CHAPTER 3

AFFECTED ENVIRONMENT

CHAPTER 3

AFFECTED ENVIRONMENT

3.1 INTRODUCTION

3.1.1 Organization

This section of the Environmental Impact Statement (EIS) provides description of the existing conditions at Fort Wainwright (including the Main Post, and the Tanana Flats and Yukon Training Areas), Donnelly Training Area (including nearby training areas at Gerstle River and Black Rapids), and Fort Richardson (Figure 3.1.a). The conditions at each post are described within subsections of each environmental category.

Section	Category	Page Number
3.2	Air Quality	3-7
3.3	Geology Resources	3-17
3.4	Soil Resources **(Issue D, Maneuver Impacts)**	3-23
3.5	Surface Water	3-29
3.6	Groundwater	3-41
3.7	Wetlands **(Issue C, Wildlife and Habitat; Issue D, Maneuver Impacts)**	3-47
3.8	Vegetation	3-53
3.9	Wildlife and Fisheries **(Issue C, Wildlife and Habitat)**	3-65
3.10	Threatened or Endangered Species and Species of Concern	3-91
3.11	Fire Management **(Issue E, Fire Management)**	3-97
3.12	Cultural Resources **(Issue F, Cultural Resources)**	3-105
3.13	Socioeconomics	3-117
3.14	Public Access and Recreation **(Issue A, Access; Issue C, Wildlife and Habitat)**	3-139
3.15	Subsistence	3-149
3.16	Noise	3-159
3.17	Human Health and Safety **(Issue B, Traffic)**	3-165
3.18	Environmental Justice	3-177
3.19	Infrastructure	3-183

3.1.2 Description of USARAK Lands

A majority of the lands currently used by USARAK are on long-term withdrawal from the public domain and were originally assigned to the Bureau of Land Management (BLM). Residual responsibility for USARAK withdrawn lands remains with the BLM, which retains interest in the stewardship of the transferred parcel, even though the land is under the Department of Defense's long-term management. Withdrawal documents and executive orders indicate that lands are not available for disposal. This includes state or Native selection, sales under the Federal Land Planning and Management Act or the Recreation and Public Purposes Act, or exchanges.

3.1.2.1 Fort Wainwright

Fort Wainwright (FWA) is located in central Alaska, north of the Alaska Range in the Tanana River Valley. The installation lies 120 miles south of the Arctic Circle near Fairbanks and encompasses approximately 928,000 acres. Main Post consists of 13,700 acres, Tanana Flats Training Area (TFTA) is over 655,000 acres, and the Yukon Training Area (YTA) totals 247,952 acres (Figure 3.1.a).

Main Post is situated on a flat alluvial plain. It is bordered on the west by the city of Fairbanks and on the other three sides by open space that is owned by the state of Alaska. TFTA is located

south of Main Post. Its north and east boundaries are formed by the Tanana River, while the Wood River borders the western edge. YTA is located 16 miles east-southeast of Fairbanks, and the post is bounded by the Chena River on the north and Salcha River to the south. Eielson Air Force Base is located on YTA's west border.

3.1.2.2 Donnelly Training Area

Donnelly Training Area (DTA) is located approximately 100 miles southeast of Fairbanks and lies within the Tanana River Valley (Figure 3.1.a). DTA encompasses approximately 631,000 acres. The Main Post consists of 7,000 acres (after the transfer of lands to the Missile Defense System), DTA West is 531,000 acres, and DTA East is 93,000 acres (USARAK 2002e).

The Little Delta River borders the west boundary of DTA West, and the Delta River and portions of its floodplains form the eastern border. The southern border follows a straight diagonal line from MacArthur Mountain to the Delta River, approximately 26 miles from the intersection of the Alaska and Richardson highways. To the north, the boundary follows a diagonal line from the Little Delta River to the Main Post.

The Delta River and its floodplain form the west side of DTA East, and Granite Creek forms the eastern border. The northern boundary roughly parallels the Alaska Highway, and the southern boundary lies at the base of the Alaska Range's foothills. The Main Post is managed with DTA East, and it lies south of Delta Junction.

Two outlying land parcels are located near DTA. The Gerstle River Training Area is approximately 20,000 acres and is located about three miles south of the Alaska Highway, and 30 miles southeast of Delta Junction. The rectangular area is oriented northwest to southeast and measures about five miles, north to south, and nine miles, east to west. Black Rapids Training Area is a 2,780-acre site, located approximately 35 miles south of Delta Junction along the east side of the Richardson Highway.

