, including lands within the one proposed ACEC (Carter Spit, 36,220 acres). These lands would be open to leasable activities, managed by adaptable management and would be subject to ROPs and Stipulations that include seasonal restrictions to protect Federally listed migratory bird species and caribou (Appendix A).

Acres available and subject to minor (seasonal) constraints is roughly 36,220 acres. To protect caribou habitat on identified aggregation areas, oil and gas exploration and development activities would be closed from May 20 through August 15. An additional closure to protect calving caribou would restrict exploration and development activities from May 1 through June 15. These closures would be dependant upon the actual location of caribou aggregation (Appendix A, ROP FW-3b and Oil and Gas Stipulations 5 and 6). These constraints would limit exploration and development during specific time periods and increase recovery costs.

Approximately 1,910 acres of the planning area would be open to leasing, subject to major No Surface Occupancy (NSO) constraints. Areas subject to NSO include a 300 foot buffer on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River, and Klutuk Creek (Appendix A, Stipulation 8). These rivers are located within the Goodnews or Klutuk Creek planning blocks. According to the RFD for Leasable Minerals, neither the Goodnews nor Klutuk Creek planning blocks are expected to have leasable mineral development.

Approximately 3,318 acres of existing Agency withdrawals would be closed to leaseable mineral activities as described within specific PLOs.

Leasable oil and gas potential does exist on BLM lands. Exploration and development would proceed at the level described in the Reasonably Foreseeable Development Scenario under the *Analysis Assumptions and Guidelines* for leasable minerals. Other than provided in ROPs and Stipulations, Alternative D provides no restrictions to leasable mineral development in the Koggiling Creek planning block. Because leasable mineral development is anticipated in the Koggiling Creek planning block only, impacts to leasable mineral activities resulting from Alternative D would be similar to that discussed in Effects Common to All Action Alternatives section. Should Federal leasing take place, the BLM Alaska State Office would assume lease administration responsibilities and oversight of field operations.

## Locatable Minerals

### a) Effects to Locatable Minerals for All Alternatives

- Placer Mining - Placer mining for gold and platinum is the most common type of mining that occurs in the planning area. Placer platinum is the most likely development target while placer gold is the most likely target for exploration and development. Mineral resource development in the planning area is occurring primarily on State, Native, and private lands. This can be attributed to the patenting of large numbers of Federal mining claims staked during the gold rush era and to the State and Native Corporations targeting mineral resources for selection under their respective entitlement statutes.
- Additional exploration should prove that development of placer properties in the Bonanza Creek, Goodnews Bay/Snow Gulch, Iliamna/Fog, Kijik Lake, Platinum, and Shotgun Hills areas within the planning area are feasible. These deposits would probably be developed either as a small surface open-cut sluice box operation or as a bucket-line dredge operation (Goodnews Bay Platinum Mine).
- Placer mining activity in the planning area is expected to occur in the Snow Gulch part of the Goodnews Bay/Snow Gulch area on BLM lands. There are expected to be 1 to 3 small scale placer operations employing 3 to 5 people at each location. Activity would most likely occur on Barnum Creek, Domingo Creek, Faro Creek, or on Jacksmith Creek.

- Hard Rock Exploration and Development - Historic producers of hard rock for mercury operated on a small scale in the early part of the twentieth century. Today, development projects involve gold and copper from developing new and old prospects. Most of these are located on State and Native lands in the Iliamna/Kvichak area. Hard rock exploration is up in the region, generated by the increasing price of gold and increased interest in mineral occurrences on State and Native lands.
- Elsewhere around the State, exploration has focused on deposits of rare metals (nickel and platinum group metals [PGM]). Exploration results indicate that there is potential for a significant discovery of these metals. This interest, coupled with the rising price of platinum, has sparked recent exploration efforts in Goodnews Bay along the Salmon River where platinum has historically been mined by placer methods.
- Additional exploration should prove that development of lode properties in the Bonanza Creek, Goodnews Bay/Snow Gulch, Iliamna/Fog, Iliamna/Kvichak, Kasma Creek, Kemuk Mountain, Kijik Lake, Pebble Copper, Platinum, Shotgun Hills, and Sleitat Mountain areas in the planning area are feasible. These deposits would probably be developed either as open pit or as cut and fill underground mines. Surface disturbance will vary depending on the mine design, construction of roads, power line corridors, selection of tailing disposal method, and other factors. An order of magnitude estimate would be in the range of 1,300-3,400 acres. Road building, airstrips, and associated material sites account for the largest surface disturbance followed by mine, mill, tailings disposal site, and camp facilities. While most of these disturbances would occur on State or Native lands, some road construction or power lines could cross BLM land.
- The Pebble property, on State lands near Lake Iliamna, is a proposed hard rock, combination open pit and underground mine with a mill that combines free milling processes with floatation and vat chemical leach circuits to recover gold and copper. This mill could include ore from locations situated close by, such as the Pebble South and the Big Chunk (BC) properties. More than 100 employees would contribute to the Iliamna area economy and the mine mill complex could draw power from the Homer utility grid.

## **a) Effects to Locatable Minerals for Alternative A**

Under the No Action Alternative, 963,862 acres of BLM land in the planning area are currently closed to mineral entry by ANCSA 17 (d)(1) withdrawals and Agency withdrawals. Approximately 138,627 acres are currently open for mineral entry. If current State- or Native-selected lands are not conveyed and returned to BLM management, they would be opened for mineral entry. Pre-ANCSA mining claims exist on BLM lands. Locatable lode mineral activity is occurring at the Iliamna Project, D Block and Iliamna Project, and H Block locations on State-selected land. Placer activity is conducted on the Arolik River on Native-selected land and the Salmon River (Federal mining claims) on Native land. All currently active Federal and State mining claims and 2005 APMA's are in the Bonanza Creek, Goodnews Bay/Snow Gulch, Iliamna/Kvichak, Kemuk, Pebble Copper, Platinum, and Shotgun Hills areas. Current mineral activities would occur in the Iliamna/Kvichak and Platinum areas.

If locatable mineral activity were to occur on every active Federal mining claim on BLM land, an estimated total of 23 acres (5 lode and 18 placer) could potentially be disturbed in the planning area. No disturbance would occur on State- or Native-selected lands. Under this Alternative no further disturbance would be anticipated until the conveyance process is completed. Future mineral activities could be expected to occur on those lands returning to BLM management.

All mineral related activities occurring on BLM land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to submit Plan of Operations or Notice of Operations which contains stipulations based on site-specific resource concerns. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

## **b) Effects to Locatable Minerals for Alternative B**

Under Alternative B, ANCSA 17(d)(1) withdrawals would be revoked and 1,102,489 acres of BLM lands would be open to mineral entry. Any State- or Native-selected lands would be made available for locatable mineral entry if the selection is revoked or relinquished. Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. An additional 3,968 acres are closed to material entry due to Agency withdrawals. If all reasonable foreseeable future mineral activities were to occur in the planning area on BLM land, activities would occur in the Goodnews Bay/Snow Gulch, Iliamna/Fog, Iliamna/Kvichak, Kasna Creek, Kijik Lake, and Pebble Copper areas.

Lode mineral activities in the Goodnews Bay/Snow Gulch area would occur at the Tatlignagpeke Mountain and Mitlak Mountain properties on State-selected lands (due to Top Filing) and Wattamuse-Granite Lode property on Native-selected land. Lode activities in the Iliamna/Fog area would occur at the Dutton, Easy, Karen, and Meadow properties on State-selected land and the Duryea and Ground Hog properties on Native-selected land. Lode activities in the Iliamna/Kvichak area would occur on the Iliamna Project, D Block; Iliamna Project, H Block; and LSS 1-3 properties on State-selected land. Lode activities in the Kasna Creek area would occur at the South Current Creek and Upper South Current Creek properties on Native-selected land. Lode activities in the Kijik Lake area would occur at the Dicks Lode, Gull, and Kijik Mountain properties on Native-selected land. Lode activities in the Pebble Copper area would occur at the Hill 1759 property on Native-selected land.

Placer activities in the Goodnews Bay/Snow Gulch area would occur at the Barnum Creek, Domingo Creek, Faro Creek, and Jacksmith Creek Tributary on State-selected lands (due to Top Filing); the Slate Creek property on State-selected land; and the Arolik River, Malaria Creek, Snow Gulch, Tyrone Creek, and Wattamuse Creek properties on Native-selected land. Placer activities in the Iliamna/Fog area would occur at the Unnamed (west of Chetok) property on Native-selected land. Placer activities in the Kijik Lake area would occur at the Bertha M. property on Native-selected land.

If locatable mineral activity were to occur on every existing operation, as allowable by present BLM authority on BLM land, an estimated total of 115 acres could potentially be disturbed in the planning area. Total includes surface disturbance of 0 acres on BLM land, 50 acres on State-selected land, 47 acres on Native-selected land, and 18 acres on Native land (active Federal claims). Depending upon the results of conveyances, some of this locatable mineral activity may occur on land owned by the State and Native Corporations. Due to the small size of the existing operations as well as the short period of operation there would be a minor impact on the local air and water quality.

All locatable mineral related activities occurring on BLM land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to submit Plan of Operations or Notice of Operations which contains stipulations based on site-specific resource concerns. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

### c) Effects to Locatable Minerals for Alternative C

Under Alternative C, 1,064,313 acres of BLM lands would be open to locatable mineral activities due to lifting of ANCSA 17(d)(1) withdrawals. 3,968 acres are closed to material entry due to Agency withdrawals other than ANCSA 17(d)(1). Upon revocation of ANCSA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. The Carter Spit (61,251 acres) and the Bristol Bay (974,970 acres) ACECs would be proposed under Alternative C. Of these two areas, only the Carter Spit ACEC would retain ANCSA 17(d)(1) withdrawal, closing this area to mineral entry. Proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork Rivers (12,210 acres) would be closed to locatable mineral entry due to retention of ANCSA 17(d)(1) withdrawals.

Locatable mineral activity would still be allowed on existing pre-ANCSA mining claims within the Bay planning area. Active Federal lode mining claims occur at the Iliamna Project, H Block property in the Iliamna/Kvichak area on BLM and State-selected land. Active Federal placer mining claims occur on the Salmon River in the Platinum area on Native land. Locatable mineral activity may also occur on lands within the planning area that are conveyed to the State and Native Corporations.

If locatable mineral activity were to occur an estimated total of 43 acres could potentially be disturbed in the planning area on BLM, State- and Native-selected land. No disturbance would occur on BLM lands due to retention of ANCSA 17(d)(1) withdrawals in the Carter Spit ACEC and ANILCA 906(e) Top Filings.

All locatable mineral related activities occurring on BLM land are subject to current BLM surface regulations as outlined in 43CFR 3809. Operators are required to have an approved Plan of Operations which contains site-specific guidelines. All operations are required to meet applicable Federal and State air and water quality standards for permitting. Required Operating Procedures (Appendix A) would be applied to locatable mineral activities occurring on BLM lands.

### d) Effects to Locatable Minerals of Alternative D

Under Alternative D, ANCSA 17(d)(1) withdrawals would be revoked and all segregated lands returning to BLM-management would be open for mineral entry. Approximately 1,102,489 acres of unencumbered BLM lands would be available for locatable mineral entry. The Carter Spit ACEC (36,220 acres) would be recommended under Alternative D and ANCSA 17(d)(1) withdrawals would be lifted, opening this area to mineral entry. Agency withdrawals (3,968 acres), would be closed to mineral entry due to withdrawals other than ANCSA 17(d)(1). If all Reasonable Foreseeable Future mineral activities were to occur in the planning area on BLM land, activities would occur in the Goodnews Bay/Snow Gulch, Iliamna/Fog, Iliamna/Kvichak, Kasna Creek, Kijik Lake, and Pebble Copper areas.

Lode and placer mineral activities on BLM land are the same as discussed in Alternative B.

If locatable mineral activity were to occur on every existing operation, as allowable by present BLM authority on BLM land, an estimated total of 115 acres could potentially be disturbed in the planning area. Total surface disturbance includes: 50 acres on State-selected land, 47 acres on Native-selected land, and 18 acres on Native land (active Federal claims), no disturbance on BLM land. Depending upon the results of conveyances, some of this locatable mineral activity may occur on land owned by the State and Native Corporations. Due to the small size of the existing operations as well as the short period of operation, there would be a minor impact on the local air and water quality.

All locatable mineral related activities occurring on BLM land are subject to current BLM surface regulations as outlined in 43 CFR 3809 Operators are required to submit Plan of Operations or Notice of

Operations which contains stipulations based on site-specific resource concerns. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

## **Salable Minerals (Mineral Materials)**

### **a) Effects to Salable Minerals for Alternative A**

Approximately 1,163,594 acres of BLM lands are available for salable mineral activities. State- and Native-selected lands would be made available if their selections are revoked or relinquished. An additional 3,968 acres are closed to salable mineral activities due to Agency withdrawals. Large reserves of salable material exist on State and Native land and no disturbance of BLM land is anticipated due to the remote location of BLM lands. Activities would require approved mining and reclamation plans and compliance with constraints developed through project-specific NEPA analysis, and are subject to all Federal and State laws and regulations.

### **b) Effects to Salable Minerals for Alternative B**

Approximately 1,102,488 acres of BLM lands are available for salable mineral activities. State- and Native-selected lands would be made available if their selections are revoked or relinquished. Upon lifting of ANCSA 17(d)(1) withdrawals, ANILCA 906(e) Top Filed land (61,105 acres) would become State-selected, closing this land to salable mineral activities. An additional 3,968 acres are closed to material sales due to Agency withdrawals. Large reserves of salable material exist on State and Native land and no disturbance of BLM land is anticipated. Activities would require approved mining and reclamation plans, compliance with Required Operating Procedures (Appendix A), and compliance with constraints developed through project-specific NEPA analysis, and are subject to all Federal and State laws and regulations.

### **c) Effects to Salable Mineral for Alternative C**

Approximately 115,163 acres of BLM lands are available for the salable mineral activities. State- and Native-selected lands may be made available if their selections are revoked or relinquished. However, two areas, the proposed Carter Spit (61,251 acres) and Bristol Bay (974,970 acres) are recommended as ACECs and the proposed Wild River segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork Rivers (12,210 acres) would be closed to salable mineral activities. An additional 3,968 acres are closed to salable mineral activities due to Agency withdrawals. Large reserves of salable material exist on State and Native land, and no disturbance of BLM land is anticipated except in the Koggiling Creek planning block to support leasable mineral activities. Salable mineral activities would require approved mining and reclamation plans, compliance with Required Operating Procedures (Appendix A), and compliance with constraints developed through project-specific NEPA analysis, and are subject to all Federal and State laws and regulations.

### **d) Effects to Salable Mineral of Alternative D**

Approximately 1,100,654 acres of unencumbered BLM lands are available for salable mineral activities. State- and Native-selected lands would be made available if their selections are revoked or relinquished. The Carter Spit ACEC (36,220 acres) would be proposed and closed to salable mineral activities. An additional 3,968 acres area would be closed to salable mineral activities due to Agency withdrawals other than ANCSA 17(d)(1). No disturbance of unencumbered BLM land is anticipated from salable mineral activities due to the remote location of BLM lands and the more easily available locations of salable material on State and Native land. Activities occurring on unencumbered BLM lands would require

approved mining and reclamation plans, compliance with Required Operating Procedures (Appendix A), and compliance with constraints developed through project-specific NEPA analysis, and are subject to all Federal and State laws and regulations

## **7. Direct and Indirect Effects to Special Designations**

### **a) Areas of Critical Environmental Concern**

#### **(1) Effects to Areas of Critical Environmental Concern for Alternative A**

There are currently no ACECs in the planning area. Under this Alternative, no ACECs would be proposed. Because of the retention of ANCSA 17(d)(1) withdrawals on most BLM, very little resource development activity is anticipated under this Alternative. Consequently, there would be little effect to the resource values identified for the Bristol Bay and Carter Spit areas.

#### **(2) Effects to Areas of Critical Environmental Concern for Alternative B**

Under this Alternative, no ACECs would be proposed. Additionally, most ANCSA 17(d)(1) withdrawals would be recommended for revocation, thus opening most BLM lands to mineral leasing and location. The direct effects of resource development on the resource values associated with the Bristol Bay and Carter Spit areas are discussed in previous sections, particularly those discussing effects to Fish, Wildlife and Special Status Species.

#### **(3) Effects to Areas of Critical Environmental Concern for Alternative C**

Under Alternative C, the Carter Spit ACEC (61,251 acres) and the Bristol Bay ACEC (974,970 acres) would be proposed. In addition, Stipulations, ROPs, and additional requirements, determined through project-specific NEPA analysis, would provide protection of relevant and important values of these ACECs.

These two potential ACECs would be designated, based on relative and important resources values (43 CFR §1610.7-2). The values for each area are discussed in Chapter III and Appendix B. Management would result in limitations or restrictions placed on other resource uses and activities in order to prevent irreparable damage to the identified values. Management objectives of both ACECs, if proposed within the preferred alternative, would be described within the Bay RMP. Should the selected lands immediately adjacent to these proposed ACECs revert to BLM, they may be incorporated into the ACEC. This would be accomplished by a plan amendment following relative and important criteria in 43 CFR §1610.7-2.

#### **Carter Spit ACEC**

Impacts to fish, wildlife, vegetation, special status species, and cultural resources under Alternative C are discussed in this chapter under each topic heading. Under Alternative C, ANCSA 17(d)(1) withdrawals would be retained for the Carter Spit ACEC (61,251 acres). This ACEC would remain closed to all mineral activities. The Carter Spit ACEC would be designated as a right-of-way avoidance area, OHV travel would be limited to designated roads and trails, closed to FLPMA leases, and would be unavailable for disposal. Applications for livestock grazing would be analyzed on a case-by-case basis, though no applications for grazing have been received nor does BLM expect to receive applications for grazing within the life of the Bay RMP.

Impacts to resources in the Carter Spit ACEC would be similar to Alternative A due to retention of ANCSA 17(d)(1) withdrawals and designation of a right-of-way avoidance area. The retention of ANCSA 17(d)(1) withdrawals would preclude mineral exploration and development, while designation of a right-of-way avoidance area would preclude road and pipeline construction. Precluding this type of development would prevent impacts to the natural environment, including; soil compaction, increased siltation of water

bodies, vegetative removal, degraded localized air quality resulting from dust and vehicle emissions, and disturbance to wildlife and special status species wildlife.

