APPENDIX F

ENVIRONMENTAL CONSEQUENCES

APPENDIX F

ENVIRONMENTAL CONSEQUENCES

Table of Contents

THIS PAGE INTENTIONALLY LEFT BLANK.

4.2 AIR QUALITY

Appendix Table 4.2.a Assumptions for MOBILE6 Modeling of Mobile Emissions During Travel.

1.	Total vehicle miles traveled on and off post is 50 miles during each full air or mock full air deployment.
2.	Total number of four annual full air deployments or mock full air deployment exercises utilizing all 1,006 vehicles is expected.
3.	A mid-winter deployment/exercise would represent the worst-case scenario for CO emissions accumulation due to inversion meteorological conditions.

Appendix Table 4.2.b Assumptions for Calculating Mobile Source Idling Emissions.

1.	The minimum number of 14 vehicles must be processed per hour to meet the 96-hour deadline for full deployment.
2.	An internal 72-hour deadline was used to achieve the 96-hour deadline for the SBCT final arrival time at their deployed location. This assumption allows for 24 hours of air travel to any given travel destination worldwide.
3.	In any given hour, the ratio of light duty diesel vehicles to heavy-duty diesel vehicles would be proportional to that vehicle class representation within the fleet. Therefore, nine of 14 vehicles processed in any one hour would be heavy-duty vehicles, while five would be in the light duty vehicle class.

Calculating Miles Impacted

The number of miles impacted by vehicles during maneuvers was calculated using the Maneuver Impact Miles (MIMs) presented in Chapter 2. Because MIMs are normalized to a tank, calculating the number of vehicle miles traveled (VMT) by the SBCT required that the MIM normalization process be reversed. Therefore, the normalization factors for the Stryker vehicle were applied to the MIM results to remove the normalization and calculate actual VMTs. This adjustment produced actual VMTs that were approximately 2.4 times greater than the MIMs.

In addition to VMT on unpaved areas, AP-42 also requires input values for various other parameters. Selection of parameter values was based on use of average conditions for the four training range areas. The AP-42 emission factor calculated for the ranges was equal to 4.564 lb/VMT.

Fugitive dust modeling

Appendix Table 4.2.c presents the assumptions used in calculating emissions for vehicular movement on unpaved areas.

Appendix Table 4.2.c Assumptions for Calculating Emissions from Maneuvers on Unpaved Roads.

1.	Vehicle impact factors for the Stryker vehicle presented in Section 2.2.3.3.3 were used to represent the entire brigade when calculating VMT.
2.	Silt content of road surface material was estimated to be 20 percent. This accounts for loss of silt material from the road surfaces as compared to surrounding native soils.
3.	Mean vehicle weight selected was 10.2 tons based on the USARAK vehicle mix presented in Table 2.2.3.4.2
4.	Emissions were not reduced by surface moisture in the AP-42 equation.
5.	The number of days since rain greater than 0.01 inch was selected as 104 based on the Climactic Atlas of the United States.
6.	Snow cover prevents emission of particulates between October 15 and May 14.

Fort Wainwright Emissions modeling for the Alert Holding Area

The assumptions used for calculating the air quality impact of idling emissions were as follows:

Appendix Table 4.2.d Assumptions for Calculating Mobile Source Idling Air Quality Impacts.

1.	Building dimensions for the Alert Holding Area are 165 meters by 61 meters with a total building height of 10 meters and a functional stack height of 13 meters.
2.	The vehicular emissions from the Alert Holding Area were modeled as a point source.
3.	The calculated exit velocity used in the model was 0.247 m/s. Stack exit velocity was calculated from a conservative flow rate provided by the Alaska Corps of Engineers (Mr. Ed Ambrose). The volume flow rate used in the model was 153 actual cubic feet per minute (ACFM).
4.	The stack gas exit temperature used in the model was 293 K. The ambient air temperature used was 249 K and 300 K for winter and summer conditions, respectively.
5.	All receptors were placed at ground level.
6.	An urban dispersion option was used to reflect the developed area of the Fort Wainwright cantonment area.
7.	The default, regulatory mixing height option and the regulatory anemometer height of 10.0 meters were used.
8.	Concentrations were modeled from 0 to 5,000 meters from the Alert Holding Area.
9.	The downwash option was selected.
10.	The full meteorology option was selected.

The ISCST3 is a USEPA approved and preferred, steady-state, straight-line Gaussian plume model, which may be used to calculate short and long-term pollutant concentrations from a wide variety of point, area, and volume sources. The ISCST3 requires hourly input of surface and upper air meteorological data. These data include the wind flow vector, wind speed, ambient temperature, stability category, and the mixing height. Modeling for fugitive dust releases was based on the use of the ISCST3 area source algorithms.

The USEPA's SCRAM bulletin board offers one or more years of surface meteorological data for various National Weather Service Stations across the United States. The most recent five years of surface data (1986, 1987, and 1989 through 1991) used for the FWA, Yukon Training Area, and the Donnelly subject areas were collected at the Fairbanks International Airport. The most recent five years of surface data (1987 through 1991) used for the Fort Richardson (FRA) subject area were collected at the Anchorage WSMO Airport. The surface and upper air meteorological data sets were processed with PCRAMMET (an EPA pre-processor) to combine the surface and mixing height data, interpolate hourly mixing heights from the twice-daily mixing heights, and calculate atmospheric stability class. Selected inputs consisted of USEPA default values and rural dispersion coefficients.

Visibility Modeling DTA

Fugitive dust emissions were allocated to emission grids within each range area. The size of the emission grids varied from a tight grid of 250 meters per side to a larger grid pattern of 1,000 meters per side. The number of total unpaved road miles in each area was determined using GIS, and the percentage of these miles that would be impacted by the proposed maneuvers was ascertained for each area. The total vehicle miles traveled (VMT) was allocated to each range proportional to the estimated MIMs in each area (Section 2). VMT were allocated to individual grids to reflect the activities taking place in each grid. For example, all emissions in the Donnelly Training Area (DTA) were allocated to the easternmost portion of the area. The increases in maneuver activity and VMT are expected to be mainly in the easternmost section of DTA where additional roads would be constructed. Similar evaluations in the areas of future activity were conducted for each training area. By allocating emissions to only a portion of the training areas, emissions are concentrated and the resulting calculated impacts would represent a worst-case condition. Appendix Table 4.2.e presents the total miles of unpaved roads and VMT in each training area.

Appendix Table 4.2.e Characteristics of Unpaved Roads in Training Areas.

Training Area	Miles of Unpaved Roads		Increase in Total Vehicle Miles Traveled	
	Total	Used for Future Maneuvers	Alternative 2	Alternative 3
Fort Wainwright Main Post	82	82	20,390	20,390
Yukon Training Area	395	158	98,170	98,170
Donnelly Training Area	505	125	197,100	197,100
Ft. Richardson	316	125	5,100	12,900

Level Two analysis was performed using all of the USEPA default values with the exception of the inputs provided below:

- Emission rates for particulates and nitrogen oxides;
- Distances between the emission source and (1) the observer, (2) the closest Class I boundary, and (3) the most distant Class I boundary;
- Meteorological conditions;
- Background visual range for the Class I area of interest.

The default values for particle size and density were used. The assessment targeted the Denali NP Class I Area since it was closest in proximity to both Forts Richardson and Wainwright installations and related training areas. Appendix Table 4.2.f provides the four Alaska Class I areas and the approximate distances between the training ranges and the nearest boundary of each listed Class I area:

Appendix Table 4.2.f Distance of Training Areas to the Nearest Class I Areas.

Class I Area[1]	Fort Wainwright	Yukon Training Area	Donnelly Training Area	Fort Richardson
Denali NP	127 km	131 km	150 km	140 km
Bering Sea NWA	920 km	1000 km	1000 km	840 km
Simeonof NWA	910 km	960 km	910 km	590 km
Tuxedni NWA	560 km	600 km	540 km	260 km

[1] NP denotes National Park and NWA denotes National Wildlife Area

4.4 SOIL RESOURCES

How Carrying Capacity is Derived

The carrying capacity of Army lands is derived from a model called the Army Training and Testing Area Carrying Capacity (ATTACC).

The ATTACC method consists of three main components: training load characterization, environmental characterization, and cost analysis.

- Training load describes the collective impact of all mission activities that occur on a given parcel of land and is measured in terms of MIMs, which are based on vehicle mileage projections. One MIM has the equivalent impact on soil erosion as an M1A2 tank driving one mile in an Armor battalion field training exercise.

  $$MIM = \sum_{E=1}^{e}[\ (\sum_{v=1}^{v}(\ Number_v * Mileage_v * VSF_v * VOF_v * VCF_v)) * Duration_E * ESF_E * LCF_E]$$

  Where:

  MIM = normalized training load (Maneuver Impact Miles)
  E = event
  e = number of events
  V = vehicle type
  v = number of types of vehicles in event E
  Mileage = daily mileage for vehicle type V for event type E
  Number = number of vehicles of type V
  VSF = vehicle severity factor for vehicle type V
  VOF = vehicle off-road factor for vehicle type V
  VCF = vehicle conversion factor for vehicle type V
  LCF = local condition factor for vehicle type V
  Duration = number of days for event type V
  ESF = event severity factor for event type V
- The environmental component of ATTACC currently measures land condition in term of erosion status (ratio of predicted soil loss to tolerable soil loss rates).
- The cost component of ATTACC characterizes land maintenance and repair practices in terms of types of practice, costs, area affected, and effectiveness.

MIM values, alone, do not take into account the specific ecological setting in which an event occurs. Ecological setting is a factor, however, when considering training land carrying capacity through a land condition curve. When implemented, ATTACC will estimate the training load (i.e., MIMs) and the land condition (i.e., erosion status) for a training area or installation. These numeric values provide the data to establish a land condition curve.

ATTACC Land Condition Module (LCM)

Another component of ATTACC is the Land Condition Module (LCM), a GIS based software application that estimates changes in land condition associated with mission activity. LCM automates the ATTACC Methodology for generating land condition curves. The land condition curves are then used to determine training area carrying capacity.

LCM uses installation natural resources GIS data layers to generate land condition curves. The number of input map layers required depends on the measures of land condition selected. Erosion is currently estimated using a modification of the Revised Universal Soil Loss Equation (RUSLE), a modification of the Wind Erosion Equation (WEQ), and a modification of a vehicle dust emission model. Basic input layers required for all analyses include Distribution, Restricted Areas, Boundary, and Training Area maps. Input layers required for the Revised Universal Soil Loss Equation include climatic, erodibility, topography, vegetation cover, impact, and recovery factors. Input layers required for the Wind Erosion Equation include vegetative cover, vegetation structure and composition, impact, recovery, climatic, and soil erodibility factors. Input layers required for the vehicular dust equation include vegetative cover, impact factor, recovery factor, a climatic factor, and soil erodibility factor. Some data layers are used by multiple erosion equations.

ATTACC Land Condition Curve

The land condition curve illustrates a relationship between MIMs (i.e., training land) and erosion status (i.e., land condition) for a given parcel of land. Larger MIM values indicate more impact to training areas, whereas smaller MIM values indicate less impact to training areas.

Larger erosion status values indicate erosion levels that are less acceptable, whereas smaller erosion status values indicate erosion levels that are more acceptable. A target land condition is the erosion status that corresponds with the amount of training that a given parcel of land can accommodate in a sustainable manner. This implies a reasonable and prudent level of maintenance and rehabilitation.

Land maintenance and rehabilitation activities would decrease the erodability status and cause the curve to shift, allowing more MIMs to occur for each level of erodability status.

Land Condition Thresholds

In ATTACC methodology, land condition threshold values are established by each installation to reflect local environmental conditions, management objectives, funding restrictions, and mission priorities. Land condition threshold values are erosion status values that reflect land condition management goals. Usually two land condition thresholds are established to correspond to red, amber, and green conditions.

Once land condition threshold values are established, MIM Red/Amber/Green carrying capacity threshold values can be obtained from the land condition curve. Carrying capacity threshold values are the maximum training load (i.e. MIM) that an installation (or training area) can support while sustaining a specified land condition. For each threshold determine the training load (i.e., MIM) value where the land condition curve crosses each land condition threshold.

Land maintenance and rehabilitation activities would decrease the erodability status and cause the curve to shift, allowing more MIMs to occur at each threshold level (acceptable erodability status level).

Stryker Mobility Study

The model used to determine mobility was the NATO Reference Mobility Model.

