CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

ENVIRONMENTAL CONSEQUENCES

This section includes a discussion of the environmental impacts of the alternatives including the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented (CEQ Regulation 1502.16, Environmental Consequences). Direct and indirect effects and their significance, cumulative effects, and means to mitigate adverse environmental impacts are also discussed for each resource.

Only a limited number of studies for many resources have been conducted by the military or Federal and State agencies. In many instances, comparative data were incomplete and/or unavailable. Thus, the ability to conduct quantitative evaluations was limited. Where data were available, site specific references are included within the individual resource sections.

Various programs have been implemented by the Army on the withdrawal lands. The Army would continue these programs for the duration of the proposed withdrawal renewal. The function of these programs is to provide mitigation for achieving the military's mission while offering environmental protection. Proposed mitigation in this LEIS involves the collection of necessary data to assess military impacts and determine the rehabilitation and restoration to be implemented through the Integrated Natural Resources Management Plans under the Army's Integrated Training Area Management (ITAM) program. Please refer to Appendix 2.D for a detailed description of the ITAM program. Existing and proposed mitigation measures are explained in detail in Chapter 4.23.

4.1 LAND USE

Preferred Alternative

The Army and Air Force would continue to use the withdrawal renewal lands for 50 years to fulfill their military training and testing mission. U.S. Army Alaska and the Bureau of Land Management would continue to manage the natural resources on the withdrawal renewal lands, recognizing their primary use for the military. Management of the natural resources would follow the new Integrated Natural Resources Management Plans in accordance with the Sikes Act (Public Law 105-85) as revised in 1997.

Rights-of-way would continue in effect for the Trans-Alaska Pipeline System, Alaska Natural Gas Transportation System, and the proposed Trans-Alaska Gas System. The Bureau of Land Management would continue to grant rights-of-way on the withdrawal renewal lands with Army concurrence.

Submerged Lands

Under the Preferred Alternative, military use of the withdrawal lands would continue for 50 years. The question over ownership of the submerged lands would most likely need to be resolved between the State and Federal government in court.

Existing Mitigation

Land management for the withdrawal renewal lands will continue under the ITAM program and the Integrated Natural Resources Management Plans, which will be reviewed and updated every five years.

Proposed Mitigation

No additional land use mitigation measures are recommended.

No Action Alternative

If the withdrawal renewal lands are decontaminated sufficiently to be opened to public land laws and the State of Alaska selections become valid, the lands would be adjudicated by the Bureau of Land Management for conveyance to the State. Until conveyed to the State, the Bureau of Land Management will manage the lands in accordance with the existing Resource Management Plans (U.S. Dept. of the Interior and U.S. Dept. of Defense 1994a and 1994b).

The Fort Wainwright Yukon Training Area and the Fort Greely West and East Training Areas are contained within the *Tanana Basin Area Plan for State Lands* (1991) management area. Upon conveyance, management and use of the withdrawal renewal lands would be determined by the State. Section 2.2 and Figure 2.a summarize the resource management actions most likely to be implemented on the withdrawal lands based on the State's determination of resource values existing on the lands during the selection process, and reviewing the State's management of surrounding State land parcels.

Land parcels on the Fort Wainwright Yukon Training Area and the Fort Greely West and East Training Areas which are not withdrawn under the Military Lands Withdrawal Act, would continue to be used by the military and managed by the Army under their Integrated Natural Resources Management Plans.

Rights-of-way would continue in effect for the Trans-Alaska Pipeline System. The State of Alaska would have the jurisdiction to grant rights-of-way on the withdrawal lands for the Alaska Natural Gas Transportation System and the Trans-Alaska Gas System.

Submerged Lands
Under the No Action Alternative, the withdrawal renewal lands would be adjudicated by the Bureau of Land Management for conveyance of the lands to the State of Alaska. The State would become owner of the withdrawal lands, and thus owner of the submerged lands on the withdrawal lands.

Loss of submerged lands would decrease the training capabilities of the Army and Air Force. The U.S. Army Alaska would be unable to fulfill its' military mission in Alaska.

4.2 CLIMATE

Preferred Alternative

4.2.1 Air Quality and Emissions

The Preferred Alternative involves the renewal of existing military withdrawals for 50 years under the same conditions as provided in the Military Lands Withdrawal Act. Military use would vary little from current use (as discussed in Chapter 2.1.3).

Under the Preferred Alternative, military operations in the future would remain the same as current operations. Thus, pollutant concentrations resulting from U.S. Army point and non-point sources and Air Force aircraft operations would remain essentially the same as described for the baseline conditions (Chapter 3.2.1).

Specific air quality data has not been collected at the Fort Wainwright Yukon Training Area or Fort Greely. As a result, the contribution of pollutants resulting from military activities conducted on the withdrawal lands is unknown. No point emission sources are located on the withdrawal lands. The primary non-point sources of air pollution on the withdrawal lands are forest fires and motor vehicles. Forest fires could result in temporary episodes of poor air quality. The operation of motor vehicles in combination with other point and non-point sources, including civilian populations located off the withdrawal lands, could influence local air quality.

The largest level of Air Force aircraft operations would continue to occur during the summer months of June, July, and August, when the majority of the Major Flying Exercises (MFEs) are conducted. The Yukon 1 Military Operations Area (MOA) (as shown in Figure 1.b) has the largest number of operations below the mixing height (the point where air inversions switch) of the MOAs. Pollutant concentrations from aircraft operations would be a small percentage of the National Ambient Air Quality Standards (NAAQS), thus no appreciable impacts to air quality would result (USAF 1995).

Fort Wainwright Yukon Training Area

Primary air pollution sources on the Yukon Training Area result from forest fires, and mobile sources, such as motor vehicles. A number of point sources near Main Post in Fairbanks and on Eielson Air Force Base (AFB) emit over 100 tons of pollutants per year, and are classified as major point sources. These major point sources are not located on the withdrawal lands but could affect the air quality of the Yukon Training Area (U.S. Dept. of the Army 1997a). Combined, the Main Post and Eielson contribute approximately 65% of the total nitrogen dioxide emissions measured at Fairbanks. Approximately 50% of the total sulfur dioxide and particulate matter emissions measured in Fairbanks are also produced by Fort Wainwright and Eielson AFB (AIRSWeb 1998).

The major point emission source on Fort Wainwright is the power plant, which is located on the Main Post. Other potential emission sources on Main Post include auxiliary standby power generation facilities, vehicle maintenance shops and parking lots, storage piles and unvegetated areas, small space heaters in isolated buildings, the laundry and dry cleaning facility, and the petroleum storage facilities (U.S. Dept. of the Army et al. 1979). These point sources may contribute to the air quality of the Yukon Training Area.

Mobile source emissions from vehicular exhausts and fugitive dust from off-road traffic is expected to occur on the Fort Wainwright Yukon Training Area and could affect air quality (U.S. Dept. of the Army et al. 1979).

Air Force emission studies were not conducted specifically for Fort Wainwright. Since Eielson AFB and Fort Wainwright are within the Southern Interior Region, Eielson AFB values are presented as an estimate for the entire area. Current Air Force activities at Eielson AFB, including motor vehicle use, electrical power generation, and aircraft operations, have the potential to impact air quality on the Yukon Training Area. Aircraft operations effect local air quality when they occur below the mixing height. Mixing heights are influenced by the intensity of solar radiation, wind speeds, cloud cover, and the presence of snow on the ground. The mixing height can vary a great deal from one day to the next and from the

morning to the afternoon. The mean seasonal mixing heights provided in Table 4.2.a are very general and represent the conditions that may be present for some of the days during the year. These figures show that, in general, mixing heights are lowest in the winter and highest in the summer (USAF 1995).

Table 4.2.a Mean Seasonal Mixing Heights for Fairbanks, Alaska (USAF 1995).

Season	Mixing Height (feet)	
	Morning	Afternoon
Winter (December through February)	649	725
Spring (March through May)	991	4,572
Summer (June through August)	1,637	6,252
Fall (September through November)	1,227	1,978

Estimates of baseline air emissions from aircraft operations were calculated for Eielson AFB. Aircraft operations include annual landings, take-offs, and touch-and-go cycles for the assigned, deployed training, and transient aircraft at the base. Major Flying Exercises (MFEs), as well as aircraft maintenance activities, were included in the calculation. The baseline emissions estimates are presented in Table 4.2.b (USAF 1995).

Table 4.2.b Baseline Aircraft Air Pollutant Emissions Estimates for Eielson AFB, Alaska (USAF 1995).

Pollutants Emitted (Tons per year)					
	CO	HC	NO_x	PM_{10}	SO_2
Eielson AFB	321.2	161.2	86.7	4.0	13.2

Aircraft emission studies were not conducted for Fort Wainwright. Since the Yukon 1 MOA, was studied, these values are presented as an estimate for the Yukon Training Area. The Yukon 1 Military Operations Area (MOA), located in the Northern Interior Region, has the highest aircraft usage and would, therefore, have the highest level of aircraft emissions. Table 4.2.c and Table 4.2.d show the winter and summer emission concentrations (measured over the same averaging time as the NAAQS in Table 3.2.b for comparison).

In winter, air mixing is at its lowest level, with very little vertical mixing occurring. This results in the lowest dispersion of air emissions and the highest air pollutant concentrations of any season. Because vertical mixing is limited during the winter, air emissions occurring at or above 300 feet would not be expected to affect ground level air quality.

The largest number of aircraft operations occurs during the summer months of June, July, and August, when most of the MFEs take place. Mixing heights are at their highest level during the summer months, allowing for a greater dispersion of air pollutants. The estimates provided below show that air quality within this airspace is not being degraded to any appreciable degree by Air Force aircraft operations (USAF 1995). Thus, air quality within the Fort Wainwright Yukon Training Area would not be affected by Air Force aircraft operations.

Table 4.2.c Baseline Aircraft Air Pollutant Emissions estimates for the Yukon 1 MOA in Winter (December, January, February) (USAF 1995).

Pollutant	Concentration ($\mu g/m^3$)	Averaging Time	Percentage of Primary NAAQS
Carbon Monoxide	23.3	1-Hour	0.05
Nitrogen Oxides	0.8	Annual	0.80
Particulates	1.0	24-Hour	0.70
Sulfur Dioxide	1.7	24-Hour	0.50

Table 4.2.d Baseline Aircraft Air Pollutant Emissions Estimates for the Yukon 1 MOA in Summer (June, July, August) (USAF 1995).

Pollutant	Concentration	Averaging Time	Percentage of Primary NAAQS
Carbon Monoxide	13.5	1-Hour	0.03
Nitrogen Oxides	1.7	Annual	1.70
Particulates	0.6	24-Hour	0.40
Sulfur Dioxide	0.2	24-Hour	0.06

Fort Greely
The majority of the pollutants produced on Fort Greely result from forest fires, and mobile sources, such as motor vehicles. Point sources that emit over 100 tons of pollutants per year are present on the Main Post of Fort Greely. No major point sources exist on the withdrawal renewal lands (U.S. Dept. of the Army et al. 1979, U.S. Dept. of the Army 1997b).

The primary emission sources on Fort Greely are open burning from forest fires and the incineration of solid wastes. Other potential sources include small auxiliary power plants, exhaust emissions from vehicle maintenance shops and parking lots, fugitive (uncontrolled) emissions from unvegetated areas, small space heaters in isolated buildings, and potential emissions from the petroleum storage facilities. These point sources can contribute to the air quality of the Training Areas. Mobile sources of pollutant emissions include automobile and truck traffic, and aircraft operations. Vehicle exhaust and fugitive dust from off-road traffic can also be expected to occur on the Fort Greely West and East Training Areas, and could affect air quality (U.S. Dept. of the Army et al. 1979).

Aircraft emission data from Eielson AFB and the Yukon 1 MOA (Tables 4.2.b, 4.2.c, and 4.2.d) indicates air quality within the Fort Greely West and East Training Areas would not be affected by Air Force aircraft operations.

4.2.2 Ice Fog
Data do not exist showing the percentage of ice fog occurrences caused by military activities.

Current military activities can contribute to the formation of ice fog during the winter months when temperatures drop below -22°F. Ice fog, a fog composed of suspended frozen water droplets, is a unique type of atmospheric condition. It develops primarily in populated areas in extremely cold regions under appropriate climatic conditions as a direct consequence of human activities. Ice fog crystals appear as super-cooled water droplets freeze. They form when hot vapors containing water and particulate by-products or dust are emitted into a cold, water-saturated atmosphere. The particulate by-products are a result of fossil fuel combustion processes such as power plant facilities, heating plants, and motor vehicles. The seriousness of the ice fog problem has been clearly correlated with increased use of motor vehicles (Murrmann and Reed 1972).

The most obvious problem caused by ice fog is reduced visibility for vehicle and aircraft operation. Visibility in ice fog decreases to several feet in extreme cases. A far more serious problem is that ice fog, in combination with other cold regions hardships, creates a local condition where inhabitation is difficult. Also, the

airborne ice particles provide a large active surface area for interaction with other gaseous and particulate pollutants. As the ice fog precipitates, the local ground levels of pollutants intensify and act as a visual indication of the presence of other more common atmospheric contaminants. Also, the presence of ice crystals in the atmosphere may cause differences in local weather conditions due to radiative cooling. For military operations, ice fog, even in isolated situations, could provide a detectable signature thereby affecting operational efficiency (Murrmann and Reed 1972).

Existing Mitigation

Unnecessary vehicle idling is restricted on Fort Wainwright and Fort Greely. Head bolt electrical outlets (HBOs) have been installed in most parking lots on post at Fort Wainwright to reduce "cold starts", which have been linked to increases in both carbon monoxide and unburned fuel emissions. They also decrease the amount of parked vehicles idling during extreme low temperatures, thus reducing the generation of ice fog. In addition, the installation of a bag-house on the exhaust stacks of the Fort Wainwright central power plant (located on Main Post) to reduce coal particulate emissions has been planned (Griffin, pers. com. 1998).

Fort Wainwright participates in a motor vehicle emissions inspection and maintenance program with the Fairbanks North Star Borough, which is designed to reduce air pollution.

Proposed Mitigation

No additional air quality mitigation measures are recommended.

Cumulative Effects

In addition to military activities, including Army vehicle maneuvers, Air Force aircraft operations, and stationary point sources, point sources from nearby cities and private vehicles all contribute air emissions. Grading of dirt roads has an adverse effect on air quality. Climatological conditions, including vast annual temperature variations, low precipitation, low humidity, and extreme seasonal contrasts in sunlight duration, all contribute to low levels of air mixing and result in low dispersion of air pollutants. These factors combine, creating an environment conducive to episodes of poor air quality.

No Action Alternative

If the renewals are not granted, the military would no longer be able to use the withdrawal lands for training purposes. Military non-point air pollution sources associated with the withdrawal lands would no longer exist. Forest fires associated with controlled burns (as discussed in Chapter 3.15) and lightning

strikes would still create temporary episodes of poor local air quality. Existing point emission sources located off the withdrawal properties would continue to operate. A quantitative value representing the decrease in emissions production is not known as a result of the non-renewal because of the lack of representative air quality data for the Fort Wainwright Yukon Training Area and Fort Greely.

Ice fog generation would decrease in localized areas due to the elimination of military vehicular use of the withdrawal lands. A quantitative value representing the decrease in ice fog production is not known as a result of the non-renewal because of the lack of representative air quality data for the Fort Wainwright Yukon Training Area and Fort Greely.

4.3 TERRAIN

Preferred Alternative

Terrain features, including glaciers, of the Fort Wainwright Yukon Training Area and Fort Greely will be unaffected by the renewal of the withdrawal lands for 50 years.

Existing Mitigation

No mitigative measures exist regarding terrain features.

Proposed Mitigation

No mitigative measures are recommended for terrain impacts.

No Action Alternative

If the withdrawals are not renewed, public or private use of these areas for recreation, wildlife, and forestry will not impact terrain features, including glaciers. It is difficult to predict the extent and nature of changes to terrain as a result of private or commercial use of the lands for mining, agriculture, and homesteads.

4.4 GEOLOGY

Preferred Alternative

Geological conditions in the Fort Wainwright and Fort Greely areas will be unaffected by the Preferred Alternative. Continued military activities will have no inherent interaction with bedrock, surficial deposits, or geologic structures.

Existing Mitigation
No mitigative measures exist regarding geologic features.

Proposed Mitigation
No mitigative measures are recommended for impacts to geologic features.

No Action Alternative
If the withdrawal is not renewed, public or private use of these lands should have no impact on the underlying geologic conditions.

4.5 MINERAL RESOURCES

Preferred Alternative
If the lands remain closed to mineral location and leasing, there will be no impact on the mineral resource except for localized extraction of saleable materials by the Army. However, the Bureau of Land Management (BLM) and the Army may choose, at their discretion, to re-evaluate the status of the mineral closures even if the withdrawal is renewed (U.S. Dept. of the Interior and U.S. Dept. of Defense 1994a and 1994b).. Mineral exploration or development could be allowed in specified areas. Closures would probably remain in effect in the Impact Areas and other places where there is a substantial safety risk due to unexploded ordnance and other hazardous materials.

The economic impact of continued closure is difficult to estimate. Some withdrawal areas have high potential for placer gold, and some potential for lode gold and other mineralization associated with intrusive rocks (see Chapters 3.4 and 3.5 and Figures 3.5.a and 3.5.b).

There has been little detailed delineation or assessment work within the withdrawn lands, but the mineral industry has shown considerable interest in other areas with similar geologic conditions. Gold, silver, lead, zinc, copper, molybdenum, and tin are among the minerals that could be present in this geologic setting.

Improved techniques in geochemistry and geophysics are helping to locate and delineate mineral resources in ways that the "old" methods of geologic mapping could not. The evolution of mining techniques has led to the development of resources previously considered uninteresting or uneconomic, such as the Fort Knox deposit near Fairbanks.

Neither Fort Wainwright or Fort Greely is particularly attractive for leasable minerals, with the exception of some geothermal possibilities in the Fort Wainwright area and moderate probability of coal in the Fort Greely area. Leasable mineral resources are unlikely to be affected either by the Preferred Alternative or the No Action Alternative.

Existing Mitigation
No mitigative measures exist regarding mineral resources.

Proposed Mitigation
No mitigative measures are recommended for impacts to mineral resources.

No Action Alternative

If the withdrawn lands are opened up to mineral activity, exploration and development, activities could potentially impact soils, surface water, groundwater, and wildlife. However, exploration and development would be subject to applicable Federal and State environmental regulations. Potential impacts would have to be addressed on a case-by-case basis by the land management agencies before activity is approved.

Socioeconomic impacts of development may include increased employment associated with exploration and development activities, and economic benefits if marketable reserves are identified.

Development of mineral resources would result in irreversible depletion; however, the withdrawal areas are currently unproven and therefore unaccounted for in the estimated global reserves.

4.6 SOILS

The environmental standards against which off-road vehicle disturbances and the extent of munitions damage are measured have not yet been adequately defined for the Fort Wainwright Yukon Training Area and Fort Greely. A general rating scheme addressing the levels of off-road vehicle disturbance to Arctic tundra was presented by Rickard and Brown (1974). This rating scheme is used as an evaluation tool when assessing the impacts of off-road maneuvering and munitions damage to the soil surface of the withdrawal lands. The following generalized degrees of impact are arranged in the order of increasing severity of surface disturbance:

Level 1: Aesthetically objectionable - single or low-frequency passes of low-pressure vehicles which produce no marked physical change in the environment, but leave greener strips or belts that persist for several years. Their effects have not yet been environmentally evaluated. Although all other forms of tundra trails are also aesthetically unsightly, they have disruptive physical characteristics which differentiate them from this category.

Level 2: Disturbance to vegetation, including crushing and shearing of woody and shrubby vegetation which occurs during winter road use. No easily measurable impact on soil properties can be observed in this category.

Level 3: Significant destruction of plant cover and breakage or compaction of the surface organic mat occurs to the extent of initiating erosion and measurable increase in thaw depth. This type of impact is characteristic of multiple passes on light snow cover or in summer. Compaction of peat results in increased transfer of heat into and out of the underlying soil.

Level 4: Disruption of the surface peat or other organic material with actual physical displacement or removal of it, generally followed by subsidence of the frozen ground as it thaws, undergoes ponding, or experiences erosion on slopes. This occurs under high frequency passage of moderate- to high-ground pressure vehicles in summer, or under conditions of improper construction and use of winter roads, with associated digging operations and establishment of fire lines.

Preferred Alternative

Concerns regarding impacts to soils by military use under the Preferred Alternative include surface disturbance and erosion due to off-road maneuvering, and soil contamination due to munitions and ordnance firing.

A complete discussion of military facilities and use is presented in Chapter 2.1.3. Currently, Fort Wainwright Yukon Training Area and Fort Greely are used by military and non-military entities. Primarily, these areas are used by the military for training purposes. The Yukon Training Area is utilized year-round, but access is largely limited to the road system due to the steepness of the terrain and thick vegetative cover.

Military Vehicle Maneuvering

Spring, summer, or fall including spring-thaw (or anytime the active layer is unfrozen)

Training Area 4 on the Fort Wainwright Yukon Training Area (Figure 2.b) was used most frequently during 1995 and 1996 (Table 2.f). Training Area 22 on Fort

Greely (Figure 2.c) was used most often during 1988 to 1995 (Table 2.g). Quantitative data is not available on the extent of damage occurring from military vehicle maneuvering on Fort Wainwright Yukon Training Area and Fort Greely. The most severe terrain damage from off-road maneuvering would be expected to occur during the summer months when the ground is not frozen. However, due to Army regulations which restrict off-road maneuvering during spring thaw (1 April to 15 May) and summer months (usually May to September in designated creek bottoms, wetlands, and alpine areas above 2,000 feet in elevation), impacts would not be expected to reach Level 4, the highest severity level. Vehicles are also instructed to remain on marked trails and designated routes until directed otherwise during tactical deployment.

The majority of military activities conducted on Fort Wainwright Yukon Training Area involve off-road maneuvering, which accounts for the majority of soil damage on the Training Areas. Damage from training maneuvers include ruts and tire tracks from military vehicles (Table 4.6.a), and evidence of excavation activities. Overlying vegetation and soil is usually disturbed by these operations. The severity of overland traffic damage and its effect on the local environment can range from compression of microtopographic irregularities (Level 1) to removal of the entire vegetation mat and near surface sediments (Level 4) if restoration practices required by Army regulations are not adhered to. Severity of damage also depends on the width of the tire or track and the weight of the vehicle.