### **Bristol Bay ACEC**

Impacts to fish, wildlife, vegetation, special status species, and cultural resources under Alternative C, are discussed in this chapter under each topic heading. This ACEC would remain open for leasable and locatable mineral activities. It would be closed to salable minerals and designated as a right-of-way avoidance area. OHV travel would be limited to designated roads and trails, closed to FLPMA leases, and would be unavailable for disposal. Applications for livestock grazing would be analyzed on a case-by-case basis, though no applications for grazing have been received nor does BLM expect to receive applications for grazing within the life of the Bay RMP. A fire management plan developed to protect lichen range for caribou would be developed for this ACEC.

The use of ROPs and Stipulations will reduce impacts to the natural environment caused by mineral exploration and development, resulting from revocation of ANSCA 17(d)(1) withdrawals, in the proposed Bristol Bay ACEC. A more detailed description of impacts to natural resources resulting from mineral exploration and development is contained in the discussion on effects from leasable and locatable minerals. In addition, a Plane of Operation will be required for locatable mineral activities occurring in the ACEC, per 43 CFR 3809.11(c)(3), requiring detailed disturbance and rehabilitating planning.

#### **(4) Effects to Areas of Critical Environmental Concern for Alternative D**

Only the Carter Spit ACEC (36,220 acre) would be designated to provide protection of relevant and important values. Upon lifting of ANSCA 17(d)(1) withdrawals, ANILCA 906(e) Top Filed land (61,105 acres) would become State-selected. These Top Filed lands include Goodnews Bay/Snow Gulch area. These lands are immediately adjacent to the proposed Carter Spit ACEC. Should the selected lands immediately adjacent to the proposed ACEC revert to BLM, they may be incorporated into the ACEC. This would be accomplished by a plan amendment following relative and important criteria in 43 CFR §1610.7-2. The following site would be designated under this Alternative:

### **Carter Spit ACEC**

This ACEC would be designated to provide protection to federally-listed migratory bird species. Additional impacts to fish, wildlife, vegetation, Special Status Species, and cultural resources under Alternative D are discussed in this chapter under each topic heading. ANSCA 17(d)(1) withdrawals would be revoked from the lands within the proposed ACEC boundary. This ACEC would be open to leasable and locatable mineral activities, closed to salable minerals, and designated as a right-of-way avoidance area. Lands within the Carter Spit ACEC would be closed to FLPMA leases, unavailable for disposal, and OHV travel would be limited to designated roads and trails. Applications for livestock grazing would be analyzed on a case-by-case basis, though no applications for grazing have been received nor does BLM expect to receive applications for grazing within the life of the Bay RMP.

## **b) Wild and Scenic Rivers**

Wild and Scenic River areas are not essentially natural resources or resource uses, but represent statutory decisions to protect certain resources or uses over a long period of time. For this reason, impacts of various Alternatives to proposed Wild and Scenic River areas should be examined by looking at the impacts to resources and uses described elsewhere in this chapter.

The most basic characteristics of a Wild and Scenic River are its free-flowing nature. Impacts of the various Alternatives on the quality and free-flow of water are described in the Soils, Water, Air, and Vegetation Resources section of this chapter.

Seven outstandingly remarkable values were identified for the eligible river areas: free-flowing nature and water quality, scenery, subsistence use, prehistory and history, recreational use, fish habitat, and wildlife habitat. Each of these values has a corresponding section in this chapter where an assessment of potential impacts may be found. Appendix B provides the Wild and Scenic River matrix used to determine the river segments' eligibility and suitability.

**(1) Effects to Wild and Scenic Rivers for Alternative A**

There is currently no Wild and Scenic River designation on BLM lands in the planning area. Under this Alternative, no rivers would be nominated. Because of the retention of ANCSA 17(d)(1) withdrawals under this alternative, resource development activities are anticipated to be limited.

**(2) Effects to Wild and Scenic Rivers for Alternative B**

Under this Alternative, no eligible rivers would be found suitable for designation.

**(3) Effects to Wild and Scenic Rivers for Alternative C**

Under Alternative C, all eligible rivers (Alagnak River (Wild/Recreational), the Goodnews River Mainstem (Wild), and the Goodnews River Middle Fork (Wild)) would be found suitable for designation (12,210 acres). This would provide maximum protection to the free-flowing characteristic of these rivers. The BLM would gain additional authority to review Federal authorizations for water resources projects, and would be mandated to protect the outstandingly remarkable values of designated rivers. ANCSA 17(d)(1) withdrawals would be retained until Congress had an opportunity to act on the proposal.

**(4) Effects to Wild and Scenic Rivers for Alternative D**

Under Alternative D, no eligible rivers would be found suitable for designation.

**8. Social and Economic Conditions**

**a) Effects to Social and Economic Conditions Common to All Alternatives**

Proposed management of the following resources, resource uses or programs would have no anticipated effects on Social and Economic Conditions: Soil, Water, Air, and Vegetation Management, Visual Resources, and Renewable Energy.

**(1) Effects to Social and Economic Conditions from Livestock Grazing (Common to All Alternatives)**

No livestock grazing currently occurs under permit, nor has any interest been expressed in requesting livestock grazing authorization. Authorizations for grazing will be examined on a case-by-case basis. No requests for reindeer grazing permits are anticipated. There are no current reindeer grazing authorizations within the planning area. Therefore, no effect on the regional economy is expected under any alternative.

**(2) Effects to Social and Economic Conditions from Forest Products (Common to All Alternatives)**

Individual and subsistence use of forest products is typical in the planning area. There is no commercial demand, few permits for individual use, and no expectation of change in the current pattern of use. The demand for forest products on BLM land within the plan area is not expected to change in the foreseeable future. Therefore, the effect on the regional economy is very low for all Alternatives.

### **(3) Effects to Social and Economic Conditions from Recreation and Travel Management (Common to All Alternatives)**

BLM issues approximately 4-6 special recreation use permits annually to commercial guides or outfitters using BLM land within the planning area. Very little visitor use or trip data is available. BLM assumes that access to the planning area for commercial or public recreation is largely provided by local businesses.

OHV management will not have economic effects on the area. Although tighter management of OHVs is proposed under Alternatives C and D, reasonable access to subsistence resources will remain unaffected under all Alternatives.

### **(4) Effects to Social and Economic Conditions from Hazardous Materials Management (Common to All Alternatives)**

The BLM management actions proposed under all Alternatives for hazardous or solid wastes may have localized, beneficial effects on socioeconomic resources through prevention measures and mitigation practices as sites become recognized that are near communities.

### **(5) Effects to Social and Economic Conditions from designation of Areas of Critical Environmental Concern (Common to All Alternatives)**

The range of alternatives analyzed consider different ACEC designations, from no designations (Alternatives A and B) to two ACECs (alternative C) to one ACEC (alternative D). These designated areas affect economic conditions indirectly through the constraints that are identified for specific resource protection. These constraints may limit resource development and thus economic development to some extent. The effects to social and economic conditions from these designations are best expressed through their direct effect on mineral development. These effects are described below for each alternative under Effects to Social and Economic Conditions from Minerals.

### **(6) Effects to Social and Economic Conditions from Fisheries and Wildlife Management (Common to All Alternatives)**

Chapter III of this document, in the section on Social and Economic conditions, emphasizes the role and importance of subsistence activities to the local economy. The importance of commercial fishing is also emphasized. These economic opportunities are largely dependent on high-quality fish and wildlife habitat. Within the range of alternatives presented in this analysis, BLM considers a varying range of resource development scenarios. Even under the most aggressive development scenario (Alternative B) there would be only 115 acres of disturbance from mining activity and the development of one gas field in the Koggiling block. The effects of these activities on fish and wildlife habitat and on subsistence are displayed in this Chapter under the respective resource categories. Under no alternative would the direct and indirect effects of development on BLM lands have a significant impact on subsistence opportunities or on the regional commercial fisheries or on the economic benefits derived from these activities.

## **b) Effects to Social and Economic Conditions for Alternative A**

### **(1) Effects to Social and Economic Conditions from Mineral Activities (Alternative A)**

**Leasable.** The area would be closed to mineral leasing due to ANSCA 17(d)(1) withdrawals. Therefore, management of BLM lands under this Alternative would not result in changes in the regional economy.

**Locatable.** Mining claims predating ANSCA are available to locatable mineral development. Mining activity is currently taking place only on some of these claims. Under Alternative A, no new mining activity would be likely to occur on BLM land due to ANSCA 17(d)(1) withdrawals. Therefore, management of BLM lands under this Alternative would not result in changes in the regional economy.

**Salable.** The area would be closed to mineral leasing due to ANSCA 17(d)(1) withdrawals. Therefore, management of BLM lands under this Alternative would not result in changes in the regional economy.

### **(2) Effects to Social and Economic Conditions from Lands and Realty Actions (Alternative A)**

FLPMA permits, leases, and sales would continue to be processed on a case-by-case basis. There is no record of previous FLPMA sales. No disposal or exchange activity would be allowed under this Alternative. Therefore, management under this Alternative would not result in changes to the regional economy.

### **(3) Effects to Social and Economic Conditions from Wild and Scenic Rivers (Alternative A)**

No river segments would be considered for inclusion to the National WSR system. Recreation opportunities and commercial operations associated with any eligible rivers would remain the same.

### **(4) Effects to Social and Economic Conditions from Recreation Management (Alternative A)**

Recreation management would maintain the existing spectrum of opportunities. Only a slight increase in commercial Special Recreation Permits would be expected, consistent with current trends. There would be very little to no economic effect from this management.

## **c) Effects to Social and Economic Conditions Alternative B**

### **(1) Effects to Social and Economic Conditions from Minerals Activities (Alternative B)**

#### **Leasable Minerals**

Approximately 1,103,138 acres of BLM lands and any State- or Native-selected lands (820,627 acres) whose selection is relinquished or revoked, would be open to leaseable mineral activities.

Revenues - Long term gas prices must be over \$12.45 per Mcf to encourage production where a gas pipeline must be constructed to deliver product to Dillingham (Craig 2004). This is based on current costs. Leases may be offered as early as 2010 and exploration may begin during the period 2010 to 2014. Leases are most likely to be requested within approximately 40 miles east northeast of Dillingham.. Economic effects of a gas field will more likely impact the Dillingham area, and will be less likely to impact the remainder of the planning area.

Bonus bids in the Alaska Peninsula Area wide 2005 oil and gas lease sale of state land, brought the State of Alaska \$1,268,121 in revenue. State leases covered about 213,000 acres in this sale. The total area in the Koggiling Creek planning block of unencumbered land is 159,732 acres. Bonus bids are expected to be lower for an offering here. The State of Alaska transfers part of its share of bonus bids to boroughs, such as in 1998 following the NE NPRA lease sale (DOI, 2003). However, the likely location of a lease sale is not within an organized borough in the planning area.

Rent is charged for lease acreage until it produces oil or gas, and thereafter royalty. The Federal government charges \$1.50/acre for the first five years and \$2.00/acre for the second five years of a typical 10 year lease. Rents are split with the State in the same manner as royalties. 1,404,000 of 5,816,919 acres offered were leased in the 1998 NW NPRA sales, for example.

Royalties will be based on 12.5% of the well head value of gas and be split between the State (90%) and Federal government (10%). The State received a total of approximately \$1.755 billion from rents, bonus bids, and royalties statewide during calendar year 2005.

Property tax may be assessed by the State and shared with a borough. The scenario used and analyzed in this EIS predicts development outside of existing boroughs in the planning area. Therefore, even if the State assesses property tax, it will not go directly to a local government.

Employment and Income - Crew estimates presented in BLM's Reasonably Foreseeable Development Scenario (RFD) for Leasable Minerals estimate manpower requirements for gas exploration and related activities. Seismic testing is predicted to begin in the period 2010. Crews will range from 20 to 50 workers. These workers may be based in a central location or in a field camp, as is often the case in other parts of Alaska where remote operations occur.

All other activities would occur in 2014 or later. Drilling would require 17 to 34 workers. Production would require 19 to 73 workers. Construction of a 3 inch diameter steel transmission pipeline would require 21 to 34 workers.

It is assumed that development activities would be based from a camp located on one of the gravel pads associated with development and production. Camp operations would require 10-20 additional workers in trades or laborers during set up, and catering services indicated in the following tables during operation.

Direct and indirect impact to the central location during exploration would include an effect on local lodging and catering services, and could be a significant input to Dillingham's economy. Later construction and operations may have a lower effect on lodging and food service in Dillingham, but may increase transportation service requirements for materials barged or flown in from supplier locations outside the planning area. It is possible that all direct and indirect input in the Dillingham area would be new jobs, though temporary and paralleling the project timeline. Tables 4.3 through 4.6 show direct employment under a camp scenario. Direct employment includes catering service at camp facilities, which are not included in the BLM RFD labor requirement. Therefore, the figures in preceding paragraphs will be lower than shown in the tables. Indirect employment would likely occur in Dillingham at hotels and in the transportation sector. This is estimated at 2 to 12 jobs during the life of the project. Personal income derived from the project would be most likely to result in the construction, service, and transportation sectors.

**Table 4.3. Potential Seismic Manpower Requirements for Proposed Yukon Flats Oil and Gas Development (Adapted from Doyon 2004)**

| Position               | 2D Seismic | 3D Seismic |
|------------------------|------------|------------|
| Supervisor and Co. Rep | 3          | 4          |
| Surveyors              | 8          | 16         |
| Drilling Crew          | 15         | 20         |
| Recording Crew         | 18         | 25         |
| Catering               | 4          | 6          |
| <b>Total</b>           | <b>48</b>  | <b>71</b>  |

**Table 4.4. Potential Drilling Manpower Requirements for the Proposed Activity in This Planning Scenario (adapted from Doyon 2004)**

| Position                                       | Number       |
|--|--------------|
| Supervisors/Tool Pushers                       | 2-4          |
| Rig Crews                                      | 6-14         |
| Welders, Electricians, Mechanics & Roustabouts | 3-6          |
| Drilling Services                              | 6-10         |
| Catering                                       | 6            |
| <b>Total</b>                                   | <b>23-40</b> |

**Table 4.5. Potential Production Operations Manpower Requirements for the Proposed Activity in This Planning Scenario (adapted from Doyon 2004)**

| Position   | Number       |
|--|--------------|
| Production Supervisors                           | 2-4          |
| Production Operations                            | 10-50        |
| Roustabouts                                      | 5-12         |
| Support Services such as Mechanics, Electricians | 2-7          |
| Catering   | 6            |
| <b>Total</b>                                     | <b>25-79</b> |

**Table 4.6. Potential Pipeline Construction Manpower Requirements for the Proposed Activity in This Planning Scenario (adapted from Doyon 2004)**

| Position   | Number       |
|--|--------------|
| Project Management                               | 1-2          |
| Welders & Helpers                                | 10-15        |
| General Laborers                                 | 5-7          |
| Support Services such as Mechanics, Electricians | 5-10         |
| Catering   | 6            |
| <b>Total</b>                                     | <b>25-40</b> |

Bristol Bay area oil and gas industry employment and income will vary from low levels during the exploration phase, increase during development, and drop during production phases. Workers will travel to the gas field from other parts of the United States (27%), other parts of Alaska (58%), and very few workers originating from the planning area (15%), based on comparisons drawn from the North Slope oil industry (Hadland 2005).

In addition, *The Economic Multiplier* shows that in rural areas, the multiplier has a value only a little more than one (ISER 2005). Most goods and services purchased by businesses and households in small towns come directly from larger trade centers outside the local market. In this instance, sources are outside the planning area. The Institute of Social and Economic Research at the University of Alaska in Anchorage estimates that in rural census areas in Alaska, it would take \$15 or more of purchasing power flowing into the region to produce \$1 of income in a support business within the region itself. According to the report, additional spending would generate more support wages in Dillingham than the same amount of spending in Bristol Bay Borough.

The effect of the employment and income on the United States is negligible.

### **Locatable Minerals**

The revocation of all ANCSA Section 17 (d)(1) withdrawals would allow new mineral entry. Under this Alternative, one to three new placer operations could begin over the life of the plan. Up to 15 new seasonal jobs at mining locations may be created, adding income of \$150K to \$250K per annum to the regional economy.

Exploration for resources leading to lode mine potential will begin to occur over the life of the plan. From 4 to 40 new seasonal jobs may be created in various stages of exploration. In initial exploration, one or more small crews consisting of two well qualified geologists and two lesser qualified assistants would receive an average of \$300 per day for approximately six months work. Work would be conducted from small field camp(s), with all supplies shipped to location using commercial air transport, and all local

transportation by helicopter on contract. Using these assumptions, each crew could receive about \$216,000 for 180 days of seasonal employment. This is the most likely scenario for the period 2010-2015.

If potential lode resources are located, additional employment may result as exploration to define a deposit continues. Additional capital and labor will be required to drill, sample, and process findings. This scenario indicates spending may increase by a factor of ten in later stages of exploration or assessment of resources. Primary labor resources will continue to be imported from outside the planning area. Depending upon location of activity, a field camp may still be required, with little use of local lodging.

A large portion of wages will be paid to workers who do not live in the region, and much of the capital investment will occur outside the region. The effect to the regional economy is expected to be low. As development begins, the likelihood of local resource utilization, lodging and air taxi service, and participation by local labor is likely to increase.

Under this scenario Government revenues may increase due to the potential amount of mining claim fees, rental fees, and possible production royalties.

### **Salable Minerals**

Due to the location of BLM lands within the planning area, and the availability of these resources on State or private lands, development of salable mineral materials is expected only in conjunction with leasable mineral activities in the Koggiling Creek planning block. Development of salable minerals and the impacts to social and economic conditions to the region are incorporated into the discussion of leasable minerals.

#### **(2) Effects to Social and Economic Conditions from Lands and Realty Actions (Alternative B)**

FLPMA permits, leases, and sales would continue to be processed on a case-by-case basis. Effect of future disposal or land exchange proposals may be assessed when the value of specific parcels is determined. BLM is unlikely to act until land conveyance to the State of Alaska, ANCSA Native Corporations, and Native Allottees is complete. At that time, BLM may attempt to consolidate land management responsibilities.

#### **(3) Effects to Social and Economic Conditions from Wild and Scenic Rivers (Alternative B).**

Same as Alternative A.

#### **(4) Effects to Social and Economic Conditions from Recreation management (Alternative B)**

This alternative would manage recreation opportunities towards a roaded natural experience. This recreation setting includes some rustic facilities in a largely natural setting. Managing for this experience would imply a higher level of recreational visitor use and consequently a higher level of commercial Special Recreation Permits. More commercial recreation opportunities could provide an economic benefit to local communities or villages in the planning area.

