for fur and other craft materials may require maintenance of healthy populations of large predators such as brown bear, black bear, wolf and wolverine, which would also utilize livestock as prey.

The high value of salmon related commercial fishing in the region may require placing restrictions on grazing to protect spawning, rearing, and migratory habitats for salmon and to maintain water quality, temperature and riparian protection of stream banks/channels/spawning beds. This may restrict open range grazing by some classes of livestock.

Disease transmission between wildlife and livestock could limit successful livestock grazing without added vaccination and other measures. Alaska protocols for quarantine and other disease control related measures may need to be installed for BLM lands. For example, brucellosis is widespread in wild ungulates in the Bay planning area. Insects from both the standpoint of harassment and disease transmission may also require greater measures to insure successful livestock grazing and to avoid impacts to production of waterfowl and other wildlife.

(6) Effects to Grazing from Special Status Species Management (Common to All)

Special Status wildlife species that are found or that have the potential to be found in the Bay planning area are birds, which are primarily only present during spring and fall migration for feeding, molting and resting, and occasionally for nesting and brooding, especially in the Goodnews Block of BLM-administered lands. Currently there are no livestock grazing or reindeer herding operations in the Bay planning area, and no interest has been expressed for decades. In the future, there may be a requirement for species and habitat protection that could alter grazing opportunities, practices, or use.

(7) Effects to Grazing from Fire and Fire Management (Common to All)

Potential effects of fire and fire management on livestock and reindeer grazing would involve the removal by wild land fire all or a portion of annual forage resources allocated to livestock or reindeer. Existing growing season forage production and availability would be eliminated by a fire. A minimum of two post-fire growing seasons are required for forage plants to recover vigor and production to tolerate resumption of livestock and reindeer grazing, depending on rainfall and other factors. Any range improvements, structures, or facilities would be vulnerable to damage or destruction from a wildland fire. Grazing permit holders would be responsible for fire protection of their facilities, including line cabins, corrals, and fences. Livestock could be vulnerable to injury and mortality resulting from wildland fire.

(8) Effects to Grazing from Recreation Management (Common to All)

Recreation management could impact grazing uses by interference from commercial and public recreation uses that may conflict in time or place with livestock operations. Incidental and accidental mortality of livestock or reindeer could occur when livestock or reindeer are mistaken for harvestable wildlife and animals available for subsistence use. Damage to livestock facilities from recreational or commercial users of BLM lands may occur. There is a potential for aircraft hazing or running livestock in the Bay planning area due to the high levels of aircraft use for access and for other uses. Increased infrastructure development such as roads would increase public, subsistence user, and commercial user access to livestock use areas and would increase management intensity for permit holders.

(9) Effects to Grazing from Subsistence (Common to All)

In the event that livestock or reindeer grazing would be authorized there is a potential for livestock to be taken by subsistence users participating in subsistence activities. It is likely that reindeer would be harvested, being mistaken for caribou.

(10) Effects to Grazing from Social and Economic Conditions (Common to All)

Current and projected socio-economic conditions have potential impacts to livestock and reindeer grazing management. Prevailing subsistence lifestyles and lack of robust cash economies in the region make it

clear that residents of the Bay planning area are dependent upon wild plant, fish and wildlife resources. Constraints for grazing activities in order to maintain soils, vegetation and other ecosystem components; maintain the Federal rural resident subsistence priority; and keep subsistence uses in traditional use areas, as well as in important subsistence fish and wildlife habitat, may increase costs to livestock operators and limit local marketing for livestock products.

3. Direct and Indirect Effects to Minerals

Leasable Minerals

a) 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-managed lands within the planning area would remain closed. It is assumed that no leasing would occur as appropriate NEPA analysis must be completed and approved before Federal oil and gas lease sales can occur. Leasing may take place without a land-use plan in the event of drainage of oil and gas resources from adjacent development. Additionally, no withdrawal review would occur and all 17 ANCSA (d)(1) withdrawals would remain in place, pending future legislation or unrelated management direction. Therefore, under this Alternative no oil and gas exploration and development would occur, rendering these resources unavailable for future generations.

b) Effects to Leasable Minerals for Alternative B

Under Alternative B, all existing ANCSA 17(d)(1) withdrawals would be revoked to allow increased opportunities for mineral exploration and development, pending Native and State conveyances.

Approximately 2,499,941 million acres (1,327,671 selected) of the BLM-administered lands within the planning area would be open to mineral entry subject to the ROPs and Stips. There would be no restriction under this Alternative for seasonal closures or no surface occupancy. Additionally, stipulations #6 and #7 would not be applicable under this Alternative. Withdrawals, excluding the ANCSA 17(d)(1), would close approximately 3,999 acres to leasing. Closing this acreage would preclude oil and gas exploration and development, rendering these resources unrecoverable.