Table 4.6.a Tire and Track Data for the Most Commonly Used Military Vehicles on Fort Wainwright Yukon Training Area and Fort Greely (Richmond *in* Blaisdell 1991 and Dept. of the Army and Navy 1992). * = rough estimate

Vehicle	Width of Track or Tire (Inches)	Width of Vehicle (Feet)	Contact Area (Square Feet)	Weight (Pounds)
Wheeled Vehicles				
HMMWV (High Mobility Multipurpose Wheeled Vehicle)	13.0 16.7	Unavailable Unavailable	0.80 Unavailable	7,519
HEMTT (Heavy Expanded Mobility Tactical Transporter)	18.7 19.0	Unavailable Unavailable	1.84 1.60	60,350
Truck 5.0 Ton 2.5 Ton	14.0 9.0	10.1* 8.8*	0.54* 0.64*	22,175 13,360

Table 4.6.a Tire and Track Data for the Most Commonly Used Military Vehicles on Fort Wainwright Yukon Training Area and Fort Greely (Richmond *in* Blaisdell 1991 and Dept. of the Army and Navy 1992). * = rough estimate

Vehicle	Width of Track or Tire (Inches)	Width of Vehicle (Feet)	Contact Area (Square Feet)	Weight (Pounds)
ATV (All Terrain Vehicle)	8 12	Unavailable	Unavailable	Unavailable
Tracked Vehicles				
SUSV (Small Unit Support Vehicle)	24.0	2.0	12.70	13,781
Bradley Fighting Vehicle (CRTC Testing only)	21.0	10.5	22.49	49,325
Abrams Main Battle Tank (CRTC Testing only)	Unavailable	12.0	Unavailable	115,380
Snowmachine	15.0	3.5	7.72	433

The most common impact occurring to soils is the compression of microtopographic relief by overland movement. As the topography of the soil surface is changed by compaction and vegetation removal, the thermal properties of the surface layers may be altered in such a way to affect the stability of the permafrost beneath the surface. The permanently frozen subsurface layers are exposed to increased solar radiation and the underlying ice begins to melt. Subsidence of the surface soil and the ponding of surface water, known as thermokarst, then occurs as the underlying ice disappears (Radforth and Burwash *in* Radforth and Brawner 1977). The depth of the summer thaw can increase after impact but tends to rebound in later years (Walker et al. 1987).

Most severe damage (Level 4) may occur when off-road maneuvering is conducted during the summer months when the active layer is unfrozen. Areas with high moisture content, when exposed to vehicular traffic in summer, typically have the most rapid development of vegetation disturbance (Radforth and Burwash *in* Radforth and Brawner 1977). Drier shrub-covered hillsides support more rugged vegetation, which is more resistant to disturbance by vehicular traffic (Radforth and Burwash *in* Radforth and Brawner 1977).

Low relief areas underlain by sand-sized material of lower ice content are least affected (Walker et al. 1987). In these areas, subsidence does not always

accompany increased thaw, as the volume changes due to ice-melt are minimal. On the other hand, long-term physical modifications are greatest in terrain that is underlain by high-ice-content, fine-grained sediments and has sufficient relief to permit meltwater to run off as the permafrost thaws. Local soil disturbance may expand when the exposed, thawing sediments are located on slopes susceptible to failure. The chance of severe erosion following hillside slumping and hydraulic erosion increases with topographic relief (Walker et al. 1987).

If severe terrain damage and vegetation removal occurs on sloped areas, hydraulic erosion can create gullies and may also contribute to ice melting near the surface. The reduction in the amount of ice near the surface ultimately threatens slope stability due to the loss of the bonding effect of ice to the soil (Radforth and Burwash *in* Radforth and Brawner 1977).

Eroded sediment could be transported to adjacent wetlands threatening the natural function of these highly sensitive hydrologic systems. Soil erosion could also impact the water quality of adjacent streams by increasing suspended sediment. This could cause adverse impacts to benthic invertebrates as well as salmonoid reproduction due to reduction in the penetration of light and an increase in heat absorption (Chapman and McLeod 1987 *in* MacDonald, et al. 1991). Decreased light penetration could also reduce primary production if other factors are not limiting (MacDonald 1991).

Continual use of Training Areas in the form of bivouac operations, Drop Zones, Air Strips, and Firing Points could eventually create large areas of exposed bare soil. These areas are highly susceptible to wind erosion. Soil particles could be picked up by large gusts of wind and deposited on nearby vegetation, including wetlands and tundra. Continual erosion could result in a net loss of soil and an increase in particulate matter levels within the air.

Winter (or anytime the active layer is frozen)

Cross-country travel in vehicles with low ground pressure, such as the Small Unit Support Vehicle (SUSV), is not restricted during the winter months when the ground is frozen and the vegetative mat is protected by the snow cover. The larger tracked Bradley Fighting Vehicle and Abrams Main Battle Tank are allowed to operate only at Fort Greely and are typically used only during the winter months for Cold Regions Test Center (CRTC) studies.

The same sources of impacts are applicable during the winter months as for the summer months. However, little terrain damage results from using oversnow vehicles provided sufficient snow cover (depth and extent) exists (Gray and Male 1981). For snow to withstand wheeled traffic, studies show that it must be

compacted to an average density of at least 1,102.5 pounds per cubic foot (Gray and Male 1981). If there is insufficient snow cover or if vehicles are used too early in the fall or too late in the spring, severe damage can result (Level 3 to Level 4). Winter roads and trails should be constructed so that vehicles do not significantly compact or wear the vegetative layer, preserving its insulative capacity and preventing permafrost degradation.

The effects of snowmachines and other off-road vehicles during the winter include damage to trails, vegetation, and destruction of fish and wildlife habitat (Level 1 to Level 2). Mechanical compaction of the snow can also reduce the snow depth and destroy the air spaces while increasing the snow density and thermal conductivity. These effects inhibit the movement of small mammals beneath the snow and produce lower temperatures that subject the mammals to greater temperature stresses (Gray and Male 1981).

Fuels

Potential spill sites at Fort Wainwright and Fort Greely are those associated with the storage and transfer of fuels. Chapter 2.1.3.3 lists past fuel spills that have occurred on withdrawal lands at Fort Wainwright between 1989 and 1996 and at Fort Greely between 1986 and 1993.

Spills during tanker truck refueling operations could be caused by leaking trucks, open above ground storage tank bottom valves, improper drop tube connections, tank failure or overloading. Although all truck drivers are instructed in proper fuel transferring procedures, spills during refueling operations account for 10% of all spills larger than 100 gallons on Fort Wainwright since 1985. A similar figure was not available for Fort Greely (U.S. Army Corps of Engineers 1996a and 1996b).

The Army utilizes several vehicular tankers (HEMTTs) and 5-ton trucks with collapsible rubber containers for transporting aviation and other fuels to the field for training exercises. Historically, the collapsible containers have been responsible for a large number of fuel spills because they are easily ruptured. Since 1985, approximately 18% of all spills on Fort Wainwright larger than 100 gallons have been associated with portable tanks. A corresponding estimate was not available for Fort Greely (U.S. Army Corps of Engineers 1996a and 1996b).

There are no underground storage tanks located on Fort Wainwright Yukon Training Area, though three are located on Fort Greely West Training Area. If these tanks were to leak, the containers would be drained and replaced. Also, any contaminated soil would be removed and disposed of in accordance with U.S. Army Alaska's standard operating procedures (U.S. Army Corps of Engineers 1996a and 1996b).

Munitions

The primary impact of ammunition use by the Army is the disturbance of soil within the Impact Areas. Quantitative data representing the damage caused by munitions use within Stuart Creek and Oklahoma/Delta Creek Impact Areas are not available. In general, projectiles contain high explosive compounds that detonate upon impact with the ground, creating a crater and distributing steel fragments across the local landscape. Over time, large areas of bare ground result. This could lead to localized episodes of wind and water erosion similar to the disturbance caused by off-road maneuvering. The soil profile may contain embedded shrapnel making removal of the foreign material difficult. Evidence of long-term use of the Impact Areas include thousands of craters, debris from used targetry, pieces of shrapnel, and occasional unexploded ordnance.

It is known that the Impact Areas have been contaminated with evidence of exploded ordnance such as fragments of steel, filler material, munitions residue, and unexploded ordnance.

Brush or forest fires ignited by munitions released during training operations could occur and would result in loss of vegetative cover. Soil erosion and siltation of adjacent water bodies may result after vegetation is removed by fire.

An additional impact of ammunition use by the Army is soil contamination. The extent of soil contamination by ammunition has not yet been determined at Fort Wainwright Yukon Training Area and Fort Greely. Little information is available on the levels of accumulation of explosives residues at active firing ranges. Only frequency of use and composition of munition types are available for the withdrawal areas (Chapter 2.1.3.4 and Appendix 2.C).

The primary muniton types that have been fired into the Impact Areas are small arms and high explosives. The small arms ammunition type does not contain filler material and would not be expected to contribute to chemical contamination of the surrounding soil. Shell casings would be expected to remain within the soil profile. High explosives were the second most commonly used munition in Stuart Creek and Oklahoma/Delta Creek Impact Areas. The dominant filler materials contained in high explosives are TNT and RDX (Appendix 2.C).

Extensive contamination studies assessing the impacts of TNT and RDX on the soil profile and the surrounding local environment at Fort Wainwright Yukon Training Area and Fort Greely do not exist. However, comprehensive studies on the role of munition residues within the soil profile from locations across the country have been completed (Crockett et al. 1997, Jenkins et al. 1994, Walsh et al. 1993, Walsh and Jenkins 1992). TNT and RDX are mobile in the soil.

Thus, residues of these chemicals in the soil can be a source of groundwater pollution both on Army installations and beyond installation boundaries (Crockett et al. 1997, Jenkins et al. 1994, Walsh et al. 1993). Once explosives enter the environment, they may be transformed by microbiological and photochemical processes, creating secondary compounds (Walsh and Jenkins 1992). Information available on chemicals used in munitions expended on the withdrawal lands is presented in Appendix 2.C.

A limited site-specific study was conducted at Fort Greely to determine if munitions fired into the Impact Areas were having any adverse effect on water and sediment quality (U.S. Army Environmental Hygiene Agency 1990). The greatest environmental concern is the migration of contaminants from the Impact Areas. The streams crossing the installation are likely to be the major transport mechanisms.

Water and sediment samples were analyzed upstream and downstream of Fort Greely. Sample locations included Delta River, Jarvis Creek, Delta Creek, Little Delta River, and One Hundred Mile Creek. Chemical parameters collected at Fort Greely (Appendix 3.8.D) decreased in concentration downstream indicating a loss of minerals to the water column and no buildup from munitions. General changes in sediment chemistries were the same for Delta Creek and One Hundred Mile Creek (inside the Oklahoma/Delta Creek Impact Area) as compared to the Little Delta River (outside the Oklahoma/Delta Creek Impact Area). No explosives were detected during sampling of water or sediment and the data indicated the stream chemistries were not adversely affected by munitions (U.S. Army Environmental Hygiene Agency 1990).

A munitions study has not been completed for Fort Wainwright Yukon Training Area.

Air Force training at Stuart Creek and Oklahoma/Delta Creek Impact Areas also has an effect on the natural environment. Chapter 2.1.3.2 discusses the military use of these areas by the Air Force. The primary type of training munition expended by the Air Force is the BDU-33 (excluding 20mm and 30mm aircraft machine gun ammunition). BDU-33 expenditures accounted for over 70% of the total munitions delivered in the withdrawal lands Impact Areas since 1992. Data representing the extent of damage to the Impact Areas as a result of Air Force use have not been collected. Impacts of practice bombs could result in a Level 2 or 3 severity rating. Short-term and long-term effects to the soils would be expected to be similar to those discussed for munitions firing by the Army.

Targets are constructed of plywood, steel drums, concrete, or salvaged metal vehicles. Targetry placement and maintenance has an impact on the surrounding soil. These activities require an extensive road system that is used year-round. Removal of vegetation and soil disturbance around targetry by ordnance and maintenance activities can have an effect on the local environment.

Chaff and flares are used by the Air Force on the withdrawal lands. Detailed authoritative data concerning the effects of chaff on land is lacking. However, with the wide dispersion pattern of chaff and the small amounts actually deposited per acre and lack of toxicity, no impact to land resources is anticipated from the deployment of chaff during low-altitude aircraft operations (USAF 1995). Previous Air Force environmental assessments have determined that the use of airborne chaff (under appropriate guidelines) does not produce any significant adverse environmental impact (USAF 1995).

Brush or forest fires ignited by flares released during training operations could occur and result in loss of vegetative cover. Soil erosion and siltation of adjacent water bodies may result after vegetation is removed by fire. The Air Force has established minimum altitudes for flare release that assure burnout plus three seconds of fall time before surface impact, in order to preclude the ignition of ground fires (USAF 1995).

Existing Mitigation

The following programs would continue to provide mitigation for achieving the military's mission while offering environmental protection.

Training exercises conducted on Alaska military lands are regulated by USARAK Range Regulation 350-2. This regulation provides procedures for planning, scheduling, and operating ranges and training areas, and identifies environmental requirements. All actions undertaken by the Army are required to consider their impact to the surrounding environment and to take precautions to avoid impact. These include the refilling and leveling of any foxholes, trench systems, tank traps, hull-down positions, or explosive excavations; conducting vehicular stream crossings in designated areas only; limiting cross-country vehicular travel to established roads and dry trails during spring thaw; and avoiding cross-country movement in creek bottoms, marshes, and moist tundra areas during summer months.

Damage control steps are also included within individual training plans to minimize natural resources damage. These include the protection of known sensitive areas, repair of unavoidable maneuver damage, coordination and permitting of any ground disturbing activities, and scheduling of natural resources

and hazardous material inspections of training areas to ensure regulation compliance.

To guide and regulate the actions of Army personnel using and managing training lands, the Army has developed the Integrated Training Area Management (ITAM) program. The goals of ITAM are to inventory and monitor, repair, maintain, and enhance training lands at Army training installations. The Land Condition-Trend Analysis (LCTA) program serves as the inventory and monitoring portion of ITAM. This program inventories land conditions and monitors vegetation trends on military installations. The data provide installation-wide summaries of land use, disturbance, plant cover, vegetation communities, tactical concealment, birds, and small mammals. (See Appendix 2.D).

The ITAM program relies on soil surveys with an inventory of soil resources and evaluation of soil capabilities. The Natural Resources Conservation Service (NRCS) has been funded and has begun the process of completing soil surveys for Fort Wainwright Training Area and Fort Greely West and East Training Areas. These surveys will include the description, classification, and an inventory of soil properties. The establishment of the relationships between geomorphology, soils, permafrost, and vegetation unique to the withdrawal lands as a result of these surveys will also aid in monitoring and rehabilitation operations.

An additional component of ITAM is the Land Rehabilitation and Maintenance (LRAM) program. This program repairs damaged areas and uses land construction technology, such as revegetation and erosion control, to minimize future damage to training lands. These efforts are designed to maintain quality military training lands and minimize long-term costs associated with land rehabilitation.

Proposed Mitigation

A program will be implemented to identify possible muntions contamination to soils of the withdrawal lands. This program is described in Chapter 4.23.2 Proposed Mitigation, Pollution.

Cumulative Effects

Comparative data, such as historical versus current aerial photographs, were unavailable for the withdrawal area. Limited studies have precluded extensive evaluations of cumulative impacts.

The military use of the withdrawn lands as Training Areas and Impact Areas would continue to negatively impact soils. With the continuation of the Land Condition-Trend Analysis and Land Rehabilitation and Maintenance programs,

impacts to soils would be identified and monitored, and areas restored when feasible. An irretrievable loss of soils would occur in areas where munitions have contaminated the soil and rehabilitation is limited by funding and technology.

No Action Alternative

The first evaluation of the returned lands would be an assessment of the extent the lands are contaminated with explosive, toxic, or other hazardous materials. If decontamination was authorized, severe damage (Level 4) to the Impact Areas could possibly result from excavation activities needed for ordnance removal.

If these lands are opened to public land laws, and the State selections become valid, the land would be adjudicated by the Bureau of Management (BLM) for conveyance to the State. The withdrawal lands have been selected by the State of Alaska for various resource values. The selected land uses that would most directly affect soil conditions would be agricultural homesteads, settlements, heavy recreational use, forestry, and mineral development (Chapter 2.1.2). The land uses would be subject to all applicable local, State, and Federal regulations.

Farming activities requiring large scale surface disturbance could result in subsidence, if permafrost is present and if proper planning and control procedures are not followed. These changes in surface relief could damage the land for future farming operations and other purposes (National Academy of Sciences 1973). However, the areas selected for agricultural development would involve only small portions of land, which would decrease the amount of possible disturbance.

The creation of new settlements would require substantial disturbance to the soil surface. Construction activities, including building foundations, water supply systems including wells, waste disposal systems, and transportation rights-of-way, require that vegetation and soil be removed in localized areas. If proper management practices are not followed, erosion and transport of soil may result.

The northeast portion of the Fort Wainwright Yukon Training Area is considered by the State of Alaska as a high potential as an addition to the Chena River State Recreation Area. An accessible trail and road system could result in heavy recreational use. Impacts to the soil environment as a result of off-road recreational use include compaction of the surface vegetative layer and may expose the mineral soil, possibly leading to erosion. In areas underlain by permafrost, surface disturbance may lead to thawing, creating ponds and subsidence.

Soil disturbance could result in areas selected for forestry practices. The removal of trees may decrease the vegetative cover, and the soil surface could be disrupted from transportation routes and timber harvesting activities. The reduction in the vegetative cover could result in permafrost thawing.

Problems associated with mineral extraction activities include severe surface disturbances such as removal of the vegetative mat and underlying mineral soil, thawing or removal of permafrost, subsidence, and eventual erosion in the form of gullying. These effects are caused by excavation and extraction of the mineral body and associated transportation routes.

4.7 PERMAFROST

Permafrost is defined as soil material with a temperature below freezing which has existed continuously for two or more years. Disturbances to the delicate thermal balance of permafrost as a result of off-road maneuvering, munitions firing, and wildfires can induce permafrost thawing, which could lead to subsidence and soil erosion. These actions could affect future maneuverability, soil conditions, water quality, aesthetics, and wildlife and aquatic habitat.

Preferred Alternative

As temperatures rise, permafrost soils are at a greater risk of disturbance. When permafrost temperatures are near 32°F, the slightest disturbance is enough to induce thawing. Once vegetation mats are torn and no longer able to provide thermal insulation, the thawing of frozen soil results. Surface runoff may cause soil erosion, and loss of ice may lead to localized volumetric reduction, resulting in subsidence of the surface. In extreme cases, fine textured soils with high ice content may also liquify, become unstable, and move downward on slopes (National Academy of Sciences 1973).

Surface disturbance in permafrost areas often has an adverse impact on the appearance of the surrounding landscape. Removal of surface vegetation, subsidence, erosion, and gully formation from unregulated off-road maneuvering and munitions firing combine to form long lasting visible scars to the landscape.

As permafrost thaws and subsidence results, the resulting erosion can damage existing roads and trails, making them impassable. Uncontrolled off-road use results in a decrease in the amount of land available for future training opportunities, increased safety hazards, decreased tactical maneuverability, increased maintenance costs, and a loss of vegetation, which can ultimately reduce training realism and undermine the training mission.

Thawing of permafrost may affect water quality by increasing suspended sediment values if there is soil movement from the thawed area to a water body. Increased suspended sediment reduces light penetration and increases heat absorption. These factors adversely impact benthic invertebrates and salmonoid reproduction (Chapman and McLeod 1987 *in* MacDonald et al. 1991). Decreased light penetration could also reduce primary production if other factors are not limiting (MacDonald et al. 1991).

An additional military-induced impact on the natural occurrence and formation of permafrost results from prescribed burning and munition wildfires. Limited data are available for the thickness of the active layer (the zone above the permafrost table that thaws in summer and freezes again in winter) after fire in forest stands in Alaska. The active layer is known to be thicker in the successional stands after fire than it is in unburned black spruce forests. The heat produced by the fire seldom causes the organic layer to burn to the permafrost boundary. However, following a fire, the changes in surface albedo (reflectivity of the vegetative cover) and the removal of vegetation and organic mat result in warmer soils and deeper thawing (National Academy of Sciences 1973).

The active layer continues to expand until the vegetation is re-established to its original condition. Data indicate that the active layer thickness increases for at least 15 years after a fire. Even after 40 years, the active layer is somewhat thicker than it is in older stands (National Academy of Sciences 1973). Subsidence of the surface soil and the ponding of surface water, known as thermokarst, occurs as the underlying ice disappears.

Existing Mitigation

Training exercises conducted on Alaska military lands are regulated by USARAK Range Regulation 350-2. This regulation provides procedures for planning, scheduling, and operating ranges and training areas, and identifies environmental requirements. All actions undertaken by the Army are required to consider their impact to the surrounding environment and to take precautions to avoid impact. These include the refilling and leveling of any foxholes, trench systems, tank traps, hull-down positions, or explosive excavations; conducting vehicular stream crossings in designated areas only; limiting cross-country vehicular travel to established roads and dry trails during spring thaw; and avoiding cross-country movement in creek bottoms, marshes, and moist tundra areas during summer months. This regulation is important to the preservation of permafrost due to the close relationship between soil damage and permafrost degradation.

Damage control steps are included within individual training plans to minimize natural resources damage. These steps include the protection of known sensitive areas, repair of unavoidable maneuver damage, coordination and permitting of any ground disturbing activities, and scheduling of natural resources and hazardous material inspections of training areas to ensure regulation compliance.

To guide and regulate the actions of Army personnel using and managing training lands, the Army has developed the Integrated Training Area Management (ITAM) program. This program inventories land conditions and monitors vegetation trends on military installations. The data provide installation-wide summaries of land use, disturbance, plant cover, vegetation communities, tactical concealment, birds, and small mammals. Specifically, soil and vegetative data can be used to evaluate permafrost areas. (See Appendix 2.D).