### **d) Effects to Social and Economic Conditions for Alternative C**

#### **(1) Effects to Social and Economic Conditions from Minerals**

##### **Leasable Minerals**

Under Alternative C, 1,063,129 acres of BLM land within the planning area will be open to leasable mineral activities. ANCSA 17(d)(1) withdrawals will be lifted, with the exception of the proposed Carter Spit ACEC (61,251 acres) and proposed Wild River segments of the Alagnak, Goodnews and Goodnews

Middle Fork Rivers (12,210 acres). Additional Agency withdrawals (3,318 acres) would be closed to leasable mineral activities as described within specific PLOs. A 300 foot NSO buffer would be placed on either side of East and South Fork Arolik, Faro Creek, South Fork Goodnews River, and Klutuk Creek (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8) to protect riparian areas and soils adjacent to sensitive habitat for salmon and resident fish. According to the leasable RFD, gas operations are expected to take place within the Koggiling Creek planning block only. Because the described closures are not within the Koggiling Creek planning block, the effect on the regional economy from leaseable mineral development is expected to be the same as Alternative B.

**Locatable Minerals**

ANSCA 17(d)(1) withdrawals will be lifted, with the exception of the proposed Carter Spit ACEC (61,105 acres) and proposed Wild River segments of the Alagnak, Goodnews and Goodnews Middle Fork Rivers (12,210 acres). Additional Agency withdrawals (3,968 acres) would be closed to locatable mineral activities as described within specific PLOs. Upon revocation of ANSCA 17(d)(1) withdrawals, Top Filings would attach to lands selected by the State under ANILCA 906(e). The lands would remain closed to mineral entry pursuant to 43 CFR § 2627.4 (b). The high locatable mineral occurrence potential area of Goodnews Bay/Snow Gulch, is Top Filed by the State under 906(e) of ANILCA. Economic opportunities would be slightly greater compared to Alternative A, due to the amount of expected development (43 acres) as discussed within the RFD for locatable minerals.

**(2) Effects to Social and Economic Conditions from Lands and Realty Actions (Alternative C)**

Impacts would be the same as Alternative B.

**(3) Effects to Social and Economic Conditions from Wild and Scenic Rivers (Alternative C)**

Under Alternative C, all eligible rivers (Alagnak River (Wild/Recreational), the Goodnews River Mainstem (Wild), and the Goodnews River Middle Fork (Wild)) would be found suitable for designation (12,210 acres). If these rivers were eventually designated as Wild and Scenic, visitor use and commercial recreation opportunities would increase, based on experience with other Alaskan Wild and Scenic Rivers. This could provide some economic opportunities for local communities or villages.

**(4) Effects to Social and Economic Conditions from Recreation Management (Alternative C)**

Same as Alternative A.

**e) Alternative D**

**(1) Effects to Social and Economic Conditions from Minerals**

**Leasable Minerals**

Most of the planning area (1,101,304 acres) would be open to mineral leasing, including the Carter Spit ACEC, due to lifting of ANSCA 17(d)(1) withdrawals. A 300-foot NSO buffer (Appendix A, ROP FW-6a and Oil and Gas Lease Stipulation 8) would be placed on either side of East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek. Agency withdrawals (3,318 acres) would be closed to leasable mineral activities. According to the leasable RFD, leasable mineral activities are expected to take place within the Koggiling Creek planning block only. Because the described closures are not within the Koggiling Creek planning block, the effect on the regional economy from leaseable mineral development is expected to be the same as Alternative B.

**Locatable Minerals**

Economic and social effects would be the same as Alternative B.

**(2) Effects to Social and Economic Conditions from Lands and Realty Actions**

Impacts would be the same as Alternative B.

**(3) Effect to Social and Economic Conditions from Wild and Scenic Rivers**

Same as Alternatives A and B.

**(4) Effects to Social and Economic Conditions from Recreation Management**

Same as Alternatives A and C.

## **9. Environmental Justice**

The Alutiiq, Athabascan, and Central Yup'ik Native people, recognized minorities in the planning area, engage in a particularly subsistence based economy. It is characterized by high unemployment in the cash-based economy, low labor force participation, and relatively low income where the cost of living is very high. Therefore, activities restricting subsistence practices, access, and resources will certainly affect a large segment of the local population. Analysis of the effects to subsistence resources and opportunities is presented in the next section of this Chapter. Arguably, creation of jobs and income provide positive effects on the Native population, based on value perspectives.

Activities not associated with mineral extraction or oil and gas activities likely to occur in the Planning Area would primarily be transitory in nature, of short duration, and highly localized. Under all Alternatives the effects of recreation, and forestry, lands and realty actions, and grazing would be similar. Activities could temporarily divert, deflect, or disturb subsistence species from their normal patterns. These activities could alter the availability of subsistence species in traditional harvest areas, which could in turn affect harvest patterns by requiring hunters to travel further in pursuit of resources. Increased travel distances would result in greater expenditures for fuel and equipment, and increased wear and tear on equipment. Consequently, there could be an effect on the subsistence hunting activities of local minority populations as a result of these activities. The effect would be likely minor, short term, and highly localized.

Alternatives B, C, and D would allow oil and gas activities in areas formerly unavailable for leasing. Year-round activities could increase the amount of area affected, increase the duration of effects, and spread the effects where development occurs in the Planning Area. Disturbances caused by development under Alternatives B, C, and D would be potentially greater or more likely than under the No Action Alternative. Mining of locatable minerals under Alternatives B or D would not be likely to adversely affect local people since small placer operations would be seasonal and of short duration. Mineral exploration will have little effect on the local populations as employees and supplies will originate outside the planning area.

## **10. Subsistence**

Proposed management of the following resources/resource uses/programs would have no anticipated impacts to Subsistence: Cultural Resources, Paleontological Resources, Visual Resources, Renewable Energy, Social and Economic Conditions.

### **a) Effects to Subsistence Common to All Alternatives**

#### **(1) Effects to Subsistence from Climate Change (Common to All Alternatives)**

The climate within the Bay planning area is described as maritime near the coasts, and more transitional farther inland. Current scientific evidence suggests that the climate warming in Alaska can be linked to changes occurring in the structure and function of terrestrial ecosystems throughout the state. These

changes include the thawing of permafrost, the conversion of tundra to more shrub habitats, and the drying and decrease in areas of closed basin lakes, causing alteration and conversion of wildlife habitats. Climate change has also been linked to changes in disturbance regimes such as fire potential and insect outbreaks, further affecting ecosystem processes and causing habitat changes in some areas. Warming climates may be instrumental in the introduction of disease and parasites previously unknown in the planning area. Current research suggests that these trends will continue, and will likely occur to a greater extent and magnitude at higher latitudes first. These climatic changes and subsequent habitat changes will impact subsistence uses, by expanding habitats for some species, and limiting habitat for other species, thereby altering the distribution and abundance of these resources, particularly those dependent on wetlands, tundra, shrub or closed forest habitats. Additional impacts may include alterations to caribou migration patterns and alterations in the abundance and timing of spawning anadromous fish species, which could have negative impacts to subsistence users.

## **(2) Effects to Subsistence from Soils, Water, Vegetation and Air Management (Common to All Alternatives)**

Soils, Water, Vegetation and Air resources will be managed per BLM-Statewide Alaska Land Health Standards. In general, subsistence users throughout the planning area would benefit from efforts to protect soil, water, vegetation, and air resources. These resources contribute to a healthy ecosystem, which in turn benefits subsistence users by allowing fish stocks, wildlife populations and other renewable resources to remain healthy and obtain increased productivity.

## **(3) Effects to Subsistence from Fire and Fire Management (Common to All Alternatives)**

Fire management has the potential to impact wildlife or wildlife habitat in a variety of ways which in turn could impact subsistence use if they: 1) depleted a subsistence resource population; 2) altered the range of a subsistence species away from the traditional use area; or 3) resulted in an easier route of access for non-subsistence users into subsistence use areas, increasing the potential for competition of the resource.

Impacts as a result of fire are expected to be minimal within the planning area, as fire has been and continues to be a normal part of the ecosystem. Mitigation measures designed to reduce the impacts of fire suppression activities include limitations on the use of tracked, or off-road vehicles; measures to prevent the introduction of invasive or noxious plant species; establishment of riparian buffer zones; and rehabilitation of fire and dozer lines. Impacts as a result of suppression efforts are expected to be minimal, as most BLM lands are far from the road system, minimizing the use of mechanized equipment.

## **(4) Effects to Subsistence from Forestry Management (Common to All Alternatives)**

Some minimal forestry activity generally occurs within the Bay planning area each year, consisting of small-scale localized timber removal for personal use, including gathering firewood and house logs. While it is unlikely that any type of road construction will occur in conjunction with this activity, it is conceivable that short spurs or temporary roads may be constructed to access parcels of timber in the future. If roads were constructed there could be localized impacts to subsistence due to alterations in habitat, wildlife migratory patterns, wildlife abundance and distribution. Direct habitat loss may also lead to wildlife displacement and habitat fragmentation, overall reducing the abundance of wildlife and plant species available for subsistence use. Currently, there is no commercial use of timber and no associated road construction activity on BLM lands within the planning area.

## **(5) Effects to Subsistence from Locatable and Salable Mineral Activities (Common to All Alternatives)**

**Locatable Minerals.** Locatable mineral exploration and development may occur under every Alternative. Potential impacts to subsistence wildlife would include temporary displacement in localized areas; temporary and long term loss of habitat; long-term degradation of habitat; and direct mortality of small mammals or nestlings and brooding birds. In addition, mining activity may result in access constraints to

subsistence users, or cause an increase in competition for resources if miners took the opportunity to hunt. Both direct and indirect impacts may be reduced under all Alternatives with the implementation of mitigation measures developed during NEPA analysis of specific locatable mineral actions.

**Salable Minerals.** Mineral material disposal has both direct and indirect impacts on wildlife and their habitat, and therefore, has an impact on subsistence. In addition, mineral material activity may also result in access constraints to subsistence users, or cause an increase in competition for resources. However, these impacts would be very minimal under most alternatives, as sufficient material sources exist on private lands to meet the needs of most communities within the planning area and few mineral material disposal actions are anticipated. Additional project-specific subsistence stipulations and ROPs created in response to the proposed activity, such as limitations in the timing or location of the proposed activity, would serve to minimize the potential impacts to subsistence users.

#### **(6) Effects to Subsistence from Lands and Realty Management (Common to All Alternatives)**

There would be both direct and indirect impacts to subsistence activities and resources from lands and realty actions under all Alternatives. Subsistence fish and wildlife species may be temporarily displaced or disturbed during activities authorized under this program and habitat may be destroyed or degraded. Additional project-specific subsistence stipulations and ROPs created in response to the proposed activity, such as limitations or directions regarding helicopter use, would serve to minimize the potential impacts. Land acquisitions and exchanges may benefit subsistence resources by consolidating land status and protecting important fish and wildlife habitats. Disposal actions may result in removal of habitat protection requirements or make lands unavailable for subsistence uses.

#### **(7) Effects to Subsistence from Recreation Management (Common to All Alternatives)**

There may be impacts to subsistence resources from both commercial and non-commercial recreation activities, including aircraft over flights, landing in remote areas, camping, and boating. The primary impacts to subsistence resources from recreation activities may be temporary stress or displacement from authorized activities on BLM-managed lands through a Special Recreation Permit. As stated in Chapter II, under all alternatives, BLM has the discretion to deny an application for a Special Recreation Permit, based on site-specific analysis, including an ANILCA section 810 analysis considering the impacts of the activity on subsistence. BLM has used this discretion in the recent past. In addition habitat degradation may result from trampling or removal of plant species. Under Alternative B, the ROS would be classified as "Roaded Natural" providing for rustic facilities. Impacts to subsistence resources and use within the planning area under this designation would be minimal. Project-specific subsistence stipulations and ROPs created in response to the proposed activity, would serve to minimize potential impacts.

#### **(8) Effects to Subsistence from Travel Management (All Action Alternatives B, C, D)**

The noise and activity associated with OHV use can adversely affect subsistence wildlife both directly and indirectly. Direct effects include stress and displacement of animals, possibly to less suitable habitats, especially from important seasonal habitats (i.e. calving and insect relief areas). Stress and displacement may result in reduced productivity (ADF&G 1990). In Alternative B, the planning area would be designated as open to OHVs and allow cross country travel. Under Alternatives C, and D, BLM-managed lands would be designated as "limited" restricting OHV travel to designated roads/trails.

In addition, a 2,000-lb GVWR would be enforced on OHV use. ROPs and stipulations created in response to any proposed permitted activity, would serve to minimize potential impacts to subsistence use and resources.

### **b) Effects to Subsistence for Alternative A**

Alternative A would continue present management practices and levels of resource use based on the existing Southwest MFP (BLM 1981), supplemented by direction contained in existing laws, regulation and policy. Few uses would be limited or excluded as long as they were consistent with State and

Federal laws. Activities would be analyzed through the NEPA process, including an ANILCA 810 evaluation, on a case-by-case basis, and any identified impacts from the proposed action to subsistence would be mitigated through appropriate consultation and stipulations.

### **(1) Effects to Subsistence from Minerals Activities (Alternative A)**

**Leasable Minerals.** Alternative A would retain all ANCSA 17(d)(1) withdrawals, thus preventing mineral leasing on BLM lands.

**Locatable Minerals.** Under Alternative A, most BLM lands within the planning area would remain closed to locatable mineral entry due to existing ANCSA 17(d)(1) withdrawals. However, some pre-ANCSA claims exist on BLM lands where some mining may take place or continue. These operations and any future proposals for locatable minerals activities would be subject to review through the administration of Plans of Operations. Measures to maintain the integrity of subsistence resources and use would be identified and required as part of the individual mine operating plan. This analysis assumes disturbance of 23 acres of BLM-managed and Native (Federal claims) lands under this alternative, mostly from placer mining operations (BLM, 2006). Effects to subsistence from locatable mineral activities would be as described under “Effects Common to All Alternatives”. Under Alternative A, impacts to subsistence would be less than Alternatives B and D, but similar to Alternative C due to the amount of acres estimated to be disturbed.

**Salable Minerals** No impacts would be expected in areas withdrawn from mineral entry and this analysis assumes no salable mineral activities on BLM lands for this alternative (BLM 2006).

### **(2) Effects to Subsistence from Recreation Management (Alternative A)**

Under Alternative A, the ROS classification would remain classified as Semi-Primitive Motorized and both commercial and non-commercial recreation would continue to be managed to maintain existing conditions.. Consequently, no areas would be identified for commercial or non-commercial use limits, and impacts to subsistence resources and uses associated with these activities would be identified through the NEPA process required for each permit request. Under Alternative A, impacts to subsistence would be the same as discussed under impacts associated with “Effects Common to All Alternatives.”

### **(3) Effects to Subsistence from Travel Management (Alternative A)**

Impacts to subsistence resources and uses would be the same as discussed under impacts “Common to All Action Alternatives.” Under Alternative A, there would be no travel management restrictions and no OHV weight limits. Cross country travel would be allowed everywhere on BLM lands within the planning area. The degree of potential impacts to subsistence would be both positive and negative. The lack of travel restrictions would allow increased access, but has the potential to cause degradation of habitat, from excessive OHV use.

### **(4) Effects to Subsistence from Special Designations (Alternative A)**

No special designations are proposed under this alternative.

### **(5) Effects to Subsistence from Lands and Realty Management (Alternative A)**

Impacts to subsistence from lands and realty actions (use authorizations and land disposals) would be similar to that discussed in effects “Common to All Alternatives.” Alternative A anticipates a low level of resource development and consequently fewer land use authorizations and rights-of-way applications than other alternatives.

**ANCSA 17(d)(1) withdrawals.** This alternative would retain withdrawals, thus preventing most new mineral leasing or location. Impacts to subsistence associated with mineral development would be minimized.

## **b) Effects to Subsistence for Alternative B**

### **1) Effects to Subsistence from Lands and Realty Management (Alternative B)**

**Land Exchanges.** Small isolated parcels identified in Alternative B for disposal could result in privatization of some tracts and could increase levels of access and human activity creating greater competition for subsistence resources. Once under private ownership, these lands are not protected by Federal regulations or policy concerning resource or habitat protection. Wildlife may be displaced from preferred habitats, and habitat may be destroyed or degraded. Exchanges could result in larger, contiguous Blocks of BLM lands that are of high wildlife value.

**Withdrawals.** ANCSA 17(d)(1) withdrawals would be recommended for revocation under this Alternative. Because of the constraints currently in place under these withdrawals, revocation of the withdrawals could increase potential resource development and subsistence wildlife may be disturbed during activities. Associated impacts to subsistence resources would be expected from mineral exploration and development and infrastructure development. Activity level proposals would be handled on a case-by-case basis, and would be subject to Required Operating Procedures and Stipulations.

**Rights-of-Way.** This alternative anticipates the most applications for rights-of-way associated with resource development activities. These would include roads or pipelines associated with mineral development. Impacts to subsistence from these activities are described under impacts "Common to All Alternatives". More impacts to subsistence from rights-of-way would be expected under this alternative than under alternatives A, C, or D.

### **(2) Effects to Subsistence from Minerals Activities (Alternative B)**

**Leasable Minerals.** Under Alternative B, ANCSA 17(d)(1) withdrawals would be lifted and leasable mineral activities would be allowed on 1,103,138 acres of BLM lands. Year around subsistence resource distribution, abundance, movement and associated seasonal harvest activities could be affected by leasable mineral activities.

Other activities associated with leasable mineral activities that have the potential to impact subsistence uses are: helicopter-supported activities, access and facilities (pipelines, production water treatment units, separation ponds, electric lines, buildings, storage facilities etc), construction and OHV use. Although these activities can be a hindrance and an annoyance, it does not create a substantial barrier between communities and subsistence resources.

Potential impacts from leasable mineral development and associated infrastructure are greater than for exploration, given the permanent and year-round nature of operations. If a development were to occur in the calving area of the MCH, or if infrastructure was constructed in such a way as to impede movements of the herd to important seasonal aggregation sites (i.e. calving and post calving aggregations, insect-relief habitat, and breeding or winter ranges) then there could be considerable impacts to this important subsistence resource. However, for the purposes of this planning effort, the reasonable foreseeable development scenario indicates six exploratory wells and one developmental gas field could be constructed in the Koggiling Creek planning block under this alternative. Additionally, roads, docks, and even remote airstrips constructed to aid production may serve as potential inroads for additional local subsistence user accessibility to resources as well as non-local hunters and fishermen, which could lead to increased competition for resources in the area. Under Alternative B, impacts to subsistence from leasable mineral activities would be greater compared to Alternative A. Though the Koggiling Creek planning block is available for leasable mineral activities under Alternatives C and D, the use of seasonal restrictions to protect caribou, applied through ROPs would impact subsistence less compared to Alternative B.