Given the few restrictions impose/d on this Alternative, it would likely be the most supportive to oil and gas activity.

c) Effects to Leasable Minerals for Alternative C

Under Alternative C, withdrawals would be maintained or recommended for 1,067,190% acres including two ACECs (Bristol Bay, Carter Spit) and on proposed Wild River segments of the Alagnak River, Goodnews River, Goodnews River Middle Fork. These withdrawals would eliminate areas that possess geologic potential for oil and gas resources. Additional closures would come from State and Native land selections which have a segregation against oil and gas leasing and would only be open if retained in long-term Federal ownership.

Approximately 1,432,752 acres (57%) of the BLM-administered lands within the planning area would be open subject to the ROPs and Stips. All of these lands are State-selected or Native-selected, leaving no lands available for leasing unless portions of the selected lands are retained in long-term Federal ownership.

Acreage available subject to minor (seasonal) constraints is roughly 1,768,450 acres (71%) with 773,767 acres on selected lands. To protect caribou habitat on identified aggregation areas, oil and gas exploration and development activities will be closed from May 20 through August 15. An additional closure to protect calving caribou will restrict exploration and development activities from May 1 through

June 15. Lands under seasonal closure will be dependant upon the location and size of caribou aggregation.

Approximately 2,355 acres (>1%) of the planning area would be open to leasing subject to major constraints (No Surface Occupancy). Areas subject to NSO include a 300 foot buffer on either side of the East and South Fork Arolik River, Faro Creek, and South Fork Goodnews River. This region, the Goodnews Block, is not projected to be oil or gas-bearing, based on current knowledge. 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 resource may be rendered unrecoverable. Product price fluctuations may require premature abandonment that would decrease the recoverability of the resource and potentially create an irretrievable incremental loss of resources. This is not likely with an NSO area composed of a 300 foot buffer around select sensitive streams. However, 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 for future generations.

Oil and gas leasing closures exist on withdrawals other than ANCSA 17(d)(1)s that make up approximately 3,999 acres (>1%). Existing ANCSA 17(d)(1) withdrawals totaling 15,125 acres (>1%) would be proposed to be maintained 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 Block, the area projected to be most likely to have oil and gas reserves. Remaining ANCSA 17(d)(1) withdrawals would be revoked or modified to allow for oil and gas exploration and development, pending Native and State conveyances. The acreage closed would preclude oil and gas exploration and development, rendering these resources unrecoverable.

It is unlikely that these constraints on less than 1% of BLM-administered lands judged to be of low potential for oil and gas would deter oil and gas exploration and development in higher potential areas under this Alternative.

d) Effects to Leasable Minerals for Alternative D

Under Alternative D, existing ANCSA 17(d)(1) withdrawals would be revoked or modified to allow for increased opportunities for oil and gas exploration and development, pending Native and State conveyances. This Alternative would not close any lands, but rather would implement an adaptable management approach. Oil and gas activities would be subject to timing restrictions and the guidelines list in the Required Operating Procedures and Stipulations.

Approximately 1,447,877 acres (59%) of the BLM-administered lands within the planning area would be open to leasable mineral activities subject to the Required Operating Procedures and Stipulations. Of that amount, 1,176,629 acres are selected.

Acreage available subject to minor (seasonal) constraints is roughly 1,768,450 acres (71%) with 773,767 acres on selected lands. 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. These constraints would limit exploration and development during specific time periods and increase recovery costs.

There would be no lands identified under this Alternative subject to No Surface Occupancy (NSO).

There are no oil and gas leasing closures proposed. Existing withdrawals other than ANCSA 17(d)(1) make up approximately 3,999 acres (>1%). Closing this acreage would preclude oil and gas exploration and development, rendering these resources unrecoverable.

Leasable oil and gas potential does exist for the leasing of oil and gas on BLM-managed 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. 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 Alternative A

Under the No Action Alternative 1,023,523 acres of BLM managed land in the Bay planning area are currently closed to mineral entry either by ANCSA 17 (d)(1) withdrawals or by State or Native selection. Approximately 152,746 acres are currently open for mineral entry. An additional 3,999 acres are closed to material entry due to withdrawals other than ANCSA 17(d)(1). At the time conveyances are completed (2010) all segregated land returning to BLM-management would be open for mineral entry. Currently locatable lode mineral activity is occurring at the Iliamna Project, D Block and Iliamna Project, H Block locations on State-selected land and placer activity on the Arolik River on Native-selected land and the Salmon River (active Federal mining claims) on Native land. All current 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, as allowable by present BLM authority on BLM-managed land, an estimated total of 23 acres (5 lode and 18 placer) could potentially be disturbed in the Bay planning area on State-selected and Native land. No disturbance would occur on BLM unencumbered or Native-selected land. 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-managed land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to submit Plan 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 the Development Alternative all future mineral activities would be allowed in the Bay planning area as all ANCSA 17(d)(1) withdrawals would be repealed and all segregated lands returning to BLM management would be open for mineral entry. Approximately 1,176,269 acres of BLM unencumbered lands would be available for locatable mineral entry. Selected lands would be made available for locatable mineral entry if the selection is revoked or relinquished. An additional 3,999 acres are closed to material entry due to withdrawals other than ANCSA 17(d)(1). If all reasonable foreseeable future mineral activities were to occur in the Bay planning area on BLM-managed 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 BLM unencumbered land 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 BLM unencumbered land; 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-managed land, an estimated total of 115 acres could potentially be disturbed in the Bay planning area. Total includes surface disturbance of 14 acres on BLM unencumbered land, 36 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-managed land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to have an approved Plan of Operations which contains site-specific guidelines as listed in the BLM-Alaska Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