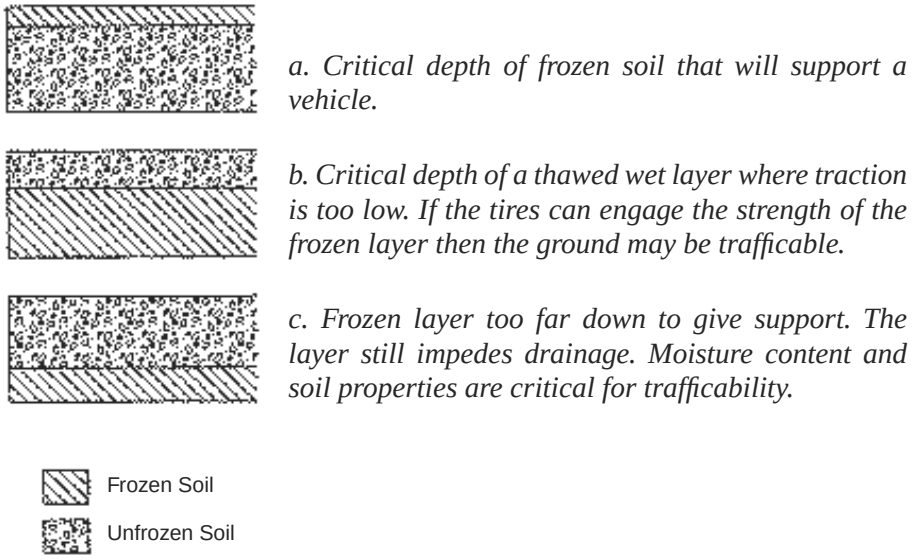
The NATO Reference Mobility Model (NRMM) is the second version of a computer model developed in the early 1970s which combines many mobility-related technologies into one comprehensive package designed to predict the mobility of vehicles operating in on and off road

terrain (Ahlvin and Haley 1992). This model predicts maximum available traction and motion resistance for vehicles operating during summer and winter conditions (Richmond et al. 1990; Richmond et al. 1995; Ahlvin and Shoop 1995). Winter terrain includes shallow and deep snow, ice, and frozen and thawing ground (Richmond et al. 1995). Maneuverability for a summer and a winter scenario were modeled (Appendix A, Figures 4.4.a, b, c, d, e, and f). Details of the model assumptions and input data are provided in Shoop et al. (2002).

A traction versus wheel slip curve, in conjunction with power train capabilities, is used to generate an overall maximum traction versus speed prediction. The motion resistance is used in combination with other resisting forces (e.g., vegetation, slope) to determine the maximum possible force controlled by speed (Ahlvin and Haley 1992). Speed values were then used to describe maneuverability as GO, NO GO, and SLOW GO. If there is available traction, the terrain is characterized as GO, or maneuverable. If motion resistance is high or no traction available, then the terrain is characterized as NO GO, or not maneuverable. Areas that have some traction are considered SLOW GO, or semi-maneuverable. NO GO areas on the speed map are also a result of dense forest and/or slope greater than 30% despite soil strength. Additionally, GO areas include roadways and existing trails throughout training lands.

Rut depth potential was calculated for a wide range of soil strengths for four different Army vehicles, including the Stryker. For the Stryker, minimal to minor impact is expected when soil strength is high (Cone Index > 60). For soil strength between cone index 36 to 60 (associated with wet or poorly-drained sand or silts) moderate impact is expected. For very weak soils (associated with saturated or water logged sands, silts, and peats) the Cone Index is less than 36 and severe impacts with ruts greater than 6 inches are possible.

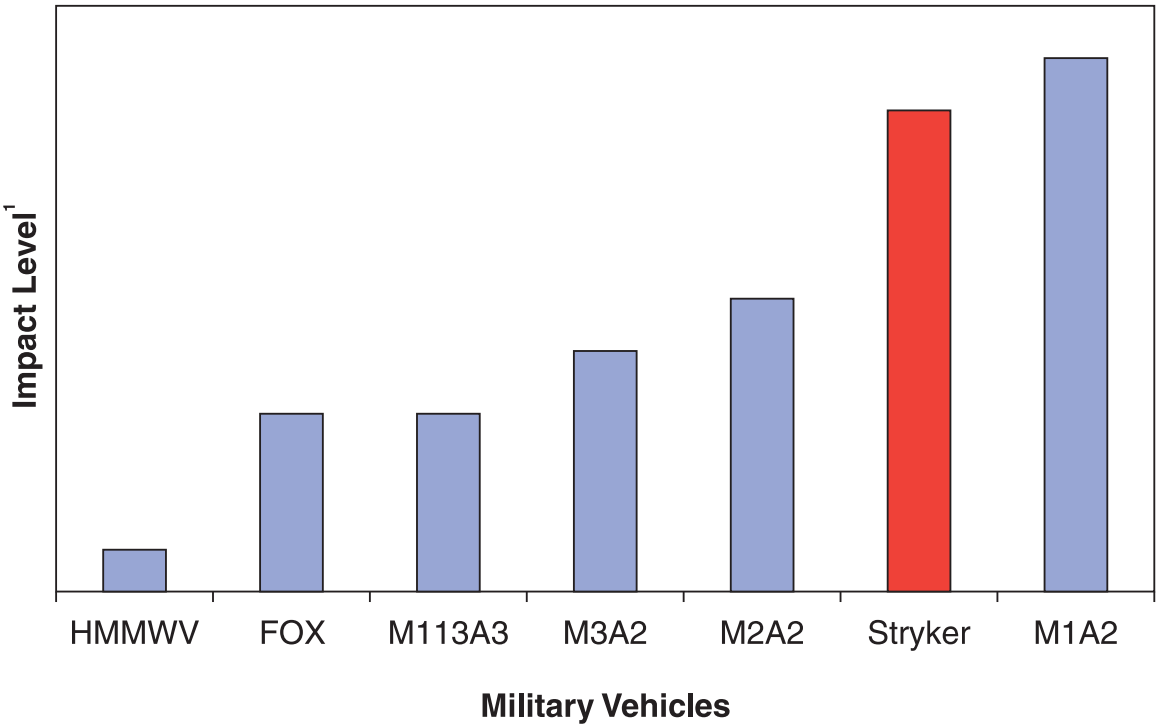
Freezing ground can often increase vehicle mobility, while thawing ground nearly always reduces mobility. An additional issue of importance is the possibility of severe terrain damage when vehicles operate in areas with thawing conditions. Three critical conditions for vehicle mobility on freezing and thawing soils are illustrated below (Figure 4.4.a).



Appendix Figure 4.4.a Critical conditions for trafficability of freezing or thawing ground.

Vehicle operation on frozen ground is characterized by the ability of the ground to fully support the vehicle. For unfrozen soils that are not extremely difficult to traverse, the presence of 5 cm of frost at the surface will usually allow unlimited cross-country operation. Terrain that is normally untrafficable may require a substantial frost layer before vehicle operations are possible. The freezing of rivers and wetlands in winter allows maneuver access into many areas that are inaccessible in the summer (e.g., Tanana Flats Training Area, Donnelly West Training Area). Additionally, frozen soil and depth of snow cover act as a protective layer and may prevent the vehicle from creating ruts and causing disturbance to soil and vegetation.

Early winter snow cover may occur before the ground has frozen. During this time the unfrozen soil is subject to rutting. The primary importance of the snow cover with regard to unfrozen terrain disturbance is: (1) it will provide additional moisture to the soil, and (2) it may help reduce rutting due to the added structural support of the snow. It is assumed that Stryker vehicles would rut the soil through early snow cover. On the other hand, the HMMWV will probably rut the soil beneath the snow only in very wet and soft soil conditions (saturated silt, organic silt, and peat).



[1] Estimated impact level based on an average of vehicle severity factors, vehicle conversion factors, and vehicle off-road factors.

Appendix Figure 4.4b Comparative Impact Level for Military Vehicles.

Based on the maneuverability maps (Appendix A, Figures 4.4.a, b, c, d, e, f), Strykers are more limited in summer (soft soil) conditions when compared to vehicles currently used by USARAK. During summer, soil strength and slope are the speed limiting factors for all vehicles except for SUSVs. SUSVs can maneuver in most terrain conditions on USARAK training lands. In winter, frozen ground would enable Strykers and other vehicles to maneuver in many more areas. Site specific descriptions are provided for each installation under Section 4.4.4, Comparison of Alternatives.

4.9 WILDLIFE AND FISHERIES

4.9.a Impacts of Human Disturbance to Selected Species and Types of Wildlife

The following review provides information on the status of selected wildlife species with populations that could be affected by transformation from Legacy Force to SBCT. The species/ taxa were selected based on ecosystem management objectives (See Appendix E, Section 3.11) or importance as game species.

Wolverine (FWA, DTA, FRA)

Wolverines in central Alaska are habitat generalists that do not prefer any habitats per se, but they avoid tundra during winter and forests during summer (Whitman et al. 1986). Many details of wolverine ecology are poorly understood, and few studies have been completed (Weaver et al.1996). Little is known about impacts of anthropogenic disturbance (Banci 1994), but wolverines appear to have low resilience to disturbance (Weaver et al. 1996). Wolverines appear to be susceptible to habitat fragmentation associated with forestry, livestock grazing, energy extraction, and human settlement. Use of snow machines during winter appears to negatively affect wolverines (Hornocker and Hash 1981).

Studies of the impacts of military land use and training activities on wolverines are lacking. Knowledge of wolverine ecology would be beneficial for conservation planning at the landscape and regional level (Carroll et al. 2001).

Grizzly Bear (FWA, DTA, FRA)

The highest quality grizzly bear habitats on USARAK lands are associated with alpine, sub-alpine, or riverine ecosystems. Grizzly bears are susceptible to human disturbance, and populations have low resilience because of low reproductive rate and life history characteristics (Weaver et al. 1996). Critical periods for these bears include late summer and fall, when bears consume high quantities of food required for winter hibernation.

Effects of military maneuvers and training on brown bears have not been documented (U.S. Air Force 1995, U.S. Army Alaska 1999a). Grizzly bears have been documented to flee from low flying civilian aircraft (Golden et al.1979), but studies of impacts from military aircraft have not been documented.

Gibeau et al. (2002) evaluated the distribution of grizzly bears in relation to high use highways, secondary paved roads, high use trails, and non-transportation developments (e.g., campgrounds and lodges or other buildings). Adult bears avoided busy highway corridors. Females avoided roads and humans at the expense of using high quality habitats. Bears apparently learn to avoid trails during times of high use by humans. Mattson et al. (1987) and Mace et al. (1996) documented that avoidance of high quality habitats adjacent to roads resulted in decreased body condition of females resulting in lower fecundity and survival rates. Bears are also susceptible to disturbance during hibernation (Linnell et al. 2000). Research in Montana and Wyoming have indicated that female grizzly bears require security blocks (habitat) that range between 4 mi^2 and 10 mi^2 (Mace et al. 1996, Mattson et al. 1987).

Wolf (FWA, DTA, FRA)

Wolves are adapted to a wide variety of ecosystems, and these animals are important ecologically because of the relationship with the prey base, prey habitat, and scavengers. The vast majority of wolf mortality in the lower 48 states is human-related, but they are moderately resilient to human

disturbance because populations can rebound quickly and animals readily occupy vacant habitat (Weaver et al. 1996).

Wolves tend to avoid roads with traffic but would use roads with limited vehicular (Thurber et al. 1994). Wolf packs tend to utilize areas with low road densities (Fuller et al. 1992). Wolves demonstrated increased glucocorticoid activity (physiological stress response) during snowmachine activity (Creel et al. 2002); however relationship between snowmobile activity and survival/reproduction of wolves was not determined.

Caribou (DTA)

Higher quality habitats for caribou include alpine habitats and open lowland areas. Important management considerations for caribou include population declines, access to winter grounds, hunting, human development projects, barriers to migration corridors, disturbance from human activities, and predator-prey interactions (Bergerud 1978). Populations of caribou are strongly affected by winter forage availability and calf survival.

Research on human disturbance to caribou is extensive compared to other wildlife species. The Delta caribou herd, which uses DTA, has been subjected to widespread disturbance for decades. Davis et al. (1985) indicated that the Delta caribou herd had become habituated to military training. However, Meier et al. 1998 demonstrated that low flying jets during late winter disrupted resting patterns of caribou, and that reactions to jet aircraft were greatest during post calving. In a study of woodland caribou, Harrington and Veitch (1992) reported decreased calf survival during the post-calving period following disturbance from military aircraft.

Less is known about the effects of military weapons and maneuver training or military facilities, but research has documented the effects of human activities and infrastructure. Caribou exposed to winter tourists demonstrated increase vigilance at the expense of resting and foraging (Duchesne et al. 2000). In Norway, caribou exhibited a 70-80% reduction in the use of winter foraging habitats by reindeer within 2.5-4 miles of power lines Nellemann et al. (2000) and Vistnes and Nellemann (2001). Woodland caribou in Canada avoided wellsites (up to 1,100 yards), and roads or seismic lines up to 275 yards (Dyer et al. 2001).