**Locatable Minerals.** Under Alternative B, ANCSA 17(d)(1) withdrawals would be lifted and locatable mineral activities would occur and may potentially increase compared to Alternative A. Potential impacts

to subsistence resources and use would be similar to that discussed within “Common to All Alternatives,” though increased acreage would be available for mineral activities. Surface disturbance under this alternative is presumed to be a total of 115 acres from locatable mineral activities (BLM, 2006). Under Alternative B, impacts to subsistence resources and uses would be similar to Alternative D, but less compared to Alternatives A and C due the amount of acreage estimated for locatable mineral activities.

**Salable Minerals.** Under Alternative B, ANSCA 17(d)(1) withdrawals would be lifted and saleable mineral activities could occur on BLM lands. Impacts to subsistence resources and use would be similar to that discussed within “Common to All Alternatives”, Due to the remote locations of BLM lands within the planning area it is presumed salable mineral activities would only occur in support of leasable mineral activities in the Koggiling Creek planning block. Under Alternative B, impacts to subsistence resources and uses would be greater than Alternatives A, C, and D. Though the Koggiling Creek planning block is anticipated to have salable mineral development under Alternatives B, C, and D, the use of seasonal restrictions applied through ROPs, in Alternatives C, and D, would create less impacts on subsistence resources, primarily caribou.

### **(3) Effects to Subsistence from Recreation Management (Alternative B)**

Under Alternative B, the ROS classification would be classified as Roaded Natural and both commercial and non-commercial recreation would continue to be managed on a case-by-case basis. Management for a Roaded Natural recreation experience implies an increase in recreation users over existing levels. Additional recreation use, both casual and commercial, could result in a greater degree of impacts to subsistence resources. No areas would be identified for commercial or non-commercial use limits, and impacts to subsistence resources and uses associated with these activities would be identified through the NEPA process required for each Special Recreation Permit request. Under Alternative B, impacts to subsistence would be the same as discussed under impacts associated with “All Action Alternatives” but would occur to a greater degree than under any other alternative.

### **(4) Effects to Subsistence from Special Designations (Alternative B)**

No special designations would be proposed under this Alternative.

### **(5) Effects to Subsistence from Travel Management (Alternative B)**

Same as Alternative A.

## **c) Effects to Subsistence from Alternative C**

### **(1) Effects to Subsistence from Reality and Lands Actions (Alternative C)**

**Land Exchanges.** Impacts to wildlife from land exchanges and acquisitions would be the same as described for Alternative A.

**Withdrawals.** Under this alternative, ANCSA 17(d)(1) withdrawals would be maintained on proposed Wild River segments on the Alagnak, Goodnews mainstem and Goodnews Middle Fork (12,210 acres) and within the Carter Spit ACEC (61,251 acres). Conservation of these areas would benefit subsistence resources by protecting important habitats.

**Rights-of-Way.** Impacts to subsistence resources and uses from Rights-of-Way would be the same as described under impacts “Common to All Alternatives” but would occur to a lesser degree. The proposed Bristol Bay and Carter Spit ACECs would be identified as avoidance areas. Restricting or stipulating Rights-of-Way within these ACEC would minimize impacts to important subsistence wildlife habitats and protect federally-listed migratory bird species, harvested for subsistence purposes, from impacts described in “Common to All Alternatives.”

## **(2) Effects to Subsistence of from Leasable, Locatable, and Salable Minerals (Alternative C)**

**Leasable Minerals.** Under Alternative C, ANCSA 17(d)(1) withdrawals would be revoked, opening 1,063,129 acres of BLM lands to mineral entry. ANCSA 17(d)(1) withdrawals would be retained on eligible/suitable Wild Rivers (12,210 acres) including the Alagnak, Goodnews and Goodnews Middle Fork Rivers and within the proposed Carter Spit ACEC (61,251 acres). The retention of these withdrawals would prohibit mineral leasing within these areas. A NSO would be established within 300 feet of the East and South Fork Arolik River, Faro Creek, South Fork Goodnews River and Klutuk Creek. Consequently, under this alternative there is less land available for mineral leasing compared to Alternatives B or D. However, this analysis predicts the development of one gas field in the Koggiling Creek planning block. Potential impacts to subsistence from such a development are the same as those discussed under Alternative B.

**Locatable Minerals.** The effects to subsistence from locatable mineral activities would be similar to those discussed in Alternative B but smaller in scope. Twenty-three acres of disturbance is expected from locatable mineral activities under this Alternative on State-selected and Native lands. Segments of eligible/suitable Wild Rivers (12,210 acres) including the Alagnak, Goodnews and Goodnews Middle Fork Rivers of the Alagnak River, the mainstem of the Goodnews River, and the Goodnews Middle Fork, and the proposed Carter Spit ACEC (61,251 acres) would retain ANCSA 17(d)(1) withdrawals precluding these areas from mineral entry while allowing subsistence use. Conservation of these areas would benefit subsistence resources by protecting important habitats.

**Salable Minerals.** Impacts to subsistence would be similar to those in Alternative B but smaller in scope because the proposed Carter Spit ACEC, the proposed Bristol Bay ACEC, and segments of the Alagnak, Goodnews mainstem and Goodnews Middle Fork rivers proposed for Wild and Scenic River designation would be closed to salable mineral activities. This Alternative would provide protection to subsistence resources by minimizing the amount of acreage available for salable mineral activities.

## **(3) Effects to Subsistence from Recreation (Alternative C)**

Under Alternative C, the entire recreation area setting would be managed as ROS classes primitive, semi-primitive, and semi-primitive motorized. Impacts to subsistence resources would be the same as those described under Alternative A.

## **(4) Effects to Subsistence from Off-highway Vehicles (Alternative C)**

Under Alternative C, all lands would receive a "limited" designation for OHV use, which would require vehicles to stay on existing trails whenever possible. A vehicle weight limit of 2,000 pounds would be proposed. These restrictions would benefit subsistence resources by reducing proliferation of trails resulting in degradation of habitats, and would reduce the indirect impacts to wildlife created by noise and disturbance, which can cause abandonment from preferred habitats.

## **(5) Effects to Subsistence from Special Designations (Alternative C)**

**Wild and Scenic Rivers.** Under Alternative C, segments of the Alagnak, Goodnews mainstem and Middle Fork Goodnews rivers would be proposed for inclusion to the National WSR system. ANCSA 17(d)(1) withdrawals would be retained, closing these river corridors to mineral activities. These actions would be beneficial to subsistence resources by protecting riparian habitats from disturbance from resource development activities and by providing undisturbed wildlife habitats to riparian species. A Wild and Scenic River nomination or subsequent designation may result in increased visitation on nominated river segments. Increased visitation may stress or displace subsistence resources within riparian corridors due to increased noise from humans and boat and aircraft traffic. Competition for resources may result due to increases in non-subsistence hunting and fishing.

**Areas of Critical Environmental Concern.** Under Alternative C, the Carter Spit ACEC (61,251 acres) and the Bristol Bay ACECs (974,970 acres) would be proposed. This would benefit subsistence resources by providing increased protection to wildlife habitat in this area by the following measures:

- Requiring Plans of Operations for any mining operation, even those less than five acres (43 CFR 3809.11).
- Managing the area as a rights-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Developing a transportation plan that identifies specific designated trails for OHV use, thus preventing unauthorized stream crossings, trail proliferation, and associated negative impacts subsistence resources habitats.
- ANCSA 17(d)(1) withdrawals would be retained and seasonal constraints to protect the Steller's eider would be developed in the Carter Spit ACEC.

## d) Effects to Subsistence from Alternative D

### (1) Effects to Subsistence from Reality and Lands Actions (Alternative D)

**Land Exchanges.** Impacts to subsistence resources would be the same as those discussed for Alternative B.

**Withdrawals.** Impacts to subsistence resources from removing ANCSA 17(d)(1) withdrawals would be the same as those in Alternative B.

**Rights-of-Way.** Impacts to wildlife from Rights-of-Way would be the same as those for Alternative B; however, the proposed Carter Spit ACEC (36,220 acres) would be identified as an avoidance area for Rights-of-Way. This would benefit subsistence wildlife and habitat by reducing the potential of impacts resulting from road or pipeline development in the area.

### (2) Effects to Subsistence from Mineral Development (Alternative D)

**Leasable Minerals.** Under Alternative D, ANCSA 17(d)(1) withdrawals would be revoked and 1,101,304 acres of BLM lands would be open to leasable mineral activities. A 300-foot "No Surface Occupancy" area on either side of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River, and Klutuk Creek would be proposed. There would be slightly less land available for mineral leasing compared to Alternative B, but more than Alternatives A and C. However, this analysis predicts the development of one gas field in the Koggiling Creek planning block. Potential impacts to subsistence use and resources from leasable mineral activities would be similar to those discussed under Alternative B, with the exception that under Alternative D, Stipulations that contain seasonal constraints for protection of caribou would be applied (Appendix A, Stipulations 5 and 6).

**Locatable Minerals.** This analysis predicts potential mining development and disturbance on 115 acres from both placer and lode mining (BLM, 2006). This disturbance is expected to occur entirely on State-selected, due to ANILCA 906(e) Top Filings, and Native (Federal mining claim) lands.

Impacts to subsistence and subsistence resources from this level of development would be the same as for Alternative B. At this level of anticipated development and with the application of ROPs in mining Plans of Operations, impacts to subsistence uses and subsistence resources may be significant in the immediate area associated with locatable mineral activities. Within the Carter Spit ACEC, Plans of Operation would be required for any operation (43 CFR 3809.11). This would have the effect of minimizing small-scale exploratory or development activities and would enable BLM to work with the operator in the Plan of Operation to apply ROPs for protection of resources.

**Salable Materials.** Impacts to subsistence resources would be the similar to Alternative B, except the Carter Spit ACEC (36,220 acres) would be closed to salable mineral activities. This ACEC designation

would benefit subsistence uses and subsistence resources by protecting important riparian and coastal habitats, located within the ACEC boundary.

### **(3) Effects to Subsistence from Recreation (Alternative D)**

Under Alternative D, the entire recreation area setting would be managed as ROS classes primitive, semi-primitive, and semi-primitive motorized. Impacts to subsistence resources would be the same as those described under Alternative A.

### **(4) Effects to Subsistence from Off-highway Vehicles (Alternative D)**

Under Alternative D, all lands would receive a “limited” designation for OHV use, which would require vehicles to stay on existing trails whenever possible. A vehicle weight limit of 2000 pounds would be proposed. Impacts would be similar to that discussed in Alternative C.

### **(5) Effects to Subsistence from Special Designations (Alternative D)**

There would be no Wild and Scenic River nominations under this alternative. This would result in more acres available for resource development. Effects to subsistence resources from anticipated resource development under this alternative are discussed in the topics above.

Under Alternative D, the Carter Spit ACEC (36,220 acres) would be designated. This would benefit subsistence resources by providing increased protection to wildlife habitat in this area by the following measures:

- Requiring Plans of Operations for any mining operation, even those less than five acres (43 CFR 3809.11).
- Managing the area as a rights-of-way avoidance area, thus avoiding potential impacts from road or pipeline construction.
- Developing a transportation plan that identifies specific designated trails for OHV use, thus preventing unauthorized stream crossings, trail proliferation, and associated negative impacts.
- Seasonal constraints to protect federally-listed, subsistence authorized, migratory bird species would be developed (Appendix A, ROP SS 1b).

## E. Cumulative Effects

### 1. Methods

The National Environmental Policy Act (NEPA) and its implementing guidelines require an assessment of the proposed project and other projects that have occurred in the past, are occurring in the present, or are likely to occur in the future, which together may have cumulative impacts that go beyond the impacts of the proposed project itself. According to the Act's implementing regulations (40 CFR Sec. 1508.7 and 1508.25[a][2]):

A **cumulative impact** is the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In addition, to determine the scope of environmental impact statements, agencies shall consider cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

The analysis of cumulative impacts is a four-step process that follows guidance provided in Considering Cumulative Effects under NEPA (CEQ 1997).

- **Specify the class of actions whose effects are to be analyzed.** Activities allowed under the RMP and advances in technology are considered in the analysis. The assumptions and scenarios used by the resource specialists in the analysis of the cumulative impacts include those identified for the planning area in Analysis Assumptions beginning on page 4-3.
- **Designate the appropriate time and space domain in which the relevant actions occur.** For some resources and uses, the area of which an effect could be felt would be the "footprint," but for others the effect may extend well beyond that area. For example, noise effects to wildlife can extend beyond the footprint of the development. For purposes of this analysis, the spatial domain for past, present, and reasonably foreseeable activities is primarily the planning area. However, this document also considers effects to resources that could occur outside of the planning area, primarily to migratory birds and mammals. Due to the difficulty of predicting advances in technology and the need for oil and gas very far into the future, the analysis period which most of the cumulative effects analysis is 50 years into the future.
- **Identify and characterize the set of receptors to be assessed.** The set of receptors assessed in the cumulative effects analysis are the physical, biological, and human systems discussed in Chapter III.
- **Determine the magnitude of effects on the receptors and whether those effects are accumulating.** The potential extent of the total cumulative effects (e.g., number of animals and habitat affected, jobs and revenues created or lost), and how long the effects might last (e.g., population recovery time, duration of income flows) are estimated to determine the magnitude of effects that could accumulate for each resource. Where possible, the assessment of effects on a resource is based on quantitative analysis (e.g., number of miles of gravel constructed; number of animals killed). However, many effects are difficult to quantify, and a qualitative assessment of effects is made.

## 2. *Activities Considered in the Cumulative Case*

The following are past, present, and reasonably foreseeable future actions on Federal lands and non-Federal lands within the planning area or outside of the planning area. Actions outside the planning area include those that could contribute to cumulative effects on resources within the planning area.

### a) Past Development

- **History of Oil and Gas Exploration** - To date, oil and gas exploration has been limited to 26 onshore wells and 2 offshore wells in the Bristol Bay region, an area comprising about 40,000 square miles (Magoon et al. 1996). None of the wells were drilled in the planning area, nor has any produced oil or gas in commercial quantities.
- **First Lease Sales** - The State of Alaska first made land available for oil and gas leasing in the Bristol Bay area in the 1960s. Sales #2 and #5 resulted in the leasing of five isolated tracts in Nushagak Bay and on the Alaska Peninsula (State of Alaska 2005). A total of 476,824 acres were leased. In 1961, Pure Oil Company received a contract from the State of Alaska to drill three wells in the Nushagak Bay area. The project was abandoned when Pure Oil Company failed in an attempt to land a drilling rig in the area due to icing conditions (State of Alaska 1961).
- **Historic Wells** - The North Aleutian COST #1 well (1983) and the Amoco Becharof #1 well (1985) were drilled in the Aleutian Islands region. The North Aleutian COST #1 well was drilled offshore by ARCO into the Bear Lake Formation, which exhibited good reservoir properties. Approximately 33 feet of coal was also found (Reifenstuhl and Finzel 2005).

Becharof #1, the nearest well on the Alaska Peninsula to the planning area boundary, is located approximately 30 miles south of the boundary. It was drilled in 1985 by the Amoco Petroleum Company. Significant gas shows were encountered in Tertiary rocks (Reifenstuhl and Brizzolara 2004).

- **Cook Inlet Basin Oil and Gas** – The Cook Inlet region is generally considered as the birthplace of commercial oil and gas production in Alaska. Oil was discovered in the Swanson River oil field in 1957, which provided an important catalyst for the Alaska statehood in 1959. After statehood, a competitive leasing program was established. Since then, over 5.6 million acres of State land have been leased in 40 State oil and gas lease sales in the Cook Inlet region. Prior to Statehood in 1959, the Federal government conducted non-competitive lease sales. About 67,000 acres of the non-competitive Federal leases remain active in the Cook Inlet basin. One competitive Federal lease has been issued to date: a 400-acre parcel. In 1960, annual production rose to 600,000 bbls, and peaked at 83 million bbls in 1970. Industry-related developments include a Unocal ammonia-urea plant in Nikiski, the first oil refinery developed by Tesoro in 1969 near Kenai, and a liquid natural gas (LNG) plant in Nikiski in 1969.
- **History of Locatable Mineral Production** – Known mineral deposits within the Bay planning area that have seen historical production include one deposit of placer platinum, placer gold, and one small mercury lode deposit. Placer platinum mining has historically occurred on the Salmon River near the Goodnews Mining Camp and associated side drainages including Dowery Creek, Squirrel Creek, and Clara Creek. Between 1928 through 1982, an estimated 646,312 troy ounces of platinum were mined from these drainages. Early open cut mining was conducted by draglines/sluc-boxes in the side drainages. In 1937 a large bucket-line dredge was brought in to mine the Salmon River which operated through 1982.
- Placer gold mineralization has been identified and mined in the past but these operations were small and have been inactive for many years. Placer gold mining has occurred in the headwaters of the Arolik River and the Wattamuse/Slate Creek area, north of Goodnews Bay; at Trail Creek, a tributary

of the Togiak River; at American Creek, north of Naknek Lake; and at Portage Creek and Bonanza Creek, north of Port Alsworth. The largest gold placer operation occurred around Wattamuse Creek and associated drainages, where between 1917 through 1947, an estimated 30,041 troy ounces of gold were mined (BLM, 2005 AMS).

- Mercury was discovered at the Redtop Mercury Mine, located on Marsh Mountain north of Dillingham. Production occurred from 1952 to 1959 with a total of approximately 100 flasks (Hudson, 2001a OFR 01-192). Several abandoned mine projects have been conducted at the Redtop Mercury Mine during the last decade, including hazardous waste removal of the retort and contaminated soil at the Redtop Millsite along the Wood River. Additionally, dynamite demolition, and a closure of the main underground adit have occurred at the associated mine site on top of Marsh Mountain (BLM 2005).
- **Omnibus Roads** – Three Omnibus roads were constructed in the Bay planning area.

## b) Present and Reasonably Foreseeable Future Development

- **Commercial Fishing** – Commercial fishing in Bristol Bay continues as the key economic driver in the region. Residents in every village in the region participate in the fishery, with members of every community holding set net and drift net limited entry permits.
- **The Oil Industry** – Oil provides approximately 85% of the State of Alaska income, Permanent Fund Dividends to residents, and has resulted in infrastructure development in the Bristol Bay Region.
- **Oil and Gas in Bristol Bay Basin** – Offshore drilling is currently off limits following a 1996 presidential moratorium; however, directional drilling from onshore is authorized (State of Alaska 2004). The moratorium on offshore drilling is in effect until June 30, 2012, but can be revoked by the President prior to that date (Sherwood et al. 2006).