Fort Wainwright and Fort Greely Integrated Natural Resources Management Plans are being developed with specific actions for management and use of permafrost areas.

Proposed Mitigation
A program will be implemented to identify possible muntions contamination to permafrost of the withdrawal lands. This program is described in Chapter 4.23.2 Proposed Mitigation, Pollution.

Cumulative Effects
Limited studies of permafrost located within the withdrawal lands have precluded extensive evaluations of cumulative impacts.

The use of the withdrawn lands for military activities would continue to negatively impact permafrost in areas that are continually utilized for training activities. With the continuation of the Integrated Training Area Management program, impacts to permafrost would be identified and monitored, and areas restored when feasible. An irretrievable loss of land would result in areas where permafrost degradation has been undetected or not rehabilitated due to a long recovery time associated with permafrost.

No Action Alternative

The first evaluation of the returned lands would be an assessment of the extent of contamination with explosive, toxic or other hazardous materials. If lands are contaminated, and a decontamination program is authorized, damage to the Impact Areas may result from excavation activities needed for ordnance removal. Damage would include disruption of the surface peat or other organic material with actual physical displacement or removal of it, generally followed by

subsidence of the frozen ground as it thaws, and eventual ponding in areas and erosion on steeper slopes. Damage may not be severe or irreversible if proper mitigative measures are implemented to minimize degradation during excavation such as conducting operations during the winter and stockpiling the vegetative mat.

Nonmilitary land uses that would most directly affect permafrost would be agricultural homesteads and settlements (Chapter 2.1.2). Farming activities, including clearing and cultivation in areas underlain by permafrost, would require surface disturbance and could result in subsidence and changes in surface relief sufficient to make the land useless for future farming operations and other purposes (National Academy of Sciences 1973).

Surface stability is the primary concern for new construction operations in areas of permafrost. Other aspects associated with the establishment of new settlements in permafrost areas that must be considered are domestic water supply, waste disposal, and street systems. Poor site selection for streets in permafrost areas could result in increased temperatures of the surface soil. In the discontinuous permafrost areas where ice is warmer, the increased temperature may be sufficient to melt the ice. Typically, special locations or structural designs are necessary in permafrost areas (National Academy of Sciences 1973).

4.8 SURFACE WATER

Preferred Alternative

Fort Wainwright Yukon Training Area and Fort Greely are utilized by military and nonmilitary entities. Primarily, these areas are utilized by the military for training purposes. Nonmilitary use is considered secondary and involves recreational activities including off-road recreational vehicles (ORRV) use, prescribed burns, and rights-of-way.

The most severe damage to the withdrawal area tends to occur when off-road maneuvering and munitions firing is conducted during the summer months when the active layer is unfrozen. Cross-country vehicular travel is less harmful during the winter months when the ground is frozen and the vegetative mat is protected by the snowpack.

4.8.1 Streamflow

The effects on streamflow by military activities are primarily caused by off-road maneuvering within training areas and ordnance firing into Impact Areas during

the summer months. These activities, when conducted continuously in the same area for a length of time and without remediation, will eventually remove the vegetative cover exposing the mineral soil or organic material underneath. As this exposed material is traveled upon, the soil is compacted creating a smooth surface for precipitation and snowmelt runoff to travel over. Also, the loss of vegetation reduces the amount of rain and snow intercepted by the vegetative canopy and is instead delivered directly to the stream system. Eventually, water velocities are increased and infiltration into the soil profile is decreased, resulting in a greater amount of water reaching the stream system in a shorter amount of time. Overall, changes in the peak flow may have important implications for the stability of the stream channel, size and quantity of the bed material, and sediment transport rates (MacDonald et al. 1991).

No additional impacts to floodplains would occur with the withdrawal renewal. No new development or additional land acquisition is proposed in floodplain areas as part of this withdrawal renewal. Thus, any short or long term adverse impacts associated with the occupancy and modification of floodplains would not be expected. In addition, floodplain development would be avoided, in accordance with Executive Order 11988, Floodplain Management.

4.8.2 Water Quality

Sediment

Military activity conducted near or within water bodies during the summer months can lead to localized erosion and sediment delivery to the stream system. Activities include unplanned stream crossings by military vehicles, ordnance explosions along stream banks within the Impact Areas, and general maneuvers on lands adjacent to streams.

Sedimentation of rivers, streams and adjacent lakes, ponds and wetlands could be caused by military operations. Adverse impacts to benthic invertebrates as well as salmonoid reproduction due to increased sedimentation has been documented. This includes the reduction in the penetration of light and an increase in heat absorption (Chapman and McLeod 1987 *in* MacDonald et al. 1991). However, sedimentation would not be expected to negatively impact larger, naturally sediment-laden glacial streams of the withdrawal lands, such as the Delta River, Jarvis Creek, Little Delta River and Delta Creek. The amount of additional sediment to the stream system is negligible.

The direct erosion of streambanks as a result of military activities in a localized area could be matched by deposition of material on an opposite downstream bank. This could lead to the alteration of channel morphology and bank stability. Stream width could increase, creating a larger stream surface area allowing

more direct solar radiation to reach the stream surface. Bank instability in an area tends to lead to additional erosion on a continual basis. In turn, these actively eroding streambanks support little or no vegetation. This may lead to a decrease in riparian wetlands and forage for wildlife species. Also, the long-term input of organic matter into the aquatic ecosystem could be reduced (MacDonald et al. 1991).

Fuels

Local water quality could also be threatened by fuels (petroleum, oils, and lubricants) and solid waste (garbage and human waste) during military operations. If a large, undetected spill were to occur near or within a surface water body at Fort Greely, waste could migrate downstream and threaten the developments of Delta Junction and Big Delta or eventually reach the Tanana River, which flows by the City of Fairbanks. If an undetected spill were to occur at the Fort Wainwright Yukon Training Area within a tributary of the Chena River, it may cause degradation to the City of Fairbanks. Potential spill sites at Fort Wainwright and Fort Greely are those associated with the storage and transfer of fuels. Chapter 2.1.3.3 lists past fuel spills that have occurred on withdrawal lands at Fort Wainwright between 1989 and 1996 and at Fort Greely between 1986 and 1993.

If a pollutant spill were to result on withdrawal lands, proper cleanup protocol would be followed, as outlined in USARAK Regulation 200-4, Hazardous Waste, Used Oil, and Hazardous Materials Management and Spill Prevention Control and Countermeasure Plans for Fort Wainwright and Fort Greely, to insure rapid and complete decontamination. In addition, all applicable local, State, and Federal regulations would apply.

Human solid waste contamination to water bodies could create increased levels of fecal coliform, fecal streptococci, and enterococci leading to a violation of Alaska Water Quality Standards (Appendix 3.8.C).

Munitions

Impacts to the water quality of submerged lands (property below the mean high level water mark) due to military use is a significant issue with the public concerning this Legislative Environmental Impact Statement. During the scoping process, concerns were expressed over possible surface water contamination of the Delta River as a result of munitions. A series of mitigation measures have been proposed to assess the extent of water quality contamination by munitions (Chapter 4.8 Proposed Mitigation and Chapter 4.23 Proposed Mitigation).

Five types of ammunition have been fired into the Stuart Creek and Oklahoma/Delta Creek Impact Areas by the Army. These are high explosives, smokes, illumination rounds, small arms, and inert. Chapter 2.1.3.4 provides a description of the characteristics, use, and annual expenditure of each ammunition type on the withdrawal lands. Targets constructed of plywood, steel drums, concrete, or salvaged metal vehicles are also located within the Impact Areas. The extent of contamination by munitions has not yet been determined at the Fort Wainwright Yukon Training Area and Fort Greely.

The primary munition types that have been fired into the Impact Areas are small arms and high explosives. The small arms munition was used most frequently at Stuart Creek and Oklahoma/Delta Creek Impact Areas. High explosives were the second most commonly used munition at Stuart Creek and Oklahoma/Delta Creek Impact Areas (Chapter 2.1.3.4). The dominant filler materials contained in high explosives are TNT and RDX. Munition components are listed in Appendix 2.C.

Extensive contamination studies assessing the impacts of TNT and RDX on the soil profile and the surrounding local environment at Fort Wainwright Yukon Training Area and Fort Greely do not exist. However, comprehensive studies on the role of munitions residues within the soil profile from locations across the country have been completed (Crockett et al. 1997, Jenkins et al. 1994, Walsh et al. 1993, Walsh and Jenkins 1992). TNT and RDX are mobile in the soil. Thus, residues of these chemicals in the soil can be a source of pollution both on Army installations and beyond installation boundaries (Crockett et al. 1997, Jenkins et al. 1994, Walsh et al. 1993). Once explosives enter the environment, they may be transformed by microbiological and photochemical processes, creating secondary compounds (Walsh and Jenkins 1992). Information available on chemicals used in munitions expended on the withdrawal lands is presented in Appendix 2.C.

A limited site-specific study was conducted at Fort Greely to determine if munitions fired into the Impact Areas were having any adverse effect on water and sediment quality (U.S. Army Environmental Hygiene Agency 1990). The greatest concern is the migration of contaminants from the areas. The streams crossing the installation are likely to be the major transport mechanisms.

Water samples were analyzed upstream and downstream of Fort Greely. Sample locations included Delta River, Jarvis Creek, Delta Creek, Little Delta River, and One Hundred Mile Creek. Several of the water quality parameters collected at Fort Greely (Appendix 3.8.D) increased in concentration downstream. However, these minerals were available in substantial quantities in the upstream

(background) sediment samples. In addition, the water samples were not filtered, and the heavy load of glacial flour suspended in the water column contributed to the increases. This was especially true for aluminum, iron, barium, and phosphorous because they are only slightly soluble in surface water with a neutral pH. The general changes in water chemistries were the same for Delta Creek and One Hundred Mile Creek (inside the Impact Area) as they were for the Little Delta River (outside the Impact Area). No explosives were detected during sampling and the data indicated the stream chemistries were not adversely affected by munitions (U.S. Army Environmental Hygiene Agency 1990).

A munitions study was not completed for Fort Wainwright Yukon Training Area.

U.S. Air Force training at Stuart Creek and Oklahoma/Delta Creek Impact Areas also has an effect on the natural environment. Chapter 2.1.3.2 discusses the military use of these areas by the U.S. Air Force. The primary type of training munition expended by the Air Force is the BDU-33 (excluding 20mm and 30mm aircraft machine gun ammunition). Effects of these practice bombs could result in disturbance of streambanks within the Impact Areas. Data representing the extent of damage to the Impact Areas as a result of Air Force use have not been collected. Short-term and long-term effects would be expected to be similar to those discussed for munitions firing by the Army.

Chaff and flares are used as a defense mechanism on withdrawal lands. Chaff is relatively insoluble in water. Chaff landing on water would either be submerged or driven across the surface by wind. Chaff in water bodies could be consumed by wildlife or fish. No change in dissolved oxygen content or temperature from the introduction of chaff into the water would be expected (Block and Schiff 1977 *in* USAF 1995, USAF 1989 *in* USAF 1995). The current form of chaff used by the Air Force is non-toxic to fish and mammals.

Flares used in training exercises would have no affect on the underlying surface water. The flares would be extinguished once they reached the body of water.

4.8.3 Ice Bridges

The effects of ice bridges on the environment are short term and localized to the areas where they are constructed. Ice bridge construction involves direct contact with the streambanks and surrounding areas of the Delta River and Jarvis Creek. The State of Alaska Department of Natural Resources, Division of Land issued a Land Use Permit for the purpose of construction and use of ice bridges and associated work areas at bridge sites. This permit requires that activities employing wheeled or tracked vehicles shall be conducted in such a manner as

to minimize surface damage, and that existing roads and trails shall be used whenever possible. All activities must minimize disturbances of natural drainage systems including channel morphology, water quality and quantity.

Effects to fish and wildlife resources must also be avoided. All hazardous waste, garbage, and other debris must be removed from the work site. Prior to termination of permit activities, the military must dismantle ice bridges so that the melting rate coincides with those of naturally occurring ice formations in the area.

An annual report summarizing ice bridge design specifics, damage associated with construction and use, and number of personnel involved in the exercise must be submitted within thirty days of the anniversary of the effective date of the authorization. If these stipulations are not adhered to, the Land Use Permit will not be renewed for the following year, terminating all ice bridge construction by the military.

In addition to ice bridge permit revocation, deviations from the Land Use Permit provisions may lead to adverse impacts to local and surrounding resources. Construction and excavation techniques could cause excessive scarring or removal of vegetation. It has been shown that compression and removal of surface vegetation causes an increase in thermal conductivity once the snow cover melts.

Also, the buildup of snow for bridge construction tends to persist longer than the surrounding snow cover during the thaw season and may have a retarding effect on plant growth in the area for the following season (Radforth and Burwash *in* Radforth and Brawner 1977).

Inadequate bridge design or improper load capacities could cause sagging of the bridge. The velocity of the stream may increase in certain areas resulting in increased erosion along the streambank (Gray and Male 1981).

4.8.4 National Wild and Scenic Rivers System

The proposed withdrawal renewal would not affect the current Wild and Scenic Rivers designation of the Delta River. If the No Action Alternative is selected, the Bureau of Land Management would not anticipate on extending the Wild and Scenic River designation of the Delta River onto the withdrawal lands (Bonnell, pers. com. 1999, Wilson, pers. com. 1999).

Existing Mitigation

Training exercises conducted on Alaska military lands are regulated by USARAK Range Regulation 350-2. This regulation provides procedures for planning,

scheduling, and operating ranges and training areas, and identifies environmental requirements. All actions undertaken by the Army are required to consider their impact to the surrounding environment and to take precautions to avoid impact. These include the refilling and leveling of any foxholes, trench systems, tank traps, hull-down positions, or explosive excavations; conducting vehicular stream crossings in designated areas only; limiting cross-country vehicular travel to established roads and dry trails during spring thaw; and avoiding cross-country movement in creek bottoms, marshes, and moist tundra areas during summer months. These precautions will decrease the incidence of soil erosion and subsequent sedimentation causing degraded water quality.

In addition to these environmental considerations, damage control steps are also included within individual training plans to minimize natural resources damage. These steps include the protection of known sensitive areas, repair of unavoidable maneuver damage, coordination and permitting of any ground disturbing activities, and scheduling of natural resources and hazardous material inspections of training areas to ensure regulation compliance.

Additionally, the military must comply with all applicable State and Federal statutes involving water resources. The Alaska State Drinking Water Standards establish maximum contaminant levels and monitoring requirements for public water systems. The standards for each regulation are discussed in Appendix 3.8.D.

Proposed Mitigation

A water quality sampling program will be established for the withdrawal lands. The study effort will include an analysis of surface water bodies, with monitoring stations located directly upstream and downstream of the installations.

Cumulative Effects

Comparative data were unavailable for the withdrawal area. Limited studies have precluded extensive evaluations of cumulative impacts.

The continued use of the withdrawal lands for military training activities will have the greatest impact on surface water quality. Off-road maneuvers and ordnance firings will cause surface disturbance that can lead to increased sediment loads to the stream system. The Integrated Training Area Management program will continue to monitor and correct any erosion and sediment delivery problems.

No Action Alternative

The first evaluation of the returned lands would be an assessment of the extent the lands are contaminated with explosive, toxic, or other hazardous materials.

If they are contaminated, the Secretary of the Interior and Secretary of the Army would determine if decontamination is practicable and economically feasible. Although it is not specifically stated, waters within the withdrawal lands should also be considered during decontamination activities.

Once these lands are sufficiently decontaminated, they would be open to public land laws, State selections would become valid, and the lands would be adjudicated by the Bureau of Land Management (BLM) for conveyance to the State of Alaska. Areas of the withdrawal lands have been selected by the State of Alaska for certain land uses. The land uses that would most directly affect surface water quality and quantity would be agricultural homesteads and settlements, and forestry (Chapter 2.1.2). The land uses would be subject to all applicable local, State, and Federal regulations.

Farming activities, once established, may pose a water quality threat to the surrounding stream system. If agricultural chemicals are applied, they could be transported to the nearest surface water source, causing contamination.

The creation of new settlements would require water supply systems including waste disposal systems. Overuse or improper design of these systems could result in surface water contamination.

Disturbance to water quality and quantity could result in areas selected for forestry practices. The removal of trees will decrease the vegetative cover, which may lead to increased peak flows. Also, increased erosion and sediment transport to the stream system could lead to degraded water quality.

The military would lose its ability to use the withdrawal lands for training purposes and there would be no need for ice bridge construction. The existing permits required for ice bridge construction would expire and not be renewed.

4.9 GROUNDWATER

In general, groundwater exists in large supply on the withdrawal lands and is the primary drinking water source. Based on limited information, the overall groundwater quality on the withdrawal lands is good. The only naturally occurring water quality parameter with measured values above the set standard is iron (Appendix 3.9), which was collected at Fort Wainwright. All of the water quality parameters measured at Fort Greely were below the concentrations recommended by the Alaska Drinking Water Standards (18 AAC 80) (Appendix 3.9). Continued use by the military would not affect the amount of groundwater

available for use. However, groundwater quality could be negatively impacted by military operations.

Preferred Alternative

4.9.1 Groundwater Occurrence

Groundwater sources of Fort Wainwright Yukon Training Area and Fort Greely would be unaffected by the Preferred Alternative.

4.9.2 Groundwater Quality

Fuels

The primary potential spill sites at Fort Wainwright are those associated with the storage and transfer of fuels. Areas that are relatively flat with well-drained, very fine sand and silts overlying stratified gravel and gravelly sand with permeability rates of 5 to 10 inches per hour would limit the horizontal migration of spilled fuel as opposed to vertical migration (U.S. Army Corps of Engineers 1996a and 1996b). Areas with the highest permeability rates are located along the floodplains of the Tanana and Chena rivers, and where depth to the water table averages between 10 and 20 feet. In areas free of permafrost, contamination to the water table during a major oil discharge onto unfrozen ground is possible. In areas with permafrost and poorly-drained soils, such as creek valley bottoms, the permafrost acts as a confining layer above the aquifer. Oil spills in these areas would be confined above the permafrost areas and would migrate laterally downgradient in a flow direction similar to the Tanana and Chena rivers (U.S. Army Corps of Engineers 1996a and 1996b). Chapter 2.1.3.3 lists past fuel spills of 10 gallons or more that have occurred on withdrawal lands at Fort Wainwright between 1989 and 1996.

Similar to Fort Wainwright, the primary potential spill sites at Fort Greely are those associated with the storage and transfer of fuels. Areas that are relatively flat with well-drained, very fine sand and silts overlying stratified gravel and gravelly sand would limit the horizontal migration of spilled fuel. Depth to the water table averages between 170 and 220 feet. Oil spills in areas where permafrost exists would be confined above the permafrost areas not reaching the water table and would also migrate laterally downgradient in a northeasterly direction (U.S. Army Corps of Engineers 1996a and 1996b). Chapter 2.1.3.3 lists past fuel spills of 55 gallons or more at Fort Greely between 1986 and 1993.

A large diesel spill resulted at the Fort Greely Main Post area when a Petroleum, Oil, and Lubricants (POL) line broke in the winter of 1982. The quantity of the spill was estimated to be in excess of 50,000 gallons. It was determined that the spill was bound in the soil structure. Over time, the fuel could migrate to the

groundwater table as precipitation and snowmelt (U.S. Army Corps of Engineers 1994). All applicable U.S. Army regulations regarding spills were implemented.

Spills during tanker truck refueling operations could be caused by leaking trucks, open above ground storage tank bottom values, improper drop tube connections, tank failure, and overloading. Although all truck drivers are instructed in proper fuel transferring procedures, spills during refueling operations account for 10% of all spills larger than 100 gallons on Fort Wainwright since 1985. A corresponding estimate was not available for Fort Greely (U.S. Army Corps of Engineers 1996a and 1996b).

The Army utilizes several vehicular tankers and collapsible rubber containers for transporting aviation and other fuels to the field for training exercises. Historically, the collapsible containers have been responsible for a large number of fuel spills because they are easily ruptured. Since 1985, approximately 18% of all spills on Fort Wainwright larger than 100 gallons have been associated with portable tanks. A corresponding estimate was not available for Fort Greely (U.S. Army Corps of Engineers 1996a and 1996b).

There are no underground storage tanks located on Fort Wainwright Yukon Training Area, though three are located on Fort Greely West Training Area. If these tanks were to leak, the containers would be drained and replaced and proper cleanup operations would be conducted as required by U.S. Army Alaska regulations (U.S. Army Corps of Engineers 1996a and 1996b).

An additional area of potential groundwater contamination is the area downgradient of the landfill located on the Fort Greely Main Post. Materials from the landfill could migrate to the groundwater table from the infiltration of precipitation and snowmelt. Monitoring wells installed near the landfill do not indicate any contamination. However, deposits underlying the immediate area are composed of relatively clean gravel and sands to moderately silty gravels and sands, which would allow contaminant movement (U.S. Army Corps of Engineers 1994).

Contamination events occurring off of the withdrawal lands pose a threat to the quality of the underlying groundwater as a whole. Contamination of the groundwater supply could inhibit future use by the military and public down gradient from the source.

Existing Mitigation

USARAK Regulation 200-4 outlines proper management of hazardous wastes, used oils, and other hazardous materials. It mandates specific policies for the

management of these items, including storage and labeling requirements, proper handling, training requirements, pollution prevention, and transport and disposal requirements.

Spill Prevention Control and Countermeasure Plans exist for Fort Wainwright and Fort Greely. The plans document methods implemented at each installation to prevent oil spills from reaching navigable waters and/or groundwater. They include spill prevention, discovery, and emergency notification procedures. Fort Wainwright and Fort Greely conduct "cradle to grave" management of hazardous materials. Records are maintained on anything that transpires over the "lifetime" of any hazardous material on the installation. Documentation is required for equipment inspections, tests, and repairs; personnel fuel handling and spill response training; reportable spills; corrective actions to prevent recurring spills; and investigations including soil, surface water, and/or groundwater.

Proposed Mitigation

Existing groundwater data for the withdrawal lands will be organized and evaluated for completion of a more detailed groundwater quality assessment. Any future monitoring efforts will be based on these assessments. Once a sampling scheme is developed, monitoring for munitions by-products will be included.