3.1.2.3 Fort Richardson

Fort Richardson (FRA) is located in south-central Alaska adjacent to the cities of Anchorage and Eagle River, and Elmendorf Air Force Base (Figure 3.1.a). The Knik Arm of Cook Inlet borders the north side of the post, and Chugach State Park lies to the south and southeast. The town of Eagle River lies along the northeast border; Anchorage and Elmendorf Air Force Base form the western boundary. The western boundary is approximately 11 miles long, from Knik Arm to its terminus beside Anchorage and Chugach State Park. The eastern border is 21 miles, and also runs from Knik Arm to Chugach State Park. FRA is approximately six miles across, from east to west. FRA encompasses 61,376 acres.

3.1.2.4 Climate Regime

3.1.2.4.1 Fort Wainwright

FWA and its associated installations have the northern continental climate of the Alaskan Interior, which is characterized by short, moderate summers; long, cold winters; and little precipitation or humidity. Weather is influenced by the mountain ranges on three sides, usually forming an effective barrier to the flow of warm, moist, maritime air. The surrounding uplands also cause the settling of cold Arctic air into Tanana Valley lowlands. Climate statistics for FWA are listed in Table 3.1.a.

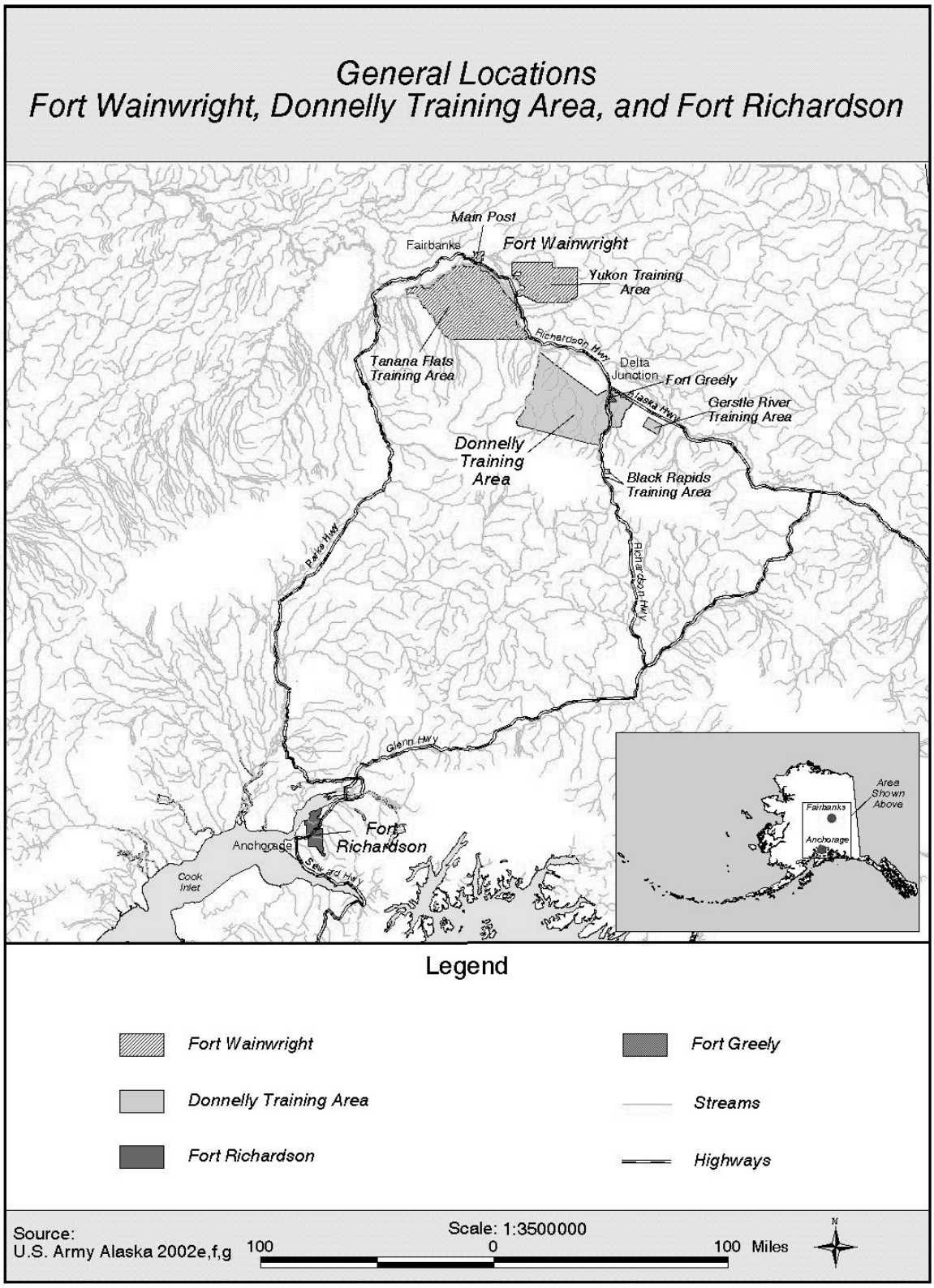

Figure 3.1.a General Locations of Fort Wainwright, Donnelly Training Area, and Fort Richardson.

3.1.2.4.2 Donnelly Training Area

The climatic conditions are similar to FWA due to the Tanana Valley and surrounding uplands and mountains. Climate statistics for DTA are listed in Table 3.1.a.

3.1.2.4.3 Fort Richardson

The principal factors affecting the climate of FRA include terrain, latitude, and geographic position relative to large landmasses and water bodies. FRA is located in a transitional zone between the maritime climatic zone to the south and the interior or continental climatic zone to the north (Selkregg 1974). The St. Elias and Chugach Mountains to the south act as a barrier to the maritime influence of the northern Pacific Ocean; the Alaska Range to the north protects the area from the extreme cold of the arctic air masses of the state's interior region. Additionally, Cook Inlet creates local temperature influences on the Anchorage Lowland. Climate statistics for FRA are listed in Table 3.1.a.

Table 3.1.a Mean Average Climate Statistics for USARAK Lands.

Location	July Maximum Temp. (°F)	January Minimum Temp. (°F)	Annual Precip. (in.)	Annual Snowfall (in.)	Maximum Snow Depth (in.)	Wind Speed (mph)
FRA (Elmendorf Weather Station)	65.1	7.1	15.29	77	13	7.1
FWA (Eielson Weather Station)	71.7	- 17.0	11.54	75	17	5.4
DTA (Big Delta Weather Station)	70	3.1	12	43.8	10	8.2

Source: Western Regional Climate Center 2002.

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3.2 AIR QUALITY

Topics discussed in this section include:

- Ambient air quality concepts