On Jan. 9 President Bush lifted the moratorium on oil and gas leasing in the North Aleutian planning area, an area that includes the outer continental shelf of Alaska's Bristol Bay and the southeastern corner of the Bering Sea. The president's action should enable the U.S. Minerals Management Service to include two North Aleutian lease sales in its 2007 to 2012 leasing program. (<http://www.gov.state.ak.us/archive.php?id=54&type=1>)

- **Alaska Peninsula and Nushagak Peninsula Oil and Gas Leasing Program** – On March 17, 2004, ADNR, Lake and Peninsula Borough, Bristol Bay Borough, and Aleutians East Borough signed a Memorandum of Understanding (MOU) in support of oil and gas lease sales and licensing of State land in the Bristol Bay and Alaska Peninsula regions. Similar MOUs were already in place between the ADNR and the Aleut Corporation and the Bristol Bay Native Corporation (State of Alaska 2004).
- **Oil and Gas Exploration Licensing Near Dillingham** – The multi-agency coordination resulted in the State of Alaska initiating an Exploration Licensing area near Dillingham, which originally totaled 329,113 acres, only applicable for lands owned by the State (State of Alaska 2004). Bristol Shores, LLC, the primary interested licensee, was granted a license but let it lapse. In June 2005, Bristol Shores applied for a new license application for a reduced area consisting of 20,154 acres on the east side of Nushagak Bay, south of Dillingham (Petroleum News 2005), with the intent of conducting initial exploration. Currently there is no proposed or pending license in the Bristol Bay license area. Commercial oil finds are unlikely, but the area may contain up to 1 tcf of natural gas (Loy 2004).
- **Oil and Gas Lease Sales** - ADNR held an oil and gas lease sale October 26, 2005, offering 1,047 tracts of 5.8 million acres within the Alaska and Nushagak peninsulas (Decker 2005). Lands offered within the planning area include the lower Nushagak Peninsula and the southern portion of land extending from south of Ekuk eastward to the Kvichak River delta (State of Alaska 2005). About 510,000 acres lie within the Bay planning area boundary, none of which are BLM-managed lands. At

that time, 213,120 acres were leased, none of which were within the planning area. Interest was limited to Port Moller and vicinity, on the lower Alaska Peninsula approximately 200 miles south of the planning area. According to ADNR the next sale for the Alaska Peninsula is scheduled for February 2007 (State of Alaska 2006).

- **Cook Inlet Basin Leasables** – The Cook Inlet basin is currently the only commercially producing oil and gas region in southern Alaska. Between 1997 and 2001, Cook Inlet natural gas production remained relatively stable at an average of 213 Bcf per year.
- **Locatable Mineral Exploration in the Bay Planning Area** – During 2005, the last complete year of information, seven Annual Placer Mining Applications (APMA) and Annual Hardrock Exploration Application (AHEA) were submitted for Locatable Mineral projects located within the Bay planning area. Four lode exploration applications and three placer mining applications were filed (AK DNR 2005). APMAs are currently being submitted for 2006.
- **Lode and Placer Exploration** – Lode exploration projects include the Big Chunk, Kamishak Project, Pebble Copper, and Shotgun/Mose Projects located on State land. One placer mining project on the Arolik River is located on Native-selected land and one location at Salmon River Bench is located on Native land. One placer mining operation on State land includes the Syneeva Creek (Northern Bonanza). There are no lode or placer mining activities on BLM land at this time.
- **Pebble Mine Project** – State lode mining claims are located on the Big Chunk (BC), FUR, GDH, KAK, Pebble Copper, Pebble South, 25 Gold: Sill, 37 Skarn, and 38 Porphyry properties. The Pebble copper-gold-molybdenum-silver deposit is located in the Lake and Peninsula Borough, just north of Frying Pan Lake and 18 miles northwest of Iliamna. The exploration and planning phase of this project is likely to continue for several years, and provides income for lodge and hotel owners in Iliamna as well as jobs for locals.

In 2004, Northern Dynasty Minerals, Ltd. began a program to collect engineering, environmental, and socioeconomic data required for completion of a Bankable Feasibility Study and submission of permit applications for the Pebble Copper Mine. New finds in 2005 have delayed the permit application submission timeline. Production is not expected to begin before 2010 (Northern Dynasty Minerals Ltd. 2005).

In conjunction with the mining project, ADOT&PF is examining the feasibility of constructing a 75 mile road from the Pebble Copper mine site to a port site at Iniskin Bay or Williamsport. Draft reconnaissance engineering started in July 2004, and final reconnaissance engineering was to be completed in 2005 (ADOT&PF 2004).

- **Big Chunk (BC) Project** – Liberty Star Gold Corporation conducted a comprehensive exploration project to evaluate copper-gold deposits on state mining claims adjacent to the Pebble Copper Mine deposit (Alaska Minerals Commission 2005).
- **Locatable Mineral Claim Staking** – Mining claims have been staked throughout the Bay planning area for both lode and placer deposits. Extensive claim staking has historically occurred in the Bonanza Hills, Kemuk, Kvichak, Pebble Copper, Shotgun Hills, Sleitat Mountains, Snow Gulch, and Red Top areas. As of January 2005, there were a total of 257 Federal claims covering approximately 10,280 acres and as of December 2005 there were a total of 5,824 State claims and no State prospecting sites covering a total of approximately 232,960 acres (BLM, 2005).
- **Bonanza Creek Area** – State placer mining claims are located on Bonanza Creek and Syneeva Creek. State lode mining claims are located on the Bonanza Hill and Bonanza property.
- **Goodnews Bay/Snow Gulch Area** – State placer mining claims are located on the Arolik River.

- **Iliamna/Kvichak Area** – Federal and State lode mining claims are located on the Iliamna Project, H Block property. State lode mining claims are located on the Iliamna Project, D Block and LSS properties.
- **Kemuk Mountain Area** – State lode mining claims are located on the Kemuk and NAP properties.
- **Platinum Area** – Federal placer mining claims are located on the Salmon River Bench property.
- **Shotgun Hills Area** – State lode mining claims are located on the Shot, Shotgun/Mose, and Win properties.
- **Exploration and Development Activities Bonanza Creek Area** – There are no identified exploration projects reported in the Bonanza Creek area as of 2004 (Szumigala and Hughes, 2005). One APMA placer mining project was submitted for Syneeva Creek for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Goodnews Bay/Snow Gulch area** – There are no identified exploration projects reported in the Goodnews Bay/Snow Gulch area as of 2004 (Szumigala and Hughes, 2005). One APMA placer mining project was submitted for the Arolik River for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Iliamna/Fog Area** – There are no identified exploration projects reported in the Iliamna/Fog area as of 2004 (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Iliamna/Kvichak Area** – Detailed geophysical survey and core drilling was completed in 2004 on the Iliamna Project H Block by Geocom Resources Inc. Over 3,303 feet of core drilling was completed at four locations outlining a 2,296 by 4,921 foot gold, copper, and molybdenite mineralized zone. At their Iliamna Project, D Block additional geophysical studies were conducted to delineate drill targets (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Kasma Creek Area** – There are no identified exploration projects reported in the Kasma Creek area as of 2004 (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Kemuk Mountain Area** - There are no identified exploration projects reported in the Kemuk Mountain area as of 2004 (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Kijik Lake Area** - There are no identified exploration projects reported in the Kijik Lake area as of 2004 (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).
- **Recent Exploration and Development Activities Pebble Copper Area** - Three properties had extensive exploration activities conducted during 2004; Pebble Copper, Big Chunk (BC), and Pebble South. Northern Dynasty Minerals, LTD. conducted comprehensive drilling, base-line environmental and socioeconomic studies to support Federal and State project permit applications. Also, Northern Dynasty conducted site testing and engineering studies for a bankable feasibility study which will be started in 2005. In-fill drilling to upgrade resources to measured and indicated status and to finalize pit design was conducted. During 2004, more than 157,614 feet of core drilling in 227 holes was completed, in-fill drilling totaled 101,539 feet in 122 holes, metallurgical and process drilling totaled 21,335 feet in 26 holes, geotechnical drilling totaled 32,502 feet in 70 holes, and exploration drilling totaled 13,815 feet in 9 holes. A new higher-grade, laterally extensive gold, copper, and molybdenite “East Zone” was discovered on the east side of the “Central Zone” of Pebble Copper. Mineralization has been discovered to a depth of 2,379 feet, and extends beyond to an unknown depth. More

extensive drilling was conducted during 2005. This deposit would be mined by underground methods and is richer than the Central Zone (Szumigala and Hughes, 2005).

Liberty Star Gold Corporation conducted exploration activities on the Big Chunk (BC) property, abutting the northwest corner of the Pebble Copper claims. Airborne magnetic survey, geologic, geochemical, space imagery, and aeromagnetic studies identified 21 anomalous areas. Geological sampling, mapping, and diamond drilling activities were conducted during 2004 (Szumigala and Hughes, 2005).

Full Metal Minerals, Ltd. conducted exploration activities on the Pebble South property, abutting the south side of the Pebble Copper claims. A geological sampling program, geophysics and ground magnetic studies were completed in 2004. Eleven anomalous areas were identified with two high priority targets identified; the Boo and TYP properties (Szumigala and Hughes, 2005).

Two AHEA exploration projects were submitted for the Big Chunk (BC) and Pebble Copper projects for 2005 (AK DNR, 2005).

In 2006 Northern Dynasty Minerals, LTD. conducted comprehensive drilling, base-line environmental and socioeconomic studies to support Federal and State project permit applications. A total of 74,000 feet of core drilling was done with emphasis on determining the overall size and grade of the Pebble East deposit discovery made in 2004. This drilling extended the north-south strike length to over 7,000 feet in which the grades consistently exceed 1% copper equivalent.\* The deposit is still open ended to the north and south across a width exceeding 4,000 feet. The discovery of the Pebble East has boosted the inferred mineral resource at the deposit by nearly 90%. This deposit is richer than the Central Zone, but lies at depth would be mined by underground methods.

As of February 2007 the Pebble Deposit has inferred resources, at a 1.0% copper equivalent cutoff, of:

1.4 billion \*\*tonnes grading 1.29% copper equivalent, containing 24.6 billion pounds of copper, 20.9 million ounces gold, and 1.2 billion pounds of molybdenum.

Northern Dynasty has stated that the combined resources at the Pebble Deposit constitute one of the most significant metal accumulations in the world. In 2007 the company plans to focus efforts on Pebble East with an estimated 250,000 feet of drilling to further expand the resource and upgrade the classification of known mineralization (Northern Dynasty news releases, January 23 and February 20, 2007)

\*Copper equivalent ( $CuEQ = Cu\% + (Au \text{ g/t} \times 12.86/22.05) + (Mo\% \times 132.28/22.05)$ )

\*\*tonnes = metric tons.

- **Exploration and Development Activities Platinum Area** – There are no identified exploration projects reported in the Platinum area as of 2004 (Szumigala and Hughes, 2005). One APMA placer mining project was submitted for the Salmon River for 2005 (AK DNR, 2005).
- **Exploration and Development Activities Shotgun Hills Area** – TNR Gold Corporation conducted geological and geochemical exploration programs during 2004. This resulted in acquiring 14,080 acres of new State mining claims. The claims follow a north-south trend from the Main Shotgun Zone and are called the Shot, King, and Winchester areas. New drill targets for 2005 were identified along this zone as well as more extensive drilling of the Main Zone. One AHEA exploration project was submitted for the Shotgun/Mose Project for 2005 (AK DNR, 2005).
- **Sleitat Mountain Area** – There are no identified exploration projects reported in the Sleitat Mountain area as of 2004 (Szumigala and Hughes, 2005). No APMA or AHEA exploration projects were submitted for 2005 (AK DNR, 2005).

- **Construction of the Wood River Bridge** – The Alaska Department of Transportation and Public Facilities (ADOT&PF), with the Federal Highway Administration, have made an Environmental Assessment and Finding of No Significant Impact for the proposed construction of the Wood River Bridge in Alaknagik. The bridge is currently in the design phase, with construction to begin in late 2007 or in 2008 (ADOT&PF 2005).
- **Iliamna Airport Improvements** – The ADOT&PF began a study of ways to improve the Iliamna airport in 2005, including identifying improvement options, preparing engineering and environmental reports, and completing a master plan that outlines short-term (5 years), intermediate (10 years), and long-term (20 year) airport improvements (ADOT&PF 2005).
- **Manokotak Airport Improvements** – The ADOT&PF with the Federal Aviation Administration is proposing improvements to Manokotak Airport in Manokotak. Improvements include expanding the runway, surfacing the entire facility, providing adequate area for snow storage, constructing an apron and taxiway system, installing an airport lighting system and precision approach path indicators and runway end identification lighting, adding two snow removal equipment storage building bays, and extending overhead electrical lines to the new facility. A draft Environmental Assessment was published in July, 2005 (ADOT&PF 2005; FAA 2005).
- **Proposed Naknek River Bridge and Aviation Operations Improvements** – The proposed ADOT&PF project would entail a bridge spanning the Naknek River and connecting the three communities of the Bristol Bay Borough, South Naknek, Naknek, and King Salmon. The bridge would tie into the existing Omnibus road that connects Naknek and King Salmon. A bridge would influence aviation use patterns and the priority of aviation operations, and improvements at the individual airport facilities, some of which had been identified by 2005 and were waiting for funding (ADOT&PF 2005).
- **Near-Term Recommendations for Community Linkages** – In the Transportation Plan, the ADOT&PF recommends five community linkage projects, three of which are in or immediately adjacent to the Bay planning area: Williamsport-Pile Bay roadway improvements; Iliamna-Nondalton road improvements and bridge construction connection; and Dillingham-Aleknagik road improvements and bridge construction connection (ADOT&PF 2005).
- **ADOT&PF Recommendations for Port and Harbor Improvements** – One recommended set of port improvements is Williamsport navigation improvements and dock facility, and Pile Bay dock and boat launch facility. While this is outside the Bay planning area, it is seen as providing an intermodal complement to key transportation infrastructure, some of which would probably be within the planning area (ADOT&PF 2005).
- **ADOT&PF Marked Winter Trail System** – Provides a system of trail markers that permit safe travel by snowmachine between Bristol Bay communities during the winter months (ADOT&PF 2005).

### c) Speculative Development

- **ADOT&PF Corridor Delineation** – The purpose of corridor delineation is to recognize the patterns of existing travel and desired travel in the region, and to establish and protect the surface transportation “highways” that would best serve the region’s long term social and economic infrastructure needs. The Transportation Plan identifies four primary corridors, three of which are in or immediately adjacent to the Bay planning area: Cook Inlet to Bristol Bay corridor; Alaska Peninsula corridor, and Dillingham/Bristol Bay corridor (ADOT&PF 2005). It is possible that all or segments of these projects may be completed during the life of this plan.
- **ADOT&PF “Triggers” for Planning** – ADOT&PF’s Transportation Plan recommends a series of triggers for re-evaluation of lower-priority projects that could lead to their development within the 20-

year period considered by the plan (ADOT&PF 2005). This is dependent on such factors as a dramatic increase in population and increased demand from the economic sector.

### 3. Resources

#### a) Cumulative Effects to Soils, Water Resources, Vegetation and Air Quality

##### (1) Cumulative Effects to Air, Vegetation, Soils, and Water from Minerals

###### Past and Present Effects to Soils and Vegetation

Past and present effects to soil and vegetation resources would largely result from surface disturbing activities that degrade the vegetative cover, compact soils, and expose ice-rich permafrost soils causing thermokarst erosion and subsidence. Wetland soils, stream bank soils and vegetation; and lakeshore soils and vegetation would be particularly vulnerable due to the increased possibility of additional vegetation loss. Weeds may become more prevalent, along with erosion from seasonal breakup, ice scouring, wave action, and high flow events. Thermokarst erosion could also result from the cumulative effect of seismic and exploration activity when less than ideal snow conditions expose tussock tundra to surface disturbance during winter months. Habitat maintenance and enhancement through adherence to the Required Operating Procedures, Stipulations, and project-specific requirements would normally reduce the unnecessary long-term disturbance to soils.

###### Cumulative Effects to Soils and Vegetation

**Leasables.** Based on findings presented in "Present and Reasonably Foreseeable Future Development," limited on-shore oil and gas development would occur on non-BLM lands within this planning period. Therefore, the direct and indirect effects to soils and vegetation presented for each alternative, which include the development of a gas field in the Koggiling block under Alternatives B, C, and D, are an adequate analysis of the cumulative effects of mineral leasing on soils and vegetation.

**Locatables.** Based on the Reasonably Foreseeable Development Scenario for Locatable and Salable Minerals (BLM, 2006), the following acres of total surface disturbance on non-BLM lands could occur from mining:

- There is expected to be a very high amount of reasonable foreseeable future locatable lode mineral activity in the Pebble Copper area. Future exploration, development, and lode and placer mining activities are expected to continue at eleven lode locations on State land. During the next 20 years mineral related lode activities would result in a disturbance of 6,450 acres for lode exploration and development activities in the Pebble Copper area; 6,400 acres would be a result of activities at the Pebble Copper property.
- There is expected to be a high amount of reasonable foreseeable future locatable lode and placer mineral activity in the Shotgun Hills area. Future exploration, development, and lode and placer mining activities are expected to continue at three lode operations: at the Shot, Shotgun/Mose, and Win properties and one placer operation on the King Salmon River. During the next 20 years mineral related activities would result in a disturbance of 1,311 acres in the Shotgun Hills area; 1,310 acres for lode exploration and 1 acre of placer exploration on State land.
- There is expected to be a moderate to high amount of reasonable foreseeable future locatable lode and placer mineral activity in the Platinum area. During the next 20 years mineral related activities would result in a disturbance of 56 acres in the Platinum area; 10 acres for lode exploration and 46 acres of placer exploration on Native land.
- Other smaller placer and lode developments are anticipated on non-BLM lands throughout the planning area.

These numbers, combined with the highest projected numbers of surface disturbance on BLM lands (115 acres under alternatives B and D) from mining disturbance, total 7,996 acres of projected reasonably foreseeable surface disturbance for all lands within the planning area. Based on the direct and indirect effects described in this Chapter, this represents a significant impact to soils directly disturbed by mining operations. However, the cumulative projected disturbed acreage of 7,996 represents only .03 percent of the total acres in the planning area. Reclamation on both State and BLM lands prescribed in Plans of Operations would help to restore soils and vegetation to pre-mining productivity.

### Past and Present Effects to Water

Past and present events and actions that have affected fresh water resources within and adjacent to the Bay planning area have included climate change, mining activities, transportation projects, military activities, industrial and domestic activities and related disposal of hazardous materials, and construction of facilities. Climate change could affect annual precipitation amounts. Future reasonably foreseeable development activities associated with transportation projects and mineral activities may have adverse effects on water quality, although this would depend upon the location and area of activity. Mineral exploration and development can substantially decrease water supply in local aquifers, alter drainage patterns, and degrade the water quality in receiving waters.