Cumulative Effects

Limited studies of groundwater on the withdrawal lands have precluded an extensive evaluation of cumulative impacts.

No severe negative impacts to the groundwater quantity or quality are associated with military activities. The quantity of groundwater underlying the withdrawal areas is very large and is constantly recharged from surface water sources. Localized areas of contamination may occur as a result of fuel oil spills. However, strict regulations and response procedures regarding spills are followed by the military.

No Action Alternative

The withdrawal lands have been selected by the State of Alaska for certain land uses. The land uses that would most directly affect groundwater quantity and quality would be agricultural homesteads and settlements (Chapter 2.1.2). Although not directly stated in the Evaluation Units for Final State Land Selections (1992), agricultural activities may require groundwater sources for irrigation. Also, the use of agricultural chemicals could pose a contamination threat to underlying groundwater. Residential settlements would also require water sources, most likely in the form of groundwater wells, for inhabitation.

Septic systems and other waste disposal methods would also be associated with the settlements and could create localized contamination. The land uses would be subject to all applicable local, State, and Federal regulations.

4.10 WETLANDS

Preferred Alternative

Fort Wainwright Yukon Training Area and Fort Greely are utilized by military and nonmilitary entities. Primarily, these areas are utilized by the military for training purposes. These activities may cause various detrimental impacts to wetlands and ultimately affect surrounding soils, permafrost, and water bodies. A complete discussion of military facilities and their uses is presented in Chapter 2.1.3.

The distribution of wetlands within the withdrawal areas is presented in Chapter 3.10 and Appendix 3.10. Knowledge of the areal extent of wetlands in the withdrawal areas is limited. Current data were collected in 1992 by the U.S. Fish and Wildlife Service as part of the National Wetlands Inventory (NWI). All but 5% of the Fort Wainwright Yukon Training Area was surveyed by this program. However, approximately half of Fort Greely (54%) was not surveyed. Inferring from current data, it is apparent that wetlands exist within Impact and Training Areas, mainly along floodplains and stream corridors (Figures 3.10.a and 3.10.b).

The most severe damage to wetlands tends to occur when off-road maneuvering and munitions firing is conducted during the summer months, when the active layer is unfrozen. Areas with high moisture content (wetlands), when exposed to vehicular traffic in summer, typically have the most rapid development of vegetation disturbance (Radforth and Burwash *in* Radforth and Brawner 1977). Cross-country vehicular travel is less harmful during the winter months when the ground is frozen, and the vegetative mat is protected by the snowpack. A proper thickness of snow will protect wetland vegetation, preserving its insulative capacity.

Permits are required by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act for wetland modification by mechanized equipment. Typically, the density and inundation with water of wetland areas prevent maneuvering during much of the time. However, wetlands are present within each Impact and Training Area, and even though off-road military exercises are regulated, some disturbance may occur. The military may maneuver or conduct foot traffic in wetland areas as long as the wetlands are not disturbed. If wetland areas are disturbed, they must be promptly reclaimed.

Many impacts occur to the surrounding environment as a result of wetland disturbance and loss. One effect of the removal of wetlands in an area is an increase in peak flows downstream. Although wetlands in permafrost-dominated areas contribute only slightly to flood storage, when wetland vegetation is removed and natural depressions are eliminated, water will no longer be detained in these areas. Removal of vegetation can lead to increased water velocities, leading to greater amounts of water delivered downstream. In addition, the amount of time between precipitation inputs and the greatest amount of storm discharge (lag time) will shorten.

Removal and disruption of wetlands can also affect low flows, which occur in late summer and early fall, of surrounding stream systems. Low flows may increase because the removal of vegetative cover reduces evapotranspiration and rainfall interception. Regular flows may return once the wetland is fully revegetated.

An additional effect to the local environment as a result of wetland disturbance is loss of erosion control. Wind and water velocities could increase near the ground. Soil particles would loose their stability once the vegetative roots are removed, making transport of the soil particles easier.

Wetlands provide insulation for underlying permafrost by preventing warming and eventual thawing of permafrost-rich soils. Disturbance or removal of wetland vegetation can increase local erosive forces creating thermokarst conditions.

Wetlands in floodplain areas also aid in erosion control in a limited capacity by removing suspended sediment from floodwaters. Wetland vegetation in these areas help to stabilize the riverbank, preventing streambank collapse and the widening and deepening of channels. Stream width increases result in a larger stream surface area allowing more direct solar radiation to reach the stream surface. Also, bank instability in an area leads to additional erosion on a continual basis. In turn, these actively eroding streambanks support little or no vegetation, leading to a decrease in riparian wetlands and forage for wildlife species. Also, the long-term input of organic matter into the aquatic ecosystem will be reduced (MacDonald, et al. 1991).

Wetland disturbance can lead to a loss of a natural filtering mechanism. Wetlands can filter out or transform waterborne constituents through a variety of biological and chemical processes. For example, increased suspended sediment concentrations, a direct result of erosion and sediment transport, can reduce the penetration of light, and sustained suspended sediment levels could ultimately reduce primary production if other factors are not limiting.

Impacts to wetlands are minimized by various Army, Federal, and State laws and regulations. The Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act require permits before construction work using mechanized equipment occurs, in order to maintain wetland integrity. Section 10 of the Rivers and Harbors Act requires permits prior to commencing any work or structures built in navigable water of the United States. Such work includes dredging and bank stabilization. Section 404 permits are required for the discharge of dredged or fill material into a water of the United States, including wetlands.

Current knowledge regarding the status of wetlands located within the withdrawal boundaries is based upon the U.S. Army Corps of Engineers permitting system, which is required by Section 404 of the Clean Water Act. According to Section 404, wetland modification will occur only in designated areas with the acceptance of a permit application by the U.S. Army Corps of Engineers. A total of 114.86 acres, based on U.S. Army Corps of Engineers permitting records, have been disturbed by military activities since 1989 (Table 4.10.a).

These permits usually contain special provisions that require the permittee to maintain natural drainage patterns to prevent flooding or excessive drainage of nearby wetlands, stabilize construction areas to prevent erosion, prevent encroachment upon adjacent wetlands, and implement a plan to avoid future disturbance and reestablish vegetation when such disturbance cannot be avoided.

In addition, Executive Order 11990, Protection of Wetlands, requires that Federal agencies minimize any significant action that contributes to the loss or degredation of wetlands and that action be initiated to enhance their natural value. It is the Department of the Army's policy to avoid adverse impacts to existing aquatic resources and offset those adverse impacts when they are unavoidable. Additionally, the Army will "strive to achieve a goal of no net loss of values and functions to existing wetlands, and permit no overall net loss of wetlands on Army controlled lands". Furthermore, the Department of the Army will take a progressive approach towards protecting existing wetlands, rehabilitating degraded wetlands, restoring former wetlands, and creating wetlands in an effort increase the quality and quantity of the nations's wetlands resource base. To meet this requirement, identification and maintenance of a wetlands inventory is essential (DA 1995).

Since military activities conducted on the withdrawal renewal lands would be consistent with those conducted during the past 15 years, and the Army is not proposing to expand or add Impact Areas on the withdrawal lands, and various

wetland damage mitigation measures are planned, an increase in future impacts to wetlands are not expected to occur if the renewal is granted.

Existing Mitigation
A wetland planning-level survey was recently completed at Fort Wainwright Yukon Training Area and a similar study is in progress at Fort Greely. A wetlands management and revegetation plan is funded and in progress for the withdrawal lands. Fort Wainwright and Fort Greely Integrated Natural Resources Management Plans are under final review by the Army and BLM with specific actions for management of wetland areas.

Training exercises conducted on Alaska military lands are regulated by USARAK Range Regulation 350-2. This regulation provides procedures for planning, requesting, and operating ranges and Training Areas with USARAK and highlights certain environmental aspects to be taken into consideration. All actions undertaken by the U.S. Army are required to consider their impact to the surrounding environment and to take certain precautions to avoid impact. Wetlands use permits are obtained through the U.S. Army Corps of Engineers permitting process. In addition to these environmental considerations, damage control steps are also included within individual training plans to minimize natural resources damage.

Proposed Mitigation
Additional wetland mitigation will be determined by the U.S. Army Corps of Engineers through the permitting process for the Clean Water Act, Section 404.

Cumulative Effects
Severe negative impacts to wetlands associated with military activities are minimal because unauthorized military activity is strictly prohibited in wetland areas. According to Section 404 of the Clean Water Act, wetland modification will occur only in designated areas with the acceptance of a permit application by the U.S. Army Corps of Engineers. A total of 114.86 acres or 0.0132% of the withdrawal lands, based on U.S. Army Corps of Engineers permitting records, have been disturbed by military activities since 1989 (see Table 4.10.a). Since future military activities are presumed to be similar to current operations and wetland restoration techniques are currently applied, cumulative impacts to wetlands over time would not be expected to be significant. Third party development interests, including rights-of-way granted by the Bureau of Land Management, would also not be expected to greatly impact the distribution of wetlands on the withdrawal lands. A more complete survey of wetland type and location will aid military operation coordinators in planning field exercises away from these sensitive areas.

No Action Alternative

The first evaluation of the former withdrawal lands would be an assessment of the extent any wetland areas are contaminated with explosive, toxic or other hazardous materials. If they are contaminated, the Secretary of the Interior and Secretary of the Army would determine if decontamination is practicable and economically feasible. If the lands were deemed unusable, they would sit idle until decontamination was authorized by the Army. Decontamination would involve the physical removal of all ordnance from the Impact Areas.

Once these lands are sufficiently decontaminated, they would be open to public land laws, State selections would become valid, and the lands would be adjudicated by the Bureau of Land Management (BLM) for conveyance to the State of Alaska. Areas of the withdrawal lands have been selected by the State of Alaska for certain land uses. The ensuing land uses would be subject to the same requirements as the military as stated in Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Thus, any new agricultural, construction, forestry, or mining activity would need a permit prior to initiation. The land uses would be subject to all applicable local, State, and Federal regulations.

4.11 VEGETATION

No Federal or State threatened, endangered, or proposed plant species are listed as occurring within or near the withdrawal lands and no listed plant species have been found on the withdrawal lands during field surveys. Chapter 3.14 contains a discussion on rare plants found on the Fort Wainwright Yukon Training Area. Appendix 3.14 contains the informal consultation response from the U.S. Fish and Wildlife Service regarding threatened and endangered species and the withdrawal of Fort Wainwright Yukon Training Area and Fort Greely West and East Training Area.

Military activities that affect vegetation on the withdrawal lands include direct impacts from bombing and artillery firing into Impact Areas, foot maneuvers, and tracked vehicle use. Establishment of Maneuver Areas, Firing Points, Observation Points, Bivouac Sites, Firing Ranges, Assault Strips, and Drop Zones all damage and/or destroy vegetation. Although these areas are dispersed over large land areas, cumulative impacts to vegetative communities occur.

Preferred Alternative

Retention of the lands by U.S. Army Alaska would have some negative effects on vegetation on the withdrawal lands. Rehabilitation of areas under the Land

Rehabilitation and Maintenance (LRAM) program would mitigate negative impacts (See Appendix 2.D).

Impacts of military activities to vegetation include breaking and crushing of plants and direct mortality. This can directly or indirectly alter plant communities, structure, and cover. Changes from large perennial plants to small annuals, decreases in plant cover, reduced densities of woody vegetation, and increases in introduced plant species have resulted from military maneuvers (Severinghaus et al. 1981, Goran et al. 1983, Shaw and Diersing 1990, Thurow et al. 1995, Jones and Bagley 1997).

Tracked vehicles can cause direct mortality to plants and indirectly affect plant communities through soil compaction and by altering competitive relationships (Milchunas et al. 1998). Shaw and Diersing (1989 & 1990) investigated the impacts of tracked vehicles on short grass steppe vegetation that had not previously been used for this type of activity. They found that tracked vehicles decreased plant litter, vegetative ground cover, and basal cover, while bare ground increased. The reduction in cover was accompanied by changes in species composition. As the amount of cover decreased, cool-season grasses and warm-season forbs replaced perennial warm-season grasses. Decreases in succulents, shrubs, and trees resulted with the occurrence of secondary succession in disturbed areas. Large military vehicles can alter vertical and horizontal structure of plant communities (Severinghaus et al. 1981). Van Cleve (1977) considered tracked vehicles the most widespread cause of disturbance to Arctic ground surfaces.

Disturbed areas result in soils becoming more compacted (Braunack 1986, Prose 1985, Goran et al. 1983). Increased soil compaction can indirectly alter plant communities by affecting seedling establishment, plant water and nutrient uptake, root penetration, and cause invasion of more tolerant plant species. Reestablishment of plant communities and structure may be impeded by changes in soil properties (Shaw and Diersing 1990).

Jones (1993) reported that bivouac sites damage vegetation in forested areas by reducing overstory and understory stem density and species richness. There was less ground cover resulting in an increase in bare ground and bulk soil density, with significant soil loss in some areas. Soil compaction occurred, resulting in crown die-back, although canopy cover was not significantly different between bivouac sites and non-bivouac sites.

Fire from military activities impacts vegetation. Vegetation in these areas is kept in varying successional stages, maintaining diversity of vegetation composition.

A greater number of fires occur on the withdrawal lands due to incendiary devices. The Impact Areas and some of the Buffer Zones are burned periodically.

Existing Mitigation
U.S. Army Alaska Regulation 350-2 Range Regulation, U.S. Army Regulation 200-2, Environmental Effects of Army Actions, and U.S. Army Regulation 200-3 Natural Resources-Land, Forest, and Wildlife Management, provide procedures for protecting vegetation.

Floristic inventories have been completed to collect, identify, and catalog all vascular plants on Fort Wainwright Yukon Training Area. Inventories are being conducted on Fort Greely. Vegetation mapping has been completed to identify ecosites on Fort Wainwright Yukon Training Area and is being conducted at Fort Greely as part of the Ecological Land Classification. The Ecological Land Classification will allow U.S. Army Alaska to manage lands on an ecosystem level.

To guide and regulate the actions of Army personnel using and managing training lands, the Army has developed the Integrated Training Area Management (ITAM) program. The goals of ITAM are to inventory and monitor, repair, maintain, and enhance training lands at Army training installations. The Land Condition-Trend Analysis (LCTA) program serves as the inventory and monitoring portion of ITAM. This program inventories land conditions and monitors vegetation trends on military installations. The data provide installation-wide summaries of land use, disturbance, plant cover, vegetation communities, tactical concealment, birds, and small mammals. Land Rehabilitation and Maintenance (LRAM) projects are being conducted to restore vegetation (See Appendix 2.D).

Forest Management Plans for Fort Wainwright and Fort Greely are being prepared as part of the Integrated Natural Resources Management Plans.

Proposed Mitigation
The forest resources inventory will be implemented and results used to complete and implement the Forest Ecosystem Management Plans that are part of the Integrated Natural Resources Management Plans.

Cumulative Effects
The use of the withdrawal lands for military activities would continue to cause some negative impacts on vegetation in areas such as Drop Zones, Assault Strips, and Impact Areas. With the continuation of the Integrated Training Area

Management Programs (LCTA and LRAM), impacts to vegetation would be identified and monitored, and areas restored when feasible. There would be some irretrievable impacts to vegetative communities in areas that are used frequently or developed for military training. The extent of vegetation disturbance that would cause irretrievable impacts can not be quantified at this time because the research programs have only been in force a few years and little data are available.

No Action Alternative

Damage to vegetative communities from military activities would decrease. U.S. Army Alaska has the ability to restore some of the vegetative communities disturbed by military activity through the LRAM program. If the withdrawn lands are not renewed for military use, LRAM projects would be discontinued and some areas would not be rehabilitated. These lands would remain damaged and scarred.

It is difficult to assess future use of most of the withdrawal lands if they are returned to the State. The Beaver Creek area of Fort Wainwright Yukon Training Area would receive increased use when the State implements plans to create a loop trail and build a cabin near the creek. Vegetation in this area would be destroyed in construction of the trail, cabin, and from possible camping along the trail. Roads and trails could receive increased use by the public, which could damage vegetation near these areas.

Mining, forestry, agriculture, and settlements may occur if the lands are returned to the State. These activities would alter and possibly destroy vegetative communities.

4.12 WILDLIFE

The U.S. Fish and Wildlife Service has listed one Federally endangered species, the American peregrine falcon, and one Federally delisted species, the Arctic peregrine falcon, as occurring within the area of Fort Wainwright Yukon Training Area and Fort Greely. Confirmed sightings of falcons have occurred on Fort Wainwright and Fort Greely.

The U.S. Forest Service has listed the trumpeter swan and osprey as sensitive species. Trumpeter swans have been confirmed on the Fort Greely West Training Area and osprey have been found on Fort Wainwright and Fort Greely.

No State listed threatened or endangered wildlife species are documented as occurring within or near the withdrawal lands. Four passerines listed by the State of Alaska as "species of concern" have been confirmed on the withdrawal lands. The species are the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler. Chapter 3.14 and Appendix 3.14 contain more information on Federal and State listed species.

Impacts to wildlife species and their habitat is a significant issue with the public concerning this Legislative Environmental Impact Statement. During the scoping process, concerns were expressed over possible disturbance to bison, moose, caribou, and their habitat. U.S. Army Alaska is working with the Alaska Department of Fish and Game to minimize disturbance to these wildlife populations during sensitive times, such as calving season, and to protect sensitive habitat.

Some research has been conducted on the withdrawal lands to identify sensitive habitat and impacts to wildlife from military activities. Studies of Dall sheep, grizzly bear, bison, and caribou have been conducted, and present management reflects research findings and recommendations.

Researchers debate whether investigating the impacts to wildlife from military activities should be evaluated at the population level or on the responses of a few animals. Tazik et al. (1992) stated it is important to take the population-based view. "If the local population is stable and relatively abundant, then adverse impacts that affect only a few individual animals should be considered insignificant". Most research studies however, measure the immediate rather than long-term effects due to difficulty in gathering long-term data over many years and several generations.

In some species, immediate effects and population effects are clearly correlated. In a study of caribou calves, survival was negatively correlated to exposure to low-level overflights of military jet aircraft (Harrington and Veitch 1992).

Preferred Alternative

Military activity does negatively affect individual animals and could affect populations. The methods taken by the military to manage these problems could determine if effects are short or long-term. No studies have been conducted on the withdrawal lands to measure military activity disturbance on specific species. Management guidelines relating to minimal disturbance of animals during sensitive periods and minimum damage to sensitive habitats will decrease negative effects on individual animals and populations. These sensitive periods and sensitive habitats are identified in Chapter 3.12.

Wildlife responses to and impacts from noise caused by fixed wing aircraft and helicopters is the most researched impact from military activities. Information is also available on wildlife responses to off-road vehicles, mainly 4-wheel and snowmachine use. Noise, more than sight of machines, causes disturbance to wildlife. It can be assumed that other machines, such as tracked vehicles, used by the military, cause similar responses from wildlife.

The following review of research findings for specific wildlife species gives a better understanding of the complexities involved in estimating disturbance levels and minimizing negative impacts to wildlife from military activity, while meeting the requirements of the military mission.

Grizzly Bear and Black Bear - No studies have been conducted to analyze the specific effects of military activities on grizzly and black bears (USAF 1995). One study noted that grizzly bears panicked, stumbled, and ran when exposed to noise from aircraft (Golden et al. 1979). Bears have been observed to retreat to dens when disturbed by aircraft, and potential den sites may be abandoned during periods when dens are sought (Harding 1976, USAF 1992). Periods of sensitivity are during mating, postpartum (shortly after birth), and during feeding concentration times (USAF 1992).

Grizzly bears and black bears are distributed throughout the Fort Wainwright Yukon Training Area and Fort Greely West and East Training Areas. Fort Greely West Training Area has a grizzly bear intensive spring use area along the Delta River in the southern portion of the West Training Area due to bison calving in the area. A portion of the intensive spring use area lies within the Washington and Texas Ranges. These are Dedicated Impact Areas and as such, the bears could be negatively impacted by live firing, bombing, and noise disturbance.

On Fort Greely, grizzly bears are known to concentrate in the riparian areas along Buchanan Creek, the East Fork Little Delta River and Delta Creek to Dinosaur Ridge. The southern portion of the West Training Area is a breeding and cub rearing area (Reynolds, pers. com. 1998). The only area of intense military activity is the riparian area along Delta Creek. This area is part of the Oklahoma/Delta Creek Impact Area and is subject to intense military air-to-ground training and bears could be disrupted from feeding.

The extent to which negative impacts would affect the grizzly and black bears is unknown. Reynolds et al. (1986) reported that underground blasts caused brief periods of movement from denning grizzly bears, but the bears did not leave the dens and torpor (period of inactivity, low respiration) was not disrupted. Present

information suggests negative impacts could disrupt feeding, mating, cub rearing behavior, and to a lesser extent, denning.

Moose - Little information is available on the effects of military activity on moose. Moose have shown startle responses and increased their walking speed when disturbed by civilian aircraft. Sensitive periods for moose are winter, and rutting and calving seasons. Adults could become startled and temporarily leave their young, making them vulnerable to predators.

Moose concentrate in riparian areas, and military overflights tend to follow river valleys. This may create a higher frequency of disturbance time to moose than other ungulates that do not concentrate in high flight corridors (USAF 1995). Moose prefer riparian habitat. These areas are sensitive to disturbances by off-road recreational vehicles. Degradation of habitat would have a negative impact on moose.

A high number of fires occur on the withdrawal lands from military activities. The fires reduce the amount of forested areas, creating open areas of early successional vegetation on which moose browse.

Concentration areas on Fort Greely West Training Area receive little disturbance from on-the-ground military activities. Fall, winter, and spring concentration areas in the East Training Area would be impacted by military activities. The East Training Area, Oklahoma, Lakes, and Washington Impact Areas would have the most activity, therefore causing higher disturbances to moose than other areas. Aircraft activity impacts all of Fort Greely.