- Federal and State of Alaska air quality regulations
- Air quality status for each installation

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional air quality information is presented in Appendix E.

Ambient air quality refers to the atmospheric concentration of specific pollutants exhibited in a particular geographic location. The lower the concentrations of pollutants the higher the ambient air quality in that location. Many factors influence air quality. Local, regional and global meteorological patterns influence the movement and dispersion of air contaminants over time and space. Activity rates and the physical attributes of air emission sources influence air quality as well. Other pollutants are discussed and evaluated, but carbon monoxide (CO) and particulate matter (PM_{10}) are specific pollutants of concern for Alaskan communities and are emphasized.

Temperature inversions resulting from high latitudes, long winter nights, and weak daytime solar insulation are common in some areas of Alaska. During temperature inversions, cold air masses are often held in lowland areas by surrounding hills and mountains, and covered by a blanket of warm air masses. These conditions result in very stable atmospheric conditions that leave the air stagnant and trap pollutants near the ground, preventing winds from dissolving and dispersing the pollutants. Exceptionally strong inversions are almost always present when surface air temperatures fall below -30°F and their strength increases as temperatures drop further (Benson 1970).

When the ambient temperature drops below -20°F, ice fog, a condition unique to frigid climates, may form and contribute to pollution and visibility problems. Ice fog forms when water vapor is exposed to completely saturated air. Water vapor from sources such as automobiles is cooled so quickly when it is exposed to ambient air that tiny ice particles are formed. Ice fog is a form of air pollution in populated areas where the topography, combined with strong inversions, causes air to stagnate (Benson 1970). In a study by Benson (1970), the largest source (64%) of ice fog in Alaska was cooling water dumped into rivers from power plants. Combustion of fuels from automobiles, power plants, and fuel oil accounted for 32% of localized ice fog. The remaining 4% was contributed by miscellaneous sources such as people, animals, and leaks from houses and steam lines.

The Alaska Department of Environmental Conservation (ADEC) controls ice fog indirectly through its Prevention of Significant Deterioration (PSD) permitting mechanism by requiring a permit for building or operating industrial processes, fuel burning equipment, or incinerators in areas of potential ice fog or when excess water vapor emissions become a compliance issue. Permittees may be requested to reduce water vapor emissions (State of Alaska 2002a). See Appendix E for additional information on air quality regulations.