### Cumulative effects to Water

**Leasables.** Based on findings presented in "Present and Reasonably Foreseeable Future Development," limited on-shore oil and gas development would occur on non-BLM lands within this planning period. Therefore, the direct and indirect effects to soils and vegetation presented for each alternative, which include the development of a gas field in the Koggiling block under Alternatives B, C, and D, are an adequate analysis of the cumulative effects of mineral leasing on water resources.

**Locatables.** Cumulative effects to water from placer mining, including small informal projects may include deposition of heavy metals, including concentrations of arsenic and mercury (LaRoche et al. 2006; BLM 2006; Hunerlach et al. 1999; Alpers and Hunerlach 2005; Allan 1995). A problem that has been identified, is determining whether the source of the heavy metal is the mining operation, or whether it occurs naturally in the environment (Mueller and Matz 2002).

The cumulative case assumes exploration and development for all of the planning area. The planning area is comprised of several distinct watersheds or drainages that do not extend into adjacent areas outside the Bay planning area boundary. Therefore, activities involving surface water that are taking place outside the planning area would not be expected to directly impact water resources within the planning area; however, activities affecting surface water within the planning area could also have an effect downstream and in the bays. Additionally, water resources in aquifers which may extend beyond planning area boundaries could be affected by activities polluting or drawing from surface or underground water sources.

The following is a cumulative analysis of the effects and estimated quantity and quality of produced water disposed on the surface and estimated amount of surface water needed, by locatable mineral potential areas within the planning area:

**Goodnews Bay/Snow Gulch area:** Lode exploration at the Tatlignagpeke Mountain and Miltak Mountain locations on State-selected land and the Wattamuse-Granite Lode location on Native-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

Water use for placer mining on Barnum Creek, Domingo Creek, Faro Creek, Jacksmith Creek tributary, and Slate Creek on State-selected land; and on the Arolik River, Malaria Creek, Snow Gulch, Tyone Creek, and Wattamuse Creek locations on Native-selected land would be limited to the amount put

through a gravity separation process (500 gallons per minute, possibly recycled; 38 million gallons based on seven working hours each of 180 days), for surface disposal of non-recycled water. An additional 9,000 to 18,000 gallons would be required for domestic purposes annually at each location, but disposal must meet applicable Federal and State water quality standards for permitting.

**Iliamna/Fog area:** Lode exploration at the Dutton, Easy, Karen, and Meadow locations on State-selected land and the Duryea and Ground Hog locations on Native-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

Water use for placer mining on Unnamed (west of Chetok) on Native-selected land would be limited to the amount put through a gravity separation process (500 gallons per minute, possibly recycled; 38 million gallons based on seven working hours each of 180 days), for surface disposal of non-recycled water. An additional 9,000 to 18,000 gallons would be required for domestic purposes annually at each location, but disposal must meet applicable Federal and State water quality standards for permitting.

**Iliamna/Kvichak area:** Lode exploration at the Iliamna Project, D Block; Iliamna Project H, Block; and LSS 1-3 locations on State-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

**Kasna Creek area:** Lode exploration at the South Current Creek and Upper South Current Creek locations on Native-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

**Kemuk Mountain area:** No lode or placer mineral activities will occur on BLM, State-selected, or Native-selected land. Operations would be required to meet applicable Federal and State water quality standards for permitting.

**Kijik Lake area:** Lode exploration at the Dick's Lode, Gull, and Kijik Mountain locations Native-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

Water use for placer mining at the Bertha M. location on Native-selected land would be limited to the amount put through a gravity separation process (500 gallons per minute, possibly recycled; 38 million gallons based on seven working hours each of 180 days), for surface disposal of non-recycled water. An additional 9,000 to 18,000 gallons would be required for domestic purposes annually at each location, but disposal must meet applicable Federal and State water quality standards for permitting.

**Pebble Copper area:** Lode exploration at the Hill 1759 location on Native-selected land may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

The proposed Pebble mining project is located within the planning area on lands managed by the State of Alaska. This site is located in the headwaters of North Fork and South Fork Koktuli River. Each of these

rivers converges to connect with the Mulchatna River, to the Nushagak River, and eventually draining into Nushagak Bay. Though no BLM lands exist within the Kuktuli River watershed, Native-selected lands exist within the lower Mulchatna River and large blocks of BLM and State- and Native-selected lands exist throughout the Nushagak River drainage (not bordering the Nushagak River). Pollutant discharges emitted from the proposed Pebble mine would be expected to meet State and Federal water quality regulations for the North Fork and South Fork Kuktuli Rivers. Additional contributions of pollutants throughout the watershed, all meeting water quality discharge standards, may cumulatively exceed water quality standards. Potential waste water discharge occurring from activities on all lands within the greater Nushagak River drainage would be managed by the State of Alaska.

**Platinum area:** Water use for placer mining at the Salmon River location on Native land would be limited to the amount put through a gravity separation process (500 gallons per minute, possibly recycled; 38 million gallons based on seven working hours each of 180 days), for surface disposal of non-recycled water. An additional 9,000 to 18,000 gallons would be required for domestic purposes annually at each location, but disposal must meet applicable Federal and State water quality standards for permitting.

**Shotgun Hills area:** No lode or placer mineral activities will occur on BLM, State-selected, or Native-selected land. Operations would be required to meet applicable Federal and State water quality standards for permitting.

All of the mineral activities in the Shotgun/Mose area are located on State land.

**Sleit Mountain area:** No lode or placer mineral activities will occur on BLM, State-selected, or Native-selected land. Operations would be required to meet applicable Federal and State water quality standards for permitting.

#### **Other cumulative impacts to water**

Leaky underground storage containers may provide contamination to ground water resources which may ultimately contribute to surface water contamination. The State of Alaska DEC Division of Spill Prevention and Response provides records for contaminated sites and leaking underground storage tanks for communities within the planning area that have the potential to affect water, soil, and vegetation. Table 4.7 probably does not represent a comprehensive list of all such sites in the planning area. It is probable that many sites have not yet been identified.

**Table 4.7. State of Alaska DEC Division of Spill Prevention and Response Contaminated Sites by Community (ADEC 2006)**

| Community     | Number of Contaminated Sites Identified | Number of Leaking Underground Storage Tanks Identified |
|---------------|---|--|
| King Salmon   | 49                                      | 9  |
| Naknek        | 2                                       | 3  |
| South Naknek  | 0                                       | 0  |
| Iliamna       | 12                                      | 3  |
| Nondalton     | 2                                       | 0  |
| Pedro Bay     | 1                                       | 0  |
| Manokotak     | 1                                       | 0  |
| Aleknagik     | 1                                       | 0  |
| Clark's Point | 0                                       | 0  |
| Dillingham    | 4                                       | 8  |
| Ekwok         | 0                                       | 0  |
| Goodnews Bay  | 0                                       | 0  |
| Platinum      | 1                                       | 0  |
| Igiugig       | 0                                       | 0  |
| Kokhanok      | 0                                       | 0  |
| Koliganek     | 1                                       | 0  |
| Levelock      | 0                                       | 0  |
| New Stuyahok  | 0                                       | 0  |
| Newhalen      | 2                                       | 0  |
| Port Alsworth | 0                                       | 0  |
| Portage Creek | 0                                       | 0  |
| Togiak        | 0                                       | 0  |
| Twin Hills    | 1                                       | 0  |
| Quinhagak     | 2                                       | 0  |

In addition to water quality impacts, consumptive uses of water for industrial and municipal purposes may impact surface and/or ground water supplies. Impacts from consumptive uses may include altered in-stream flow regimes and alterations or degradation of riparian vegetation.

**Hydrocarbon Contamination**

With reference to Table 4.7, a number of contaminated sites already exist in the planning area. The greatest concentration is in and around King Salmon. It is related to historic activities at the King Salmon Air Force Base and the King Salmon Airport. Red Fox Creek, located near King Salmon on State land, is the only EPA/Alaska DEC recognized impaired (for hydrocarbons) water body within the planning area. The aquifer in this area has also been affected, but it is not known to what extent the contaminants are hydrocarbons. The size and depth of this aquifer has not been mapped.

Because there have been no oil and gas exploration or development activities in the planning area, there have been no spills related to these activities. Other types of oil and fuel spills, if they have occurred, have been small, and have occurred in conjunction with other small-scale activities, generally taking place in and around the villages. Due to the minor degree of potential for oil and gas exploration and development in the planning area during the life of this plan, the potential for development-related oil or fuel spills to occur is considered to be low during the life of this plan. Effects to air, vegetation, soils and water would be the same as described in Section II.b. Direct and Indirect Effects for Air Quality, Soils, Vegetation and Water, and will not be repeated here.

## **Past and Present and Cumulative Effects to Air Resources**

Past and present effects of air quality impacts may result from the emissions of hydrocarbons and by-products of combustion. Airborne particulates from fire, mining activities, OHV use, and road construction may cumulatively result in both long-term localized and short-term regional impacts to air quality and potential water quality from atmospheric deposition. These impacts may be regionally additive (e.g., increased concentrations of specific pollutants) or synergistic (e.g., chemical reactions that form ozone), and could degrade air quality. Ambient air quality in the Goodnews Bay – Bristol Bay region is relatively pristine.

The proposed Pebble mine is a large project that may provide an opportunity for air quality degradation from mining operations, infrastructure development, and access/road development. Proposed road construction for support of Pebble mining operations intersects Native-selected lands. Any permitted activities occurring on BLM lands during time of road construction will provide cumulative impacts to air quality.

Arctic haze is a phenomenon resulting from elevated concentrations of fine particulate matter found over the Arctic, primarily in winter and spring. Scientists believe that most of the pollutants contributing to Arctic haze are from combustion sources in Europe and Asia. Particulates from burning coal include mercury, arsenic, chromium, and selenium; those from oil combustion contain nickel and vanadium (AMAP 1997). It is not known to what extent local sources in Alaska contribute to Arctic haze in the southwest Alaska region. No major degradation of air resources as a result of any of the proposals in this plan is expected during the life of the plan.

Adherence to Required Operating Procedures, Stipulations and project-specific requirements, limitations on OHV use, and activity planning for BLM lands would protect air resources and keep impacts from a minor to moderate level. The fact that there is no forestry program, and based on a reasonably foreseeable projection of low level mineral development and low to moderate recreation use on BLM lands within the planning area during the life of this plan, the contribution to cumulative effects on soil, water, air, and vegetation resources from these activities is projected to be low.

### **(2) Cumulative Effects to Air, Vegetation, Soils, and Water from Lands and Realty Actions**

Privatization of State or Native Corporation lands has the potential to open up areas to private development. After the land conveyance process is completed, BLM would seek to consolidate remaining unencumbered lands through land exchanges. The anticipated level of development would remain low during the life of this plan.

### **(3) Cumulative Effects to Air, Vegetation, Soils, and Water from Recreation**

Direct and indirect effects as described in this chapter from Recreation on BLM lands, combined with the effects on other lands, would not have a significant impact on Soil, Water, Vegetation, or Air resources in the planning area. This assumption is based on the fact that recreation use throughout the planning area, on all lands, is dispersed. Recreation opportunities are not easily accessible in the planning area; consequently recreation use levels are relatively stable and are expected to remain that way.

### **(4) Cumulative Effects to Air, Vegetation, Soils, and Water from Travel Management**

Alternatives A and B would not attempt to limit OHV use on BLM lands. Under these management scenarios, OHV use on all lands would continue unmanaged, which would result in a gradual extension of impacts as described in direct and indirect effects. Effects would include vegetation removal and compaction, soil compaction and shearing, soil subsidence where permafrost is present, trail braiding, and very localized increases of sedimentation at stream crossings. Because of the remote nature of the BLM lands in the planning area and limited amount of OHV use, these impacts cumulatively would not cause significant water quality degradation, alteration of drainage systems, or habitat damage.

Alternatives C and D would limit OHV use on BLM lands. This in combination with any OHV management on other lands would decrease the level of negative impacts described above.

## **b) Cumulative Effects related to Climate Change**

Climate trends over the last three decades have shown considerable warming (USDA 2004; UAF 1999; AMAP 1997). This has already led to major changes in the environment and in Alaska's ecosystems. Alaska has experienced the largest regional warming of any state in the U.S., with a rise in average temperature of about five degrees Fahrenheit since the 1960s and eight degrees Fahrenheit in winter (UAF 1999). This has led to extensive melting of glaciers, thawing of permafrost and reduction of sea ice (UAF 1999).

Alaska's warming is part of a larger warming trend throughout the Arctic. The warming has been accompanied by increases in precipitation of roughly 30% between 1968 and 1990 in some areas. Other areas have experienced drying (UAF 1999). Projections suggest that the strong warming trend will continue, particularly warming during the winter months (UAF 1999). Some anticipated changes in weather patterns include intensification in the Aleutian low-pressure system, which may shift slightly southward. Alaska would then continue to grow wetter, with annual precipitation increases of 20-25% in the north and northwest, but little change from present conditions in the southeast. Winters are anticipated to be wetter in the east and drier in the west, with summers being drier in southeast Alaska and wetter elsewhere. Winter soil moisture changes with precipitation, but summer increased evaporation from a warmed climate exceeds any projected increases in precipitation, and soils are dry everywhere (UAF 1999).

Tree growth in the boreal forest depends on temperature and precipitation. Boreal forests may be at risk from climate change associated with regional warming. Potential impacts may include decreases in effective moisture sufficient for forest growth, tree mortality from insect and disease outbreaks, probability of an increase in wildland fires, changes caused by permafrost thawing and invasion of trees, shrubs and other plant species that are adapted to the new conditions (USDA 2004; UAF 1999).

Regional environmental changes are observed to be impacting the entire Bay planning area, including coastal areas. Another predicted result of climate change is a shift in vegetation. Projections are that the amount of tundra would shrink to its lowest extent in at least the last 21,000 years (ACIA 2004). Mosses and lichens are among the groups expected to decline as warming increases (ACIA 2004). The timeframe of these shifts will vary. Where suitable soils and other conditions do not exist, changes are likely a century away. However, significant changes in Arctic communities over the past few decades have already been documented (Sturm et al. 2001). The reduced sea ice along Alaska's coasts and a rising sea level are rapidly eroding the coastal soil. These are natural processes, but should be monitored on BLM-managed lands for effects on a wide variety of resources.

Changes in permafrost and resulting changes in lakes due to global climate change may negatively affect waterfowl. Shrinking pond surface areas could become a common feature in the discontinuous permafrost regions as a consequence of warming climate and thawing permafrost (Yoshikawa and Hinzman 2003).

Because climate change must be viewed from a global perspective, the magnitude of emissions potentially contributed by any proposed activities in the planning area need to be viewed in that context. Activities associated with oil and gas or mineral exploration and development, recreation, or prescribed burning would produce some greenhouse gases. The incremental contribution of greenhouse gases from the proposed alternatives in the planning area would be minor when compared to global greenhouse gas contributions. The Required Operating Procedures (Appendix A) allow for changes in project design in response to changing environmental conditions.

## c) Cumulative Effects to Fisheries

### (1) Cumulative Effects to Fisheries and Aquatic Habitat from Minerals Activities

**Leasable.** Based on findings presented in Reasonably Foreseeable Future Development, limited on-shore oil and gas development would occur on non-BLM lands within this planning period. Therefore, the direct and indirect effects to fisheries presented for each alternative, which include the development of a gas field in the Koggiling block under Alternatives B, C, and D, are an adequate analysis of the cumulative effects of mineral leasing on fish and fish habitat.

**Locatable.** Direct and indirect effects to fisheries and aquatic habitat from locatable mineral development are discussed earlier in this Chapter. This analysis presents a range of alternatives for locatable mineral development on BLM-managed lands. Alternatives B and D anticipate the most development, estimated at 115 acres of surface disturbance. BLM's Reasonably Foreseeable Development Scenario (RFD) describes anticipated surface disturbance on an additional 7,881 acres on State or Native lands within the planning area. Cumulative effects to fisheries would be dependent on the exact location of the anticipated development and the type of mining that would occur. The RFD for locatable minerals projects the greatest level of surface disturbance to be in the Pebble Copper and Shotgun Hills areas, mostly on State lands. These areas are projected to be mined using open pit methods, which generally include the mine pit, overburden and waste rock piles, tailings impoundment, a mill and facilities location, and associated roads. Remote Alaskan sites may include an employee camp, electrical generation plant, airfield, marine terminal, and road between the mill and the terminal that may be some distance.

In general, loss of riparian vegetation associated with such a mining operation would likely cause accelerated stream bank soil erosion resulting in impacts to water quality. Excessive sedimentation could cover fish eggs, resulting in die-off. This die-off of eggs could have population impacts to fisheries. Chemical pollution of aquatic habitat can have significant impacts to fisheries, particularly in anadromous fish populations. The impacts of multiple, small inputs of chemical pollution may be compounded further downstream. Spawning fish, though only for a short time, may be exposed to chemical pollution even though no pollutant concentrations are found in their destination water bodies. A longer exposure of time may result for species whose spawning grounds are impacted by pollutants, resulting in deformities, kills, or bioaccumulation of contaminants. Effects of water withdrawal from lakes and rivers for industrial uses may be intensified by climate change.

A continuation of current water and land use practices by private, State, and other Federal agencies would continue to affect fish habitat within the planning area. Higher intensity mineral development or exploration on lands upstream from BLM lands within a watershed could continue to be a concern due to sediment and water quality issues that influence the quality of fish habitat downstream from the source.

A large open pit mine such as those anticipated for the Copper Pebble and Shotgun Hills areas on State lands could have significant direct and indirect impacts to fish habitat in specific streams. Cumulatively, the anticipated surface disturbance on BLM lands, even under the most aggressive development scenarios under Alternatives B and D, would have little effect compared to the direct and indirect effects on State lands.

### (2) Cumulative Effects to Fisheries from Travel Management

Alternatives C and D manage Off Highway Vehicles more intensely by limiting them to existing or designated trails and by implementing a 2,000-lb weight limit. Direct and indirect effects of these actions on fisheries and aquatic habitats are described earlier in this chapter. Cumulatively, OHV use on private or State lands in the area, if unmanaged, could result in localized adverse effects to fisheries and aquatic habitats, particularly at stream crossings.

Under Alternatives A and B, OHVs would be left unmanaged, allowing trail proliferation and associated impacts to fisheries to continue. This in combination with OHV use on private or State lands in the area, could result in significant localized adverse effects to fisheries and aquatic habitats.