c) Effects to Locatable Minerals of Alternative C

Under the Conservation Alternative limited future locatable mineral entry would be allowed on lands retained in BLM management in the Bay planning area. Given the current land status, approximately 1,071,189 acres of BLM unencumbered lands would be closed to locatable mineral entry. Only 152,746 acres would be open to locatable mineral entry. 3,999 acres are closed to material entry due to withdrawals other than ANCSA 17(d)(1). Two areas, the Proposed Carter Spit (62,863 acres) and the Proposed Bristol Bay (989,202 acres) are recommended as ACECs and the proposed wild river segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork rivers (15,125 acres) would be closed to locatable mineral entry.

However, locatable mineral activity would still be allowed on existing "grandfathered" Federal 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 unencumbered 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 on every active Federal mining claim, as allowable by present BLM authority on BLM-managed land, an estimated total of 23 acres (5 lode and 18 placer) could potentially be disturbed in the Bay planning area on BLM unencumbered, State-selected, and Native land. Under this Alternative no further disturbance would be anticipated as land returning to BLM-management would be included into existing or future withdrawals that would be closed to mineral entry. Due to the

small size of the existing and future anticipated operations, as well as the short yearly period of operation, there would be a minor impact on the local air and water quality.

All locatable mineral related activities occurring on BLM-managed 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 as listed in the BLM-Alaska Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

d) Effects to Locatable Minerals of Alternative D

Under the Development Alternative all future locatable mineral activities would be allowed in the Bay planning area as all ANCSA 17(d)(1) withdrawals would be repealed and all segregated lands returning to BLM-management would be open for mineral entry. Approximately 1,176,269 acres of BLM unencumbered lands would be available for locatable mineral entry. Approximately 62,863 acres would be considered for one ACEC (Carter Spit) and subject to more stringent Required Operating Procedures. An additional 3,999 acres are closed to material entry due to withdrawals other than ANCSA 17(d)(1). If all reasonable foreseeable future mineral activities were to occur in the Bay planning area on BLM-managed 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-managed land are the same as discussed in Alternative B - Development.

If locatable mineral activity were to occur on every existing operation, as allowable by present BLM authority on BLM-managed land, an estimated total of 115 acres could potentially be disturbed in the Bay planning area. Total includes surface disturbance of 14 acres on BLM unencumbered land, 36 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-managed land are subject to current BLM surface regulations as outlined in 43 CFR 3809. Operators are required to have an approved Plan of Operations which contains site-specific guidelines as listed in the BLM-Alaska Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

Salable Minerals (Mineral Materials)

a) Effects to Mineral Materials for Alternative A

Salable material (sand and gravel) activities on Federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by Public Land Order (PLO). Approximately 1,176,269 acres of BLM unencumbered lands are available for the sale of mineral materials. State-selected and Native-selected lands would be made available if their selections are revoked or relinquished. An additional 3,999 acres are closed to material sales due to withdrawals other than ANCSA 17(d)(1). Large reserves of salable material exist on State and Native land and no disturbance of BLM unencumbered land is anticipated. Activities would require an approved Plan of Operations containing stipulations based on site-specific resource concerns and are subject to all BLM and State laws and regulations.

b) Effects to Mineral Materials for Alternative B

Salable material (sand and gravel) activities on Federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by Public Land Order (PLO). Approximately 1,176,269 acres of BLM unencumbered lands are available for the sale of mineral materials. State- and Native-selected lands would be made available if their selections are revoked or relinquished. An additional 3,999 acres are closed to material sales due to withdrawals other than ANCSA 17(d)(1). Large reserves of salable material exist on State and Native land and no disturbance of BLM unencumbered land is anticipated. Activities would require an approved Plan of Operations containing Required Operating Procedures based on site-specific resource concerns and are subject to all BLM and State laws and regulations.

c) Effects to Mineral Materials for Alternative C

Salable material (sand and gravel) activities on Federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by Public Land Order (PLO). Approximately 1,176,269 acres of BLM unencumbered lands are available for the sale of mineral materials. State-selected and Native-selected lands would not be made available if their selections are revoked or relinquished. However, two areas, the Proposed Carter Spit (62,863 acres) and the Proposed Bristol Bay (989,202 acres) are recommended as ACECs and the proposed wild river segments of the Alagnak, Goodnews mainstem, and Goodnews Middle Fork rivers (15,125 acres) would be closed to the sale of mineral materials. An additional 3,999 acres are closed to mineral material sales due to withdrawals other than ANCSA 17(d)(1). Large reserves of salable material exist on State and Native land and no disturbance of BLM unencumbered land is anticipated. Activities would require an approved Plan of Operations containing Required Operating Procedures based on site-specific resource concerns and are subject to all BLM and State laws and regulations.

d) Effects to Mineral Materials of Alternative D

Salable material (sand and gravel) activities on Federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by Public Land Order (PLO). Approximately 1,176,269 acres of BLM unencumbered lands are available for the sale of mineral materials. State-selected and Native-selected lands would be made available if their selections are revoked or relinquished. However, one exception in the Bay planning area would be closed to material sales, the Proposed Carter Spit ACEC containing 62,863 acres. An additional 3,999 acres are closed to material sales due to withdrawals other than ANCSA 17(d)(1). Large reserves of salable material exist on State and Native land and no disturbance of BLM unencumbered land is anticipated. Activities would require an approved Plan of Operations containing Required Operating Procedures based on site-specific resource concerns and are subject to all BLM and State laws and regulations.