Pollutants can also be generated as a byproduct of industrial activities. Fugitive dust is typically generated from daily industrial activities such as bulk material handling, storage, and construction activities.

Air quality is regulated by the Clean Air Act Amendments of 1990 and ADEC. Areas in compliance with National Ambient Air Quality Standards (NAAQS) are considered attainment areas. Those areas not in compliance are considered nonattainment areas for the air pollutant in violation. A description of this regulatory framework for air quality is provided in Appendix E.

3.2.1 Air Quality Topics

3.2.1.1 Regional Air Quality

Air quality is a particular concern in the Fairbanks and Anchorage areas. All vehicles operating in the Fairbanks North Star Borough or in the Municipality of Anchorage are required to pass a vehicle inspection and maintenance emissions test every two years.

3.2.1.2 Air Quality Status

Air quality concerns differ among installations. Information about emission sources, attainment status, permitting, and violations is described for each installation.

3.2.2 Fort Wainwright and Fairbanks North Star Borough

3.2.2.1 Regional Air Quality

Fairbanks has been compared to Los Angeles in terms of poor air quality. The population and pollution are far less in Fairbanks; however, the severity and occurrence of temperature inversions raises pollution levels that mirror Los Angeles ambient conditions.

A portion of Fairbanks is considered a serious nonattainment area for CO. The developed portion of Fort Wainwright's Main Post is included in this nonattainment area (USARAK 1999a). Fairbanks ranks among the top 10 worst western cities for CO pollution in the United States (Summarized in Table 3.2.a). Since FWA is considered nonattainment for CO, new projects that have the potential to emit more than 100 tons per year require a conformity analysis.

Table 3.2.a Summary of 8-Hour Averages Reported for CO near Fort Wainwright[1].

Year	Monitoring Sites								
	Federal Building 2nd & Cushman St.			State Office Building 675 7th Ave.			Hunter Elementary 17th & Gilliam Way		
	Highest CO Level	2nd Highest CO Level	No. Days Exceeded	Highest CO Level	2nd Highest CO Level	No. Days Exceeded	Highest CO Level	2nd Highest CO Level	No. Days Exceeded
1995	15.2	11.8	9	13.1	10.6	3	12.1	11.6	7
1996	9.8	8.6	1	9.1	8.4	0	8.8	8.6	0
1997	13.3	12.1	3	12.2	10.8	2	12.8	10.6	4
1998	10.4	10.2	2	11.1	8.0	1	10.4	8.7	1
1999	11.2	10.3	2	9.1	8.9	0	9.9	9.8	2
2000	11.5	8.9	1	9.7	7.4	1	8.6	7.2	0

[1] Data recorded from three stations west of FWA. Values are reported in parts per million volume (ppmv), and compared to the U.S. Environmental Protection Agency (EPA) 8-hour Air Quality Standard for CO (9 ppmv) to determine the number of days the standard was exceeded.

Source: AIRSData 2000

The average PM_{10} concentrations in Fairbanks are below the NAAQS. However, during temperature inversions and periods of ice fog, concentrations typically reach higher than average levels (Table 3.2.b).

Table 3.2.b Summary of Averages Reported for PM_{10} near Fort Wainwright[1].

Calendar Year	Annual Average ($\mu g/m^3$)	Highest 24-hour Average ($\mu g/m^3$)	2nd Highest 24-hour Average ($\mu g/m^3$)	No. of Days Exceeding NAAQS	Annual Average ($\mu g/m^3$)	Highest 24-hour Average ($\mu g/m^3$)	2nd Highest 24-hour Average ($\mu g/m^3$)	No. of Days Exceeding NAAQS
1995	23.8	99.0	57.0	0	29.3	102.0	87.0	0
1996	21.6	57.0	49.0	0	28.5	98.0	98.0	0
1997	23.3	56.0	47.0	0	26.5	60.0	59.0	0
1998	20.8	50.0	48.0	0	---	---	---	---
1999	22.1	99.0	62.0	0	---	---	---	---
2000	20.6	61.0	32.0	0	---	---	---	---

[1] Data recorded from two stations near FWA. Values are compared to USEPA Air Quality Standards to determine the number of days the standard was exceeded.

Source: AIRSData 2000

Ice fog is a common problem at FWA and in the Fairbanks area. A major contributor to ice fog in this area is the cooling pond that supports the central heating and power plant at FWA. A military construction project is planned to replace the cooling pond with water-cooled condensers. Implementation of this new design will reduce the amount of moisture evaporation and the formation of ground fog at the power plant (U.S. Army Corps of Engineers 2000).