## **d) Cumulative Effects to Wildlife**

### **(1) Cumulative Effects to Wildlife from Minerals Activities, Travel Management, and Recreation**

Future leasable mineral activities projected for the Koggiling Creek Planning Block, current and potential locatable mining within the Goodnews Bay/Snow Gulch and on State and Native managed lands throughout the planning area, combined with hunting, and climate change would have cumulative impacts on caribou. Depending on the location of development, these impacts could include: short or long-term disturbance to caribou insect relief habitat and migratory routes; disruption of caribou movements; stress and disturbance impacts to caribou during all seasons of the year; and possible reductions in herd productivity. Because caribou population size fluctuates naturally over time, it is difficult to determine if effects are accumulating at the population level, or just reflect natural shifts in population numbers.

Any new development as considered under Alternatives B, C, and D in combination with projected mineral development on State and Native lands, would result in additive impacts to caribou herds. If significant activity occurred within the calving grounds or crucial insect relief habitat, these impacts could be significant).

Within the Goodnews Bay/Snow Gulch area, much of the land is ANILCA 906(e) Top Filed land (61,105 acres) by the State, meaning it becomes State-selected land upon lifting of ANSCA 17(d)(1) withdrawals. Selected lands are segregated from mineral entry and leasing until such time as the lands are relinquished or conveyed. Therefore, no new mineral activities would occur over the short-term. If conveyed, mineral exploration or development could be authorized by the new land owner. According to the RFD for locatable minerals, 23 acres of disturbance is expected under Alternatives A, 43 acres in Alternative C, while 115 acres of disturbance is anticipated under Alternatives B and D, none of which would occur on unencumbered BLM lands. Some BLM lands may see increases in wildlife species due to mineral development on State and Native lands and a low occurrence with a less likely development scenario for BLM lands. This could potentially occur due to locatable mineral activities associated with the Pebble/Copper, Kemuk Mountain, and Goodnews/Snow Gulch areas.

Development of connecting transportation corridors would open the planning area to additional hunters, thereby increasing the duration of habitat fragmentation and alteration of behavior or movement patterns of wildlife. Construction of major road projects within the life of the plan would be dependent upon social and economic conditions and it is not clear which of these projects would be completed within the life of this plan. Those projects connecting two or three local communities are farther along in planning than those proposing to connect the Bristol Bay area with Anchorage, for example.

Should leasable or locatable mineral projects go forward during the life of the plan, temporary and/or long-term influxes of people could be expected, increasing the hunter pool and affecting wildlife species, especially big game animals. The activities with the greatest potential for cumulative effects to wildlife are mineral development in the Bristol Bay region and attendant infrastructure development, which would likely occur in sensitive habitat areas for the Mulchatna Caribou Herd, moose, brown bears, and migratory waterfowl species.

## **e) Cumulative Effects to Special Status Species**

### **(1) Special Status Plants**

Only one Special Status plant species is known to occur on BLM lands in the planning area. The widely scattered nature of Special Status plant populations and incomplete knowledge of their distribution and range complicate efforts to predict cumulative impacts. However, current and potentially increased levels of mining and mineral leasing development on State and private lands, combined with the potential for such development on BLM lands, could result in cumulatively adverse effects on Special Status plants and habitats over the long term. Dispersed recreation activities, including gradual increases in amounts and frequency of Off Highway Vehicle travel, remote landing sites for bush aircraft, temporary campsites,

and hiking may have minor adverse and cumulative impacts to sensitive plants and habitats on BLM lands. However, it is unlikely that anything other than lode mining in the Goodnews Bay Block would affect the sensitive *Smelowskia pyriformis*, or pear-fruited smelowskia. Tatlignagpeke Mountain has both habitats for the smelowskia and known lode mineral occurrences.

## **(2) Special Status Fish**

There are no known Special Status fish species in the planning area.

## **(3) Special Status Wildlife**

The widely scattered nature of Special Status Wildlife populations and incomplete knowledge of their distribution and range complicate efforts to predict cumulative impacts. Potentially increased levels of all types of mineral exploration and development on State, Native Corporation, and BLM lands could result in cumulative, adverse effects on Steller's eiders and their habitats over the long term. The exploration and development of one gas field, six exploratory wells (each disturbing approximately six acres), one seismic survey every five years (total of 250 miles) in the Koggiling creek planning block under Alternatives B, C, or D would result in minimal addition to cumulative impacts to these species due to the transient nature of their presence in this part of the planning area.

## **f) Cumulative Effects to Fire Management and Ecology Resources**

Under the current fire management strategies being implemented across the planning area, there are few if any anticipated cumulative impacts on BLM lands. Wildland fire management is accomplished on an interagency basis and across administrative boundaries.

## **g) Cumulative Effects to Cultural Resources**

Cumulative impacts to cultural resources could occur through incremental degradation of the resource base from a variety of sources which reduce the information and interpretive potential of historic and prehistoric properties, or which affect traditional cultural values important to Native Alaskans. Much of the anticipated development within the planning area would occur on non-Federal lands that are not covered by Federal cultural resource laws. As a result, there could be losses to the regional resource base that could potentially limit management options within the planning area.

## **h) Cumulative Effects to Paleontological Resources**

Cumulative impacts to paleontological resources in the planning area could result from development on non-BLM lands as well as BLM lands, and from natural agents and unauthorized uses throughout the area.

## **i) Visual Resources**

Continued development of Off-Highway Vehicle trails, roads, mining activities and associated infrastructure development, and wildland or prescribed fire could lead to changes to existing visual resources by altering basic visual elements of form, line, color, and texture at the landscape level. These changes will influence the design of similar projects on adjacent BLM lands where repeating these basic elements is an objective of the Visual Resource Management class. However, the VRM Class is not likely to change during the life of this plan.

## 4. Resource Uses

### a) Cumulative Effects to Forest Products

There currently is no forest products program due to a lack of forests, lack of trees appropriate for commercial market, remoteness of the few trees that are located on BLM lands in the planning area, and lack of infrastructure to transport trees to market. It is unlikely that the situation will change during the life of this plan; therefore, there would be no impacts to a forest products program.

### b) Cumulative Effects to Minerals

**Leasable Minerals.** The cumulative impacts to oil and gas resources would be the removal of the resources by producing wells on leases with the fewest restrictions and lowest operating costs. Production of oil and natural gas from one geologic reservoir would not affect the recovery of oil and/or natural gas from other geologic reservoirs. The production of natural gas and oil is a beneficial, irretrievable commitment of the resource, as the produced natural gas or oil no longer would be available for future use. The amount of oil, gas, or heat produced would vary depending on the number of wells drilled in the field and the ability to recover the resource.

The cumulative impact to Federal leases would be a reduction in lease value resulting from the application of stipulations and regulations. The cumulative impacts to lease developments would result from a reduction in wells drilled on leases encumbered with stipulations, an increase in wells drilled on leases with minimal constraints, and an increase in operating costs because of land use decisions, lease stipulations, and regulations. Restrictions on Federal leases could impact the leasing and development of adjacent non-Federal leasable minerals. If an exploration company cannot put a Block of leases together because of restrictions on Federal leasable minerals, the private or State minerals may not be leased or developed either. Leasing of Federal minerals on the other hand, could encourage the leasing of private or State minerals.

Oil and natural gas activities could be located in parts of the planning area where other mineral resources are mined or potentially could be mined. However, the production of oil and natural gas resources is not expected to be a significant impact on other mineral resources within the planning area. A potential conflict exists between coal and CBNG. Should coal resource development precede CBNG development in a specific area, the biogenic gas would be displaced. Similarly, if CBNG were to occur first, coal development would be delayed which could affect economics. The long-term aerial extent of the Reasonably Foreseeable Development Scenario (RFD) (e.g., the acreage affected) for petroleum activities is small relative to the planning area. After abandonment of the facilities and wells, exploitation of the other minerals still can occur.

Cumulative impacts would be greatest under Alternatives B and D, as no leasing will occur in Alternative A, and leasing would be less in Alternative C. Under Alternatives B, C and D, larger acreages of fluid mineral estate would be made available due to the revocation of ANCSA (d)(1) withdrawals. However, exploration and development are not readily anticipated on BLM lands as indicated by the low and very low development potential assigned to the resource locations in the RFD. Lands with the greatest resource potential are in ownership by other entities or on State- or Native-selected lands. In the case of selected lands, mineral activity will be delayed by segregation until the ownership status can be finalized. If conventional or coalbed resource development were to occur, the market would likely be local as indicated in the RFD.

Roads resulting from mineral exploration and development or community support would add infrastructure to a region largely without cost and could increase interest in exploration on BLM lands by reducing logistics costs. However, these types of benefits to industry could be offset by restrictions. An area on the cusp of showing economic development could become non-profitable by imposing restrictive guidelines. This would result in the displacement of mineral activities to adjacent landowners.

**Locatable Minerals.** Impacts to the Locatable Minerals program that are individually minor may cumulatively reduce exploration and production of commodities from public lands. Factors that effect mineral extraction and prospecting include, but are not limited to, permitting and permitting delays, regulatory policy, public perception and concerns, travel management, transportation, mitigation measures, proximity to sensitive areas, low commodity prices, taxes, and housing and other necessities for workers. BLM has no control over many of these issues. Most result in additional costs and/or permitting delays that could individually or cumulatively add additional costs to projects.

Public land with no access could reduce the amount of mineral exploration and development that may occur. Mineral resources in other ownership may not be developed if the adjacent public lands are withdrawn from mineral entry. The deposit may not be economically feasible to develop if it crosses multiple ownerships and only a portion is available for development.

Overall, Alternative A would be the most restrictive to mineral developments. Existing ANSCA 17(d)(1) withdrawals, specific to closure to mineral entry, would be retained. The next most restrictive would be Alternative C, which would revoke ANSCA 17(d)(1) withdrawals but would recommend two Areas of Critical Environmental Concern and propose three Wild and Scenic River segments.

**Salable Minerals (Mineral Materials).** Under Alternative C, the closure of two ACECs to sale/permit of mineral materials would essentially close a majority of BLM lands in the planning area to mineral materials development and production.

### c) Cumulative Effects to Travel Management and Recreation

The planning area currently provides and would continue to provide a diversity of recreation experiences, regardless of the Alternative selected. The greatest influence on recreation experience within the planning area is the use of Off-Highway Vehicles (OHVs). Without management and some limitations on OHV use, the general trend in OHV-accessible topography, is for recreation experiences to trend toward semi-primitive motorized and Roded Natural experiences. However, most of the planning area is dominated by steep topography, wetlands, dense vegetation, and remote settings with no road infrastructure, making it inaccessible to most OHVs, unless they are flown in to a destination. These areas provide for primitive and generally inaccessible recreation experiences except by aircraft or by boat, regardless of which Alternative is selected. Under Alternative C, river segments would be proposed for WSR inclusion. As a result, recreation opportunities could increase within the area of these rivers.

### d) Cumulative Effects to Renewable Energy

No cumulative impacts to renewable energy are anticipated under any Alternative.

### e) Cumulative Effects to Special Designations

#### (1) Areas of Critical Environmental Concern

A wide range of cumulative effects could occur to the variety of resources intended to benefit from designation of one or two Areas of Critical Environmental Concern in Alternatives C and D. These impacts would derive mostly from actions that are not guided by BLM management decisions, such as mineral development on State or Native lands adjacent to designated ACECs. Management within certain ACECs could be significantly diminished by cumulative impacts should numerous development projects occur either inside or immediately outside the boundaries of the ACEC. Under all actions, Alternatives B, C, and D, ANSCA 17 (d)(1) withdrawals would be lifted and all ANILCA 906(e) Top Filed land adjacent to the proposed Carter Spit ACEC would become State-selected, closing these lands to new mineral activities until conveyance occurs or selection becomes relinquished. Once an action is

taken regarding the land status of Top Filed lands, new mineral activities could be authorized which may impact water, vegetation, wildlife, Special Status Wildlife, and subsistence within the proposed Carter Spit ACEC.

## **(2) Wild and Scenic Rivers**

No cumulative impacts to the rivers considered for Wild and Scenic River designation are anticipated under any Alternative. The determination of suitability for these rivers is a BLM determination and analyzed within the range of alternatives. Direct and indirect effects to these river areas have already been discussed in other portions of this chapter.

## **f) Cumulative Effects to Social and Economic Conditions**

The global salmon industry will eventually affect the salmon industry in Bristol Bay. Salmon harvests have remained relatively stable in the last thirty years, but the value has decreased. Data reported in the Alaska Economic Trends article, The Global Salmon Industry (Gilbertson 2003) show decreasing value of salmon harvest. Although the fishery is healthy in Bristol Bay, it is forecast that participation in commercial fishing may drop in future years. The global salmon farming industry is displacing wild caught fish. Local and statewide revenue and employment in this industry may weaken as a result. Fish tax collected by the borough(s) could diminish.

The recreation industry will continue to be a positive input into the local and state economy. Recent studies report spending on recreation of over \$90 million in 2005, and fulltime equivalent employment of over 1,300 persons. (Duffield, 2007) The McDowell Group reported statewide effects of tourism including total direct and indirect spending of \$2.6 billion, employment 30,700 direct and indirect jobs, and \$640 million in total direct and indirect visitor related earnings. McDowell, 2006)

Pebble Prospect is the significant mineral potential in exploration in the Bristol Bay region. The McDowell Group reported that Pebble provided 441 jobs to Alaska, including 21% local hire and 26% native hire. (McDowell, 2006) Although the Pebble mine is not yet licensed, income and employment for regional and state individuals and businesses are likely to continue. Mining activity in other parts of Alaska, continues to provide jobs, and revenue, as well as other benefits by agreement. A construction labor force of up to 2000 is forecast for Pebble.

Oil and Gas may be explored and developed in Bristol Bay Basin, either offshore, on the Alaska Peninsula or Nushagak Peninsula. There is state licensed activity on the Alaska Peninsula. This will add employment and income to the state, and eventually could involve local residents. The Lake and Peninsula or Aleutians East Boroughs may be able to collect revenue either from distribution of state revenues or from property tax.

The onshore and offshore oil industry in and near Prudhoe Bay is anticipated to decline. An authoritative source, DOE's Energy Information Administration (U.S. Dept. of Energy, 2001a), projects North Slope oil production to decline from 1.084 million barrels per day (MM bpd) in 2005 to 0.208 MM bpd in 2034. This decline encompasses oil exploration, development, production and associated direct employment.

Employment for oil workers on the North Slope is projected to decline from recent numbers. Total NSB employment exclusive of oil workers in 1998 was 4,651. 1998 NSB employment in mining (assumed to be all oil employment) was 4,753 workers. Of these, 70% (3,329) reside in the rest of Alaska outside the NSB, primarily in Southcentral Alaska and Fairbanks. The total of all workers in Southcentral Alaska and Fairbanks in 2002 was 284,000. In addition to the North Slope workers who reside in Southcentral Alaska and Fairbanks, additional workers commute to residences outside the State. As much as 30% of the North Slope work force, classified as oil and gas workers, commutes to locations outside the State. However, the workers commuting to residences outside the State would not generate economic effects of indirect and induced employment or expenditure of income in the State and would have a negligible effect on the economy of the rest of the U.S.

Without new oil and gas development, associated indirect employment in Southcentral Alaska, Fairbanks, and the North Slope Borough (NSB), and revenues to the Federal, State, and NSB governments are also anticipated to decline. From 1975-1995, Alaska's fluctuations in economy directly tracked fluctuations in oil prices and to other industry factors (McDowell Group, Inc., 1999b). Even though the Alaskan economy currently is not nearly as dependent on the oil sector as it was in the mid-1980's (when a major crash in the Alaska economy occurred), additional oilfield development in any region would generate employment, economic opportunity, and benefits to the cash economy of Alaska.

In addition to the North Slope workers who reside in Southcentral Alaska and Fairbanks, additional workers commute to residences outside the State. As much as 30% of the North Slope work force, classified as oil and gas workers, commutes to locations outside the State. However, the workers commuting to residences outside the State would not generate economic effects of indirect and induced employment or expenditure of income in the State and would have a negligible effect on the economy of the rest of the U.S. Total NSB employment exclusive of oil workers in 1998 was 4,651. The projected employment for workers on the North Slope residing in Southcentral Alaska and Fairbanks is in comparison to 1998 NSB employment in mining (assumed to be all oil employment) of 4,753. Of these, 70 percent (3,329) reside in the rest of Alaska outside the NSB, primarily in Southcentral Alaska and Fairbanks. Employment projections can also be compared to the total number of workers in Southcentral Alaska and Fairbanks in 2002 (284,000).

Cumulative effects of oil and gas development and production are addressed in other recent documents, including the Northwest National Petroleum Reserve-Alaska IAP/FEIS (USDOJ 2003), and in the Alpine Final Development Plan FEIS (USDOJ 2004). These are herein incorporated by reference.

BLM management of mineral resources, including oil and gas leasing, and metaliferous mineral exploration, recreation resources, and fisheries is not expected to contribute to cumulative effects to the regional economy. Only potential exploration for natural gas, prospectively near Dillingham, and a small amount of additional placer or lode mining, likely near Goodnews Bay, is expected to contribute to employment and income in the planning area.

## **g) Cumulative Effects to Environmental Justice**

Alaska Natives are the predominant residents of southwestern Alaska, the area potentially most affected by activities under Alternative B, C, and D and other activities associated with cumulative projects in Alaska. Effects on Alaska Natives could occur because of their reliance on subsistence foods, and potential effects could impact subsistence resources and harvest practices. Potential cumulative effects from noise, disturbance, and oil spills on subsistence resources and harvest practices and socio-cultural patterns would focus on communities throughout the planning area.

It is acknowledged that cumulative socio-cultural impacts have occurred on the North Slope and that regional culture has undergone a noticeable change. The influx of money from wage employment has added benefits and raised the standard of living, but has also given rise to an array of social pathologies, including increased alcoholism. In southwest Alaska, arguably, the commercial fishing industry has long since had similar effects.

Expanded oil and gas development in Alaska, on both Federal and State leases, would expand the extent of disturbance effects on subsistence species and harvest patterns. While each individual project would likely be a small incremental increase, the cumulative effect would eventually become more repressive to the subsistence lifestyle. In addition to potentially diverting, deflecting, or disturbing subsistence species, oil and gas development could affect subsistence harvest by causing subsistence hunters to avoid certain areas because of concerns about firearm safety, and perhaps for aesthetic reasons. Southwestern Alaska still has vast undisturbed areas, yet the subsistence hunting environment continues to change in response to increased visitation and development.

Transportation facilities and activities would also contribute to cumulative effects to subsistence resources and, consequently, to the Native population. Any new permanent road connection in southwestern Alaska would also facilitate development, use, and visitation.