Cumulative impacts may be even greater (Nellemann et al. 2000; Vistnes and Nelleman 2001). Reindeer avoid developed areas with as low as 0.5-.9 mi/mi^2 of linear structures (i.e., roads or power lines). Moreover, female reindeer with calves maintained a distance of 6 miles from resort areas. The implication is that available habitats near developments would be underutilized, while areas away from development would be overused, resulting in poor nutrition and survival, thus lower carrying capacity. Wolf predation on caribou is higher near these corridors (James and Stuart-Smith 2000).

Moose (DTA, FWA, FRA)

Moose use a variety of scrub, forest, and open habitats. As long as forage, access to water, and cover are available, moose appear to be readily adaptable to human dominated landscapes.

Few studies have evaluated the effect of disturbance on moose. In Norway, responses of moose to humans on foot (including pedestrians, infantry troops, and skiers) elicited stronger heart rate responses and flush distances compared to various mechanical disturbances, such as snow machines, all-terrain vehicles, and helicopters (Andersen et al. 1996). During maneuvers, the home range size of moose nearly doubled in size and did not return to near normal for one week following the exercises. The moose appeared well-adapted to multiple use management (forestry,

hunting and military activities), and military training was no more detrimental than other land uses (Andersen et al. 1996).

Dall Sheep (DTA, FRA)

Dall sheep utilize steep and alpine habitats in the southwestern portion of DTA, and the Snowhawk Creek drainage at FRA.

Effects of military training on Dall sheep have not been studied, and relatively few human disturbance studies on this species have been reported. Dallemolle and Vanhorn (1991) reported that Dall sheep that were habituated to vehicle traffic readily crossed roadways, but animals migrating from roadless areas were reluctant to cross the roads.

The effects of aircraft on bighorn sheep have been studied. Bighorns sheep exhibit reduced foraging efficiency and increased movements when exposed to helicopters (Stockwell et al. 1991). A study of low-elevation bighorn sheep documented that when military jets passed within 200 yards animals exhibited strong behavioral responses and habitat shifts more frequently than when jets were more than 200 yards away (Sayre et al. 2002). Desert bighorn sheep exposed to simulated aircraft noise responded with increased heart rates, but the animals quickly habituated (Weisenberger et al.1996). The combined stimulus of noise and sight of aircraft appears to be a stronger disturbance than either alone.

Bison (DTA)

The calving area for the Delta bison herd includes the Delta River floodplain and nearby habitats (DuBois and Rogers 2000). During fall, bison migrate from the Delta River, through DTA East, and into agricultural fields and open habitats near the Richardson Highway, southeast of Delta Junction.

Few studies have documented the effects of military activity to bison (USARAK 1999a). Bison respond to low flying civilian aircraft by behaving nervously and moving away from the noise (Golden et al. 1979). However, in another study bison habituated to noise from military aircraft (Frazier 1972). Effects of military training and activities on the Delta bison herd are not known (DuBois and Rogers 2000). A study in Yellowstone National Park reported that bison were not negatively affected by road grooming during winter (Bjornlie and Garrott 2001).

Beluga Whales (FRA)

Beluga whales in Cook Inlet are geographically and genetically isolated from other groups of beluga whales in Alaska waters. Their isolation from other stocks makes them vulnerable to impacts from hunting and anthropogenic environmental hazards (Mahoney and Shelden 2000, Rugh et al. 2000).

The Cook Inlet population of beluga whales has experienced a decline in recent years and was designated as depleted in 2000 under the Marine Mammal Protection Act of 1972 (Mahoney and Shelden 2000). Factors impacting beluga whales in Cook Inlet include subsistence hunting, noise from transportation and offshore oil and gas extraction, ship transits, aircraft overflights, and water quality degradation from sewage effluent from industrial and military activities (Moore et al. 2000; Speckman and Piatt 2000).

Relatively little is known about reactions of belugas to ships, but responses appear to range from tolerance to extreme sensitivity (Richardson et al.1995).

Sandhill Crane (FWA, DTA, FRA)

Sandhill cranes use open meadow, scrub wetlands, and riverine gravel bars. Relatively few studies have documented the effects of military activities or human disturbance on sandhill cranes. Low flying airplanes were a greater disturbance than humans on foot or eagles (Herter 1982). However, other studies have indicated that cranes habituate to human disturbance (Dwyer and Tanner 1992). For example, birds remained on their nest during 82% of low-altitude helicopter flyovers; a highway with heavy traffic and trucks passed within 200-330 yards of nests; and mining/farming activities were located within 440-550 yards of active nests.

Olive-Sided Flycatcher (FWA, DTA, FRA)

The olive-sided flycatcher inhabits moist coniferous forests on USARAK lands, during breeding season. Most birds arrive in mid-late May and depart by the end of August. This species has declined throughout its range and is considered to be a Species of Special concern in Alaska (Wright 1997; Boreal Partners in Flight 1999).

Relatively little is known about the conservation of the Olive-sided Flycatcher (Altman and Sallabanks 2000), although recent work in Alaska has contributed to knowledge about habitat use during breeding season (Wright 1997). Habitat degradation in the winter range could be a factor contributing to population declines. The Flycatchers prefer edge habitats and appear to be most strongly associated with post-burn habitats.

Sharp-tailed Grouse (DTA)

Sharp-tailed grouse are listed as a Species of Special concern by the state of Alaska. These birds prefer lowland land scrub and disturbed scrub habitats. Disturbances at grouse breeding grounds (leks) can result in population declines (Baydack and Hein 1987). Parked vehicles, explosions, and dogs on leashes do not appear to disturb male grouse, but disturbances such as these can affect females.

Trumpeter Swans (FWA)

Trumpeter swans use lakes, ponds, lacustrine fen meadow, riverine marsh and a variety of wetland habitats. Tanana Flats Training Area supports important breeding grounds for these birds.

Henson and Grant 1991 reviewed the effects of disturbance on trumpeter swans, and conducted field studies in the Copper River Delta in southeast Alaska. As with other water birds, risks associated with human disturbance include nest abandonment, resulting in egg morality or increased risk to predation. In addition, pairs may reduce feeding/rest time and may abandon or avoid otherwise suitable habitats.

Trumpeter swans appear to adapt to low-flying aircraft, including jets and helicopters. The birds do not respond strongly to moving vehicles, even when the roadways are within 275 yards of nests. However, birds will retreat if nearby vehicles stop and people step out. Loud vehicles such as motorcycles and airboats, elicit a strong response in swans (Henson and Grant 1991). Disturbance from pedestrians during breeding season tends to result in the strongest response by trumpeter swans.

Neotropical Migratory Birds (FWA, DTA, FRA)

The conservation of neotropical migratory birds has become an increasing issue of concern among natural resources specialists and wildlife conservationists. A wide variety of neotropical migrants use USARAK lands as breeding habitat.

Relatively few studies have been conducted on the effects of military training on neotropical birds. However, an ongoing research project is documenting the effects of aircraft noise on neotropical birds near Eielson Air Force Base (Bartecchi 2002). Preliminary results indicate that aircraft noise does not affect the density of breeding birds, physiological stress levels, or nesting success rates. In a study of urban birds in Colorado, lower avian species richness was observed in areas where noise levels were higher (Stone 2000). High noise levels might interfere with habitat use and reproductive success of birds, but definitive scientific evidence is lacking. A recent study has indicated that human use of campgrounds led to increased use by predatory birds such as gray jays; however, predation rates were not quantified (Gutzwiller and Anderson 1999).

Waterfowl and Waterbirds (DTA, FWA, FRA)

A wide variety of waterfowl and waterbirds use wetlands, waterways, and nearby habitats on USARAK installations. In one study in Maryland, black ducks habituated to noise from low-flying jet aircraft but wood ducks did not habituate, indicating that the responses may be species-specific (Conomy et al.1998). Additional research suggests that low flying aircraft over breeding concentration areas or staging areas, especially during breeding season, could affect waterfowl and result in increased stress and lower reproductive success (U.S. Air Force 1995).

Motorized recreational devices can have negative impacts on waterfowl. Educational programs aimed at operators of such crafts can reduce the frequency of disturbances and result in increased reproductive success of water birds Burger and Leonard (2000). In a study of effects of personal watercraft and outboard motors, Rodgers and Schwikert (2002), recommended buffer zones of 180 m for wading birds, 140 m for terns and gulls, 100 m for plovers and sandpipers, and 150 m for ospreys.

Raptors (FWA, DTA, FRA)

The Tanana River floodplain is a raptor breeding area. Thousands of raptors migrate through FWA and DTA each spring and fall. Peregrine falcon nests have been documented close to USARAK lands (USARAK 2002e, f, g).

Raptor populations can be negatively affected by human disturbance due to physical harm to birds or eggs, habitat alteration, disruption of behavior (Postovit and Postovit 1987). Most studies addressing impacts of military activities on raptors have focused on effects of military aircraft. Raptors have been documented to habituate and breed successfully near low-flying military aircraft or jets (e.g., Platt 1975; Lamp 1989; Trimper et al. 1998). However, Stokes (1996) reported that low-flying helicopters could cause breeding failure in eagles, and Trimper et al. (1998) reported that whereas jets were not a disturbance to nesting osprey, low flying float planes caused a stronger behavioral response.

Brown et al. (1999) evaluated the effect of weapons testing on bald eagles. Their data indicated that bald eagles had habituated to weapons testing noise. Relatively few birds reacted to explosions, even though the birds were within 0.3 and 2.5 miles of ranges.

4.9.b Meetings with Alaska Department of Fish and Game to Discuss Draft EIS

June 24, 2003

Location
Fairbanks, Alaska Department of Fish and Game Office

Attendees
Don Young – Alaska Department of Fish and Game
Roger Sayre – Colorado State University

Summary
Mr. Young was provided with a brief overview about transformation and changes associated with SBCT. The discussion focused on the distribution of large mammals in Game Management Unit 20A (especially moose, caribou, and bear). Mr. Young gave suggestions for changes in the maps from the draft EIS. The moose and caribou maps were subsequently revised. The bear map was outdated, and removed from the document.

June 26, 2003

Location
Delta Junction, Alaska Department of Fish and Game Office

Attendees
Steve DuBois – Alaska Department of Fish and Game
Jeff Mason – U.S. Army Alaska Natural Resources
Ellen Clark – U.S. Army Alaska Natural Resources
Roger Sayre – Colorado State University

Summary
The meeting focused on distribution of large mammals (including bison, moose, caribou, Dall sheep, and bear) in Game Management Unit 20D, and migration routes of Sandhill crane. The maps were subsequently revised. We began a discussion of transformation impacts, but decided hold off on further discussion until release of the Draft EIS in July.

July 15, 2003

Location
Anchorage, Alaska Department of Fish and Game Office

Attendees
Rick Sinnott – Alaska Department of Fish and Game
Jesse Coltrane – Alaska Department of Fish and Game
Roger Sayre – Colorado State University

Summary
Mr. Sinnott and Ms. Coltrane were provided with a copy of the Draft EIS, a brief overview of transformation, and expected changes. They indicated concerns about the fence at FRA. The remainder of the discussion focused on the distribution of wildlife in the FRA area. They gave

copies of maps of moose distribution and waterfowl, and indicated that they would provide maps for wolf, wolverine, and bear.

July 17, 2003

Location
Fairbanks, Alaska Department of Fish and Game Office

Attendees
Don Young – Alaska Department of Fish and Game
Roger Sayre – Colorado State University

Summary
The discussion of distribution of large mammals continued. There was additional discussion about impacts due to transformation. The discussion focused on impacts in Alpha Impact Area due to artillery firing, in particular to moose and swans during calving and nesting/brooding seasons. No changes of predicted impacts to wildlife were suggested.

July 18, 2003

Location
Fairbanks, Alaska Department of Fish and Game Office

Attendees
Don Roach – Alaska Department of Fish and Game
Cal Skaugstad – Alaska Department of Fish and Game
Roger Sayre – Colorado State University

Summary
Mr. Skaugstad and Mr. Roach were provided with a copy of the Draft EIS and with a brief overview of transformation. They indicated that they would review the document and provide comments, if needed. Mr. Skaugstad indicated that he was most concerned about restrictions to access along DTA's Meadows Road. The Department of Fish and Game had expended considerable resources to provide stocked fishing opportunities on the lakes in this area. Access restrictions could jeopardize the stocking program. They also indicated that Habitat Biologist Nancy Ihlenfeltd would review the document and provide comments.

July 22, 2003

Location
Delta Junction, Alaska Department of Fish and Game Office

Attendees
Steve DuBois – Alaska Department of Fish and Game
Jeff Mason – U.S. Army Alaska Natural Resources
Amanda Herzog – Colorado State University
Roger Sayre – Colorado State University

Summary

This discussion focused on the Draft EIS, the impacts of transformation, and mitigations. Mr. DuBois suggested several modifications regarding impacts. And these were used for revision in the document. Specifically, impacts to wolverine, wolf, bison, moose, sharp-tailed grouse, great gray owl, American dipper, Bohemian waxwing, and rusty blackbird were discussed.