There are no air quality monitoring stations located on FWA at this time, but ambient air quality data has been collected from nearby stations in Fairbanks. An ambient monitoring project is planned for late fiscal year 2002 through fiscal year 2003 to support future construction permitting requirements.

3.2.2.2 Fort Wainwright Air Quality Status

FWA is classified as a Nonattainment Area Major Facility for CO because it is within the boundary of the Fairbanks North Star Borough CO nonattainment area. As a result, proposed federal actions must undergo a general conformity review. There are portions of the installation outside of the nonattainment area. These areas are not subject to the General Conformity Rule.

FWA is also classified as a PSD Major Facility because it has the potential to emit >250 tons of at least one regulated pollutant (18 AAC 50.300). It is located in an area that is in attainment or unclassifiable for five of the six criteria pollutants. Any modifications to FWA must be evaluated for compliance with PSD regulations and must be evaluated against PSD significance levels listed in 18AAC 50.310 (d)(2), Table 6.

FWA has a variety of air emission sources ranging from large, stationary boilers at the central heating and power plant to smaller, standby emergency generators distributed throughout the installation. The FWA power plant is one of four power plant facilities in the Fairbanks area not in compliance with the ADEC's grain loading and opacity standards. The power plant, with six coal-fired boilers, is the largest stationary source for CO and PM_{10} on FWA. The original state

permit to operate (9331-AA003) imposes limitations for the coal-fired power plant at FWA. These emission limitations include a three hour sulfur average of 500 ppm and an annual emissions rate of 1,310 tons per year for all boilers. The NO_x limits are based on the AP42 emission rate of 14 lbs/ton of coal and 2,352 tons per year of NO_x. Particulate matter has a limit of 0.10 gr/dscf and an annual limit of 192 tons per year. CO has a limit of 400 ppm per one hour average and 398 tons per year annually.

The facility is currently in litigation with the EPA for noncompliance with the federally enforceable grain loading and opacity standards. Actions to dramatically reduce particulate matter from the central heating and power plant are planned with the installation of full-stream baghouses on the boiler exhaust stacks. One pulsejet-type baghouse collector will be used for each boiler exhaust. This control equipment will reduce particulate matter by approximately 99%. The project is scheduled for completion in December 2004.

FWA has a number of other outstanding Clean Air Act notices of violation. These violations include: Lack of proper record keeping and monitoring, untimely reporting, and monitoring equipment that did not meet 40 CFR 60 Appendix A specifications.

FWA must comply with the provisions and compliance schedules listed in the Title V Permit Application. FWA pursued a construction permit (#0031-AC059) to upgrade the power plant, complete an emissions reduction project, replace the Bassett Army Hospital and install and operate restoration facilities. FWA must comply with the permit conditions identified in its Air Quality Control Plan and the provisions in the Title V Permit Application USARAK submitted to the state in December 1997 (revised October 2001). Compliance with the Air Quality Control Plan must be monitored and a certification document submitted to the ADEC annually. Compliance with the Title V Permit Application provisions must be monitored and also certified annually. Compliance is monitored through internal Department of Army audits. The results of these audits are submitted to the ADEC upon completion.

Within USARAK, FWA is classified as a major source of hazardous air pollutants and is therefore subject to the 112(j) provisions of the Clean Air Act. A National Emission Standards for Hazardous Air Pollutants (NESHAP) applicability determination was conducted to identify the unpromulgated Most Available Control Technology standards that could apply to the USARAK installations if the standard(s) had been written within the legislated time frame.

The NESHAPs for Source Categories: Aerospace Manufacturing and Rework Facilities (40 CFR 63 Subpart GG) applies to some activities at the Ladd Army Airfield operations. FWA is also subject to the Asbestos NESHAP, which establishes work practices to minimize the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos and asbestos containing material when a building is being demolished or renovated. The requirements and standards are described in 40 CFR Part 61, Subpart M.

3.2.2.2.1 Other Required Permits

USARAK currently has a permit to conduct fog oil training. Fog oil is a battlefield obscurant used to produce a smoke screen to mask troops and troop locations. It is created when a petroleum distillate is heated and expelled from mobile smoking generators. Upon contact with the air, the expelled oil droplets condense to form a thick white smoke. The “Conditional Permit for Surface Oiling and Oil Discharge for Scientific Purposes” was issued to USARAK by ADEC. This applies to all USARAK and is currently effective through 2002, after which USARAK intends to renew the permit.