4. 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 created; therefore, there would be no impacts to them.

(2) Effects to Areas of Critical Environmental Concern for Alternative B

Impacts would be the same as those discussed under Alternative A.

(3) Effects to Areas of Critical Environmental Concern for Alternative C

Alternative C would propose the application of special management provisions to 1,052,065 acres (approximately 4%) of the planning area. Management identified under Stipulations, Required Operating Procedures, and project-specific requirements would provide protection of relevant and important values of these ACECs. The following sites would be designated under this Alternative:

- Carter Spit ACEC
- Bristol Bay ACEC

These two potential ACECs would be designated based on resource values and the need for special management beyond standard provisions to protect relevant and important values, values of which for each area are discussed in Chapter III and Appendix A. Management would result in limitations or restrictions placed on other resource uses and activities in order to prevent irreparable damage to the identified values. In both cases, habitat management plans would be written. The area would be subject to Stipulations, Required Operating Procedures, and project-specific requirements and conditions such as seasonal restrictions. Except for Alternative A, retaining ANCSA 17(d)(1) withdrawals, this Alternative provides the most protection to fish and wildlife habitat.

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, beginning on page 4-22. This ACEC would remain open to mineral leasing and location, would be closed to salable minerals (mineral materials: sand and gravel), designated as a right-of-way avoidance area, closed to livestock grazing, OHV travel limited to designated roads and trails, closed to FLPMA leases, and would be unavailable for disposal. Should the selected lands immediately adjacent to this ACEC revert to BLM, they will be incorporated into the ACEC.

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 to mineral leasing and location, would be closed to salable minerals (mineral materials: sand and gravel), designated as a right-of-way avoidance area, closed to livestock grazing, OHV travel limited to designated roads and trails, closed to FLPMA leases, and would be unavailable for disposal. Should the selected lands immediately adjacent to this ACEC continue under BLM management, they will be incorporated into the ACEC. Impacts from commercial recreation could be reduced by placing limitations on the number of special recreation use permits issued. A fire management plan developed to protect lichen range for caribou would support one of the purposes for this ACEC.

(4) Effects to Areas of Critical Environmental Concern for Alternative D

Alternative D could result in special management provisions being applied to an estimated 62,863 acres (less than 1%) of the planning area providing protection of relevant and important values. BLM managed lands in one area would be designated as an ACEC. After conveyances are complete, selected lands remaining in BLM ownership would be incorporated into the existing ACEC. The following site would be designated under this Alternative:

- Carter Spit ACEC

This area would be designated based on resource values and the need for special management beyond standard provisions to protect relevant and important values (Chapter III and Appendix A). Management would result in limitations or restrictions placed on other resource uses and activities in order to protect identified values and to prevent irreparable damage to the identified values. A habitat management plan

would be developed for the ACEC. The area would be subject to Stipulations, Required Operating Procedures, and project-specific requirements and conditions such as seasonal restrictions.

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, beginning on page 4-14. This ACEC would remain open to mineral leasing and location, would be closed to salable minerals (mineral materials: sand and gravel), designated as a right-of-way avoidance area, closed to livestock grazing, OHV travel limited to designated roads and trails, closed to FLPMA leases, and would be unavailable for disposal. Should the selected lands immediately adjacent to this ACEC remain in long-term BLM administration, they will be incorporated into the ACEC.

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 and its unpolluted waters. Impacts of the various Alternatives on the quality and free-flow of water are described in the Air Quality, Soil and Water 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 A provides the Wild and Scenic River matrix used to determine the river segments' eligibility.

(1) Effects to Wild and Scenic Rivers Common to All Alternatives

The three river areas described as eligible will be managed---to the extent possible using BLM discretionary authority---to protect the outstandingly remarkable values identified until a final decision is made on the suitability or non-suitability of these rivers as additions to the National Wild and Scenic River System.

(2) Effects to Areas of Critical Environmental Concern for Alternative A

There are currently no Wild and Scenic Rivers designated on BLM-administered lands in the planning area. Under this Alternative, no rivers would be nominated.

(3) Effects to Areas of Critical Environmental Concern for Alternative B

No Wild and Scenic Rivers would be nominated under this Alternative.

(4) Effects to Areas of Critical Environmental Concern for Alternative C

Under Alternative C, three river segments would be proposed for Wild and Scenic River Designation: the Alagnak River (Wild/Recreational), the Goodnews River Mainstem (Wild), and the Goodnews River Middle Fork (Wild) (15,125 acres). This would provide maximum protection to water quality and free-flow, as 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.