August 15, 2003

Location

Anchorage, Alaska Department of Fish and Game Office

Attendees

Rick Sinnott – Alaska Department of Fish and Game

Jesse Coltrane – Alaska Department of Fish and Game

Roger Sayre – Colorado State University

Pat Whitesell – Colorado State University

Kellie Peirce – U.S. Army Alaska Natural Resources

Summary

The discussion focused on the impacts of transformation to wildlife resources and public access. The personnel from Alaska Department of Fish and Game were primarily concerned about impacts from the proposed fence project and the cumulative effects of transformation and the fence. In particular, they were concerned about the fence's impact to moose and bears along the Glenn Highway and the Muldoon Area near upper Campbell Creek. Upper Campbell Creek is used by several grizzly bears during salmon spawning, and the fence could affect their movements. They also had questions about the off-road effects of the Stryker vehicle, and the definition of maneuver impact miles.

4.10 THREATENED OR ENDANGERED SPECIES AND SPECIES OF CONCERN

4.10.a U.S. Fish and Wildlife Service Consultation Letters

2002-0121

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services Anchorage
605 West 4th Avenue, Room 61
Anchorage, Alaska 99501-2249

in reply refer to:
WAES

April 26, 2002

Mr. David Snodgrass
US Army Alaska
600 Richardson Drive #5000
Fort Richardson, Alaska 99505-5000

Re: Fort Richardson construction projects (*consultation number 2002-0121*)

Dear Mr. Snodgrass,

On April 16, 2002 we received your request for information concerning federally protected species and or critical habitat that may be impact by the proposed construction activities at Fort Richardson associated with transformation to an Intermediate Brigade Combat Team.

Our records indicate that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project. In view of this, requirements of section 7 of the Act have been satisfied. However, obligations under section 7 of the Act must be reconsidered if new information reveals project impacts that may affect listed species or critical habitat in a manner not previously considered, if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat is determined that may be affected by the identified action.

This letter relates only to federally listed or proposed species and/or designated or proposed critical habitat under our jurisdiction. It does not address species under the jurisdiction of National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Clean Water Act, National Environmental Policy Act, or Bald and Golden Eagle Protection Act.

If you have any questions please contact me at (907) 271-2781. In future correspondences regarding this project please refer to consultation number 2002-0121.

Sincerely,

Charla Sterne

Charla Sterne
Endangered Species Biologist

T:\Charla\2002 section 7\USA\2002-0121FtRichardwonConstructionNOSPP.doc

United States Department of the Interior
Fish and Wildlife Service
Fairbanks Fish and Wildlife Office
101 12th Ave., Box 19, Room 110
Fairbanks, Alaska 99701
August 6, 2002

Colonel David Snodgrass
Director, Public Works
600 Richardson Drive #6000
Fort Richardson, Alaska 99505-6000

Re: Restructuring 172nd Infantry Brigade's associated ranges, facilities and infrastructure

Dear Colonel Snodgrass:

This responds to your request for a list of endangered and threatened species and critical habitats pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). This information is being provided for the proposed restructuring of the 172nd Infantry Brigade's associated ranges, facilities and infrastructure. The proposed locations for changes include Fort Wainwright, the Donnelly Training Area, and outlying areas such as Gerstle River and Black Rapids.

No listed species occur in these project areas and there is no designated or proposed critical habitat in the vicinity of the proposed projects. Therefore, the Service concludes that this project is not likely to adversely impact listed species. Preparation of a Biological Assessment or further consultation under section 7 of the Act regarding this project is not necessary.

This letter applies only to endangered and threatened species under our jurisdiction. It does not preclude the need to comply with other environmental legislation or regulations such as the Clean Water Act.

Thank you for your cooperation in meeting our joint responsibilities under the Act. If you need further assistance, please contact Jonathan Priday at (907) 456-0499.

Sincerely,

Ted Swem

Ted Swem
Branch Chief
Endangered Species

4.13 SOCIOECONOMICS

Employment and Economic Activity Projections

The index of non-uniformed personnel to uniformed personnel at Fort Wainwright (FWA) has increased substantially between 1990 and 2001, from 0.3 to over 0.4. While this data suggests an increasing proportion of non-uniformed personnel, our estimates of proposed deployment impacts are based on 0.42, the more recent average according to annual command information cards. Since 1990, the non-personnel expenditures (materials, supplies, fuel, etc.) at FWA have averaged $29,343 per uniformed personnel (in 2002 dollars).

In addition to more uniformed personnel and payroll, spending increases in non-uniformed personnel, construction, purchases of supplies, fuel, etc. would follow. Based on data from 1990 to 2001, FRA has employed an average of 0.62 non-uniformed personnel per uniformed personnel. Non-payroll expenditures for FRA have averaged $40,133 per uniformed person (in 2002 dollars) from 1990 to 2001.

For every person employed by the military, there is roughly a one-to-one increase in indirect employment in the local economy. Published estimates for military employment multipliers do not exist. Employment multipliers generally range between 1.5 and 3; we are using 2 as a conservative estimate.

As dollars are circulated through the local economy and cause further rounds of spending on other goods and services, final economic activity is raised by a multiple of these indirect expenditures. According to the survey results obtained in 2002, a total of $1.98 dollars in local economic impact is derived from a dollar in direct payroll. The indirect expenditure multiplier is considered on top of direct payroll and non-personnel expenditures.

Recreation Impacts Valuation and Projections

From the survey results it is clear that military employees primarily target salt water fish species whereas hunting tends to be more in the interior region. So the increased competition would be more localized for game than for fish. The additional fishermen would be competing with fishermen from the statewide road system and represent an insignificant addition to those licensees. The additional hunters would generally compete with other interior hunters and represent a very small addition to licensees in the Interior. When removing out-of-state hunting and fishing licensees from any calculations, the increase is less than 1% of eligible hunting and fishing licensees in the area of increased competition (a fraction of 1% for fishing). The relatively greater impact appears to be for hunting.

When adding out-of-state hunters and fishermen to the analysis, the additional military hunters and fishermen represent an even smaller proportion of total eligible licensees. There are a total of over 600,000 sport fishing, hunting and trapping licensees statewide. There are over 115,000 state resident fishermen on the road system. Only by progressively restricting our attention to state resident interior zip codes can we bring the number of hunting licensees below 10,000 and thereby imply a measurable amount of “crowding” effect. Suffice it to say that the maximum combined impact for fishing and hunting as a result of SBCT stationing is expected to be in the low hundreds of thousands of dollars.

Fishing Valuation Technique

Several techniques are available to assess the relative impact of imposing restrictions on sport fishing in stocked lakes on military lands. Angler usage, number of fish stocked, harvest estimates, and lake surface areas may all be used. Since the most reliable data available is lake surface area, calculations are based on this measure.

The total number of stocked lakes in interior Alaska exceeds 100 lakes, with 8,960 total acres. Lakes on USARAK lands total 690 acres, or 7.8% of the total. If remote lakes and those near the Denali Highway are excluded, this percentage increases to 10.9%. The rationale for this exclusion is based on user activity, indicating that stocked lakes along Richardson Highway and near Delta Junction are the most popular Interior stocked lakes. This approach avoids understating potential impacts.

The economic impact of completely restricting these recreational resources to anglers is determined by assuming that the same number of anglers would shift their efforts to unrestricted lakes, lowering the success rates on average for all anglers. Valuation estimates from the fishing survey indicates an aggregate net economic impact of $3.755 million:

10.9%	Estimated acreage loss and therefore success rate
x $9	Value per percentage change in success rate (survey result)
x 38,276	Angler-days on interior lakes (ADF&G figure)
$3,754,876	Estimated net economic value lost

Hunting Valuation Technique

The economic cost from increased restrictions to hunting on USARAK lands is also assessed using the above method. The analysis focuses primarily on the top three big game species: moose, caribou and Dall sheep. There are other hunting activities that are documented but lack sufficient data to perform reliable economic valuations. These include bear, waterfowl, other game birds and small game species. Total licensed hunters in Alaska number 8,636. There are also trap lines operated by 35-40 interior trappers on USARAK controlled lands.

The economic impact of hunting restrictions is determined by assuming that big game populations and sustainable harvest levels are fixed. Access restrictions result in a proportionate decrease in hunting success rates on non-USARAK lands due to displaced hunters competing for a fixed number of game animals on other lands. USARAK lands have a particularly high level of harvest and shifting hunters to other lands could result in a substantial reduction in success.

Using the estimates from the hunting survey provides an estimate of the net economic cost from changing access restrictions for the case of moose hunting for interior Alaska – clearly the most important game resource according to the survey. Based on these estimates and harvest data from the Alaska Department of Fish and Game, the value of moose harvested on USARAK lands is estimated to be $3.564 million:

23.7%	Reduced success rate (proportion of harvest on interior Army lands)
x $25.3	Value per percentage change in success (survey result)
x 5,945	Number of interior moose hunters
$3,564,681	Estimated net economic value lost

4.16 NOISE

4.16.a Comparative Noise Levels of Stryker and Shadow Unmanned Aerial Vehicle (UAV)

Appendix Table 4.16.a Stryker Vehicle Noise Levels Compared to the Bradley Fighting Vehicle and Abrams Tank.

Vehicle Type	Speed or Position in Relation to Vehicle	Distance from Vehicle	Noise Level (dBA)
Stationary Stryker	Front Right side Left side Behind	20 feet 4 feet 4 feet 10 feet	78 80 76 70
Mobile Stryker	50 mph	60 feet	85
Mobile M2A2/M3A2 Bradley	20 mph 10 mph	98 feet 98 feet	80 74
M1A2 Abrams Tank	Moving	328 feet	92

Source: Project Manager Brigade Combat Team 2002

Appendix Table 4.16.b Shadow (unmanned aerial vehicle) Noise Levels in Relation to Distance.

Noise Level (dBA)		Low RPM	High RPM
85	Nose Right Wing Left Wing Tail	62 feet 65 feet 77 feet 45 feet	276 feet 338 feet 346 feet 75 feet
103	Nose Right Wing Left Wing Tail	5 feet 11 feet 11 feet 9 feet	53 feet 65 feet 62 feet 45 feet
108	Nose Right Wing Left Wing Tail	0 feet 7 feet 8 feet 0 feet	32 feet 43 feet 38 feet 24 feet

Source: U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) 2002

Appendix Table 4.16.c Comparison of Noise Levels of the Shadow (UAV) compared with other common noise sources.

Type	Distance	Noise Level
Shadow (UAV)	204 feet	85 dBA
Shadow (UAV)	28 feet	108 dBA
Passenger Car (65 mph)	25 feet	77 dB
Motorcycle	25 feet	90 dB
Air Conditioner	60 feet	60 dB

Sources: USACHPPM 2002; Catherine Stewart, personal communication 2003.

THIS PAGE INTENTIONALLY LEFT BLANK.

4.20 CUMULATIVE IMPACTS

4.20.a Regional Land Use Units

Appendix Table 4.20.a Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
1 Dugan Hills	Fish and Wildlife Habitat • Lowland river areas provide prime moose and furbearer habitat • Moderate big game hunting, intensive trapping • High fisheries values for Tolovana River; other streams and rivers also support salmon and resident fisheries Recreation and Tourism • Numerous winter trails exist • Baker and Hultinana River have moderate value for boating and fishing • Tolovana, Innoko and Nowitna rivers used for fish, hunting, and other charters Subsurface resources • Low mineral values except Eureka Mining District • All units open for exploration and leasing Timber • Small stands of mixed spruce-hardwood used for fuel and sawtimber • Subunit 1A managed for personal and commercial harvest Transportation and Access • Wood cutting road from Elliot Highway • Trail easements with 25 feet width rights-of-way • Some additional roads may be constructed to allow for timber access	65 miles west-northwest

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
2 Lower Tanana	Cultural Resources • Tolovana Roadhouse is eligible for National Register of Historic Places • Low to medium probability of cultural sites along Tanana and Kantishna rivers Fish and Wildlife Habitat • Includes prime moose, black bear, and furbearer habitat • Tanana and Kantishna rivers are important migratory routes for salmon • Area is used intensively for hunting, fishing, and trapping Private Land • Includes many private tracts and Native allotments Recreation and Tourism • Tanana, Kantishna, and Tolovana Rivers are used intensively for boating, fishing, and wildlife hunting/viewing access. • Extensive recreational winter use Scientific Resources • Oblique Lake Natural Area • Caribou Crossing Research Natural Area Subsurface Resources • Low potential Timber • Bottomlands along rivers contain spruce and mixed hardwood-spruce stands • Access by winter roads Transportation and Access • Not accessible by all-season roads • Access by barge from Nenana • Planned access road from Nenana to Kantishna River	45 miles west