Dall Sheep - Aircraft noise can disrupt sheep behavior. A study of bighorn sheep at the Grand Canyon (Stockwell et al. 1990) showed sheep were sensitive to helicopter noise during winter with a 43% reduction in foraging efficiency. During spring no significant foraging effect was identified. The authors note the seasonal difference may have been due to the fact that the sheep had migrated to lower elevations farther away from helicopter noise. A study conducted in California during April and June, of sheep movements in response to helicopters, showed that animals altered both their distribution and movements. Some animals left the study area following surveys. Some animals ran upon approach of the helicopter (Bleich et al. 1990).

Sheep are especially vulnerable to disturbance in winter, during lambing, and at watering areas and salt licks. Evidence of predators keying in on mineral licks was noted by Heimer (1995), and disturbance to sheep at these areas could cause susceptibility to predation. A study by Jorgensen (1974) found a 50%

reduction in use of a watering site when off-road recreational vehicles were near. The terrain that sheep inhabit also makes them vulnerable to accidents when disturbed. A panic response to noise could cause sheep, especially lambs, to fall off cliffs.

Negative impacts on sheep foraging, distribution, and movements would increase if the frequency of military flights over habitat areas increased. This could lead to energy loss in individual animals, resulting in susceptibility to environmental stress factors and possibly death (USAF 1995).

Dall sheep inhabit alpine areas in the southern portion of the Fort Greely West Training Area. Recommendations from a study by Spiers and Heimer (1990) identified that vehicular traffic should be excluded from elevations above 3500 feet in the mountains between Buchanan Creek and Delta Creek to preclude destruction of alpine habitat. The second recommendation was that large ground exercises spread over a large area should not occur on sheep range. Sheep that were frightened by people or equipment would not have ample escape territory. Small numbers of troops could train in sheep range if they stayed in an area $1m^2$.

Present data show that the Army conducts few activities in Dall sheep habitat and therefore has little impact on Dall sheep. Implementing recommendations by Spiers and Heimer (1990) would insure minimal effects on Dall sheep and their habitat from military ground activities.

Caribou - Aircraft noise causes caribou to become nervous, startle, panic, and run. Pregnant cows may become injured prior to and during birth (Golden et al. 1979, Calef et al. 1976). Frequency and duration of nursing decreased in a herd in the Northwest Territories, and cow-calf groups were displaced for distances up to two miles following helicopter landings (Gunn et al. 1985).

The Delta caribou herd is possibly the most studied caribou herd in relation to human disturbance. Researchers speculate that the majority of this herd has become habituated to a wide range of disturbances from military overflights, ordnance delivery, habitat alteration from fire and mining, human developments, roads and railroads, and airfields on their historic range (Davis et al. 1985).

Most of the pre-calving, calving, and post-calving area identified on Fort Greely West Training Area, is in the southern portion of the Training Area where little military activity occurs. Some of the habitat does extend into the Oklahoma/Delta Creek and Lakes Impact Areas. The Alaska Department of Fish and Game has established a minimum disturbance period from 15 May-31 May for the pre-

calving, calving, and post calving areas within the West Training Area. This requirement minimizes impacts to caribou during these critical periods.

Bison - Bison habitat includes land along the Delta River, and east of the river including the East Training Area. These areas are used extensively for military training. Bison can become nervous, get up from resting positions, and run when exposed to aircraft (Golden et al. 1979); yet another study (Frazier 1972) found that bison were insensitive or habituated to military aircraft noise.

No studies have been conducted to determine long-term effects of military activity on bison. From studies conducted on other large mammals, it can be presumed that bison would have some negative short-term and possibly long-term responses to military activity.

The Alaska Department of Fish and Game has established a minimum disturbance period (mid February - early September) for bison on Fort Greely West Training Area. The military has agreed not to conduct activities or operations in or near bison habitats during this time period when bison are present. This will minimize adverse effects on bison.

Wolf - The Alaska Department of Fish and Game is currently studying wolves in Game Management Unit 20A including Fort Greely. Information is not yet available to analyze effects of the alternatives.

Wolverine - Wolverines are known to inhabit the withdrawal lands but no information is available on population size and habitat use.

Sandhill Crane - Few studies have been conducted to identify impacts to sandhill cranes from human disturbance. One study found that nesting sandhill cranes were undisturbed by highway traffic. The birds were thought to be acclimated to the noise (Dwyer and Tanner 1992). Another study reported that nesting sandhill cranes remained on their nests 82% of the time when a helicopter flew over the nests (Larkin et al. 1976).

Migratory Birds - Studies have shown that migrating birds do not show frequent reactions to loud sounds during flight, but noises such as loud blasts could have short-term or long-term effects on their oriented behavior. Migrating birds have been shown to turn away from loud sound sources, and while some birds re-corrected their course after the sound had ceased, others birds remained on the changed course (Larkin 1976 and 1978).

Studies on off-road recreational vehicle (ORRV) activity impacts to birds has shown statistically significant differences in abundance and variety of birds between low-use and high or moderate-use areas. Birds showed increased susceptibility to flushing by fleeing the area, which could result in disruption of territories, decreased ability to feed their young, or defend their nest from predators (Weinstein 1978).

Studies indicate that loud, continuous sounds could permanently damage the hearing of birds (Marler et al. 1973). Several studies suggested that high levels of ORRV noise could interfere with bird communication, especially during breeding season when males maintain territories through song and court females (Luckenbach 1975, 1978, Weinstein 1978).

Existing Mitigation

Habitat Management Plans are currently being completed as part of the Integrated Natural Resources Management Plans. The plans will identify sensitive wildlife habitats and implement management to protect these areas. The plans will comply with Federal and State regulations on management of wildlife and habitats on military lands.

A habitat improvement project is being conducted on Fort Wainwright Yukon Training Area using prescribed burns in aspen groves to improve habitat for ruffed grouse.

Surveys are being conducted to identify raptor habitats and locate nest sites on the withdrawn lands. If nests are located, necessary management requirements will be initiated to protect these areas. Surveys are also being conducted for neotropical birds, and small mammals. The surveys will include identification of threatened, endangered species. Breeding Bird Surveys are conducted on Fort Wainwright to assist State population studies. No Breeding Bird Surveys are conducted on Fort Greely.

A Bird Air Strike Hazard Program (BASH) has been implemented at Fort Wainwright and Fort Greely to minimize the risk of bird/aircraft strikes. For information on this program, see the U.S. Air Force Final Environmental Impact Statement, Alaska Military Operations Areas, Volume II (1995).

Proposed Mitigation

Information from bird surveys on the withdrawal lands will be reviewed to identify habitat areas for neotropical migrants. Breeding Bird Surveys will continue on Fort Wainwright and be implemented on Fort Greely.

Cumulative Effects

Cumulative effects to wildlife populations from noise and human disturbance are difficult to assess because of the lack of long-term research information available. It has been shown that noise from aircraft and off-road recreational vehicles, bombing, and artillery firing can negatively affect certain wildlife species and that individual animals react differently. Because certain species have been documented as having lower survival rates of young, decreased reproductive success, and avoidance of previously used habitat due to noise it can be predicted that there will be a loss of individuals of certain species. The affect this could have on general populations is unknown at this time.

Impacts to wildlife habitat are more readily assessed. Military activity is low in the southern portion of the West Training Area designated as grizzly bear, caribou, and Dall sheep habitat. If military activity continues to be low in this area, impacts to species populations levels would be low. Bison habitat is affected by military activities, but at this time, the population is at or near population levels set by the Alaska Department of Fish and Game. If bison habitat is not altered from its present condition, negative impacts from military activities will remain minimal.

No Action Alternative

With the loss of military activity on the withdrawal lands, many of the impacts to wildlife would decrease. Negative impacts to wildlife from civilian aircraft, helicopters, off-road recreational vehicles, and other recreational activities would continue. The Council on Environmental Quality has listed off-road vehicles as one of the most serious public land use problems (Berry 1980).

With the loss of military presence in the area, there could be an increase in public use. Considering the size of the withdrawn lands, it could be hypothesized that the State could not regulate public use and that increased human disturbance to wildlife from public recreational activities could occur. Disturbance to wildlife and associated habitat would occur if mining, forestry, agriculture, and settlement activities were allowed.

The Alaska Department of Fish and Game would continue to manage wildlife populations on the formerly withdrawn lands and therefore changes in wildlife harvests from hunting, trapping, and fishing would continue to be regulated by the State.

4.13 FISHERIES

No Federal or State threatened or endangered fish species are listed as occurring in waters on or near the withdrawal lands. Appendix 3.14 contains the informal consultation response from the U.S. Fish and Wildlife Service.

4.13.1 Fish Stocking

The Alaska Department of Fish and Game stocks one lake on Fort Wainwright Yukon Training Area and 15 lakes on Fort Greely West Training Area. Funding for stocking these lakes comes from two sources: the Sport Fish Account of the State Fish and Game Fund, and the Federal Aid in Sport Fisheries Restoration Program.

Preferred Alternative

U.S. Army Alaska would continue to allow fishing at the stocked lakes and other lakes and waterways on the withdrawal lands. They would continue to work with the Alaska Department of Fish and Game to evaluate other lakes and waterways for possible fish stocking. The cooperative effort by these agencies would maintain and improve fishing opportunities for the public. These efforts could increase the use of stocked lakes on military lands by the public.

Manchu Lake, on the Fort Wainwright Yukon Training Are, is stocked. The access road to this lake needs repair and upgrades for easier access. U.S. Army Alaska is planning to repair this road within the next five years. By improving the road, the military would increase public access to this lake and possibly increase public use.

The military has provided the Alaska Department of Fish and Game with helicopter transportation for stocking remote lakes on and off the post. U.S. Army Alaska would continue to support fish stocking if helicopters remain available at Fort Wainwright. The provision of helicopters to the State agency decreases the cost of stocking the lakes, allows the State to continue stocking, and releases funds for other State wildlife projects.

Heavy snows settling on lakes can cause oxygen depletion, resulting in fish die-offs. U.S. Army Alaska has used heavy equipment to remove snow from lakes and would continue this management practice. The intervention of the military saves the State money by decreasing the number of fish needed to stock these lakes and increases the possibility for high quality fishing experiences with an increase in catchable-size fish.

The Alaska Department of Fish and Game has stated that Big Lake on Fort Greely West Training Area could support an excellent fishery if the water level was raised. The agency recommended that the military evaluate costs and benefits of raising the lake level. U.S. Army Alaska would evaluate the feasibility of this project during 1998-2001. If the military decided to increase the water level of the lake, it would provide greater fishing opportunities for the public.

A few lakes on Fort Greely have undesirable fish that affect the growth and survival of game species. Alaska Department of Fish and Game and Fort Greely personnel would remove these fish through the use of rotenone. U.S. Army Alaska would build gabion dams (large rock structures that allow water, but not fish, to flow through) to protect these lakes from reintroduction of undesirable fish species during periods of high water. This would also increase fishing opportunities for the public.

The use of the withdrawal lands by the military has a positive effect on fish stocking. The use of military personnel and equipment saves the State money and allows more projects to be completed within the Delta Junction/Fairbanks area to improve public recreational fishing.

The military may have to temporarily close areas due to training exercises which could limit public access to fishing areas. This could decrease the number of fishing days available and possibly create a negative public reaction.

Existing Mitigation
At the present time, there is no existing mitigation for fish stocking on the withdrawn lands.

Proposed Mitigation
Fishing opportunities for the public will be maintained. Habitat for stocked fish will be improved.

Cumulative Effects
No negative cumulative effects would occur to fish stocking on the withdrawn lands. Lakes would continue to be stocked unless the Alaska Department of Fish and Game altered their fish stocking management plan. The public would continue to use the lakes for recreational fishing.

No Action Alternative
The lakes would continue to be stocked, but availability of military helicopters to stock lakes on the withdrawal lands and other remote areas would cease. This could decrease the number of lakes stocked and opportunities for recreational

fishing within the Fort Wainwright Yukon Training Area and Fort Greely West Training Area.

Any project such as repairing the road to Manchu Lake, snow removal from lakes, raising lake water levels to increase year-round fish populations, and improving lakes for fisheries would be a State cost. Due to the lack of military equipment and personnel available for these projects, habitat for fisheries within the withdrawal lands could decrease.

The lack of military operations on Fort Wainwright Yukon Training Area and Fort Greely would eliminate the probability of a fishing area being closed. This could increase the number of fishing days available to the public.

4.13.2 Wild Fisheries

No fish population surveys have been conducted on Fort Wainwright Yukon Training Area and Fort Greely West and East Training Areas. No studies have been conducted to analyze impacts from military operations.

Preferred Alternative

Ongoing military activities within the Impact Areas damage fish habitat in rivers and streams. This could have a negative effect on fish populations.

Another possible impact to fish populations results from crossing streams with heavy equipment. This can cause bank erosion, suspended sediment increases, and changes in the shape and structure of streams resulting in habitat loss. Although U.S. Army Alaska Regulation 350-2, Range Regulation, states that during summer months (usually May through September) cross-country movement is permitted in all areas except designated creek bottoms, marshes and moist tundra areas, this does not inhibit stream crossing. Range Control maintains a list of areas designated as closed during summer months. During winter breakup (usually 1 April through 15 May) all vehicles are restricted to established roads and dry trails.

U.S. Army Alaska is allowed to create ice bridges from November to mid March. These could have adverse effects on anadromous or resident fish species and their habitat and may obstruct passage and movement of fish (ADF&G 1992b). Requirements for necessary construction permits keep this possibility low. The Alaska Department of Fish and Game listed the Delta River and Jarvis Creek as having resident fish populations that could be affected by ice bridges.

Contamination of waterways can occur from hydrocarbons from vehicle exhaust. Adams (1975) found that a lake was contaminated with hydrocarbons from

snowmachine exhaust through snowmelts. Impacts to the Delta River and Jarvis Creek are unknown at this time.

Several creeks and rivers flow through the Impact Areas. Five types of ammunition are used in these areas; high explosives, smoke, illumination rounds, small arms, and inert. Information on possible contamination of the waterways from the use of these ammunition is not available. If the waterways are carrying contaminants, fish could be affected.

The Little Delta River and Delta Creek are listed as anadromous streams. However, chum and coho salmon are not reported in the Fort Greely area.

Existing Mitigation
Direct fisheries mitigation is currently not being conducted on the withdrawn lands. Current erosion control practices, water quality standards, and vegetation disturbance restrictions indirectly affect fish through protection of habitat.

Ice bridge permits list restrictions set by the Alaska Department of Fish and Game to protect fish populations. The restrictions minimize impacts to water flow, thus minimizing impacts to fish movement through the area.

Proposed Mitigation
Fish habitat surveys should be conducted.

Cumulative Effects
U.S. Army Alaska is required by Federal law to protect waterways from unnecessary negative impacts. Many of the waterways on the withdrawn lands would be protected, and minimal disturbance would occur. The location of Impact Areas around rivers and creeks would result in an irretrievable commitment of sections of certain rivers and/or creeks. It is difficult to determine the impacts of chemicals on fish populations in waterways that flow through the Impact Areas. Research would have to be conducted to see if there would be a cumulative effect on fish populations.

No Action Alternative
Impacts from military operations would cease. Changes in stream banks, stream flow, and fish populations would be based on natural phenomenon and recreational activities. The use of off-road recreational vehicles would probably increase with greater public access and could damage waterways by causing bank erosion, increased sediments, and loss of fish habitat.

4.14 THREATENED OR ENDANGERED SPECIES (State and Federal) AND SPECIES OF CONCERN (State)

No Federal or State threatened, endangered, or proposed plant species are listed as occurring within or near the withdrawal lands, and no listed plant species have been found on the withdrawal lands during field surveys. In 1995, a plant survey was conducted on the Yukon Training Area. Several populations of three plants (Water plantain, Crawford's sedge, Northern kittenstails), listed as imperiled in the State or rare by the Alaska Natural Heritage Program were located.

The U.S. Fish and Wildlife Service has listed one Federally endangered bird species (American peregrine falcon), and one Federally delisted species (Arctic peregrine falcon) as occurring within the area of Fort Wainwright and Fort Greely. Confirmed sightings of falcons at Fort Wainwright and Fort Greely have occurred. Appendix 3.14 contains the response from U.S. Fish and Wildlife Service concerning the withdrawal renewal and Federally listed species. Based on the project description and the fact that no new Impact Areas are proposed, the U.S. Fish and Wildlife Service concluded that the land withdrawal renewal is not likely to adversely impact listed species (Sousa, pers. com. 1998).

The olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler are listed as State species of concern and have been found on the withdrawal lands.

The U.S. Forest Service lists the trumpeter swan and osprey as sensitive species. Trumpeter swans have not been found on Fort Wainwright Yukon Training Area but are known to nest on the Tanana Flats of Fort Wainwright and within Fort Greely West Training Area. Osprey have been identified on each post.

Preferred Alternative

At the present time, there are no management guidelines for protection of the plants listed as imperiled or rare by the Alaska Natural Heritage Program. Lack of protection could increase the likelihood that populations of these species on the withdrawal lands would be decreased or lost.

There are no known American peregrine falcon or osprey nest sites on the withdrawal lands, although habitat is available. These migratory species use forest habitats for nesting and foraging. Negative impacts to forest habitat could occur if U.S. Army Alaska removes forested areas to create Maneuver Areas.

Loss of large areas of hunting habitat would result in reduction of prey abundance (USFWS 1982). Fires from incendiary devices could also decrease the amount and suitability of nesting and foraging habitat, which could cause nesting failure and possibly negatively impact populations.

Trumpeter swans require wetland habitat for nesting and feeding. The military is required by Executive Order 11990-Protection of Wetlands, to take action to minimize destruction, loss, or degradation of wetlands. Loss of habitat for trumpeter swans would be minimal. Very little on-the-ground military operations occur on Fort Greely West Training Area, which minimizes possible negative effects to habitat.

U.S. Army Alaska is working with the Alaska Department of Fish and Game (ADF&G), conducting aerial surveys for trumpeter swans. This increases the capability of the State to manage this species.

Although the osprey is not a Federal or State listed species, the U.S. Forest Service has it listed as a sensitive species. U.S. Army Alaska conducted a raptor survey in 1998, attempting to identify nesting sites. Other surveys specifically designed to identify suitable habitat and locate nesting sites for birds of prey (raptors) have not been conducted in the past on the withdrawal lands.

Breeding Bird Surveys have shown that the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler use habitat on the withdrawn lands. No management practices have been initiated to protect their habitats and minimize disturbance during sensitive periods. Lack of habitat protection and management could have negative impacts on these species.

The swan, osprey, and four passerines are protected under the Migratory Bird Treaty Act (16 U.S.C. 703-721), (MBTA). The Act specifically addresses the "taking" of migratory birds. The definition of taking includes disturbance and habitat destruction.

Impacts from military activity would include noise disturbance. Noise disturbance from on-the-ground and aerial operations could cause temporary disturbance to foraging and nesting birds. Disturbance to American peregrine falcons would be minimal due to the U.S. Fish and Wildlife Service recommended protection measures that restrict human activity around nest sites. These include aerial and ground "off-limits" zones and minimizing activities during sensitive time periods. Protection measures also include restrictions on alteration of habitat within 15 miles of nest sites (USFWS 1982).

Without such protection measures, noise disturbance can cause negative behavior changes in raptors, waterfowl, and other birds. The Air Force (USAF 1995) summarized research findings on raptor and waterfowl responses to aircraft. Adult peregrines, startled by aircraft noise, stand in the nest, leaving the eggs or nestlings underfoot. This could result in the eggs being broken or the nestlings being kicked off the nest scrape (Ambrose 1992). If adults left the nest in response to noise disturbance, the eggs or young would be exposed to weather and predators (USAF 1995).

Low altitude military training operations can cause adult raptors to flush from the nest (White and Sherrod 1973). In one study, 53% of nesting red-tailed hawks flushed from the nest during low altitude helicopter overflights (Anderson, et al 1989), and nesting gyrfalcons flushed from aircraft overflights (Platt 1975).

Species of raptors and individual birds will react differently to noise. In several studies, raptors only had minor behavior changes or reactions of short-term duration (Lamp 1989, Ellis 1981). Productivity was not limited in any of the populations studied. However, in a study of gyrfalcon response to aircraft noise, there was a statistical significance in reoccupation of the nest sites. Gyrfalcons that were disturbed during nesting sought new nest sites, but 75% of the undisturbed nest areas were reoccupied (Platt 1975).

Different species of waterfowl react differently to aircraft noise, and during different periods such as staging, nesting, and molting. Trumpeter swans seem to be most vulnerable during the spring nesting and fall staging periods (Carson 1993). Aircraft noise can cause short-term stress in waterfowl, changes in feeding behavior, habitat dislocation, and possible lowered reproductive rates (Belanger and Bedard 1989, USAF 1995). Continued use of the withdrawal lands for aerial training could disturb waterfowl during sensitive periods.

Aircraft collisions with birds is a serious problem. The Air Force has created operational recommendations based on bird behaviors such as migratory patterns, flight corridors, and major flight times. By following these recommendations, Bird-Aircraft Strike Hazard (BASH) will be minimized.

Existing Mitigation

Surveys for threatened or endangered species are currently incorporated into other surveys.

Proposed Mitigation
If threatened or endangered species are found on the withdrawal lands, management guidelines will be written and implemented after consultation with the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game.

Cumulative Effects
All of the species discussed in this chapter use habitat on the withdrawal lands. Many of the species use forest habitat. Loss of forest habitat could occur from incendiary device fires. Loss of forest habitat could lead to lower nesting success rates and possibly lower population levels.

Noise has been shown to cause certain species of raptors to leave an area, abandon the nest, and/or leave the young for periods of time, making them susceptible to predators. Noise disturbance could cause lowered nesting success in certain species.

No Action Alternative
With the lack of military presence on the withdrawal lands, disturbances such as noise from military aircraft and vehicles, loss of habitat from bombing, and large fires from incendiary devices would cease. Aerial operations would decrease with the loss of bombing ranges, thus decreasing the bird-aircraft strikes.

Returning lands to State management could increase public use of these areas and increase disturbances to sensitive species due to recreational activities. These disturbances include increased off-road recreational vehicle use and increased use of the lands for hiking and hunting.

Disturbance to sensitive wildlife species and habitat would occur if mining, forestry, agriculture, and settlement activities were allowed. Loss of habitat could lead to lower reproductive success for some species and possibly lower population levels.