(5) Effects to Areas of Critical Environmental Concern for Alternative D

Under Alternative D, no Wild and Scenic Rivers would be proposed.

5. Social and Economic Conditions

a) Effects to Social and Economic Conditions Common to All Alternatives

(1) Effects to Social and Economic Conditions from BLM Expenditures (Common to All)

Income generated by BLM expenditures in the planning area, including expenses for field operations, services, and personnel are expected to remain similar to current contributions, or increase slightly, across all Alternatives.

(2) Effects to Social and Economic Conditions from Livestock Grazing (Common to All)

No livestock grazing currently occurs under permit, nor has any interest been expressed in requesting livestock grazing authorization. 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 Bay planning area. Therefore, no effect on the regional economy is expected under any Alternative.

(3) Effects to Social and Economic Conditions from Forest Products (Common to All)

Individual and subsistence use of forest products is typical in the planning area. There is virtually no commercial demand, few permits for individual use, and no expectation of change in current pattern of use. The demand for forest products on BLM administered 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.

(4) Effects to Social and Economic Conditions from Recreation Management, Travel Management, and Special Designations

BLM issues approximately 6 annual special recreation use permits to commercial guides or outfitters using BLM administered or Public Land inside the planning area. Little visitor use or trip data is available. BLM assumes 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. Access to subsistence resources will remain unaffected under all Alternatives.

(5) Effects to Social and Economic Conditions from Hazardous Materials Management

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 site become known that are near known communities.

b) Effects to Social and Economic Conditions for Alternative A

(1) Effects to Social and Economic Conditions from Leasable Minerals (Alternative A)

The area would be closed to mineral leasing. Therefore, management under this Alternative would not result in changes in the regional economy.

(2) Effects to Social and Economic Conditions from Locatable Minerals (Alternative A)

A small portion of the planning area is currently open to mineral location, and would be open under Alternative A. The ANCSA Section (d)(1) withdrawals, State, and Native selections segregate most of the land, preventing new mineral entry. Mining activity is currently taking place only on claims predating ANCSA and selections. Planning decisions would not limit mining on existing claims.

Under this Alternative, no new mining activity would be likely to occur on BLM managed land. Therefore, management under this Alternative would not result in changes in the regional economy.

(3) 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 in the regional economy.

c) Effects to Social and Economic Conditions Alternative B

(1) Effects to Social and Economic Conditions from Minerals (Alternative B)

Most of the planning area (2,499,941 acres) would be recommended for opening to mineral leasing. Leasing would occur after ANCSA (d)(1) withdrawal orders were modified, and after segregated land either was conveyed or was returned to the public domain when land conveyances are complete.

Leasable Minerals

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 lie approximately 40 miles east northeast of Dillingham in this scenario. Economic effects of a gas field will more likely result within the Dillingham area, and less likely to result in change in 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 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, for example, 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 percent) 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 may be based 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 require19 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 effect on local lodging and catering services, and could be a significant input to an economy such as Dillingham. Later construction and operations may have a lower effect on lodging and food service in Dillingham, but may increase transportation service requirements for material barged or flown from supplier locations outside the planning area. It is possible 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 is 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 as 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
Total	**48**	**71**

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
Total	**23-40**

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
Total	**25-79**

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
Total	**25-40**

Bristol Bay area oil and gas industry employment and income will vary from low levels during exploration phase (2010 to 2014) increase during development and drop during production phases. Workers will travel to the gas field from other parts of the United States (27%) and from other parts of Alaska (58%), with very few workers originating from the planning area (15%), based on comparisons drawn from the North Slope oil industry. (Hadland 2005)

Continuing, the Interim Report *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 four 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 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.

No revenues would result to the state or Federal government under this scenario.

(2) Effects to Social and Economic Conditions from Lands and Realty Actions

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.

d) Effects to Social and Economic Conditions for Alternative C

(1) Effects to Social and Economic Conditions from Minerals

Leasable Minerals

Most of the planning area (2,488,815 acres) is open to mineral leasing.
The effect on the regional economy is expected to be the same as Alternative B.

Locatable Minerals

Impacts would be the same as Alternative A.

(2) Effects to Social and Economic Conditions from Lands and Realty Actions

Impacts would be the same as Alternative B.

e) Alternative D

(1) Effects to Social and Economic Conditions from Minerals

Leasable Minerals

Most of the planning area (2,499,941 acres) is open to mineral leasing.
The effect on the regional economy is expected to be similar to Alternative B.

Locatable Minerals

Impacts 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.

6. 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. Arguably, creation of jobs and income provide positive effects on the Native population.

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.

7. Subsistence

The potential of initiation of gas exploration and development, continuation and possible expansion of locatable mineral exploration and development, and development of infrastructure in the form of connecting roads, bridges, and supporting infrastructure for commercial development, taken together they would have cumulative impacts on caribou, moose, brown bear, some migratory waterfowl, and anadromous and freshwater fish in the planning area. Consequently, subsistence would also be affected, as all communities within the planning area rely on caribou, moose, and anadromous fish as their primary sources of protein.