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
3 Tatalina River	Fish and Wildlife Habitat • Prime moose, black bear and furbearer habitat along Tolovana and Tatalina rivers • Trumpeter swan habitat in Minto Flats • Moderate hunting and trapping Recreation and Tourism • Tolovana and Tatalina rivers used for sport fishing and canoeing • Several trails used as access or for winter recreation Subsurface Resources • Moderate to high mineral potential near Livengood-Tolovana mining district • Open to mineral exploration/leasing except along Trans-Alaska Pipeline right-of-way Timber • Productive hardwood stands adjacent to Minto Flats and Tatalina and Tolovana Rivers • No timber sales scheduled Transportation and Access • Access from pipeline access road, Elliot Highway, and trails • No further access planned	40 miles northwest

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
4 Chatanika River, Cache Creek, Goldstream Valley	Cultural Resources • Historic railroad bridge over Goldstream Creek • Protect or mitigate disturbance to cultural sites Fish and Wildlife Habitat • Prime habitat for moose, black bear, and furbearers in areas adjacent to Minto Flats, Chatanika River, and Goldstream Creek • Prime furbearer and small game habitat near Murphy Dome • Important spawning habitat and habitat for resident fish in Chatanika River • Intensive use for hunting, trapping, fishing, and wildlife viewing Private Land and Leaseholds • Numerous private tracts along Chatanika River and Left Fork Creek Recreation and Tourism • High recreational value for a wide variety of activities • Popular sites include Murphy Dome, Chatanika River, and several other areas Subsurface Resources • Low to moderate potential • Any oil/gas exploration will be timed to mitigate impacts to fish/habitat or public access Timber • High timber values on lower slopes of Goldstream Valley • Productive lands managed for timber production Transportation and Access • Access by several all-season roads, but subunit 4A is not accessible • Approximately 50 miles of access road may be constructed in subunits 4C and 4D	20 miles west-northwest

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
5 Nenana Ridge	Cultural Resources • Includes several cultural sites Fish and Wildlife Habitat • Prime habitat for moose, black bear, and furbearers in areas along Tanana River and Goldstream Creek • Peregrine falcon nest sites along Tanana River • Important waterfowl staging areas along Tanana River • Intensive use for hunting, trapping, fishing, and wildlife viewing Recreation and Tourism • Important for recreational values for a wide variety of winter and summer activities Scientific Resources • Bonanza Creek Experimental Forest lease runs until 2018 Subsurface Resources • High potential for lode and placer mineralization within the Cleary Sequence • Lands are open for mineral leasing Timber • High timber values through subunit 5B due to high productivity and volume of sawtimber and good access • Experimental Forest managed for research purposes • Tightly manage commercial harvest in unit 5B Transportation and Access • Access throughout unit available from Parks Highway and trail network • Existing all-season roads maintained	15 miles; approximately 50 miles of Nenana Ridge unit is adjacent to Tanana River and Tanana Flats Training Area

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
6 Chena	Cultural Resources • Includes prehistoric Chena Bluff site and mining cabins • Sites are protected according to state guidelines Fish and Wildlife Habitat • Prime habitat for moose, black bear, and furbearers in areas along Tanana River Critical peregrine falcon nesting habitat along Tanana River, and habitat for other raptors • Critical spawning and rearing habitat for salmon • Intensive use for hunting, trapping, fishing, and wildlife viewing Private Land and Leaseholds • Includes many tracts of private or leased land Recreation and Tourism • Important for recreational values for a wide variety of winter and summer activities • Excellent access Subsurface Resources • Moderate to high potential for lode and placer mineralization within the Cleary Sequence, and silver or zinc in southern portion of unit • Lands are open for mineral leasing Timber • Chena and Little Chena River floodplains contain high value sawtimber stands • Due to access, the area is important source for firewood and house logs Transportation and Access • Access throughout unit • Existing all-season roads maintained • Timber access may require additional 15 miles of road	15 miles east and northeast; approximately 5 miles of unit is a adjacent to Yukon Training Area

Appendix Table 4.20.a cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Fort Wainwright).

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
7 Salcha	Cultural Resources • Includes prehistoric sites and historic mining sites in the Richardson mining district • High probability of additional sites along creeks • Sites are protected according to state guidelines Fish and Wildlife Habitat • Lowlands are prime habitat for moose and furbearers • Uplands include prime habitat for black bear • Critical spawning and rearing habitat for salmon • Intensive use for trapping, moderate use for hunting Private Land and Leaseholds • Includes many tracts of private or leased land Recreation and Tourism • Moderate recreational values • Excellent access Subsurface Resources • Many mining claims exist along Banner and Canyon creeks (Richardson Mining District) • Lands are open for mineral leasing Timber • Some bottomlands along Tanana River floodplains contain mixed spruce-hardwood stands • Timber managed to protect fish habitat Transportation and Access • Access mostly from Richardson Highway and Old Valdez Trail • Timber access may require additional 13 miles of road	25 miles southeast; 20 miles of unit is adjacent to Tanana River and Tanana Flats Training Area

Appendix Table 4.20.b Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Donnelly Training Area).

Management Unit	Primary Use	Approximate Distance/Direction From Fort Greely Cantonment (i.e., Missile Defense)
8 Shaw Creek	Mineral resources • High value, some active mines Cultural resources • A number of sites Fish and wildlife • Important for moose and furbearers Forestry • Commercial production, pole-sized hardwood Scientific resources • Rosa Keystone Dunes Research Natural Area Recreation • Established trail system	24 miles northwest

Appendix Table 4.20.b cont. Tanana Valley State Forest Land Management Units Within Interior Alaska Region of Interest (adjacent to or near Donnelly Training Area).

Management Unit	Primary Use	Approximate Distance/Direction From Fort Greely Cantonment (i.e., Missile Defense)
9 Rapid Creek	Fish and Wildlife habitat • Important for moose and furbearers Recreation • Outside of state forest at Quartz Lake or Goodpaster River Valley • Established trails Scientific Resources • Shaw Creek Tamarack Research Natural Area Forestry • Some commercial production	17 miles northeast
10 Gerstle River	Cultural resources • Includes a number of historic and prehistoric sites Fish and wildlife habitat • Important for moose, furbearers, black bear, brown bear, caribou, peregrine falcons, eagles, and other raptors Recreation and tourism • Boating, paddling, snowmachining, dogmushing, and cross-country skiing. Scientific Resources • Volkmar Bluffs and Jognson Slough Bluffs research natural areas Forestry • Harvested since 1940s • Commercial and private harvest	12 miles northeast
11 Healy River	Fish and wildlife habitat • Moose, furbearers, black bear, brown bear, caribou, waterfowl • Important for subsistence Recreation and tourism • Sport fishing and hunting at George Creek Forestry • May be future harvesting in the Delta area	55 miles east
12 Tower Bluffs	Cultural resources • Probability is high that area bluffs contain cultural resources Fish and wildlife Habitat • Prime moose and furbearer habitat, also black bear and waterfowl habitat • Important for subsistence Private land and leaseholds • 21 privately owned tracts; mostly at Mansfield Lake Recreation and tourism • Sport fishing, float planes, powerboats, hunting, and sightseeing, snowmachining, dogmushing, trapping, and ORV use Forestry • Commercial and personal timber production • Future sales would be in Tok area	50 miles southeast

Appendix Table 4.20.c Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
1A Nenana Ridge West	Settlement (1,000 acres) Forestry • Very high forest values Recreation • Views from Parks highway, and trails Wildlife Habitat • Includes important to moderate-low value habitat for furbearers, black bear and moose • Important area for trapping and small game hunting; increasing demands	22 miles west-southwest
1B Goldstream Creek	Agriculture (17,350 acres) Recreation • Expect development of trails/trailheads Forestry • Suited for small scale operations and forest research Wildlife Habitat • High value and special use areas for black bear, furbearers, small game and moose	20 miles west
1C Easter Dome	Minerals • Very high priority for mineral development	15 miles west
1D Alder Creek	Settlement (1,810 acres) Forestry • Hardwood poletimber and spruce sawtimber	12 miles west
1E Chatanika River Corridor	Settlement (515 acres) Recreation • Chatanika River is popular for hunting, fishing, wildlife viewing Wildlife Habitat • High/special value habitat for salmon and resident fisheries • Special value riparian habitat Forestry • Valuable forest resources	15 miles northwest
1F North Slope of Murphy Dome	Settlement (1,250 acres) Recreation • Winter based trail use, hunting, trapping, berry picking Wildlife Habitat • Important value for upland game • Moderate-low value for other species	15 miles northwest
1G Our Creek	Settlement (300 acres) Minerals • Good potential for hard rock and placer mining Recreation • Maintain trails along ridge top	12 miles north-northwest

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
1H Greater Fairbanks	Settlement (1,150 acres) Agriculture (80 acres) Recreation • Surrounds residential areas and used for variety of summer and winter activities Wildlife Habitat • Goldstream Creek riparian zone is special value habitat for black bear, furbearers, small game, and moose • Hunting, trapping, and wildlife viewing are important uses	10 miles northwest some small parcels within 3 to 10 miles scattered through area
1I Vault Creek	Minerals • Many mining claims exist Recreation • Historic mining sites for tourism Wildlife Habitat • Important value for many species • Prime habitat along Chtanika River for moose and black bear	12 miles north
1J Cleary Summit-Pedro Dome	Settlement (520 acres) Minerals • Encourage mineral development Recreation • Land between Steese and Elliot highways and Chtanika River contain many historic gold mines Wildlife Habitat • Cleary Summit area is important/prime habitat for many species (e.g., moose) • Trapping and small game hunting also important Forestry • Contains moderately productive hardwoods	12 miles north and northeast
1K Juniper Creek	Wildlife Habitat • High value habitat for many species, including moose	30 miles northeast
1L Belle Creek	Settlement (2,000 acres) Forestry • Moderately productive birch/aspen stands Recreation Wildlife Habitat • Important habitat for several species	
1M Caribou-Poker Creek Watershed	Watershed • Used for watershed research	20 miles north
1N Upper Washington Creek	Low Value Resource Management Wildlife Habitat • Important areas for many species • Intensive trapping, wildlife viewing, and small game hunting north of Elliot Highway Forestry • Second growth hardwood stands Recreation	20 miles north-northwest

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
1O Pipeline Corridor/Elliot Highway	Settlement (1,365 Acres) Low Value Resource Management Wildlife Habitat • High/Important values for moose and furbearers • Trapping, small game hunting, fishing are intensive; big game hunting moderate	18+ miles north-northwest
1P Tatalina River	Agriculture/Settlement (8,500 acres) Wildlife Habitat • Tatalina River wetlands is important habitat • Prime habitat for moose, black bear, and furbearers Forestry • Extensive stands of hardwoods, but high use not expected	24 miles northwest
1Q Tanana River	Agriculture/Settlement (2,000 acres) Wildlife Habitat • Important habitat and prime moose, furbearer, and fish habitat along Tanana River • Essential migratory route for salmon • Intensive hunting and trapping Forestry • Accessible stands of spruce and birch Recreation • High recreational use along Tanana River	15-50 miles southeast
1R Salcha-Goodpaster Uplands	Wildlife Habitat • Prime grizzly bear and moose habitat Forestry • Moderately valued forests in South Fork Valley	45 miles east
1S Salcha River Corridor	Recreation • Salcha river used for boating and fishing • High priority for water quality enforcement Wildlife Habitat • Critical habitat for anadromous fish • High value habitat for black bear, caribou, grizzly bear, moose, furbearers, and small game • Need to natural/adequate fire regime to ensure habitat quality	35+ miles southeast and east
1T Upper Chena River Highlands	Wildlife Habitat • Prime habitat for grizzly bear dall sheep and caribou	48 miles east and northeast

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
1U Steese to Chena Hot Springs	Settlement (11,300 acres) Recreation • Outstanding natural values • Davidson Ditch an important historic site • Important trail access Wildlife Habitat • High value habitat along streams for grizzly bear, caribou, moose, black bear furbearers, and small game • Important value habitats elsewhere Forestry • Moderate volume/productivity of hardwood forests	20+ miles northeast
1V Middle Fork of the Chena	Wildlife Habitat (High Value) • Lower Chena River receives intensive fishing pressure • Middle fork of Chena is important habitat for resident fish • Riparian areas are prime habitat for moose, black bear, furbearers, and small game	50 miles east
1W Little Chena	Agriculture Wildlife Habitat • Prime habitat for moose and furbearers Forestry • Some commercial value High Value Resource Management	0 to 20 miles east
1X Johnson Road	Settlement (200 acres) Agriculture (3,000 acres) Wildlife Habitat • Maintain access to fish and wildlife recreation	24 miles southeast
1Y Salchaket River	Forestry • Will not negatively affect other resource values Recreation • Important sport fisheries resources along Little Salcha River Wildlife Habitat • Need to maintain quality of sport fisheries along river corridor	30 miles southeast
1Z Harding/Birch Lake	Settlement (acreage unknown) Agriculture (acreage unknown) Recreation • Retain winter access to Spencer Lake • Design developments to minimize degradation of wildlife and fisheries habitat Forestry • Avoid disruption of recreational access during harvest	35 miles southeast