The State would be responsible for all surveying and monitoring of species on the withdrawal lands. The State would lose the use of military equipment and personnel for surveys. U.S. Army Alaska would no longer provide funding for wildlife studies and resource management.

4.15 FIRE MANAGEMENT

Wildland fire management and suppression on withdrawn lands is the responsibility of the Alaska Fire Service, Bureau of Land Management. The

Alaska Fire Service maintains responsibility through "Interagency Support Agreements" with U.S. Army Alaska (see Chapter 3.15).

Of the seven known causes of fire on Fort Wainwright Yukon Training Area and Fort Greely, incendiary devices are the major cause of fire on withdrawal lands with lightning being second. Other causes of fire are field burning, vehicle exhaust, recreation, trash burning, and warming fires. For a more detailed description of the fire history see Chapter 3.15.

Preferred Alternative

Fire incidents have not resulted in the withdrawal area being designated as non-attainment for air quality. Fires may result in sporadic disturbance of traffic, including temporary road closures and restrictions on aviation. Slight health risks may also be associated with fires.

Under the Preferred Alternative, the present management agreements and support services between U.S. Army Alaska and the Alaska Fire Service would continue. Some of the services include fire hazard reduction work, fire suppression, technical advice, and support services provided by Alaska Fire Service in exchange for use of buildings and lands, maintenance of buildings, utility costs, and provision of services such as on-site housing and food for fire personnel when working on fire projects on military lands.

The Preferred Alternative continues U.S. Army Alaska as the land manager for fire management. The land manager and Alaska Fire Service determine the fire protection status boundaries for the withdrawal lands. If the withdrawal lands are renewed, protection status would be based on military mission requirements and equipment placement. This includes the status of "Critical Fire Pprotection" for areas containing Air Force equipment.

It is possible that fires started on withdrawal lands could cross protection status boundaries into areas managed by the State, which could have a different protection status. However, fire information for the withdrawal lands shows that out of 95 incendiary device fires, only one has crossed onto State lands indicating that the probability of this occurrence is low. Fires originating on State lands could also cross onto military lands. If fires begin in Impact Areas the cost of suppression could increase because on-the-ground fire suppression in these areas is prohibited.

Lands with Modified, Full, or Critical protection could be altered from their intended use. This might decrease the environmental and economical value of lands and decrease the value of withdrawal lands for military purposes.

Existing Mitigation

U.S. Army Alaska, in cooperation with the Bureau of Land Management, Alaska Fire Service, have written Fire Management Plans for Fort Wainwright and Fort Greely. The plans will assess current fire hazards and list recommendations to reduce them. Firebreaks are currently maintained in high risk areas on the withdrawn lands. A fire-break exists on the northern boundary of Stuart Creek Impact Area on Fort Wainwright Yukon Training Area. On Fort Greely, firebreaks are maintained on the southern end of the Main Post, from the Richardson Highway to Jarvis Creek.

Fire hazard indices are imposed on Fort Greely so that military training involving incendiary devices is restricted during high fire hazard periods. Stuart Creek Impact Area does not have fire index use restrictions. Fort Wainwright Fire Department and Range Control management guidelines for the Impact Area allows continued year-round use.

Proposed Mitigation

Interservice Support Agreements will be maintained for the length of the withdrawal.

Cumulative Effects

The number of fires from incendiary devices will continue to be high on the Impact Areas, and in Maneuver Areas within Fort Greely East Training Area, resulting in varied successional stage vegetation. Information is not available on species diversity in the Impact Areas. It is difficult to predict cumulative effects without a history of vegetative cover, intensity of past fires, and their effect on plant species diversity.

No Action Alternative

If the withdrawal lands remained under the Bureau of Land Management, the Alaska Fire Service (AFS) would continue to have primary responsibility for fire detection and suppression. Through the Annual Operating Agreement, between the AFS and State of Alaska, Division Of Forestry (DOF), the DOF has agreed to provide detection and initial attack suppression services upon request, and subject to available forces, for Fort Greely West and East Training Areas which lie within the Division of Forestry Protection Area. The lands could eventually be returned to the State of Alaska and primary responsibility would be with DOF.

The "Interservice Support Agreements" between U.S. Army Alaska and the Alaska Fire Service (AFS) would have to be reviewed and necessary changes made. The AFS would no longer provide wildland fire suppression and other

services. The AFS could lose the right to use buildings and retain services from U.S. Army Alaska.

Under the Alaska Fire Management Plan, the AFS would remain the first responder agency for the Fort Wainwright Yukon Training Area and the Division of Forestry would remain the first responder for Fort Greely.

The military would no longer train on the withdrawal lands, which would eliminate fires caused by military activity. The main cause of fire would, in all probability become lightning strikes, thus the Division of Forestry would have to respond to fewer fires.

4.15.1 Prescribed Burns

U.S. Army Alaska and the AFS use prescribed burns to enhance wildlife habitat, create fire breaks, and increase or create military Maneuver Areas on the withdrawal lands.

Preferred Alternative

The Army would continue to work with the AFS to maintain fire breaks and conduct prescribed burns to prevent large, damaging fires, and enhance wildlife habitat. The Army and AFS use prescribed burns for personnel training and equipment testing. This would continue to provide a service to both agencies in fire preparedness.

Existing Mitigation

Prescribed burns are used as a management tool to prevent large, damaging fires. On Fort Wainwright Yukon Training Area, there are two high priority areas where prescribed burns are used: the area south of the Stuart Creek Impact Area firebreak, and the Small Arms Ranges. Fort Greely contains two areas: the area between the firebreaks south of the Main Post and the Small Arms Ranges.

U.S. Army Alaska and the Alaska Fire Service develop Prescribed Burn Plans for each prescribed burn. The burns are conducted to reduce fire hazard and improve wildlife habitat.

Proposed Mitigation

No additional mitigation is needed for prescribed burns.

Cumulative Effects

Changes in vegetation composition could occur in areas where prescribed fire is frequently used to reduce fire hazard. This could cause wildlife species to

leave these areas and be replaced by species adapted to early successional stage vegetation communities.

No Action Alternative

Under the No Action Alternative there would be fewer prescribed burns. Lands that are kept in early to mid-successional vegetation stages could return to late successional stages. U.S. Army Alaska and AFS training opportunities would be reduced.

4.16 PUBLIC ACCESS

Public access on the withdrawal lands is a significant issue with residents of Fairbanks, Delta Junction, and the surrounding communities. No public opinion surveys have been conducted to analyze public sentiment on use restrictions, difficulty in access, major uses, and area closures. Scoping for this Legislative Environmental Impact Statement showed that persons attending the meetings were concerned with recreational use and airspace access.

Preferred Alternative

U.S. Army Alaska would continue to use the withdrawal lands to fulfill its military mission. The Lakes Impact Area, Buffer Zones, Maneuver Areas, and Training Areas would be temporarily closed when necessary for military activities. The High Hazard Impact Areas, and the Texas and Washington Ranges would remain off-limits to the public. U.S. Army Alaska would continue to notify the public of closures through weekly bulletins, newspaper announcements, and upon entry onto the withdrawal lands.

On Fort Greely West Training Area, the lands between Meadows Road and the Impact Area would have restricted use. The Trans-Alaska pipeline system corridor on Fort Wainwright Yukon Training Area and Fort Greely West Training Area would remain closed to off-road recreational vehicles. All Federal, State, and military regulations for off-road vehicle use on the withdrawal lands would continue to be enforced.

Restricted access policies would not change for the Air Force Technical Applications Center.

All policies and procedures for civilian airspace access would continue. Civilian pilots should call the Special Use Airspace Information Service, a 24-hour service (1-800-758-8723 or 907-372-6913) provided by Eielson Air Force Base

Range Control to civilian pilots flying in and around Military Operations Areas and Restricted Areas in interior Alaska. The purpose of the service is to reduce the unaware interaction between civilian and military aircraft in the areas of concentrated joint use (civil/military) by exchanging real-time information about location and planned activities (USAF 1995).

U.S. Army Alaska and the Air Force cannot allow increased public use of airspace and flight corridors over the withdrawal lands based on military training schedules. The restrictions are emplaced for safety purposes and to ensure completion of military exercises.

Under the current Preferred Alternative, no changes in use restrictions for Military Operations Areas (MOAs) would occur without appropriate National Environmental Policy Act (NEPA) documentation. The U.S. Air Force Final Environmental Impact Statement (EIS) for Alaska Military Operations Areas (USAF 1995), describes Air Force flight operations over the withdrawn lands and discusses conflicts with, and impacts to, civilian air use. The withdrawal lands lie beneath only 1,284 square miles of the 60,780 square miles of airspace analyzed in the MOA EIS.

An increased use of Restricted Areas over the withdrawal lands by the military could decrease the availability of the airspace to civilian pilots (USAF 1995). The increased military use of Restricted Areas could minimally decrease public recreational opportunities and possibly limit economic growth for aerial tours and guide services using the withdrawn lands.

U.S. Army Alaska would continue to provide the public with access to unrestricted areas. General access procedures would not change, the public would be required to check in with the military police before entering and upon leaving the withdrawal lands. The public would have to comply with all applicable Federal, State, and Army regulations.

Public access and use of the withdrawal lands is based on military training needs and could decrease if military operations increase.

Existing Mitigation

Military regulations for public access on the withdrawal lands are enforced to provide public safety, protect vegetative communities, wildlife, and sensitive habitat.

The Air Force provides a service to the civil aviation community to increase safety in the Military Operations Areas and Restricted Areas above Fort

Wainwright and Fort Greely. The Special Use Airspace Information Service (SUAIS) (1-800-758-8723 or 907-372-6913) is a 24-hour service to assist civilian pilots planning flights through or around Military Operations Areas and Restricted Areas in interior Alaska. The SUAIS provides information on which MOAs are active, Army artillery firing, and known helicopter operations (USAF 1995).

Proposed Mitigation
U.S. Army Alaska will develop a public information packet and media strategy to inform the public of restricted access areas and areas open for public use. The information packet would contain a map identifying restricted and open areas, roads, authorized activities, restricted airspace, and information on airspace accessibility. U.S. Army Alaska will study the feasibility of establishing an internet website and telephone hotline to provide access information.

Cumulative Effects
Effects of the military's use of the withdrawal lands and restrictions to access are discussed under the Preferred Alternative. Without data to identify the amount of use the withdrawal lands receive, including airspace use, it is difficult to address cumulative effects. Recreation is one of the major reason the public wants access to the withdrawal lands. Cumulative effects in the Preferred Alternative on recreation are discussed in Chapter 4.17.

No Action Alternative
Increased public use would occur with the removal of access restrictions. From information gathered at scoping meetings, there would be an increase in public use for recreational activities such as hunting and snowmachining.

Civilian airspace access would increase with the loss of Training Areas to the Air Force and U.S. Army Alaska. The loss of Restricted Areas would allow easier, faster travel for civilians between communities, and to and from destinations within the withdrawn land boundaries. The increase in access could provide greater opportunity for aerial tours and guide services, and persons wanting flight access into the remote areas on the withdrawal lands.

4.17 RECREATION

Preferred Alternative
U.S. Army Alaska would continue to maintain areas on Fort Wainwright Yukon Training Area and Fort Greely for public recreational activities. Areas would be subject to temporary closures based on military activity and wildlife habitat management objectives.

Hunting, trapping, and fishing opportunities would continue, and the public would be required to obtain the necessary State licenses and hunting, trapping, and fishing (HTP) permit from U.S. Army Alaska. The public would be required to follow all applicable State and Federal regulations governing use of military lands for public recreation.

Trails on the withdrawal areas would remain open to recreational use. Off-road recreational vehicle (ORRV) use would be regulated by State, Federal, and military guidelines. Areas could be closed to ORRV use by U.S. Army Alaska resource officers for land rehabilitation and to prevent negative impacts to areas and/or wildlife.

Civilian pilots, guide services, and aerial tours would be allowed continued use of airspace. Restrictions could be emplaced based on safety and use for military activities.

The Beaver Creek-South Fork Area within the Fort Wainwright Yukon Training Area was designated as part of the Chena River State Recreation Area by the State legislature. However, the State action does not transfer title of the land nor is it supported by the military. This area would be retained by U.S. Army Alaska. This area is part of the Buffer Zone as well as tactical airspace (See Figure 2.f) for the Stuart Creek Impact Area and would be subject to closures based on military training. The public would continue to be allowed to recreate there during designated times, but it could not be developed as part of the Chena River State Recreation Area.

U.S. Army Alaska would continue to work with Federal and State agencies to develop a watchable wildlife program and contribute to ecotourism through special projects.

Existing Mitigation
Federal, State, and military regulations govern recreational use of withdrawn lands; such regulations recognize environmental needs.

Proposed Mitigation
Recreational use of stocked lakes on the withdrawal lands will be monitored to determine its impact to the vegetation and shoreline surrounding the lakes.

Cumulative Effects
If the military increases restrictions on public access, it could reduce recreational opportunities and impact guide services.

No Action Alternative

The public would not be subjected to area closures and use restrictions emplaced by the military. Response during scoping meetings for this Legislative Environmental Impact Statement showed that use of trails on Fort Greely by snowmachiners would increase under the No Action Alternative.

Recreationists currently use the Winter (Valdez) Trail (see Figure 3.16.b) for snowmachining and dog sledding. The trail runs from the Blair Lakes Training Area on the Fort Wainwright to Fort Greely West Training Area, entering in the northwest corner. The trail provides access to Koole Lake. Winter Trail extends through the Oklahoma/Delta Creek Impact Area into the northern portion of the West Training Area and crosses onto State land. Efforts are currently underway to connect Alaska to the Trans-Canada Trail. The Winter Trail is one of the systems proposed for inclusion. If the State of Alaska obtains the withdrawn lands it would increase the opportunity for this trail to connect with the Canada Trail system (Heidorn, pers. com. 1997).

If the Alaska Department of Natural Resources acquires the Beaver Creek-South Fork Area, it will be developed for recreational purposes.

The Alaska Department of Fish and Game would continue to manage wildlife on the formerly withdrawal lands. Fewer wildlife surveys would be conducted without assistance from the military.

4.18 CULTURAL RESOURCES

Neither alternative would affect known Native Alaskan sacred sites, funerary sites, or artifacts of Native Alaskan cultural patrimony on lands proposed for withdrawal.

Preferred Alternative

The Preferred Alternative, to renew the withdrawal for 50 years, would require the Army to implement the Integrated Cultural Resources Management Plan (ICRMP) (Alaska State Historic Preservation Office 1998a,b) on withdrawal lands of Fort Wainwright and Fort Greely. This would have long-term, positive effects on archeological sites. The U.S. Army Alaska cultural resources management program would provide for inventory, evaluation, and protection of archeological sites in accordance with sections 106 and 110 of the National Historic Preservation Act of 1966, as amended (NHPA); U.S. Army Regulation 200-4, Cultural Resources Management; the Archaeological Resources Protection Act of 1979; and other pertinent Federal laws and regulations.

The Alaska State Historic Preservation Office has been contacted regarding potential impacts of the Proposed Action on cultural resources and possible compliance requirements per Section 106 of the National Historic Preservation Act. The Preferred Alternative would continue the existing management practices on the withdrawal lands, therefore the State concluded that this action is not an undertaking for Section 106 purposes. The State's response letter is located in Appendix 3.18.B.

Existing Mitigation
The U.S. Army Alaska (USARAK) cultural resources management program provides for the inventory, evaluation, and protection of archeological sites on USARAK lands.

Proposed Mitigation
No additional mitigative measures are recommended for cultural resources.

No Action Alternative

Effects on cultural resources would depend on whether lands remained the property of Bureau of Land Management (BLM) or were conveyed to the State of Alaska. Management by BLM would not adversely affect cultural resources. BLM is currently a partner in the cultural resources management on Fort Wainwright and Fort Greely and maintains a full-time cultural resources staff. As a Federal agency, BLM would continue to manage former withdrawal lands in accordance with sections 106 and 110 of the National Historical Preservation Act and other laws and regulations pertaining to cultural resources management by Federal agencies. However, the Army would not be required to implement the Integrated Cultural Resources Management Plan. Management responsibilities would transfer to BLM.

Management by the State of Alaska, Department of Natural Resources could indirectly result in negative effects to archeological sites. As property of the State, archeological sites on former withdrawal lands would be protected under the Alaska Historic Preservation Act of 1971. Section 41.35.070 of the Act generally stipulates review by the Department of Natural Resources, of all State-supported undertakings impacting archeological sites (Alaska State Historic Preservation Office 1998a). Because there are no implementing regulations, this clause is often ineffective (Sackett, pers. com. 1998). Therefore, former withdrawal lands would be more susceptible to development and recreational uses that could adversely impact archeological sites under State management.

4.19 SOCIOECONOMICS

Preferred Alternative

The land withdrawal renewal enhances national defense preparedness. International events dictate changes in military missions. These changes cause fluctuations in employment, income, schools, and other socioeconomic measures. The positive economic effects of the military in interior Alaska would continue with renewal of the withdrawals for 50 years. No adverse impacts are expected if the withdrawals are renewed. Socioeconomic data would be expected to fluctuate at current levels while the land is withdrawn.

The most likely consequence of renewal is continued restrictions on access to military lands. This is a serious social and economic consequence for recreational users of military lands. Recreational use is greater than that reflected in permits issued by the military. It is difficult to estimate non-permitted use of these lands. Popular activities include snowmachining, boating, dog sledding, flying, and off-road recreational vehicle use.

Existing Mitigation

No mitigative measures exist regarding socioeconomics.

Proposed Mitigation

No mitigative measures are recommended for impacts to socioeconomics.

No Action Alternative

Under the No Action Alternative, nonrenewal of the land withdrawal would occur. The withdrawal areas constitute two of the three major military training areas in interior Alaska. The Tanana Flats Training Area would be the only area available for Army and Air Force use. Extremely limited aspects of Army and Air Force missions in Alaska could continue if the withdrawal renewal lands are not available for military use. Non-renewal could substantially alter the ability to meet mission requirements in Alaska. Essentially, nonrenewal could precipitate closure of the installations and realignment of personnel and force structure.

The loss of the Yukon Training Area and Fort Greely would have a major impact on the ability of the Army to conduct land maneuvers. The Yukon Training Area and Fort Greely East Training Area are capable of supporting year-round maneuvering while the Tanana Flats is only capable of supporting maneuvers during the winter months. Loss of these training areas could lead to relocation of Fort Wainwright soldiers and would result in a significant loss of revenue for the Fairbanks area.

The loss of the Stuart Creek and Oklahoma/Delta Creek Impact Areas would have a major impact on routine and Major Flying Exercises conducted by the Air Force in interior Alaska. The loss of the Impact Areas would cause a major military forces restructuring by the Department of Defense. Air Force personnel would not be sent to Alaska to train and could not be sent to other bases because these facilities and ranges are at operating capacity. Obtaining available land and establishing new tactical bombing ranges comparable to Stuart Creek and Oklahoma/Delta Creek Impact Areas would not be feasible due to the cost.

The current realignment of Fort Greely's Main Post area serves as an example for the consequences of nonrenewal of these lands. Military and civilian positions accounted for half the direct employment in the Delta area before Fort Greely was selected for realignment.

There are approximately 50 to 60 Department of Defense jobs planned for Fort Greely after Base Realignment and Closure, 1995. These positions are contingent upon withdrawal renewal. Thus, these positions would be eliminated without renewal and other area jobs would be lost in the trade and service sectors as a consequence.

Decontamination expenditures are funded by Congress. It is estimated that the total cost to decontaminate the Impact Areas on the withdrawal properties is approximately $248.9 million (See Chapter 2.1.3.5). Additional studies are needed to accurately evaluate the quantity and type of contaminants. Funding to decontaminate the withdrawal lands would have to be appropriated by Congress.

Currently, the Fairbanks North Star Borough (FNSB) government receives Payment in Lieu of Taxes (PILT) from the Federal government of approximately $300,000 for all military lands within the Borough. There are approximately one million acres of military land in the Borough; this amounts to roughly 30 cents per acre.

Employment and Multiplier Effects

Since approximately one quarter of the employment, and nearly 30% of the payroll of the FNSB relies on the military, a closure or major downsizing would clearly have significant effects on the local economy. Together, the Army and Air Force missions account for nearly 50% of the local economy once multiplier effects are introduced.

A survey of Fort Wainwright personnel was taken in 1998 to assist in determining the effects of the nonrenewal (Appendix 3.19.C). It was determined

that 69% of local personnel expenditures are off-post rather than on-post (Table 4.19.a). The effect of nonrenewal on the FNSB economy would be substantial. In total, personnel spend approximately $61 million off-post in the FNSB economy. The primary effects would be in wholesale and retail trade, service sector, and finance insurance and real estate.

Table 4.19.a Expenditures by Personnel and Their Families in 1997.

	On-Post Expenditures	**Off-Post Expenditures**		
	TFE_{nd}	**TFE_{dm}**	**TFE_{nd}**	**TFE_{dm}**
Average	$5,278.60	$872.00	$7,027.67	6,215.28
Minimum	$0.00	$0.00	$0.00	$0.00
Maximum	$26,620.00	$16,355.00	$41,640.00	$54,808.00
Standard Deviation	$4,784.00	$2,428.39	$9,501.20	$10,869.64

Note: Off-Post refers to goods and services purchased by the respondent (and his or her family) in the North Star Borough.
TFE=Total Family Expenditures
$_{nd}$=non-durable goods
$_{dm}$=durable goods; miscellaneous goods and services

Nonrenewal of Fort Wainwright Yukon Training Area and Fort Greely could result in a maximum loss of around ten thousand uniformed personnel and their dependents; approximately 12% of the local population. Civilian employees and their dependents represent a maximum population loss of another 6%-8%. Taken together with multiplier effects, the maximum population loss would be around one-third of the current population.

Schools

In the 1997-98 school year, there were 4,377 students that were dependents of military personnel in the FNSB School District; 2,593 attended on-post, while 1,784 attended schools off-post (Stayrook, pers. com. 1998). This is approximately 27% of the Fairbanks school district total. The number of students that are dependents of civilian employees on-post is not tallied by the school district. Given that there are over 2,200 civilian positions on Fort Wainwright and Eielson Air Force Base, well over one-third of the school district population is directly associated with the military activity in interior Alaska.