Privatization of State and 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 connecting roads within the planning area would have the potential to negatively affect wildlife, wildlife habitat, and 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 existing road system within Alaska, then increased

competition for subsistence resources would likely result, as non-local hunters would be able to more readily access the area. Currently, access for non-local hunters is primarily by airplane or by boat. This may also result in an increase in visitor 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, depleting resources from the immediate area, and potentially altering harvest from currently-used traditional harvest areas.

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 (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 focused, 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 have 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** - Alaska's first commercial oil production came from discoveries in Cook Inlet. In 1959, the State of Alaska established a competitive leasing program. 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/sluice-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).

- **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 Dilllingham (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 administered lands. At that time, 213,120 acres were leased, non of which were within the planning area. Interested 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, 7 APMAs and AHEAs were submitted for Locatable Mineral projects located within the Bay planning area. Four lode exploration applications and 3 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 unencumbered land at this time.

- **Pebble Copper 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 gold-copper-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 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 Kasna Creek Area** - There are no identified exploration projects reported in the Kasna 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 as 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).

- **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 Corp. 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 projects were 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 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 awaiting funding (ADOT&PF 2005).

- **Near-Term Recommendations for Community Linkages** - In its 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 permits 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 Air Quality, Vegetation, Soils, and Water Resources

(1) Cumulative Effects to Air, Vegetation, Soils, and Water from Minerals

Cumulative 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, weed invasions, and erosion from seasonal breakup ice scouring and wave action. 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.

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 and transportation-related accidents, 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 exploration 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 resources from oil and gas exploration, development, and production in the planning area and the greater Southwest Alaska region could result from:

- Disturbance of stream banks or lake shorelines from oil and gas operations and the possible subsequent melting of permafrost.
- Temporary blockage of natural channels and floodways during construction of roads and pipelines that would result in the disruption of drainage patterns.
- Increased erosion and sedimentation in rivers and lakes.
- The removal of water from lakes for dust abatement for roads and pads.
- Increased use of the tundra for both oil and gas and non-oil and gas related activities.
- An increased number of seismic surveys.
- Removal of gravel from riverine pools and lakes.

Cumulative effects to water from placer mining, including small informal projects may include deposition of concentrations of arsenic and mercury (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 the waterbodies empty into. 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 State of Alaska DEC Division of Spill Prevention and Response provides records for contaminated sites and leaking underground storage tanks for communities within the Bay 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 Bay 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

Cumulative air quality impacts may result from the emissions of hydrocarbons and byproducts of combustion. 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.

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.

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).

Adherence to Required Operating Procedures, stipulations and project-specific requirements, limitations on OHV use, and activity planning for BLM-administered lands would protect water resources and keep impacts to a minor to moderate level. The fact that there is no forestry program, and based on a reasonably foreseeable projection of a low level of mineral development and low to moderate recreation use on BLM-managed lands within the Bay 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 Oil and Fuel Spills

With reference to Table 4.7, a number of contaminated sites already exist in the Bay planning area. The greatest concentration is in and around King Salmon, and is related to historic activities at the King Salmon Air Force Base and the King Salmon Airport. The aquifer has been affected, but it is not known to what extent the contaminants are hydrocarbons, and how far this particular aquifer reaches.

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 Bay planning area during the life of this plan, the potential for Locatable mineral 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 so will not be repeated here.

b) Cumulative Effects to Fish and Wildlife Resources

(1) Cumulative Effects to Fisheries and Aquatic Habitat

With reference to the previous discussion, future development activities associated with transportation projects and mineral exploration may have adverse effects on drainage patterns and aquatic habitat, although this would depend upon the location and area of activity. Naturally occurring events may also lead to the destruction of fish habitat; however, these events are unpredictable and often localized. Should BLM continue to allow OHV use to go unrestricted, adverse effects to fish habitat could continue through changes in drainage patterns and degradation of water quality.

(2) Cumulative Effects to Wildlife

The effects of initiating oil, gas, and locatable mineral exploration and development and development of supporting infrastructure, including ADOT&PF carrying out plans to connect portions of the planning area to the larger urban centers of Alaska would have cumulative impacts on wildlife, including caribou from the Northern Alaska Peninsula and Mulchatna caribou herds, moose, brown bears, and migratory waterfowl in all of the blocks of BLM unencumbered lands. Depending on the location of development, these impacts could include short or long-term disturbance to caribou calving habitat, insect relief habitat, migratory routes and winter range; disruption of caribou movements; stress and disturbance impacts to caribou during all seasons of the year; and possible reductions in herd productivity and recruitment. Cumulative impacts would be fewer under Alternatives A and C. Under Alternative A, no oil, gas, or locatable mineral development would occur beyond current activities. Under Alternative C, oil, gas, and locatable development could occur but only under certain conditions, and two areas would be managed as Areas of Critical Environmental Concern designations.