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
2E Elephant Mountain	Settlement (1,400 acres) Minerals • Decades of active mining • Exploration ongoing Recreation • Hutlinana Hot Spring has important recreational fish and wildlife values Wildlife Habitat • Uplands include important values for many species • Hutlinana Creek is salmon spawning habitat Forestry • Moderate to good volume hardwood forests	60 miles northwest
2F Tolovana Hot Springs Dome	Agriculture Minerals • All state land open to mineral entry Wildlife Habitat • Important values for many species • Important hunting areas Forestry • Uplands east of Minto and the Tolvana River have commercial timber values	55 miles northwest
2G Tolovana North of Minto Flats	Wildlife Habitat • High value wetlands	50 miles northwest
2H Minto	Recreation Wildlife Habitat • Includes Minto Flats State Game Refuge • Supports wide diversity and abundance of wildlife • Includes critical and special value habitats Forestry • Firewood is available	33 miles west
2I Lower Goldstream Creek	Settlement (330 acres) Agriculture (2,500 acres) Wildlife Habitat • Includes special value areas (wetlands). Uplands include important areas, and moderate/low value habitats Forestry • Includes river-bottom white spruce	30 miles west
2J West Fork of the Tolavana	Settlement (1,400 acres) Agriculture (potential to be evaluated) Wildlife Habitat • Prime habitat for raptors • High demand for hunting/trapping • Includes important areas and moderate to low value habitats • Prime habitat for salmon and resident fish Recreation • Brown Lake used for recreation Forestry • Relatively low timber values	55 miles northwest

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
2K Livengood	Agriculture Settlement (1,000 acres) Minerals • Includes Tolvana Mining District, which has large reserves of gold). Wildlife Habitat Forestry	50 miles north-northwest
2L O'Brien Creek, Elliot Highway	Agriculture Settlement (5,100 acres) Settlement (3,300 acres) Minerals • Some potential for limestone mining Wildlife Habitat • Includes prime habitat for raptors, and nesting habitat for peregrine falcons • Heavily used for hunting and trapping • Prime habitat for salmon and resident fish Recreation • Increased hunting/hiking expected Forestry • Firewood and sawtimber potential	30 miles northwest
2M Upper Tolovana	Agriculture • May have potential, but terrain may be too steep, and mining interests could conflict Minerals • High mineral potential in portions Wildlife Habitat • Includes some important areas, but not high value habitat/hunting areas	50 miles north-northwest
2N Tatalina River Valley	Wildlife Habitat • Includes prime habitat for moose, furbearers, and black bears; considered special value areas Forestry • Includes upland hardwoods	35 miles northwest
3M Upper Toklat River Flats	High value resource management Agriculture (4,500 acres) Minerals • Claims exist; potential for additional claims	65 miles southwest
3N Toklat River Corridor	Agriculture (4,800 acres) Wildlife Habitat • Important wildlife habitat along riparian areas • Prime habitat for moose, furbearers, grizzly bears	75 miles southwest
3O Toklat Critical Salmon Habitat	Wildlife Habitat • Chum salmon spawning areas • Important area for subsistence and commercial fisheries	80 miles southwest
3Q Comma Lake	Wildlife Habitat • Important habitat for grizzly bears, moose, and furbearers Forestry	65 miles southwest

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
3R Nenana-Totchaket	Agriculture (147,000 acres; cropland) Wildlife Habitat • Relatively low value • Includes some wetlands	50 miles southwest
3S Dune Lake	Settlement (1,120 acres) Wildlife Habitat	65 miles southwest
3T West Nenana	Settlement (800 acres) Wildlife Habitat • Wetlands managed to provide habitat for subsistence and recreation Forestry • Commercial stands of white spruce and hardwoods	45 miles southwest
3U Totchaket Slough	Wildlife Habitat • Sloughs, lakes, ponds supports waterfowl and other wildlife	45 miles west-southwest
4A Jack River	Wildlife Habitat • High value for grizzly bear, caribou, and Dall sheep	120 miles southwest
4B Reindeer Hills	Recreation Wildlife Habitat • High value for grizzly bear, caribou, and Dall sheep	120 miles southwest
4C Yanert River	Settlement (1,000 acres) Recreation Wildlife Habitat • High value for wintering caribou • Special value raptor habitat	90 miles southwest
4D Usibelli	Minerals Wildlife Habitat • High value for grizzly bears, raptors, furbearers • Critical habitat for Dall sheep, moose, peregrine falcon	80 miles southwest
4E Stampede Trail	Recreation Wildlife Habitat • Highest value caribou habitat • High value moose, grizzly bear, and furbearers	95 miles southwest
4F Parks Highway Corridor	Settlement (1,300 acres) Agriculture (10,830 acres) Wildlife Habitat • Important habitat for most fish and wildlife • High value for moose, black bear, and forbears Recreation	60 miles southwest
4G Upper Teklanika East	Agriculture (6,400 acres) Forestry Wildlife Habitat • Important habitat for many species • High value for caribou, grizzly bear, and furbearers	80 miles southwest

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
4H East Teklanika	Settlement (2,500 acres) Agriculture Forestry Minerals Wildlife Habitat • Critical breeding habitat for lynx • Average to low value habitat for most species	70 miles southwest
4I Teklanika Delta	Settlement (1,250 acres) Wildlife Habitat • Important habitat for most species • High value for moose	55 miles southwest
4J Seventeen Mile Slough	Agriculture (1,000 acres) Recreation Wildlife Habitat • High value for moose, black bear, and furbearers • Critical value for black bear along tributaries of Nenana River Forestry	50 miles southwest
4K Nenana River	Settlement (750 acres) Forestry Recreation	30 miles west and west-southwest
4L Totatlanika Flats	Recreation Wildlife Habitat • Critical and special value habitat for trumpeter swans • Important moose winter browse	25 miles southwest (borders far western TFTA)
4M Rex Dome to Liberty Bell Mine	Minerals Wildlife Habitat • High value habitats for many species • Important winter feeding for Delta Caribou herd	55 miles southwest
4N Upper Yanert Fork	Wildlife Habitat • High value habitats for grizzly bear, raptors, furbearers, and caribou • Critical habitat for Moose, Dall Sheep, and peregrine falcon Recreation	80 miles south
4O Mountains S.W. of Upper Wood River	Wildlife Habitat • Critical calving habitat for Yanert caribou herd	80 miles south
4P North Slope of Alaska Range	Minerals Wildlife Habitat • High value habitat for grizzly bear, raptors, furbearers, and caribou • Critical habitat for moose, Dall sheep, peregrine falcon	60 miles south
4Q Lower Dry Creek/Japan Hills	Settlement (550 acres) Wildlife Habitat • High value habitat for moose and furbearers • Important habitat for other species	33 miles south

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
4R Nenana River Corridor	Recreation Wildlife Habitat • Critical spawning, rearing, and feeding areas for coho, chum, and king salmon • Important habitat for burbot, grayling, and Dolly Varden • High Value for moose, caribou, grizzly bear, black bear, and furbearers	70 miles southwest
7A Shaw Creek	Fish and Wildlife Habitat • Highest value moose and waterfowl Forestry • Mixed spruce/hardwoods Recreation • Existing trail network, expansion encouraged	23 miles north
7B Quartz Lake	Forestry • Overmature white spruce Recreation • Quartz lake important • Commercial recreational use allowed	15 miles north
7C Tanana Uplands	Forestry • Harvesting a priority Recreation • 100 foot buffer along Goodpaster Trail	16 miles north
7D Goodpaster River	Fish and Wildlife Habitat • High value grayling, king salmon, moose, black bear, furbearers, and waterfowl Forestry • White spruce saw and poletimber, non-commercial black spruce Minerals • Moderate to high potential • Active placer mining near Goodpaster River Recreation • Hunting, fishing, trapping • 80+ private parcels along river	15 to 66 miles northeast
7E Volkmar	Forestry • Primarily for personal use Recreation • Suitable camping, picnicking Settlement • Some private parcels near Volkmar Lake	17 miles northeast
7F Tanana River	Fish and Wildlife • High value Peregrine Falcon habitat Forestry • Not to diminish fish and wildlife values Recreation • Uses that complement wildlife	3 to 28 miles scattered Borders DTA East

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
7G Delta Creek	Agriculture • Good soils for agriculture Fish and Wildlife • High value chum salmon, disruption of habitat prohibited Forestry • White spruce, mixed spruce and hardwood sawtimber Recreation • Allowed when compatible with wildlife Settlement • 1,000 acres Watershed • Water quality must remain at natural conditions	4 to 20 miles northwest Borders DTA West
7H Bluff Cabin Ridge	Agriculture • 1,600 acres offered for private ownership Fish and Wildlife Recreation • Archeological sites should be retained by state Settlement • 300 acres offered for private use	12 miles north
7I Delta Junction	Agriculture • 1,7720 acres may be offered Fish and Wildlife Recreation • Valuable open space around Delta Junction Settlement • 1,118 acres have been offered	6 to 12 miles scattered
7J Delta-Clearwater River	Fish and Wildlife Recreation • Heavy fishing and boating use Minerals • No new entry Watershed • Protection is of primary importance	10 to 12 miles west and northwest
7K Bison Range	Agriculture Fish and Wildlife • Delta Bison Management Plan should be consulted Recreation and Access • Existing trail network • Donna Lakes area important	10 miles southeast Borders DTA East
7L Greely Reserve	Recreation Settlement • 100 commercial acres may be offered along Richardson Hwy, next to DTA	1 mile south Boarders DTA East
7M Delta Wildlands	Minerals Recreation • Existing trail network Settlement • 72 acres have been offered	12 miles southeast Borders DTA East

Appendix Table 4.20.c cont. Land Use in Tanana Basin Area Plan.

Land Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
7N Dry Creek	Agriculture • 1000 acres have or may be offered Fish and Wildlife Recreation • Commercial and public use Forestry Settlement • 200 acres have been offered	28 miles southeast
7O Macomb Plateau	Fish and Wildlife • Continued public access is important Minerals • Moderate to good potential Recreation • Existing trail network • Public facilities not suitable	36 miles southeast

Appendix Table 4.20.d Land Use Designation in the Tanana Basin Area Plan.

Land Use Designation	Acres by Land Unit Subregion[a]						
	1	2	3	4	5	6	7
Agriculture	22,000		143,000				<1,000
Agriculture/Settlement	29,000	22,000		12,000		25,000	1,000
Forestry	26,000	27,000	25,000			9,000	4,000
Forestry/Minerals		5,000					
Forestry/ Recreation		<1,000		6,000			71,000
Forestry/Wildlife Habitat	90,000	164,000	33,000	28,000		211,000	63,000
Forestry/Minerals/ Recreation	26,000						
Forestry/Minerals/ Wildlife Habitat		21,000	57,000			9,000	
Forestry/Recreation/ Wildlife Habitat	26,000		2,000			64,000	206,000
Forestry/Minerals/ Recreation/Wildlife Habitat		25,000				23,000	
Materials	16,000						
Minerals	14,000	48,000					
Minerals/ Recreation	64,000						
Minerals/Wildlife Habitat		121,000	51,000	736,000		367,000	
Minerals/Recreation/ Wildlife Habitat	12,000	125,000					554,000
Recreation	4,000	23,000	1,000	13,000			28,000
Recreation/Wildlife Habitat	457,000	13,000	5,000	735,000	984,000	295,000	945,000

Appendix Table 4.20.d cont. Land Use Designation in the Tanana Basin Area Plan.

Land Use Designation	Acres by Land Unit Subregion[a]						
	1	2	3	4	5	6	7
Recreation/ Transportation/ Wildlife Habitat		13,000			11,000		
Recreation/Watershed/ Wildlife Habitat							19,000
Reserved Use							2,000
High-Value Resource Management	4,000	149,000	138,000	67,000		20,000	70,000
Low-Value Resource Management	48,000	385,000	1,086,000	42,000			
Settlement	188,000	85,000	288,000	199,000		22,000	11,000
Watershed	29,000						
Wildlife Habitat	1,335,000	400,000	1,155,000	1,677,000	68,000	435,000	155,000

[a] Land Units:
1 Fairbanks North Star Borough
2 Lower Tanana
3 Kantishna
4 Parks Highway and West Alaska Range
5 East Alaska Range
6 Upper Tanana
7 Delta Salcha

Source: Alaska Department of Natural Resources 1991

Appendix Table 4.20.e cont. BLM Lands in Interior Alaska.