Contamination and oil spills could affect the food chain in the area of development and subsistence harvest. If this were experienced, the effects would fall largely on indigenous people.

## **h) Cumulative Effects to Subsistence**

In combination with current locatable mineral activities, climate change, and population increases within the region of the planning area, the lifting of ANSCA 17(d)(1) withdrawals under Alternatives B, C, and D may contribute additional impacts to subsistence resources and uses. Under Alternatives B and D, 115 acres are expected to be disturbed from locatable mineral activities, as well as 36 acres for six natural gas wells and 20 acres of salable mineral mining for support of leasable mineral activities within the Koggiling Creek planning block. This possible development scenario on BLM lands, combined with reasonably foreseeable mineral development on State and private lands (7,881 acres of potential surface disturbance) will impact subsistence within the areas associated with these activities. This includes the areas known to be used by the Mulchatna Caribou Herd (MCH). As a result, subsistence would also be impacted, as all communities within the planning area rely on the caribou, including the MCH, as their primary source of terrestrial meat.

Privatization of State or Native Corporation lands would have the potential to negatively affect wildlife, wildlife habitat and subsistence use by opening up areas to private development.

Development of regional roads within the planning area would have the potential to negatively affect wildlife, and thus impact subsistence. These impacts would include habitat fragmentation, increased access into wildlife habitats, increased disturbance impacts, increased potential for mortality (road kills) and possible alteration of behavior or movement patterns of wildlife. If the proposed road(s) linked small or regional communities to the already existent road system within Alaska, then increased competition for subsistence resources would likely result, as non-local hunters would be able to access the area with little effort. This may also result in an increase in tourist traffic and recreational use of the area, causing additional impacts to wildlife.

Small roads that connect communities within the planning area may aid subsistence users in accessing their traditional harvest areas. However they may also concentrate hunting efforts along the road corridor, thus depleting resources from the area, and potentially altering harvest from currently used traditional harvest areas.

In summary, mineral development, privatization of land, and development of regional infrastructure would have cumulative impacts on subsistence. These activities have the potential to negatively affect wildlife and thus subsistence. Development of regional infrastructure such as roads, may improve access for non-local hunters, increasing competition for subsistence resources.

Under all alternatives, BLM would consider issuance of additional Special Recreation Permits for outfitter/guides or transporters on a case-by-case basis. BLM has the discretion to deny application for such permits, based on an analysis of the impacts of such activities to subsistence resources and uses. Number of Special Recreation Permits issued for BLM lands in the planning area has been stable. BLM does not permit outfitter/guiding activity on State or private lands or within National Parks or Wildlife refuges. Cumulatively, increasing and unlimited numbers of outfitter/guides or transporters, either on State, private, other Federal, or BLM lands, could have a significant impact on subsistence resources or access to subsistence resources through increased competition.

## F. Irreversible and Irretrievable Commitment of Resources

Only those programs or resources that would have irreversible or irretrievable commitment of resources are included here.

### 1. Resources

#### a) Air Quality, Soils, Water, and Vegetation Resources

The reasonably foreseeable activities that would cause irreversible or irretrievable commitment of soil, water, and vegetation resources (habitat) would be leasable, locatable, or salable mineral activities. These activities would be likely to occur under Alternatives B and D. This commitment level of resources is anticipated to be small in scale and only impact the immediate area. Large volumes of water withdrawn from rivers/streams may have watershed level impacts. These activities all require extensive material site excavation for gravel sources from road, pad, and airstrip construction. Impacts include irreversible loss of vegetation (ground cover) and habitat, soil compaction, soil erosion, thermokarst erosion, stream diversions, impoundments, and increased sediment runoff. These impacts would likely persist for the duration of the development, which once constructed, would continue for the foreseeable future. These impacts could be mitigated but not entirely removed. Pre-impact botanical and habitat inventories and associated habitat mitigation would minimize but would not eliminate these harmful impacts to vegetation and habitat.

#### b) Fish and Wildlife Management

##### (1) Fish

Actions that alter an aquatic community sufficiently to change the potential of a particular stream could represent an irreversible or irretrievable commitment of resources. The only reasonably foreseeable activities that would occur within the range of Alternatives considered would be leasable, locatable, and salable mineral activities. These activities would be more likely to impact fisheries under alternative B, in which ANSCA 17(d)(1) withdrawals would be lifted and no NSO buffers and ACECs would be proposed. Alternative D would propose NSO within 300 feet of the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek (Appendix A, Stipulations and ROPs) to protect riparian habitat and fishery resources. Alternative A would result in less irreversible and irretrievable commitment of fishery resources.

##### (2) Wildlife

Under all Alternatives, some irretrievable and irreversible loss of wildlife habitat could occur from road construction and other development related surface disturbing activities. Loss of wetland habitat occupied by waterfowl and shorebirds could be particularly important. In most cases, alternate habitats would be available adjacent to development, and any habitat loss would have a minor effect. Impacts would be less under Alternatives A and C, while Alternative B does not propose 300 foot NSO buffers for the East and South Fork Arolik, Faro Creek, South Fork Goodnews River and Klutuk Creek and the Carter Spit ACEC compared to Alternative D.

## **c) Special Status Species**

### **(1) Special Status Plants**

Irreversible impacts to the special status plant, *Smelowskia pyriformis*, or pear-fruited smelowskia, could occur should lode mineral exploration or development occur on Tatlignapeke Mountain.

### **(2) Special Status Wildlife**

Irreversible impacts to the Special Status Wildlife Species would likely occur under Alternative B compared to Alternatives A, C, and D. Alternative C proposes the Carter Spit ACEC to provide added protection to federally-listed migratory bird species.

## **d) Fire Management and Ecology**

Areas that are in the Critical, Full, or Modified Management Options have the potential to lose key ecosystem components due to fire exclusion and move from condition class 1 to condition class 2 or 3. Based on desired conditions for land use and resource objectives, these conditions may be mitigated through fuel management projects or a change in management options. If the areas were not treated, fire size and severity could increase, life and property could be lost, and resources could be adversely impacted.

## **e) Cultural Resources**

Mitigation through data recovery investigations at archaeological sites would recover information pertinent to current research concerns, but would also permanently remove the resource from future research and interpretive use, which would constitute an irretrievable and irreversible commitment of these resources. Any management actions that cause the inadvertent destruction of a cultural resource or make them susceptible to illegal collection could lead to the loss of these resources and would also be an irretrievable and irreversible commitment of these resources. Wildland fire may damage some types of cultural resources.

## **f) Paleontological Resources**

Mitigation through data recovery investigations at significant paleontological sites would recover information pertinent to current research concerns, but would also permanently remove the resource from future research and interpretive use. This would constitute an irretrievable and irreversible commitment of these resources. Any management actions causing the inadvertent destruction of a paleontological resource or make them susceptible to illegal collection could lead to the loss of these resources and would also be an irretrievable and irreversible commitment of these resources. There would continue to be impacts on paleontological resources associated with unauthorized activities such as OHV use, dispersed recreation, and illegal collecting.

## **g) Visual Resources**

Activities identified in this planning area under all Alternatives by direct, indirect and cumulative effects analysis may affect the visual resources within the planning area by the changes in the existing landscape character. Actions by the following activities may affect visual resources: OHV use, timber harvest, mining activities, exploration, recreation, infrastructure and industrial development, research projects, and activities on privately owned land. These activities may result in irreversible and irretrievable impacts to visual resources through degradation of soils and vegetation. This degradation is more likely under Alternative B.

## **2. Resource Uses**

### **a) Minerals**

**Leasable Minerals.** The production of oil and gas results in the irretrievable and irreversible loss of those natural, non-renewable resources. Most, if not all, surface disturbance and use can be restored through proper reclamation techniques.

**Locatable Minerals.** The removal of minerals from public lands result in the irretrievable and irreversible loss of those non-renewable natural resources, and their extraction causes potentially irreversible impacts to the natural environment and to the subsistence resources and habitat upon which residents of the region depend. However, this extraction may produce a short-term positive impact to a few residents of the region by providing them with a cash income.

**Mineral Materials.** The extraction of mineral materials from the natural environment within the planning area would be an irreversible and irretrievable commitment of those extracted mineral material resources. All impacts identified in prior sections are insignificant for mineral materials as the forecast need is negligible, and can be mitigated.

### **b) Renewable Energy**

Lands developed for renewable energy projects would no longer be available for various other purposes.

### **c) Lands and Realty Actions**

Lands transferred out of public ownership generally stay in private hands unless they are subsequently acquired for a public purpose. The right-of-way avoidance areas proposed in Alternatives C and D would limit the issuance of new rights-of-way in these locations.

## **3. Social and Economic Conditions**

### **a) Social and Economic Conditions**

Small increases in employment and personal income would occur over the life of gas field exploration, development, and operation activities. Employment in oil and gas related activities represent a loss of opportunity for workers to pursue employment in other fields. Investment by the lessees and operators in oil and gas exploration and development activities in the planning area represents a loss of opportunity to invest those monies elsewhere. Revenue increases to the State and Federal governments occurring during production years would result in the irreversible and irretrievable commitment of those revenues. Development would result in new infrastructure that would be removed at the end of production.

### **b) Environmental Justice**

Long-term population and productivity effects to the Mulchatna Caribou Herd from oil and gas development in calving and critical insect-relief areas could produce irreversible and irretrievable effects to the herd. The subsistence caribou hunt by most villages in the planning area could be affected as well.

## **4. Subsistence**

Exploration and development of leasable, locatable, and salable minerals in the planning area would be the three most important sources of irretrievable loss of wildlife habitat and subsistence resources to the residents of the planning area, as well as the potentially irreversible changes to the existing mixed subsistence-cash economy which most residents participate in. One of the sources of this change would include loss of opportunity to participate in subsistence activities due to participation in the cash economy. Since participation in subsistence, sharing and eating subsistence foods have meaning well beyond the economic aspects of the practice, the individual's physical, social, and spiritual well-being could be affected.

## G. Unavoidable Adverse Impacts

Unavoidable adverse impacts are either impacts that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts occur as a result of proposed management under one or more Alternatives. Others are a result of public use of BLM lands. Only those programs or resources that would have unavoidable adverse impacts are included here.

### 1. Resources

#### a) Soil, and Water Resources

Unavoidable adverse impacts to soil and water occur from road construction and material site excavation. Gravel roads, airstrips, and pads destroy soil structure through compaction and thermokarst erosion (where extensive permafrost exists), block natural drainage patterns, create stream flow diversions, impoundments, and increase sediment runoff that impairs water quality. By limiting the length of the roads and requiring that all permanent facilities have an approved drainage plan, a reduction in adverse impacts from project and related infrastructure development is possible but not unavoidable (Walker et al. 1987). Limiting development on floodplains and wetlands would assist compliance with regulations that direct Federal agencies to minimize the destruction, loss, or degradation of floodplains and wetlands.

#### b) Vegetation

While recognized as a natural part of northern ecosystems, occasional large, intense wildland fires will temporarily destroy vegetation and priority habitats such as lichen-rich plant communities that caribou are dependent upon. Recovery would be expected, but not always within the life of the plan. Scarring of the landscape could also result from unauthorized cross-country travel.

#### c) Fish and Wildlife

##### (1) Fish

Unavoidable direct disturbance to aquatic and riparian habitat would require many years (25-50+) to rehabilitate to a healthy functioning condition. Therefore, most of the habitat disturbed in the next 20 years would be additive to that lost in the past (at sites of previous placer mining). Some of the mining, especially placer mining, may take place on previously worked claims. This would result in setting back aquatic/riparian recovery by the number of years between the previous and future operation.

Ground water and surface water drawdown and associated impacts to nearby wetlands resulting from leasable and locatable mineral development can be a serious concern in some areas. The impacts resulting from drawdown of water resources could last for many decades, though not likely, considering anticipated development scenarios and precipitation rates within the planning area. This could potentially affect seeps and springs that provide thermal refugia in both summer and winter.

Unauthorized travel and permitted land use activities may increase sedimentation into fish-bearing streams with possible adverse effects. Many impacts can be reduced through use of Required Operating Procedures and project-specific mitigation requirements.

These sources of unavoidable impacts would be expected to be related to placer mining in localized areas on BLM lands in the Goodnews Block during the life of this plan. They are expected to be

moderate to significant in their effects, except where Required Operating Procedures, project-specific requirements, and mitigation are applied.

## **(2) Wildlife**

Some disturbance and disruption of wildlife can occur under all Alternatives. Displacement or reduced habitat use by wildlife are likely to be local (within one-half to 2 ½ miles of development or activity). Disturbance and displacement from most activities occurring in the planning area, except for leasable and locatable mineral activities, would be short-term (a few hours to a few weeks). Disturbance and displacement due to mineral development could be long-term and could persist over the life of the development. Most unavoidable adverse impacts to wildlife, being short-term and localized, would not substantially affect populations.

## **d) Special Status Species**

### **(1) Special Status Plants**

One BLM Special Status Species of plant is located within the planning area, *Smelowskia pyriformis*, or pear-fruited smelowskia. It has been located in the western Alaska Range north of the planning area and in the southernmost Kuskokwim Mountains in the Goodnews Bay region (Drury and Rollins 1952; Hultén 1968; Murray 1981; Murray and Lipkin 1987; Parker 1994; Rollins 1993; Welsh 1974). This plant prefers higher elevations and rocky, scree covered mountain slopes, and so is not likely to be affected by wildland fires. However, it is found on BLM land in an area where lode minerals are present, and so it could be affected by the development of those minerals during the life of the plan. The degree of impact would depend on the extent and type of mineral operation. The fact that the plant was observed to grow in scattered locations would provide some advantage to its survival at the population level in this case.

### **(2) Special Status Fish**

There are no Special Status Fish species in the Bay planning area.

### **(3) Special Status Wildlife**

Unavoidable adverse impacts to Special Status Species of wildlife would be similar to those discussed under wildlife. Under Alternatives B, C, and D, some disturbance to Steller's eiders and other bird species by routine activities associated with locatable mineral activities, would be unavoidable. These impacts would be more common under Alternative B due to the combination lifting ANSCA 17(d)(1) withdrawals and no proposed Carter Spit ACEC. Effects would include temporary disturbance such as displacement of incubating females from nests or broods, or disturbance of feeding, molting and migrating birds. Eiders could habituate to some disturbances or move to alternate habitats. Lease Stipulations, Required Operating Procedures, and project-specific requirements would effectively mitigate many of the effects of disturbance to Steller's eiders, but some impacts could be unavoidable. Some eider habitat could be permanently lost due to construction of leasable mineral related facilities, as discussed previously. Most disturbances of endangered and threatened species associated with routine activities would be minimized or avoided through compliance with mitigation measures developed through the Section 7 consultation process.

## **e) Fire Management and Ecology**

Large landscape-scale high severity fires would be unlikely to occur within the planning area. However, should the current warming and drying trend continue, such fires could occur in portions of the planning area within the life of the plan. Fire suppression activities pose an unavoidable risk to other resources, and have the potential to be high impact and long-term in nature. The use of heavy mechanical equipment on the ground surface could cause severe soil erosion and increase silt load into streams and rivers, as well as damage to or loss of cultural resources.

## **f) Cultural Resources**

While measures are in place to identify threats to cultural resources and prioritize management actions, some impacts would be unavoidable. Wildland fire could damage some types of cultural resources. There would continue to be impacts to cultural resources from dispersed recreation activities, OHV use, vandalism, and other types of activities not authorized by the BLM. Natural processes such as erosion and natural decay or deterioration could also result in unmitigated damage to cultural resources.

## **g) Paleontological Resources**

While measures are in place to identify threats to significant paleontological resources and prioritize management actions, some impacts would be unavoidable. Natural processes such as erosion and natural decay or deterioration result in unmitigated damage to paleontological resources and probably are the most common kinds of threats to these resources in this planning area. The other type of threat to these resources is human impact from dispersed recreation activities, OHV use, vandalism, and other types of activities not authorized by the BLM.

## **h) Visual Resources**

Natural disasters or wildland fires would be an agent of change for visual resources, and could have unavoidable, adverse impacts to visual resources values at the landscape scale. These impacts may be relatively short-term, except in the instance of environmental change, where the vegetation would have no chance of recovery.

# **2. Resource Uses**

## **a) Forest Products**

The future of forest products in the planning area may provide even fewer opportunities than at present should the current warming and drying trend continue, and current insect infestations worsen. Other unavoidable effects in this case would include additional standing dead and fallen timber and the potential for larger, more intense wildland fires. There may be an increase in other types of drought-resistant vegetation in the place of existing forests. Alteration of forest habitat from placer mine development would result in long term loss of trees in limited areas.

## **b) Recreation Management**

Changes in the amount of recreational visitation and associated duration and patterns of use could result in increased conflicts between users and unanticipated changes in resource conditions. These resource conditions may include declines in fish and game resources resulting from environmental degradation.

## **c) Travel Management**

Regardless of the Alternative, access to public lands will become more complex as Native Corporation entitlements are met. As public lands become private lands, net access is lost even if BLM reserves 17(b) easements.

## **d) Renewable Energy**

Mitigation measures would reduce the potential of bird strikes on wind turbines, but would not eliminate the possibility of incidents entirely.

### **3. Social and Economic Conditions**

Economic effects of oil and gas leasing, exploration, development, and production in the planning area may be considered positive effects by many people. Increases in employment opportunity and potential personal income would occur over the life of the exploration, development, and production activities. Revenue increases to the State and Federal governments would occur during production years. However, these increases would be short-term (less than 30 years). They would occur only for the duration of the activities. Development activity would establish infrastructure that could enhance the future productivity of oil and gas exploration, development, and production.

### **4. Environmental Justice**

The Environmental Justice Executive Order includes consideration of potential effects to Native subsistence activities. The only substantial source of potentially unavoidable Environmental Justice related to effects on Native communities from oil and gas exploration and development in the Planning area, would occur from displacement of caribou as a result of exploration and development in calving or insect relief areas. The Native communities throughout southwest Alaska harvest caribou from the Mulchatna Caribou Herd. Noise and disturbance from routine activities would be unavoidable, but not expected to produce disproportionate, highly adverse Environmental Justice impacts on the Alaskan Native minority populations in any community.

### **5. Subsistence**

Unavoidable adverse impacts that would affect fish and wildlife would also affect subsistence. They include sedimentation of fish-bearing streams by natural erosion, unauthorized travel, alteration of habitat, and temporary or permanent localized disturbance and/or displacement of subsistence species. These unavoidable impacts are not expected to be significant during the life of this plan, and would not substantially affect populations or access to resources by the subsistence user.