Development of connecting transportation corridors would open the planning area to additional hunters, thereby increasing access to caribou, moose, brown bears, black bears, and other sports and subsistence animals and habitat. Other impacts would include habitat fragmentation, increased disturbance impacts, increased potential for mortality (road kills) and possible 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 oil, gas, 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.

c) 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 Bay 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 potential increased levels of mining and mineral leasing development on State and private lands, combined with the potential for such development on BLM-managed lands could result in cumulative 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-managed 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 habitat for the smelowskia and known lode mineral occurrences.

(2) Special Status Fish

There are no known Special Status fish species in the Bay 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. Potential 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 eider and their habitats over the long term. The exploration and development of one gas field in the Koggiling Block during the life of this plan under Alternative 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.

d) 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-managed lands. Wildland fire management is accomplished on an interagency basis and across administrative boundaries.

e) Cumulative Effects to Paleontological Resources

Cumulative effects to significant paleontological resources, such as attrition from weather, trail use, or permitted activities in the planning area could occur. Activities such as development on non-BLM managed lands could affect the resource on BLM lands.

f) 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 nonfederal 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. Fire is a natural process that could damage some types of cultural resources.

g) Visual Resources

Continued development of Off-Highway Vehicle trails, roads, mining activities and associated infrastructure development, and wildland and 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 administered 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 Livestock Grazing

Currently there are no livestock anywhere in the Bay planning area, and no interest has been shown for decades. Livestock grazing could occur on a case-by-case basis by permit under any of the Alternatives. Management changes implemented on BLM-managed lands by this plan would therefore have few cumulative impacts on grazing.

c) 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 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 affect 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 all BLM unencumbered lands in the planning area to mineral materials development and production.

d) Cumulative Effects to Travel Management, Off-Highway Vehicles, and Recreation Management

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 roaded 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 which Alternative is selected.

e) Cumulative Effects to Renewable Energy

No cumulative impacts to renewable energy are anticipated under any Alternative.

f) 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. 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.

(2) Wild and Scenic Rivers

No cumulative impacts to the Wild and Scenic Rivers are anticipated under any Alternative.

g) Cumulative Effects to Social and Economic Conditions

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 (MMbpd) in 2005 to 0.208 MMbpd in 2034. This decline encompasses oil exploration, development, and production and associated direct employment.

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. Fluctuations in Alaska's economy from 1975-1995 directly tracked fluctuations in oil prices and 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.

The effects below are expressed (in most cases) in annual averages for the sake of simplicity. However, the effects generally would be higher in the early years and lower in latter years, corresponding to the decline in production.

Cumulative effects have been addressed in other recent documents, including the Northwest National Petroleum Reserve-Alaska IAP/FEIS (USDOI 2003), and in the Alpine Final Development Plan FEIS (USDOI 2004). These are herein incorporated by reference and summarized in this section.

(1) Impacts to State and Local Revenues

Oil & gas development in other parts of the state would generate additional revenue to the Boroughs, the state of Alaska, and the Federal government.

Other developments in the Planning Area resulting from forestry, recreation, grazing, and mining are considered to have little cumulative economic effect.

In 2001 State operating budget was $4.3 billion, and 2001 Federal receipts of all types of $1.7 trillion.

(2) Impacts to Employment and Personal Income

The cumulative gains in direct employment would include additive jobs in oil & gas exploration, development, and production, plus oil-spill cleanup activities. The direct employment would generate indirect and induced employment and associated personal income for all the workers. The cumulative effects are projected to generate additive employment and personal income increases as follows (USDOI 2004):

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 workforce in the classification of 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).

Aggregate personal income in 1999 was $200 million for the NSB and $13.2 billion for Southcentral Alaska and Fairbanks.

h) 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.

i) Cumulative Effects to Subsistence

Exploration and development of a gas field, development of infrastructure, and exploration and development of Locatable minerals in the planning area would the three most important sources of cumulative impacts to wildlife habitat and subsistence resources the residents of the planning area depend on, as well as the cumulative changes to the existing mixed subsistence-cash economy which most residents participate in. Cumulative effects to subsistence would come as a consequence of those cumulative effects noted for fish, wildlife, and vegetation resources, discussed above.

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, Soil, Water, and Vegetation Resources

The reasonably foreseeable activities that would cause irreversible or irretrievable commitment of soil, water, and vegetation resources (habitat) would be large scale oil and gas development, placer mining, lode mining, the material site operations required for these large ventures, and certain kinds of infrastructure development. These activities would be likely to occur under Alternatives B, C, and D. 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 activity that would occur within the range of Alternatives considered would be placer mining or lode mining, which would be more likely to occur under Alternatives B, C, and D.

(2) Wildlife

Under Alternatives B, C, and D some irretrievable and irreversible loss of wildlife habitat could occur from the placement of gravel for oil and gas infrastructure, 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.

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. Under Alternatives B, C, and D, lode mining could occur.

(2) Special Status Wildlife

Under Alternatives B, C, and D, some irretrievable and irreversible loss of habitat could occur from placement of gravel infrastructure for oil and gas facilities in the Koggiling Block, potential habitat for Steller's eider and spectacled eider habitat. While the eiders probably would not be nesting or brooding, they would use the area for eating, resting, and molting as they migrate through the area. Alternative habitat would likely be available in areas adjacent to proposed development. The density of eiders in Koggiling Block may be low. Habitat loss of this type would be considered to have a minor effect on eiders at the population level.