Management Unit	Primary Land Uses	Approximate Distance/Direction From Fort Wainwright Main Post
White Mountains National Recreation Area (1 million acres)	Resource Management Goals • Multiple use management • Provide winter and summer outdoor recreational activities in primitive or semi-primitive setting • Protect and maintain water quality of Beaver Creek National Wild River Cultural Resources • No prehistoric sites found • Many sites from gold mines, trapping, and homesteads; BLM surveys and inventories these sites Fish and Wildlife Management • Monitoring projects on Nome Creek and Beaver Creek • Surveys to monitor caribou, moose, Dall sheep, breeding birds, and other species • Habitat monitoring Minerals • No longer open to exploration or new leases • Leases obtained prior to 1980 are honored; several mining sites exist • Reclamation of old mining areas, including filling ponds, leveling tailing piles, and realigning streambeds, and reseeding floodplains and stream banks Recreation • Resources include 10 public cabins, 250 miles of trails, 16 miles of road, 3 campgrounds, 5 trailheads, and Beaver Creek National Wild River (110 miles)	30 miles north
Steese National Conservation Area (1.2 million acres)	Resource Management Goals • Multiple use and sustained yield • Maintenance of environmental quality Special Value Areas • Birch Creek National Wild and Scenic River • Critical caribou calving grounds and home range, and Dall sheep lambing and home range Uses of the Steese National Conservation Area • Canoeing and rafting • Hiking, climbing, and backpacking • Hunting, fishing, and trapping • Some restrictions on off road vehicle use • Cross country skiing, snowshoeing, snowmobiling • Wildlife viewing Prohibited Uses • Motorized equipment for mineral collection • Hovercraft or airboats • Construction of cabins or other structures without authorization	60 miles northeast (approximately 25 miles northeast of Yukon Training Area)

Appendix Table 4.20.f Chugach State Park Planning Units.

Planning Unit	Primary Land Uses	Approximate Distance/Direction From Fort Richardson Cantonment Area
Eklutna – Peters Creek (190,000 acres)	Recreation • Heavy use of Eklutna River and Thunderbird Creek drainages • Popular activities include hiking, camping, hunting, wildlife viewing, skiing, snow machining Private landholdings (1,330 acres) Native claims (40,000 acres) Natural Environment Zone Wilderness	8 miles northeast
Eagle River (136,000 acres)	Recreation • Heavy use due to close proximity to Anchorage • Popular activities include hiking, camping, hunting, wildlife viewing, skiing, snow machining Private landholdings (2,900 acres) Native claims (6,000 acres) Natural Environment Zone Wilderness	5 miles northeast this unit lies along the eastern border of Fort Richardson
Ship Creek (46,000 acres)	Recreation • Includes access to Anchorage Ski Bowl Wilderness	4 miles east this unit lies along the eastern border of Fort Richardson
Hillside (26,000 acres)	Recreational Access (10%) • Heavy use due to close proximity to Anchorage • Popular activities include hiking, camping, hunting, wildlife viewing, skiing, snow machining Natural Environment Zone (75%) Wilderness Zone (15%)	6 miles south this unit lies along the southern border of Fort Richardson
Turnagain Arm (97,000 acres)	Recreational Access (<5%) Natural Environment Zone (65%) Wilderness Zone (30%)	12 miles south

Appendix Table 4.20.g Upper Delta River (National Wild & Scenic River Designation).

Management Unit	Primary Land Uses	Approximate Distance/Direction from Donnelly Training Area
Delta River: 'Wild' river (Tangle Lakes to milepost 212, Richardson Hwy). Wild, per Wild & Scenic Rivers Act (Tangle Lakes to milepost 212, Richardson Hwy.) 'Recreational' river (milepost 212, Richardson Hwy. to 0.5 miles north of Black Rapids). Recreational, per Wild & Scenic Rivers Act (Milepost 212 to 0.5 miles north of Black Rapids)	Resource Management Goals • Multiple use management • Maintain pristine, natural condition of Wild & Scenic River area • Maintain water quality • Provide recreational opportunities Soils • Monitoring program to quantify soil disturbance from recreational use Surface Water • Priority in maintaining water quality • All use authorizations will include pollution control measures Cultural Resources • Numerous prehistoric sites, primarily within the Tangle Lakes Archaeological District • CR sites will be 'protected or enhanced'; surface-disturbing activity will be limited and will include protective measures Fish & Wildlife Management • Maintain recreational fishing opportunities • Maintain or enhance fish and wildlife habitats • Implement habitat management plan for river Minerals • Provide continued access to adjacent mining claims • Ensure that mining access does not interfere with 'pristine' nature along wild and scenic designations Recreation • Boating, fishing, hunting, floating, berry picking, sightseeing • Motorized equipment prohibited in 'wild' section of river (to milepost 212) • Hunting, fishing, and trapping are allowed throughout Subsistence • Minimal subsistence use of area; fishing, berry picking • Fuelwood harvest allowed, with BLM cutting permit • Food harvest allowed to continue Transportation • Open to all non-motorized transportation • Motorized equipment prohibited in 'wild' section of river (to milepost 212) • Exceptions: snowmobiles in winter, ORVs in designated areas, mining access, existing motorboat use, emergency vehicles Fire • Fire management plan in accordance with BLM fire policy (full or modified protection)	11-49 miles south

4.20.b Threshold Analysis for Cumulative Impacts on USARAK Lands

Appendix Table 4.20.h Summary of Impact Thresholds for Relevant Resource Categories Covered in Cumulative Impacts Analysis.

Resource/Issue	Threshold	Threshold Exceeded Due to Cumulative Impacts?	Action
Air Quality *Emissions* *Particulate Matter*	Attainment areas: PSD thresholds FWA nonattainment area: Conformity review threshold 100 tpy of CO	No	Continue monitoring
Geology	Impacts to geologic resources are not expected	No	None expected
Soils *Maneuvers, Construction* *Recreation*	MIMs capacity	No	ITAM program; monitoring and adaptive management
Surface Water *Maneuvers* *Contaminants*	Approach or exceed federal or state water quality standards *18 AAC 70* *18 AAC 80 (if applicable)*	No	Water quality monitoring; maneuver limitations; remediation on case-by-case basis
Groundwater *Contaminants* *Demand on water supply*	Approach or exceed federal or state water quality standards *18 AAC 70* *18 AAC 80 (if applicable)*	No	Water quality monitoring; standard operating procedures; maneuver limitations; remediation on a case-by-case basis
Wetlands *Maneuvers, Construction* *Recreation*	If MIMs exceed capacity or if Section 404 permits are exceeded (>40 acres/year for each post)	No	ITAM program; monitoring; additional wetlands permits as required
Vegetation *Maneuvers, Construction* *Recreation* *Fire*	If MIMs capacity is exceeded	No	ITAM program; monitoring and adaptive management
Wildlife and Fisheries *Herd mammals* *Predators* *Waterfowl* *Neotropical birds* *Stocked Fish* *Wild Fisheries*	The cumulative impact threshold for wildlife and fisheries would be if population level impacts occurred to priority species (Section 4.9, Wildlife and Fisheries).	No	USAG-AK's ecosystem management program has identified wildlife and fish priority species (Appendix H). Management goals include minimization of habitat loss and monitoring. USAG-AK has implemented and adaptive management for wildlife, and stocking program for fish.
Threatened or Endangered Species and Species of Concern	The cumulative impact threshold would be population level impacts to species of concern (Section 4.10).	No	Monitoring and adaptive management

Appendix Table 4.20.h cont. Summary of Impact Thresholds for Relevant Resource Categories Covered in Cumulative Impacts Analysis.

Resource/Issue	Threshold	Threshold Exceeded Due to Cumulative Impacts?	Action
Cultural Resources *Historic sites* *Prehistoric sites*	Damage or destruction of prehistoric or historic cultural sites	Possible	ICMRP programs; cultural resource surveys
Noise *Army/federal noise standards*	The thresholds for noise levels are consistent with the Army's Environmental Noise Management Program (AR 200-1, Chapter 7) (See Section 3.16 Noise and Appendix H). Specifically any noise levels that exceed Zone II criteria off post would be exceeding cumulative thresholds (see Table 3.16.d).	No	According to Army Regulations 200-1, the goal of Army noise management is to: (1) Control environmental noise to protect the health and welfare of people, on- and off-post/CWF, impacted by all Army-produced noise, including on- and off-post/ CWF noise sources. (2) Reduce community annoyance from environmental noise to the extent feasible, consistent with Army training and materiel testing activities.

DESCRIPTION OF CUMULATIVE IMPACTS THRESHOLDS FOR CUMULATIVE IMPACTS ANALYSIS ON NATURAL RESOURCES

Air Quality

The cumulative emission changes at FWA Main Post are below the Prevention of Significant Deterioration (PSD) threshold for all criteria air pollutants (Section 4.2, Air Quality). Additionally, new emission sources within the nonattainment area at FWA main post must be below 100 tons per year of CO in order to show it will not contribute to any new violations in the area and hinder the area's efforts to reach attainment. If emissions are below 100 tons per year it is assumed to not contribute to significant cumulative impacts.

Soil Resources

Interior – MIMs capacity is the threshold for maneuver training lands and is presented in Section 4.2, Soil Management. Only about 17% of total summer capacity and less than 1% of total winter capacity would be utilized at end state of Alternative 3 at FWA. MIMs are expected to reach 17% of capacity in summer and less than 1% of capacity in winter at the end state of Alternative 4 at FWA. The end states of Alternatives 3 and 4 would result in 69% capacity in summer and 1.2% capacity in winter at DTA.

While additional impacts to soils result from recreation, these impacts are low compared to military impacts – An indication that cumulative impacts to soils do not exceed thresholds. Nevertheless, cumulative recreational impacts are of concern to USARAK. Some cumulative impacts to soils are monitored through ITAM and from aerial surveys. These areas are managed accordingly. Management actions may include repair and/or closing off the impacted areas.

USARAK's Land Rehabilitation and Maintenance Program (LRAM) and specific projects are described in Appendix H.

South Central – MIMs capacity is the threshold for maneuver training lands and is presented in Section 4.2, Soil Management. MIMs would only reach about 3% to 5% of capacity during the interim stages of Alternatives 3 and 4 at FRA. These levels would then decrease at the end state of transformation.

While additional impacts to soil result from recreation, these impacts are low compared to military impacts – An indication that cumulative impacts to soils do not exceed thresholds. Nevertheless, cumulative recreational impacts are of concern to USARAK. Some cumulative impacts to soils are monitored through ITAM and from aerial surveys. These areas are managed accordingly. Management actions may include repair and/or closing off the impacted areas. USARAK's Land Rehabilitation and Maintenance Program (LRAM) and specific projects are described in Appendix H.

Surface Water

Due to the depth and complexity of modeling future surface water impacts, as well as the secondary and indirect nature of many impacts, the most applicable and measurable thresholds for cumulative impacts to surface water are the appropriate federal or state water quality statutes. Cumulative impacts to surface waters on USARAK lands are not expected to exceed Alaska state water quality standards 18 AAC 70 (Alaska Water Quality Standards). In some cases, 18 AAC 80 (Alaska Drinking Water Standards) are also applicable to water quality thresholds for cumulative impacts analysis. Sedimentation may exhibit a slight overall increase, but is not expected to alter water quality due to the high base sediment loads in most waterways on USARAK lands. In addition, localized increases in chemical constituents from explosive munitions or inadvertent releases of petrochemicals, oils, lubricants, or solvents may increase concentrations of hazardous or toxic chemicals in surface waterways.

Groundwater

Due to both a lack of predictive modeling for groundwater impacts and the insulated nature of groundwater in almost all areas, the most applicable and measurable thresholds for analysis of cumulative impacts to groundwater are the appropriate federal and state standards for groundwater. In this case, 18 AAC 70 (Alaska Water Quality Standards), and perhaps, 18 AAC 80 (Alaska Drinking Water Standards). Groundwater impacts tend to be indirect, as either second-order or third-order impacts from direct impacts to surface resources, such as vegetation, soils, or surface water.

In the FWA area, groundwater is used as drinking water supply. Therefore, water quantity in the area must also be a factor in cumulative impacts analysis. However, no quantity thresholds exist, and the most applicable measure may be a threshold of sufficient quantity for the population in the area. This is not expected to be an issue, as groundwater yield in the area is far more than sufficient for the current and projected populations.

Wetlands

Interior – MIMs capacity is the threshold for maneuver training lands and is presented in Section 4.2, Soil Management. Only about 17% of total summer capacity and less than 1% of total winter capacity would be utilized at end state of Alternative 3 at FWA. MIMs are expected to reach 17% of capacity in summer and less than 1% of capacity in winter at the end state of Alternative 4 at

FWA. The end states of Alternatives 3 and 4 would result in 69% capacity in summer and 1.2% capacity in winter at DTA.

While additional impacts to wetlands result from recreation, these impacts are low compared to military impacts, which is an indication that cumulative impacts to soils do not exceed thresholds. Nevertheless, cumulative recreational impacts are of concern to USARAK. Some cumulative impacts to wetlands are monitored through ITAM and from aerial surveys. These areas are managed accordingly. Management actions may include repair and/or closing off the impacted areas. USARAK's Land Rehabilitation and Maintenance Program (LRAM) and specific projects are described in Appendix H.