The effect on schools would thus be relatively greater, and could approach half the school population when multiplier effects are included. This has an atypical economic effect on communities in Alaska. Because State oil revenues, not local tax revenues, pay for most of the educational costs in Alaska, public school education is considered a "primary" or "economic base" industry (Fried and Windisch-Cole 1998). For the FNSB, the local contribution is only about 26% of the local school budget, which totals approximately $115 million. The loss in school attendance would reduce both State and Federal funding, currently around $80 million.

Tourism

The survey of base personnel indicates the immediate effect of a nonrenewal would be a substantial loss of tourism. Approximately 40% of base personnel surveyed had visitors in 1997. Total visitor days accounted for by base personnel may be as high as 40,000. Nonrenewal would cause a substantial decrease in this source of tourism.

There are specific gains to the tourism and recreation industries in the event of nonrenewal. Dog sledding, snowmachining, airboating, flightseeing, and other recreational activities are on the increase. They would only be expected to increase if the withdrawal lands are not renewed for military use.

The highest values are associated with the lands closest to Fairbanks, which do not require vehicle trailering to access. For 30 years, airboat traffic from Fairbanks has travelled up the Delta River as far as Tangle Lakes (Redfern, pers. com. 1998) The Little Delta River and Delta Creek are used by jet boaters and airboaters. They are accessed from the Salcha River.

The Fort Greely area is becoming a more important snowmachining area, accessed from the pipeline river-crossing on the Tanana River and from the Harding Lake area (Heidorn, pers. com. 1998). Hunting, fishing, trapping, and other personal use opportunities for local residents would likely increase.

Mineral Resources

Portions of the Tanana River drainage are part of the Mid-Tanana Basin of the Tanana-Kuskokwim Lowlands, which has long been thought to hold deposits of oil or gas (USGS 1975). The Mid-Tanana Basin underlies portions of the Fort Greely West and East Training Areas (Alaska Dept. Of Natural Resources website 1998)). There has been no development for oil or gas in interior Alaska historically. Interior Alaska is still remote and the exploration and development costs are relatively high. The costs have decreased significantly as the economic base has increased and infrastructure has been developed.

Some exploratory work has been done in the Copper River Basin adjacent to Lake Louise. The State has indicated two companies are interested in development. A proposed lease sale is being formulated over the next 18 months by the State Division of Oil and Gas (Fairbanks Daily News-Miner June 24, 1998).

Exploratory work for oil and gas has not been done on the military lands. But the potential for natural oil and gas exists. It is sheer speculation to estimate the value of hydrocarbons on these lands. The presence of natural gas seeps provides good potential for commercial natural gas production in the Mid-Tanana Basin, where structure affords potential accumulation (Burglin, pers. com. 1998).

Placer mining has occurred in the past on the withdrawal lands and would be expected to occur if the lands were relinquished. The historical placer mines were not large, and a few small operations could probably be supported in the Beaver Creek drainage on the Fort Wainwright Yukon Training Area as well as the southern portion of the Fort Greely West Training Area. With the recent developments in hard rock technology, some hard rock development adjacent to former placer activity would be expected.

Agriculture

The economics of agriculture would be improved marginally if the nonrenewal resulted in less expensive private land. However, it is highly doubtful that agriculture will become a viable industry in Alaska.

The State is presently harvesting only 6%-10% of the allowable harvest in interior Alaska (Mackey, pers. com. 1998). It is doubtful that under State management a substantial timber industry would develop on the withdrawal lands. Neither area appears to have large acreages of high timber value. Privatization of the land would have to occur with only the potential for a modest timber industry. A sustained yield of over 1.5 million board feet a day is possible on lands south of the Tanana across from Birch Lake (Claudis, pers. com. 1998.)

Guiding Industry

No change from existing conditions is expected under the Preferred Alternative.

4.20 SUBSISTENCE

The proposed action does not change access for subsistence use from what has occurred during almost 50 years of military use. Approximately 9% of the withdrawn lands are permanently closed to subsistence use due to Impact Area hazards.

Fort Wainwright Yukon Training Area

Neither alternative would affect subsistence practices on proposed withdrawal areas of Fort Wainwright since subsistence taking of fish and wildlife is minimal, if it occurs, on the Fort Wainwright Yukon Training Area. Increased access opportunities that could result from the No Action Alternative would not significantly increase subsistence use of these lands (see Appendix 3.20).

Preferred Alternative

Fort Greely West and East Training Areas

The Preferred Alternative may affect subsistence use of portions of the proposed withdrawal lands of Fort Greely, but this effect would not be significant (see Appendix 3.20). Some lands are less accessible than would be the case under the No Action Alternative. Military activities may affect some game species' behavior to make them more or less available to subsistence users.

Residents of Delta Junction, Healy Lake, Big Delta, Dry Creek, and Dot Lake would continue to have access to Fort Greely for hunting, trapping, and fishing. As is currently the case, seasons for non-Federal subsistence would be determined by the Alaska Department of Fish and Game (ADF&G), and access to withdrawal areas would be regulated by the Army to minimize significant disruption to the military mission or undue exposure to human safety hazards created by military operations. Currently, there is no established subsistence-user preference under State of Alaska regulations in the take of fish and wildlife on Fort Greely.

In 1986, the Bureau of Land Management (BLM) determined the renewal of military use of the lands did not significantly impact subsistence use of these lands (see Appendix 3.20). Based on the number of access permits issued for the withdrawal lands, the public comments received during scoping and review of the Draft LEIS, and the determinations made by the BLM in 1986, there is no significant impact to subsistence use under the Preferred Alternative.

Existing Mitigation

The Sikes Act requires military lands be made available for nonmilitary uses. Access to the withdrawn lands is permitted by the Army when it does not impact military training nor is a hazard to public safety.

Proposed Mitigation

No additional mitigative measures are recommended for impacts to subsistence.

No Action Alternative

A decision not to withdraw proposed lands may result in indirect, positive effects on subsistence uses since access for hunting, trapping, and fishing would improve in the absence of military mission constraints. Reversion of former withdrawal lands to Bureau of Land Management or transfer of the property to the State of Alaska would continue responsible management of game species. However, without the withdrawal renewal, the Integrated Natural Resources Management Plans would not be implemented. This could lead to decreased funding and less management of fish and wildlife on former withdrawal lands. Because seasons are determined by Alaska Department of Fish and Game on the basis of population health, it is unlikely that areas currently closed to the taking of wildlife would open. Likewise, it is unlikely that bag limits established for open areas would change.

Transfer of former withdrawal lands to the State of Alaska would improve access for hunting, trapping, and fishing to some degree. Many lands are already open to hunting, fishing, and trapping when military operations or safety hazards do not conflict. The effects of some additional subsistence opportunities are likely not to be significant, based on current subsistence use of withdrawn lands and "No Significant" determinations for the previous withdrawal renewals (see Appendix 3.20). Only approximately 75,000 acres (9%) are permanently closed due to Impact Area hazards. Fishing, in particular, would not be significantly impacted since almost all quality fishing lakes are open virtually year-round.

4.20.1 Section 810(a): Finding for the Preferred Alternative

Section 810(a) of Alaska National Interest Lands Conservation Act (ANILCA) requires an evaluation of the effects of this withdrawal action on subsistence use. Chapters 3.20 and 4.20 of this LEIS serve as the evaluation under ANILCA. If the proposed action would significantly restrict subsistence uses, then the Federal government is required to provide notice and hearing.

The Preferred Alternative would result in no significant adverse effects on the customary or traditional subsistence uses of withdrawal lands on Fort Wainwright and Fort Greely based on the number of access permits issued, the public comments received for this LEIS, and the non-significant impact determinations made by the Bureau of Land Management in 1986 for the prior withdrawal renewal (see Appendix 3.20).

4.21 ENVIRONMENTAL JUSTICE

Preferred Alternative

Under the Preferred Alternative, there would be no disproportionately high and adverse human health or environmental effects on minority and low-income populations. Effects of the military's continued use of the withdrawal lands would impact the entire population of the Fort Wainwright and Fort Greely areas. Minority and low-income populations would be affected to the same extent as the general population.

The withdrawal renewals would not disproportionately affect children through environmental health or safety risks. Renewal of the withdrawn lands for military use would affect children to the same extent as the general population.

Existing Mitigation

No mitigative measures exist regarding environmental justice.

Proposed Mitigation

No mitigation is needed for environmental justice impacts.

No Action Alternative

Under the No Action Alternative, there would be no disproportionately high and adverse environmental effects to human health on minority and low-income populations. Nonrenewal of the withdrawn lands would affect minority and low-income populations to the same extent as the general population.

Relinquishing the withdrawal renewal lands from military use would not disproportionately affect children through environmental health or safety risks. Nonrenewal of the withdrawn lands would affect children to the same extent as the general population.

4.22 NOISE

Preferred Alternative

Noise impacts from the military would continue under the Preferred Alternative as has occurred on the withdrawal lands over the past 50 years. Subsonic aircraft flights are the dominant military noise source (subsonic flights occur at speeds below the speed of sound level and do not produce sonic booms). Except for the Target Areas, all of Fort Wainwright Yukon Training Area and Fort Greely fit within Zone I noise level for A-weighted sound (Table 3.22.b). In the

vicinity of the Impact Areas, sound levels reach the Zone II level with greater probability for annoyance. Since all Impact Areas are off-limits to personnel due to unexploded ordnance, noise levels from Impact Areas would not affect people or land use.

The most common military-generated noise is by Air Force jet aircraft utilizing the Stuart Creek Impact Area and the Oklahoma/Delta Creek Impact Area. The Air Force jets conduct air-to-ground training at subsonic speeds. For routine, daily training operations, the maximum A-weighted day-night level (ADNL) is 60 to 63 dBA (USAF 1995). This sound level occurs adjacent to the target areas. Two to three miles from the target area the sound levels decrease to 55 dBA.

Noise complaints received by the Air Force for jet aircraft in the vicinity of the Yukon Training Area and Fort Greely average 24 complaints per year (Gifford 1998). The noise is usually from low flying aircraft entering or exiting an Impact Area.

During major training exercises, the ADNL increase from 62 to 65 dBA and drops to 55 dBA outside of the immediate target area. Thus, the majority of the Fort Wainwright Yukon Training Area and Fort Greely has a sound level of 55 dBA.

Impulse noise or C-weighted sound levels in the military environment are typically caused by artillery fire, sonic booms, and explosions. Noise zone levels were computed using military impulse noise activities for 1997 (U.S. Army Center for Health Promotion and Preventive Medicine 1998). Zone II and III noise limits do not leave the military boundaries for impulse noise. Figure 4.22.a shows the limits for Zone II and Zone III noise levels with noise contours. The noise zones II and III center in the Impact Areas and the Firing Points.

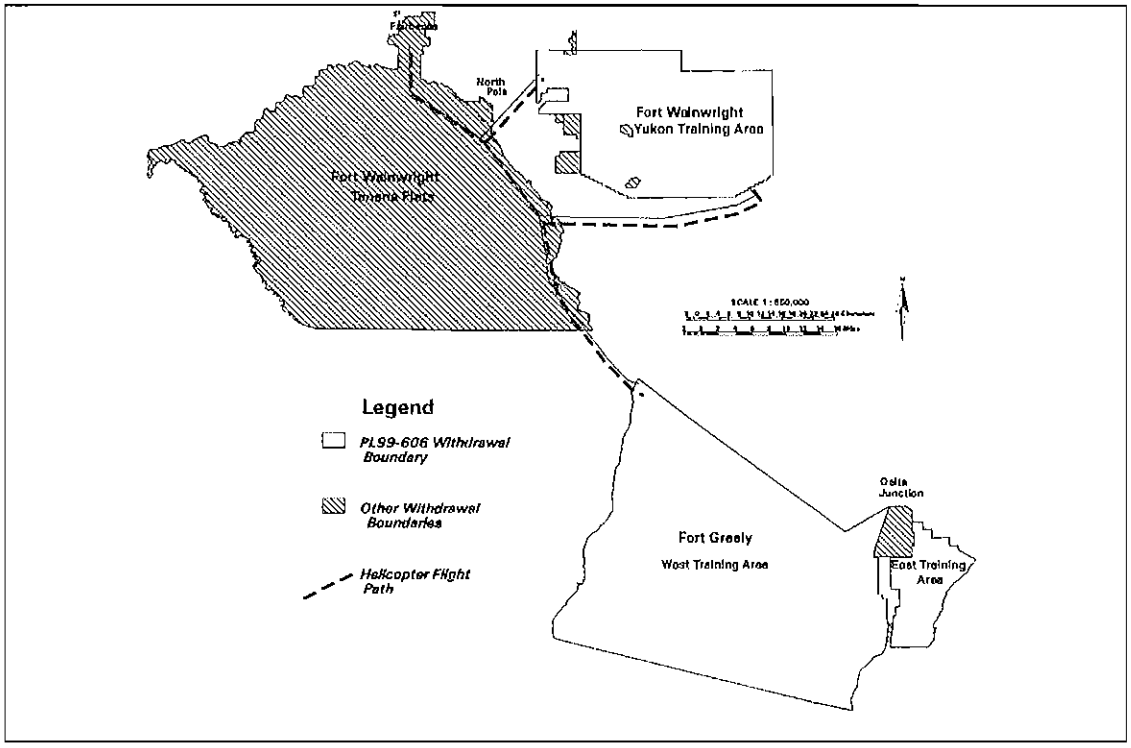
C-weighted and small arms sound levels have not been calculated for Fort Wainwright and Fort Greely. Few noise complaints have been received for artillery, explosions, or small arms firing. Most noise complaints have been from helicopter overflights while traveling from the Fort Wainwright Airfield to the Fort Wainwright Yukon Training Area or Fort Greely. As Army use shifts from the relatively loud UH-1 "Huey" helicopter to the quieter UH-60 Blackhawk helicopter, noise complaints are expected to decrease (Zeman, pers. com. 1998).

Most noise complaints received by the Army in the Fort Wainwright Yukon Training Area and Fort Greely areas have been from the overflight of helicopters near the Salcha River, which is south of the Fort Wainwright Yukon Training Area. The low human population density allows for helicopter pilots to normally

select routes away from human habitation (Douglas, pers. com. 1998, Hand, pers. com. 1998). Figure 4.22.b shows the military training routes that helicopters use to access the Training Areas.

Helicopter noise along military training routes would contribute to existing highway and rural noise. Currently, routine helicopter training flights average two round trip flights each week.

Figure 4.22.b Military Helicopter Flight Paths (Zeman 1998).



Existing Mitigation

Limited hours of firing demolitions, field artillery, and mortars is 6 a.m. to 10 p.m. The public is notified of exceptions to firing hours by the Public Affairs Office through publication of a Notice of Firing.

Aircraft are required to maintain a minimum flight altitude of at least 1,500 feet above ground level (AGL) over the Chena River Recreation Area from 1 May through 30 September.

The Air Force Final Environmental Impact Statement - Alaska Military Operations Areas (MOAs), Record of Decision (1997), lists the measures designed to

mitigate the noise-derived adverse impacts identified in the analysis for the EIS. Please refer to the Record of Decision for specific mitigation.

Air Force mitigation relevant to the withdrawal lands are changes in the Fox, Birch and Clear Creek MOA. The Fox MOA boundary was modified to avoid noise impacts to the Delta River and Gulkana National Wild and Scenic Rivers, Tangle Lakes area and Richardson Highway. Noise impacts were further reduced by raising the minimum altitude to 5000 feet above ground level.

Noise impacts were significantly reduced around the Salcha and Harding Lakes area by modifying the Birch MOA boundaries and eliminating the Clear Creek MOA.

The Air Force provides a 24-hour feedback line at 1-800-538-6647 to collect comments or complaints regarding noise.

Proposed Mitigation
A review of noise impacts to key species such as caribou and bison will be conducted and a management plan written that lists protection requirements.

No Action Alternative
Noise impacts from military operations would cease.

4.23 EXISTING AND PROPOSED MITIGATION

4.23.1 Existing Mitigation
The following programs have been implemented by U.S. Army Alaska (USARAK) at Fort Wainwright and Fort Greely. The Army will continue these programs for the duration of the withdrawal renewal to provide mitigation for achieving the military's mission while offering environmental protection.

Several programs and regulations exist which provide mitigative measures for soils, permafrost, surface water, and wetlands. The following summaries define existing mitigation for these resources.

Training exercises conducted on Alaska military lands are regulated by USARAK Range Regulation (AR) 350-2. This regulation outlines procedures for planning, scheduling, and operating ranges and training areas, and identifies environmental requirements. All actions undertaken by the Army are required to consider their impact to the surrounding environment and to take precautions to minimize impact. These include the refilling and leveling of any foxholes, trench

systems, tank traps, hull-down positions, or explosive excavations; conducting vehicular stream crossings in designated areas only; limiting cross-country vehicular travel to established roads and dry trails during spring thaw; and avoiding cross-country movement in creek bottoms, marshes, and moist tundra areas during summer months.

Damage control steps are also included within individual training plans to minimize natural resources damage. These include the protection of known sensitive areas, repair of unavoidable maneuver damage, coordination and permitting of any ground disturbing activities, and scheduling of natural resources and hazardous material inspections of training areas to ensure regulation compliance.

To guide and regulate the actions of Army personnel using and managing training lands, the Army has developed the Integrated Training Area Management (ITAM) program. The goals of ITAM are to inventory and monitor, repair, maintain, and enhance training lands at Army training installations. The Land Condition-Trend Analysis (LCTA) program serves as the inventory and monitoring portion of ITAM. This program inventories land conditions and monitors vegetation trends on military installations. The data provide installation-wide summaries of land use, disturbance, plant cover, vegetation communities, tactical concealment, birds, and small mammals. (See Appendix 2.D).

An additional component of ITAM is the Land Rehabilitation and Maintenance (LRAM) program. This program repairs damaged areas and uses land construction technology, such as revegetation and erosion control, to minimize future damage to training lands. These efforts are designed to maintain quality military training lands and minimize long-term costs associated with land rehabilitation. (See Appendix 2.D).

Land Use. Land management for the withdrawal renewal lands will continue under the ITAM program and the Integrated Natural Resources Management Plans, which will be reviewed and updated every five years.

Air Quality. Unnecessary vehicle idling is restricted on Fort Wainwright and Fort Greely. Head bolt electrical outlets (HBOs) have been installed in most parking lots on post at Fort Wainwright to reduce "cold starts", which have been linked to increases in both carbon monoxide and unburned fuel emissions. They also decrease the amount of parked vehicles idling during extreme low temperatures, thus reducing the generation of ice fog. In addition, the installation of a bag-house on the exhaust stacks of the Fort Wainwright central power plant (located

on Main Post) to reduce coal particulate emissions has been planned (Griffin, pers. com. 1998).

Fort Wainwright participates in a motor vehicle emissions inspection and maintenance program with the Fairbanks North Star Borough, which is designed to reduce air pollution.

Terrain. No mitigative measures exist regarding terrain features.

Geology. No mitigative measures exist regarding geologic features.

Mineral Resources. No mitigative measures exist for mineral resources.

Soils. The ITAM program relies on soil surveys with an inventory of soil resources and evaluation of soil capabilities. The Natural Resources Conservation Service (NRCS) has been funded and has begun the process of completing soil surveys for Fort Wainwright Training Area and Fort Greely West and East Training Areas. These surveys will include the description, classification, and an inventory of soil properties. The establishment of the relationships between geomorphology, soils, permafrost, and vegetation unique to the withdrawal lands as a result of these surveys will also aid in monitoring and rehabilitation operations.

Permafrost. Procedures outlined in AR350-2 preventing surface disturbance, aid in the preservation of permafrost because of the close relationship between soil damage and permafrost degradation. Soil and vegetative data, once complete, will be used to evaluate permafrost areas.

Fort Wainwright and Fort Greely Integrated Natural Resources Management Plans are being developed with specific actions for management and use of permafrost areas.

Surface Water. Procedures outlined in AR350-2 decrease the incidence of soil erosion and subsequent sedimentation, thereby reducing the risk of degraded water quality.

The military must comply with all applicable State and Federal statutes involving water resources. The Alaska State Drinking Water Standards establish maximum contaminant levels and monitoring requirements for public water systems. The standards for each regulation are discussed in Appendix 3.8.D.

Groundwater. USARAK Regulation 200-4 outlines proper management of hazardous wastes, used oils, and other hazardous materials. It mandates specific policies for the management of these items, including storage and labeling requirements, proper handling, training requirements, pollution prevention, and transport and disposal requirements.

Spill Prevention Control and Countermeasure Plans exist for Fort Wainwright and Fort Greely. The plans document methods to prevent oil spills from reaching navigable waters and/or groundwater. They include spill prevention, discovery, and emergency notification procedures. Fort Wainwright and Fort Greely conduct "cradle to grave" management of hazardous materials. Records are maintained on anything that transpires over the "lifetime" of any hazardous material on the installation. Documentation is required for equipment inspections, tests, and repairs; personnel fuel handling and spill response training; reportable spills; corrective actions to prevent recurring spills; and investigations including soil, surface water, and/or groundwater.

Wetlands. A wetland planning-level survey was recently completed at Fort Wainwright Yukon Training Area, and a similar study is in progress at Fort Greely. A wetlands management and revegetation plan is funded and in progress for the withdrawal lands. Fort Wainwright and Fort Greely Integrated Natural Resources Management Plans are under final review by the Army and BLM with specific actions for management of wetland areas.

Wetlands use permits are obtained through the U.S. Army Corps of Engineers permitting process.

Vegetation. Vegetation mapping has been completed to identify ecosites on Fort Wainwright Yukon Training Area and is being conducted at Fort Greely as part of the Ecological Land Classification. The Ecological Land Classification will allow USARAK to manage lands on an ecosystem level.

Forest Management Plans for Fort Wainwright and Fort Greely are being prepared as part of the Integrated Natural Resources Management Plans.

Land Rehabilitation and Maintenance (LRAM) projects are part of the annual planning cycle. Rehabilitation projects are implemented to restore vegetation using USARAK staff, troop projects, and cooperative efforts with the soil and water conservation districts.