Should gas facilities be developed, Steller's and spectacled eider mortality could result from collisions with vehicles or structures during the life of the gas field. A loss of an individual eider would be irretrievable, but would not affect eiders at the population level.

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 resources objectives, these conditions may be mitigated through fuel management projects or a change in management option. 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 adversely affect the visual resources, and in some cases may be irreversible and irretrievable.

2. Resource Uses

a) Livestock and Reindeer Grazing

Currently there is no livestock program. In the unlikely event of a livestock or reindeer proposal, loss of native forage to invasive species, although not necessarily permanent, would be an irretrievable loss of the resource because of the number of years needed to restore native vegetation. The incremental degradation of rangeland within the planning area from the effects of climate change, over-utilization, and the spread of invasive pant species could be an irreversible loss of the resource.

b) 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 results 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. Most surface disturbances from Locatable Minerals extraction can be restored via reclamation techniques.

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.

c) Renewable Energy

Lands developed for renewable energy projects would no longer be available for various other purposes.

d) 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 and to the subsistence caribou hunt to most villages in the planning area.

4. Subsistence

Exploration and development of a gas field, development of infrastructure, and exploration and development of Locatable minerals in the planning area would 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-managed lands. Only those programs or resources that would have unavoidable adverse impacts are included here.

1. Resources

a) Air Quality and 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 ecosystem, occasional large, intense wildand 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. If climate change occurs the effects of fires will be essentially permanent.

c) Fish and Wildlife

(1) Fish

Unavoidable direct disturbance to aquatic and riparian habitat would require many years (25-50+) to rehabilitate to 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 drawdown and associated impacts to surface waters and nearby wetlands can be a serious concern in some areas. The impacts resulting from ground water drawdown could last for many decades. The aquifer may take many decades to recharge and may result in continued stream flow reduction. This could potentially affect seeps and springs that provide thermal refugia in both summer and winter.

The removal of streamside riparian-wetland vegetation during mining would result in loss or degradation of aquatic habitat until proper functioning condition could be reestablished. 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).

Natural erosion processes, unauthorized travel, and permitted land use activities may increase sedimentation into fish-bearing streams with possible adverse effects. A summary of potential sources of effects, as discussed in an earlier section follows. Many of these can be controlled through use of Required Operating Procedures, project specific requirements, and mitigation of effects:

- Surface mining activities can increase erosion and accelerate sediment production and input into nearby streams and lakes.
- Mine development may also alter the natural input rate of organic matter and nutrients to aquatic systems.
- Surface mining operations may disrupt surface and ground water flow patterns.
- Mining operations have the potential to release pollutants to surface waters and ground water, the deposition of contaminants into soils, and the eventual incorporation of pollutants into plant and animal tissue.
- Both water and soil contamination may be harmful to riparian-wetland vegetation and ultimately to fish.
- Placer mining inherently degrades or completely destroys channel features and riparian habitat, resulting in increased erosion and sedimentation. As a result, new channels are often straighter, have a higher gradient, and consequently have more energy than the natural channel; new channels often lack the diversity of habitats and cover components that enhance the quality of habitat in natural channels.
- Mining activities, placer operations in particular, may lead to a loss of riparian-wetland vegetation. 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 instream 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. (Swanston 1991; Hicks and others 1991; National Research Council 1992; Strouder and others 1997).
- The current state of knowledge of 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. 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 destabilize spawning and incubation habitat, remove large roughness elements important for forming pool habitat and governing the location and deposition of spawning gravels (Harvey and Lisle 1998).
- Suction dredging may 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 causing fish to avoid certain habitats (Roelofs 1983).
- 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).
- Invertebrates and periphyton rapidly recolonize 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 recolonize (Griffith and Andrews 1981; Thomas 1985; Harvey 1986).
- 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 can interfere with stream bedload (substrate) movement, migrations to spawning, feeding, rearing, and overwintering sites if improperly designed.
- Surface mining and road placement effects may 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.

These sources of unavoidable impacts would be expected to be related to placer mining in localized areas on BLM unencumbered 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 under all Alternatives, and some habitat alterations from mineral development under Alternatives B, C and D are unavoidable. 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 Locatable Mineral exploration or development activities would be short-term (a few hours to a few weeks). Disturbance and displacement due to mineral development would be long-term and would 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-administered 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 spectacled and Steller's eiders and other bird species by routine activities associated with oil and gas exploration and development would be unavoidable. 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 for foraging, nesting, and brood-rearing. Lease Stipulations, Required Operating Procedures, and project-specific requirements would effectively mitigate many of the effects of disturbance to spectacled and Steller's eiders, but some impacts could be unavoidable. Some eider habitat could be permanently lost due to construction of oil and gas 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 are human impacts 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 Bay 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 through over harvest and environmental degradation from increased localized use.

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 potential unavoidable environmental justice related 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, high 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.