USARAK's existing wetlands permit places a threshold of 40 acres of low-function wetlands to be damaged a year. Any damage wetlands must be repaired. No high-function wetlands may be damaged. This restricts cumulative activities in addition to proposed SBCT activities. SBCT and cumulative activities are not expected to exceed this threshold.

South-Central – MIMs capacity is the threshold for maneuver training lands and is presented in Section 4.2, Soil Management. MIMs would only reach about 3% to 5% of capacity during the interim stages of Alternatives 3 and 4 at FRA. These levels would then decrease at the end state of transformation.

While additional impacts to wetlands result from recreation, these impacts are low compared to military impacts – An indication that cumulative impacts to soils do not exceed thresholds. Nevertheless, cumulative recreational impacts are of concern to USARAK. Some cumulative impacts to wetlands are monitored through ITAM and from aerial surveys. These areas are managed accordingly. Management actions may include repair and/or closing off the impacted areas. USARAK's Land Rehabilitation and Maintenance Program (LRAM) and specific projects are described in Appendix H.

USARAK's existing wetlands permit places a threshold of 40 acres of low-function wetlands to be damaged a year. Any damage wetlands must be repaired. No high-function wetlands may be damaged. This restricts cumulative activities in addition to proposed SBCT activities. SBCT and cumulative activities are not expected to exceed this threshold.

Vegetation

Cumulative impacts to vegetation arise from maneuver and weapons training, construction in the cantonment area and ranges, and from fires.

Interior – Army lands encompass about 1.55 million acres in interior Alaska. The combination of past and current maneuver training has damaged only a fraction of 1% of interior Alaska Army lands. Based on projections from the MIMs, these impacts could increase approximately five-fold. However, the impacts are sustainable, and well within capacity (see Wetlands and Soil Resources above). Institutional controls such as Integrated Training Area Management and Land Rehabilitation Management would monitor and rehabilitate damaged areas (Appendix H). An additional 1% (approximately 14,000 acres) of Army lands have been developed into cantonment areas at FWA Main Post and Fort Greely. Combined, mission essential, SBCT, and other military construction projects (i.e., Space and Missile Defense System and the Cold Regions Test Center Automotive Facility) could replace or cause long-term alteration to about 1,200 acres of vegetation, or 0.8% of the habitat on interior Alaska's Army lands. Munitions impacts affect about 200 acres per year in the impact areas; however, the loss of vegetation is not permanent, and the use of munitions in these areas would be sustainable in the future. Development of and upgrade

of ranges would alter the vegetation of about 4,000 acres at FWA and DTA combined. Vegetation would not be lost per se, but altered to an early seral state. Approximately 30% of these lands have been affected by wildfire over the past 50 years. Fire can be healthy for ecosystem function.

South-Central – In comparison with past, current, and future impacts to vegetation in Anchorage and nearby communities, the impacts to vegetation at FRA are not nearly as extensive. Potentially, about 43,000 acres of FRA's 61,000 acres are classified as maneuver areas (USARAK 2002f), although vehicle maneuvers are not feasible for much of this land due to environmental limitations. At end-state, less than 10% of MIMs capacity would be used. Development on the cantonment area, in addition to construction of roads and structures, has impacted about 6,000 acres (10%) of the land on FRA. Development of mission essential projects and SBCT projects on the cantonment area would not add significantly to that acreage. However, construction new ranges would alter the vegetative structure of about 2,100 acres in the northeast portion of FRA (3% of the post). Vegetation would not be lost, but it would be maintained in an early seral state. Since the early 1950s, there has been one 8 fires larger than one acre on FRA (range 1-25 acres). Most of FRA is under Full Management or Critical fire management restrictions, which would reduce the risk of large-scale fires.

Wildlife and Fisheries

The threshold for cumulative impacts to wildlife and fisheries would be population level changes due to Army activities.

Interior – Summaries of cumulative impacts to wildlife in interior Alaska are presented in Appendix Table 4.20.i.

Appendix Table 4.20.i Summary of Cumulative Impacts to Priority Wildlife and Fish Populations on Army Lands in Interior Alaska

Species/ Taxonomic Group	Summary of Cumulative Impact
Wolverine	Construction and use of ranges and military facilities, plus increased maneuver training could disturb individual wolverine or local populations. Development could lead to increased habitat fragmentation. However, population level impacts would not be expected.
Grizzly Bear	Construction and use of ranges and military facilities, plus increased maneuver training could disturb individual grizzly bears or local populations. Development could lead to increased habitat fragmentation. However, population level impacts, especially in high density areas (e.g., foothills of the Alaska Range) would not be expected.
Wolf	Increased maneuver and weapons training could disturb individual wolves or local populations. Disturbance could cause individual packs in some sites (e.g., near ranges or construction sites) to abandon habitat.
Moose	Range construction could improve localized moose habitats. Weapons and maneuver training could temporarily disturb individual moose or local populations. If disturbance were high in high-density calving areas during calving season, population level impacts could result.

Appendix Table 4.20.i cont. Summary of Cumulative Impacts to Priority Wildlife and Fish Populations on Army Lands in Interior Alaska

Species/ Taxonomic Group	Summary of Cumulative Impact
Caribou	Range construction and maneuver training could disturb individual caribou or local populations. Increased development of trails and roads, combined with additional weapons and maneuver training, could fragment caribou habitat and result in increased disturbance rates. Localized portions of the Delta Caribou herd could be affected by fall or winter training activities.
Bison	Increased maneuver and weapons training could disturb herd. Changes in distribution could cause herd to exceed carrying capacity, and result in habitat degradation and population decline. Range construction and maneuver training could disturb segments of herd.
Sandhill Crane	Weapons training could disturb or localized populations of Sandhill crane. Increased maneuver and weapons training could disturb Sandhill cranes in localized areas. A portion of Crane high interest area could be impacted by development of the Cold Regions Test Center Automotive Test Facility, but this would not result in a population level impact.
Trumpeter Swan	Habitat loss due to construction is not expected. Weapons training could disturb or localized populations of swans. Increased maneuver training could disturb swans. Greater high-explosive weapons training could cause population-level effects in localized areas during breeding-brooding seasons.
Waterfowl	Habitat loss due to construction is not expected. Weapons training could disturb or localized populations of waterfowl. Increased maneuver training could disturb waterfowl. Greater high-explosive weapons training could cause population-level effects in localized areas during breeding-brooding seasons.
Raptors	Localized populations of raptors could be disturbed by maneuvers or weapons training. Localized populations of raptors could be disturbed by maneuvers or weapons training, and localized habitats could be affected by construction. However, population level impacts would not be expected.
Sharp-tailed Grouse	Construction of new ranges could increase habitat; however, increased training at drop zones and ranges during breeding and nesting could impact local populations.
Forest Dwelling Neotropical Birds	Development of and use new ranges could cause habitat loss for localized populations; however, the loss of forest cover in relation to habitat availability would be relatively small.
Stocked Fish	Influx of personnel could increase fishing pressure on stocked lakes. Population level impacts to stocked fish due to construction or training on Army lands would not be expected.
Wild Fisheries	Influx of personnel could increase fishing pressure on anadromous streams. Population level impacts to wild fisheries due to construction or training on Army lands would not be expected.

South-Central – Summaries of cumulative impacts to wildlife in South Central Alaska are presented in Appendix Table 4.20.j.

Appendix Table 4.20.j Summary of Impacts to Priority Wildlife and Fish Populations on Army Lands in South Central Alaska

Species/ Taxonomic Group	Summary of Cumulative Impact
Wolverine	Construction and use of ranges and military facilities, plus increased maneuver training could disturb individual wolverine or local populations. Development could lead to increased habitat fragmentation. However, population level impacts would not be expected.
Grizzly Bear	Construction and use of ranges and military facilities, plus increased maneuver training could increase habitat fragmentation or disturb individual grizzly bears or local populations.
Black Bear	Range construction and maneuver or weapons training could disturb some black bears, and result in habitat fragmentation. Increased maneuver and weapons training could disturb some bears or local populations. Impacts could affect local population.
Wolf	Increased maneuver and weapons training could disturb individual wolves or local populations. Disturbance could cause individual packs in some sites (e.g., near ranges or construction sites) to abandon habitat.
Moose	Range construction could improve localized moose habitats. Weapons and maneuver training could temporarily disturb individual moose or local populations. If disturbance were high in high-density calving areas during calving season, population level impacts could result. Severe winters or habitat degradation could result in population level impacts to moose.
Dall Sheep	Impacts from construction or weapons training would not be expected. Dall Sheep could be disturbed from soldiers on foot or from low-flying aircraft, especially from helicopter training near summer habitat. Population-level impacts would not be expected.
Beluga Whale	Beluga whales could be susceptible to shipping, aircraft overflights, or water quality degradation. Disturbance rates could increase during deployments, but impacts would be short-term.
Common Loon	Loons are susceptible to disturbance during breeding season. Breeding pairs and offspring could be impacted from maneuver training or from recreation.
Trumpeter Swan	Habitat loss due to construction is not expected. Weapons training could disturb or localized populations of swans. Increased maneuver training could disturb swans. Greater high-explosive weapons training could cause population-level effects in localized areas during breeding-brooding seasons.
Waterfowl	Construction projects would result in population-level impacts to waterfowl. Weapons training could disturb or localized populations. Increased maneuver training could disturb waterfowl during breeding or brooding. Greater high-explosive weapons training could cause population-level effects in localized areas during breeding-brooding seasons.
Raptors	Localized populations of raptors could be disturbed by maneuvers or weapons training. Localized populations of raptors could be disturbed by maneuvers or weapons training, and localized habitats could be affected by construction. However, population level impacts would not be expected.
Sharp-tailed Grouse	Construction of new ranges could increase habitat; however, increased training at drop zones and ranges during breeding and nesting could impact local populations.

Appendix Table 4.20.j cont. Summary of Impacts to Priority Wildlife and Fish Populations on Army Lands in South Central Alaska

Species/ Taxonomic Group	Summary of Cumulative Impact
Forest Dwelling Neotropical Birds	Development of and use new ranges could cause habitat loss for localized populations; however, the loss of forest cover in relation to habitat availability would be relatively small.
Stocked Fish	Influx of personnel could increase fishing pressure on stocked lakes. Population level impacts to stocked fish due to construction or training on Army lands would not be expected.
Wild Fisheries	Influx of personnel could increase fishing pressure on anadromous streams. Population level impacts to wild fisheries due to construction or training on Army lands would not be expected.

Threatened or Endangered Species and Species of Concern

There are no threatened or endangered species directly affected by activities on USARAK lands in interior or south-central Alaska. Table 4.20.k presents a summary of cumulative impacts to species of concern in these regions.

Appendix Table 4.20.k Impacts to Species of Concern in Alaska

Species/ Taxonomic Group	Summary of Cumulative Impact
Olive-sided flycatcher	Clearing of forest for ranges could reduce habitat availability; flycatchers could benefit from fires. Habitat availability could improve if fire frequency increased. Population level impacts are not likely.
Gray-cheeked thrush	Local populations could be impacted by clearing of ranges, however, species is more affected by loss of winter range. Could be susceptible to habitat loss from fires. Localized population impacts are possible.
Townsend's warbler	Clearing of forest for ranges could affect habitat availability. Could lose habitat due to range use and from fires. Localized population impacts are possible.
Blackpoll warbler	Could lose habitat due to range construction. Could lose habitat due to range use and from fires. Localized population impacts are possible.
American osprey	Clearing of forest for ranges, particularly in riparian areas, could affect habitat availability. Primarily riparian species; habitat loss due to range construction and from fires minimal; susceptible to disturbance from range use during May-June nesting period. Population level impacts are not likely.
American peregrine falcon	Clearing of forest for ranges could affect habitat availability, but only occasional visitor to FWA. Could lose habitat due to range use and from fires, but only occasional visitor to FWA. Population level impacts are not likely.

Cultural Resources

A threshold for significance for cultural resources is extremely difficult to quantify, due to the varied nature of cultural resources and their contexts. However, the threshold could be set as low as loss of a single site. Due to the relatively low number of prehistoric sites important for understanding of the peopling of Alaska and the new world, loss of a single "eligible" site without proper mitigation is a significant impact. Because we have not evaluated sites found for eligibility for inclusion in the National Register of Historic Places, loss of any site without proper evaluation and potential mitigation is a significant impact to our potentially understanding of the region's/ state's prehistory.

In addition, the loss (through demolition or alteration) of a building contributing to either the Ladd Field National Historic Landmark at FWA would be a significant impact, because it could define the loss of the landmark itself. This also applies to the Nike Site Summit historic property at FRA, since the eight other properties of this type in Alaska have already been demolished. Thresholds of significance for other historic properties, such as the Ladd Air Force Base Historic District or the FRA Historic District, are higher, because the loss of a single building does not affect the overall historic characteristics that make the property eligible for listing in the National Register of Historic Places.