Wildlife. Habitat Management Plans are being completed as part of the Integrated Natural Resources Management Plans. The plans will identify

sensitive habitats and implement management to protect these areas. The plans will comply with Federal and State regulations on management of wildlife and habitats on military lands.

A habitat improvement project for ruffed grouse is being conducted on Fort Wainwright Yukon Training Area using prescribed burns in aspen groves.

Upon completion, the Integrated Natural Resources Management Plans will replace the Cooperative Agreement for Management of Fish and Wildlife Resources on Army lands in Alaska.

Surveys are being conducted to identify raptor habitats and locate nest sites on the withdrawal lands. If nests are located, necessary management requirements will be initiated to protect these areas. Surveys are also being conducted for neotropical birds, and small mammals. The surveys will include identification of threatened or endangered species. Breeding Bird Surveys are conducted on Fort Wainwright to assist State population studies.

A Bird Air Strike Hazard Program (BASH) has been implemented at Fort Wainwright and Fort Greely to minimize the risk of bird/aircraft strikes. For information on this program, see the U.S. Air Force Final Environmental Impact Statement, Alaska Military Operations Areas, Volume II (1995).

Fisheries. No mitigative measures exist for fish stocking.

Wild Fisheries. Current erosion control practices, water quality standards, and vegetation disturbance restrictions indirectly affect fish through protection of habitat.

Ice bridge construction permits list restrictions set by the Alaska Department of Fish and Game to protect fish populations. The restrictions minimize impacts to water flow, thus minimizing impacts to fish movement through the area.

Threatened or Endangered Species (State and Federal). Surveys for threatened or endangered species are incorporated into other surveys.

Fire Management. USARAK, in cooperation with the Bureau of Land Management Alaska Fire Service, have written Fire Management Plans for Fort Wainwright and Fort Greely. The plans assess current fire hazards and list recommendations to reduce them. Firebreaks are maintained in high risk areas on the withdrawal lands. A firebreak exists on the northern boundary of Stuart Creek Impact Area on Fort Wainwright Yukon Training Area. On Fort Greely,

firebreaks are maintained on the southern end of the Main Post, from the Richardson Highway to Jarvis Creek.

Fire hazard indices are imposed on Fort Greely so that military training involving incendiary devices is restricted during high fire hazard periods. Stuart Creek Impact Area does not have fire index use restrictions. Fort Wainwright Fire Department and Range Control management guidelines for the Stuart Creek Impact Area allows continuous year-round use.

Prescribed Burns. Prescribed burns are used as a management tool to reduce the incidence of large, damaging fires and improve wildlife habitat. On Fort Wainwright Yukon Training Area, prescribed burns are conducted on the area south of the Stuart Creek Impact Area firebreak, and on the Small Arms Ranges. On Fort Greely prescribed burns are conducted on the area between the firebreaks south of the Main Post and on the Small Arms Ranges. USARAK and the Alaska Fire Service develop Prescribed Burn Plans for each prescribed burn.

Public Access. Range bulletins provide information on area closures to the public. Military regulations are enforced to protect public safety, vegetative communities, wildlife, and sensitive habitat.

The Air Force provides a service to the civil aviation community to increase safety in the Military Operations Areas and Restricted Areas above Fort Wainwright and Fort Greely. The Special Use Airspace Information Service (SUAIS) (1-800-758-8723 or 907-372-6913) is a 24-hour service to assist civilian pilots planning flights through or around Military Operations Areas and Restricted Areas in interior Alaska. The SUAIS provides information on which MOAs are active, Army artillery firing, and known helicopter operations (USAF 1995).

Recreation. Federal, State, and military regulations govern recreational use of military lands; such regulations recognize environmental needs.

Recreational activities are monitored through the Integrated Natural Resources Management Plans.

Cultural Resources. The USARAK cultural resources management program provides for the inventory, evaluation, and protection of archeological sites on USARAK lands.

Socioeconomics. No mitigative measures exist regarding socioeconomics.

Subsistence. Access to the withdrawal lands is permitted by the Army for subsistence purposes when it does not conflict with military training nor is a hazard to public safety.

Environmental Justice. No mitigative measures exist regarding environmental justice.

Noise. Firing demolitions, field artillery, and mortars are limited to the hours of 6 a.m. to 10 p.m. The public is notified of exceptions to firing hours by the Public Affairs Office through publication of a Notice of Firing.

Aircraft are required to maintain a minimum flight altitude of at least 1,500 feet above ground level (AGL) over the Chena River Recreation Area from 1 May through September 30.

The U.S. Air Force Final Environmental Impact Statement - Alaska Military Operations Areas, Record of Decision (1997), lists the measures designed to mitigate the noise-derived adverse impacts identified in the analysis relevant to the withdrawal lands.

The U.S. Air Force provides a 24-hour public comment line at 1-800-538-6647 to collect comments or complaints regarding noise.

4.23.2 Proposed Mitigation

The following programs are proposed to be implemented by the Army at Fort Wainwright Yukon Training Area and Fort Greely with the renewal of the withdrawal lands for military use. These programs will provide additional mitigation for achieving the military's mission while offering more extensive environmental protection for the duration of the withdrawal renewal.

Pollution. The Army will implement a program to identify possible munitions contamination of withdrawal lands. This program will initiate the collection of baseline data to determine the location, extent, and potential migration of munitions contamination in soils, surface water, and groundwater. Based on these preliminary results, a long-term monitoring program will be developed to assess cumulative impacts to the withdrawal lands from on-going military activities. These results will identify areas in need of restoration, activities which pose the greatest environmental threat, and the potential mitigation measures to be implemented. Extensive and expedient investigations will be conducted in those areas considered exposure pathways, such as streams. A risk assessment will be completed to determine the relative danger of munitions contamination to the environment and surrounding human population.

Decontamination. A data collection system will be created to incorporate munitions expenditure reports, number of duds in an area, chemical components of munitions, and biohazards of each chemical. This information will be used in conjunction with the proposed pollution assessment program to identify impacts to the environment and human population. These measures will be implemented in addition to the Army's Range Facilities Management Support System (RFMSS).

In the event a range becomes inactive, the Department of Defense Range Rule will apply. The Range Rule addresses decontamination and remediation actions that must be implemented at deactivated ranges.

Land Use. No additional land use mitigation measures are recommended.

Air Quality. No additional air quality mitigation measures are recommended.

Terrain. No mitigative measures are recommended for terrain impacts.

Geology. No mitigative measures are recommended for impacts to geologic features.

Mineral Resources. No mitigative measures are recommended for impacts to mineral resources.

Soils. A program will be implemented to identify possible muntions contamination to soils of the withdrawal lands. This program is described in Chapter 4.23.2 Proposed Mitigation, Pollution.

Permafrost. A program will be implemented to identify possible muntions contamination to permafrost of the withdrawal lands. This program is described in Chapter 4.23.2 Proposed Mitigation, Pollution.

Surface Water. A water quality sampling program will be established for the withdrawal lands. The study effort will include an analysis of surface water bodies, with monitoring stations located directly upstream and downstream of the installations.

Groundwater. Existing groundwater data for the withdrawal lands will be organized and evaluated for completion of a more detailed groundwater quality assessment. Any future monitoring efforts will be based on these assessments. Once a sampling scheme is developed, monitoring for munitions by-products will be included.

Wetlands. Additional wetland mitigation will be determined by the U.S. Army Corps of Engineers through the permitting process for the Clean Water Act, Section 404.

Vegetation. A forest resources inventory will be conducted and results used to complete and implement the Forest Ecosystem Management Plans, which are part of the Integrated Natural Resources Management Plans.

Wildlife. Information from bird surveys on the withdrawal lands will be reviewed to identify habitat areas for neotropical migrants. Breeding Bird Surveys will continue on Fort Wainwright and be implemented on Fort Greely.

Fisheries. Fishing opportunities for the public will be maintained. Habitat for stocked fish will be improved.

Wild Fisheries. Fish habitat surveys will be conducted.

Threatened or Endangered Species (State and Federal). If threatened or endangered species are found on the withdrawal lands, management guidelines will be written and implemented after consultation with the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game.

Fire Management. Interservice Support Agreements will be maintained for the length of the withdrawal.

Prescribed Burns. No additional mitigation is needed for prescribed burns.

Public Access. U.S. Army Alaska will develop a public information packet and media strategy to assist the public in accessing the withdrawal lands. The information packet will contain a map identifying restricted and open areas, roads, authorized activities, restricted airspace, and information on airspace accessibility. The Army will also study the feasibility of establishing an internet website and telephone hotline to provide access information.

Recreation. Recreational use of stocked lakes on the withdrawal lands will be monitored to determine its impact to the vegetation and shoreline surrounding the lakes.

Cultural Resources. No additional mitigative measures are recommended for cultural resources.

Socioeconomics. No mitigative measures are recommended for impacts to socioeconomics.

Subsistence. No additional mitigative measures are recommended for impacts to subsistence.

Environmental Justice. No mitigation is needed for environmental justice impacts.

Noise. Determine noise impacts to key species, such as caribou and bison, and include protection requirements within a management plan.

Permit Number and Waterbody	Duration	Location	Project Description and Acreage	Special Provisions
Fort Wainwright Yukon Training Area				
4-910800, Moose Creek 10	2/6/92 - 1/31/95	Activity will occur on Fort Wainwright about 2.5 miles north of Moose Creek, and 4 miles southeast of Chena River, specifically section 12, T. 2 S., R. 3 E., Fairbanks Meridian, USGS Quad Fairbanks D-1.	Discharge of 7,500 cubic yards of gravel fill material into 1.8 acres of wetlands to construct an access road 3,900 feet long and 20 feet wide. The purpose of the discharge is to upgrade an existing dry weather/winter access trail, which connects the Husky Drop Zone to Transmitter Site Road.	Natural drainage patterns shall be maintained by culverts to prevent flooding or excessive drainage of adjacent wetlands. All disturbed and fill areas shall be stabilized to prevent erosion. Adjacent wetlands outside of the project area will not be encroached upon.
970660	1997	Activity will occur at Fort Wainwright.	Discharge of material into 0.03 acres of waters of the United States for the construction of a rifle range.	Unknown
4-970888, Stuart Creek 2	1/8/98-12/31/00	Activity will occur within the Yukon Training Area-Stuart Bombing Range between Stuart Creek and the south fork of the Chena River.	Discharge of approximately 120,100 cubic yards of gravel, rock, and soil into 24.3 acres of waters of the United States (wetlands), to improve and upgrade access to roads and target arrays; and the maintenance by mechanized landclearing (cultivation) of 36.2 acres on the existing mock airfield, within waters of the United States (wetlands). Work would consist of primary target roads (15,75 acres), secondary target roads (3.6 acres), target pads (3.67 acres), temporary equipment turnarounds (1.17 acres), temporary stockpile of fill material site (0.1 acres), and the maintenance of mock airfield by cultivation with a blade, disc harrow, or excavator to a depth of 6 inches (36.2 acres).	Natural drainage patterns shall be maintained by culverts to prevent flooding or excessive drainage of adjacent wetlands. All disturbed and fill areas shall be stabilized to prevent erosion. Adjacent wetlands outside of the project area will not be encroached upon.
Fort Greely West and East Training Areas				
890397	1989	Activity will occur at Fort Greely on less than one acre.	Cleanup of oil spill.	Unknown
D-920132, Bolio Lake	5/28/92 - ?	Activity will occur at Bolio Lake in sections 7, 8, 17, 18, and 19, T. 12 S., R. 10 E., Fairbanks Meridian at Fort Greely.	Conduct a road construction project to Bolio Lake including discharges of dredged and/or fill material into headwaters and isolated waters. The discharge will not cause the loss of greater than one acre of waters of the United States, including wetlands.	Natural drainage patterns shall be maintained by culverts to prevent flooding or excessive drainage of adjacent wetlands. All disturbed and fill areas shall be stabilized to prevent erosion. Adjacent wetlands outside of the project area will not be encroached upon.
9-930448, Jarvis Creek	6/23/93 - ?	Activity will occur at 12-mile Crossing, Jarvis Creek at Fort Greely.	Reconstruction of a ford crossing by placing fill in waters of the United States.	The proposed work will qualify for a wetlands permit exemption because clean fill material from a nearby gravel bar will be used and a road existed across Jarvis Creek at the 12-mile Crossing location prior to the passage of the Clean Water Act.
D-950283, Delta River	6/1/95-indefinite	Activity will occur along the eastern bank of the Delta River on the Fort Greely Military Installation within the Mississippi Impact Area near Observation Post 7A located in section 13, T. 12 S., R. 9 E., Fairbanks Meridian.	Discharge of 1333 cubic yards of fill material into 1.5 acres of waters of the United States (wetlands) to construct an earth berm to be used for equipment and personnel protection from possible black blast and explosion during missile launching.	After additional information was obtained from an on-site field inspection by the USACE, they determined that the proposed project area was not under regulatory jurisdiction. As a result, the berms constructed in the Delta River flood plain were left in place for future missile testing. However, any alteration of the method, scope, or location of the activity may require authorization.
4-950011, Jarvis Creek 3	7/5/95 - 5/31/98	Site 1: Activity will occur in Jarvis Creek off the east end of runway 24 of Allen Army Airfield and east of Ammunition Storage Point, in sections 1 and 12. Site 2: Activity will occur in an unnamed slough on the east side of the Delta River along Beales Range Road in section 10. Both sites are located in T. 11 S., R. 10 E., Fairbanks Meridian, Fort Greely, USGS Quad Mt. Hayes D-4.	Dredging of 1,500 cubic yards of gravel material from waters of the United States, including wetlands, for three consecutive years. At Site 1, approximately 1,000 cubic yards of gravel will be obtained from below the ordinary high water mark of Jarvis Creek. At Site 2, approximately 500 cubic feet will be obtained from below the ordinary high water mark of the unnamed slough adjacent to the Beales Range Road. The gravel and fill will be used for general road maintenance work through out the Fort Greely facility.	Gravel shall be removed only from unvegetated and exposed portions of the gravel bar to the existing water level. Any bank slopes disturbed by equipment shall be stabilized to prevent erosion. Stockpiling of usable materials shall not occur below the ordinary high water mark of streams.
4-960879, Delta River	10/28/96 - 10/31/97	Activity will occur along the Delta River approximately 9 miles south of Delta Junction.	Discharge of 3,760 cubic yards of gravel material below the ordinary high water mark of the Delta River into approximately 3.2 acres of waters of the United States to construct three diversion berms, excavate a diversion channel, and repair three existing roadway crossings. River flows are preventing access to the firing ranges, and excessive erosion could impact electrical power poles, causing interruption of electrical service to other military installations within or operated by Fort Greely.	The permittee must submit a plan addressing a proposed long-term solution to the flooding and erosion problems on later than 7/1/97.
D-970402	6/1/97 - ?	Activity will occur within wetlands on Fort Greely Military Installation along Meadows Road from the Texas Range Maintenance Facility south to OP-10A.	Construct an 18,000 foot long utility line to support military operations, of which 9,400 feet would cross waters of the United States (wetlands). The trench would be 8 inches wide by 36 inches deep. Material would be temporarily sidecast. The trench would be backfilled, and any excess material would be hauled to uplands. Approximately 0.3 acres would be temporarily impacted.	A plan must be implemented to avoid or minimize disturbance to wetland vegetation and to reestablish such vegetation when disturbance cannot be avoided.
D-970461, Delta Creek	6/18/97 - ?	Activity will occur within wetlands adjacent to Delta Creek on Fort Greely Military Installation located in section 15, T. 11 S., R. 5 E., Fairbanks Meridian.	Discharge of 92 cubic yards of fill material into 0.06 acres of waters of the United States (wetlands) to construct CALFAX Range which is necessary for soldier training in a simulated defended position.	Fill material will be clean sand and fine gravel. Stripping of the vegetated mat will not be authorized during construction or operation. Insulation and geotextile material will be placed below all site disturbances to protect permafrost. Supplies will be airlifted to the site.
M-920063, Delta Creek 1	12/24/97-12/31/00	Activity will occur within the Oklahoma Impact Area of the Fort Greely Military Installation, approximately 19 miles WSW of Delta Junction, AK located in sections 16, 21, and 28, T. 11 S., R. 7 E., Fairbanks Meridian.	Discharge of an undetermined amount of fill material into 25.5 acres of waters of the United States (wetlands), resulting from the mechanized land clearing by cultivation (with a blade or disc harrow to a depth of 6 inches) to construct and maintain a target array consisting of a mock runway, taxiway, and compound area for military pilot training purposes.	Seasonal aerial and/or ground surveys of migratory bird usage of the mock airfield must be performed. Access to and from the mock airfield site for maintenance and ordinance removal is restricted to primary routes. Off-trail activities will only be allowed at the site to retrieve ordinance.
4-970913, Tanana River 168	1/21/98 - 1/31/99	Activity will occur adjacent to or near a 110-mile corridor starting in the Tanana Flats Training Area (approximately 1 mile directly south of Fairbanks, Alaska, known as the Bonnefield Trails) via a land bridge corridor to Fort Greely combat training areas (Oklahoma Range, CALFEX Range, and to Donnelly Dome DZ).	Conduct mechanized land clearing of approximately 21 acres of waters of the United States (wetlands) and discharge approximately 17,000 cubic yards of fill material in wetlands. These discharges will be incidental to two winter military training exercises, Arctic Strike and Northern Edge, in construction of winter trails, tactical operation centers, and campsites by heavy equipment (bulldozers).	Natural drainage patterns shall be maintained by culverts to prevent flooding or excessive drainage of adjacent wetlands. All disturbed and fill areas shall be stabilized to prevent erosion. Adjacent wetlands outside of the project area will not be encroached upon.

Table 4.10.a

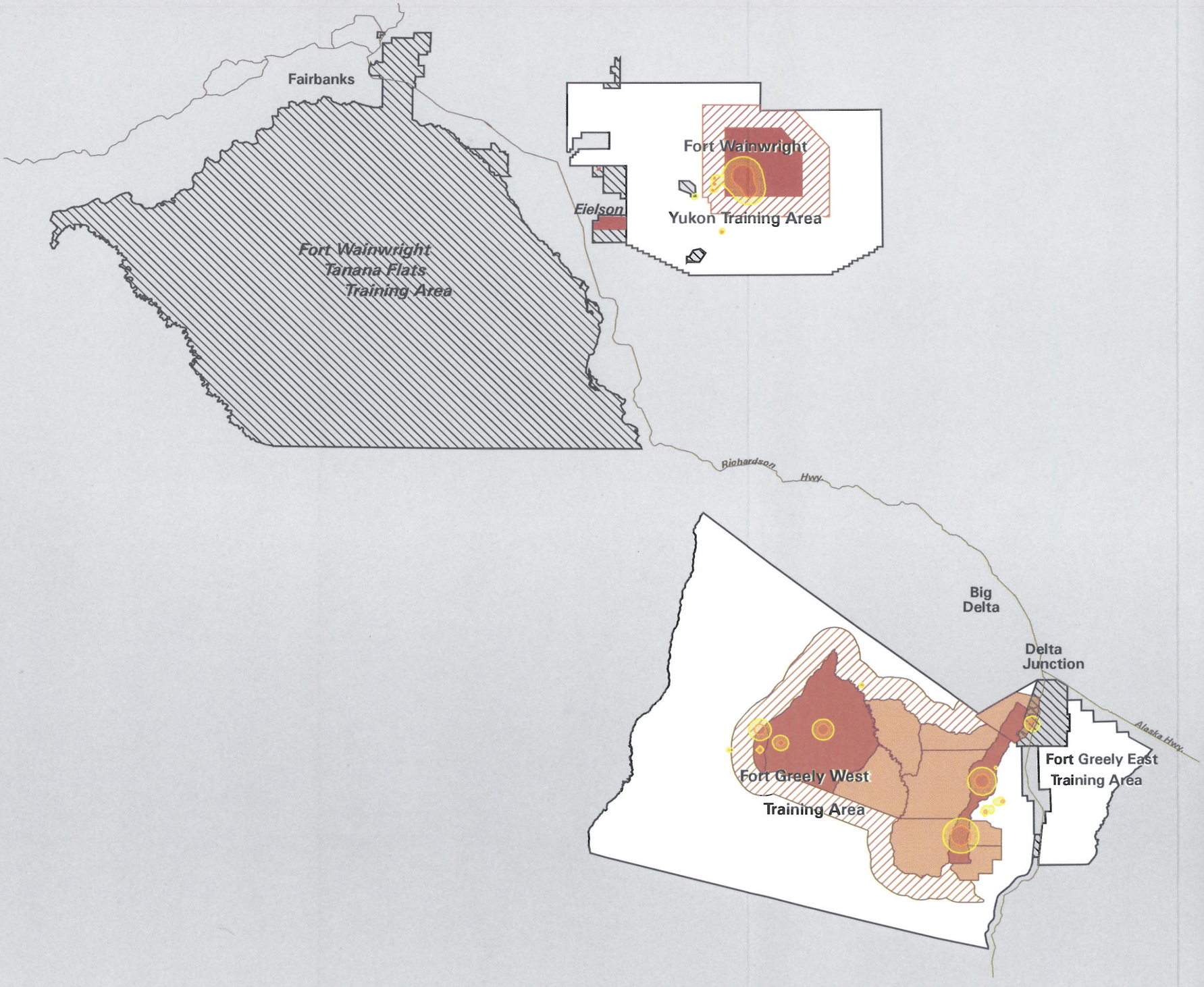
Wetland Permits Issued by U.S. Army Corps of Engineers, Alaska District on Withdrawal Lands

Source:
U.S. Army Corps of Engineers, Alaska District

Figure 4.22.a

Noise Zones

Fort Wainwright and Fort Greely



Legend

- *Noise Zone II*
- *Noise Zone III*
- *Dedicated Impact Area*
- *High Hazard Impact Area*
- *Impact Area Buffer Zone*
- *Road*
- *PL99-606 Withdrawal Boundary*
- *Other Military Withdrawal Boundaries*

SCALE 1 : 575,000

2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 Kilometers

2 0 2 4 6 8 10 12 14 16 18 Miles

N

Sources:
U.S. Army Center for Health Promotion and Preventive Medicine
Environmental Noise Program. Aberdeen Proving Grounds, MD.