Prescribed burning is listed as an insignificant source of emissions in FWA's Title V Permit Application. FWA coordinates with the Bureau of Land Management (BLM) to conduct prescribed burning. BLM has the lead for prescribed burning on USARAK lands. USARAK and BLM coordinate with ADEC when the prescribed burn plan requires burning greater than 40 acres in a given year. The proper burn permit and protocols associated with obtaining the burn permit are required.

3.2.3 Donnelly Training Area and Northern Alaska

3.2.3.1 Regional Air Quality

No air quality monitoring data exist for Donnelly Training Area (DTA) or for any of the surrounding communities. Air quality is assumed to be near baseline conditions due to the low density of human development and emission sources. This training area is in attainment for all criteria air pollutants. Ice fog forms under the same conditions at this location as FWA, but the duration of the episodes at DTA are generally shorter. Temperature inversions do occur, but due to the limited number of emission sources, the inversions are not likely to cause CO levels to exceed the NAAQS.

3.2.3.2 Donnelly Training Area Air Quality Status

DTA is not a PSD Major Facility. Generators at this location are used for emergency back-up power. Primary power is provided by the FWA central heating and power plant. DTA is covered under FWA's Title V Permit Application.

Black Rapids uses generators for primary power. USARAK is requesting a Permit by Rule for the storage tanks at this location. No emission sources exist at Gerstle River Training Area.

A majority of the emission sources associated with 7,000 acres of Fort Greely was transferred to the Space Missile Defense Command on 01 October 2002. The Title V Permit Application originally submitted by USARAK in December 1997 was formally transferred from USARAK to Space Missile Defense Command.

3.2.4 Fort Richardson and South-Central Alaska

3.2.4.1 Regional Air Quality

Temperature inversions that trap CO close to the ground also occur in the Fort Richardson (FRA) area. On days when Anchorage exceeds the NAAQS standard for CO, temperature inversions are commonly present (Municipality of Anchorage 1999). Ice fog occasionally forms when the local temperature drops below -20°F.

There are no air monitoring stations located on FRA although monitoring stations exist south of the post in Anchorage and to the east in Eagle River.

The city of Anchorage is classified as a serious nonattainment area for CO, and the Eagle River area outside of Anchorage is in a nonattainment area for PM_{10}. FRA is not within either of these nonattainment areas; however, these pollutants are the main issues of concern in the larger south-central airshed in which FRA resides.

Historically, Anchorage has also been listed among the top 10 worst air quality regions in the western United States for CO. The largest source of CO emissions is motor vehicles (83.6%), followed by aircraft (8.6%). Most exceedances to the CO NAAQS occur on weekdays when

vehicle traffic is the heaviest. Morning starts of vehicles, or "cold starts," are believed to be the leading cause of high CO levels during winter months (Municipality of Anchorage 1999). Table 3.2.c summarizes CO data from the three monitoring locations south of FRA.

Table 3.2.c Summary of 8-Hour Averages Reported for CO near Fort Richardson[1].

Year	Monitoring Sites								
	Benson 2902 Spenard Rd.			Garden 3000 E. 16th St.			Seward 3002 Seward Highway		
	Highest CO Level	2nd Highest CO Level	No. Days Exceeded	Highest CO Level	2nd Highest CO Level	No. Days Exceeded	Highest CO Level	2nd Highest CO Level	No. Days Exceeded
1995	9.2	7.6	0	8.4	7.4	0	9.0	8.4	0
1996	11.0	9.6	3	8.9	8.7	0	10.8	10.5	3
1997	7.1	6.8	0	7.3	7.1	0	7.3	7.0	0
1998	9.3	8.2	0	9.5	8.4	1	9.4	7.9	0
1999	6.6	5.9	0	8.2	7.8	0	7.5	6.4	0
2000	5.2	4.6	0	5.8	5.4	0	---	---	---

[1] Data recorded from three stations in Anchorage. Values are reported in parts per million volume (ppmv), and compared to the USEPA 8-hour National Ambient Air Quality Standard (9 ppmv) to determine the number of days the standard was exceeded.

Sources: Municipality of Anchorage 1999 and AIRSData 2000

Vehicle emissions have decreased significantly in recent decades due to the requirement for emission control equipment on all new vehicles manufactured since 1981. In 1995, Anchorage adopted an Air Quality Control Plan to reduce CO emissions by using oxygenated fuels, increasing vehicle inspection requirements, and implementing a ride-sharing program (Figure 3.2.a).

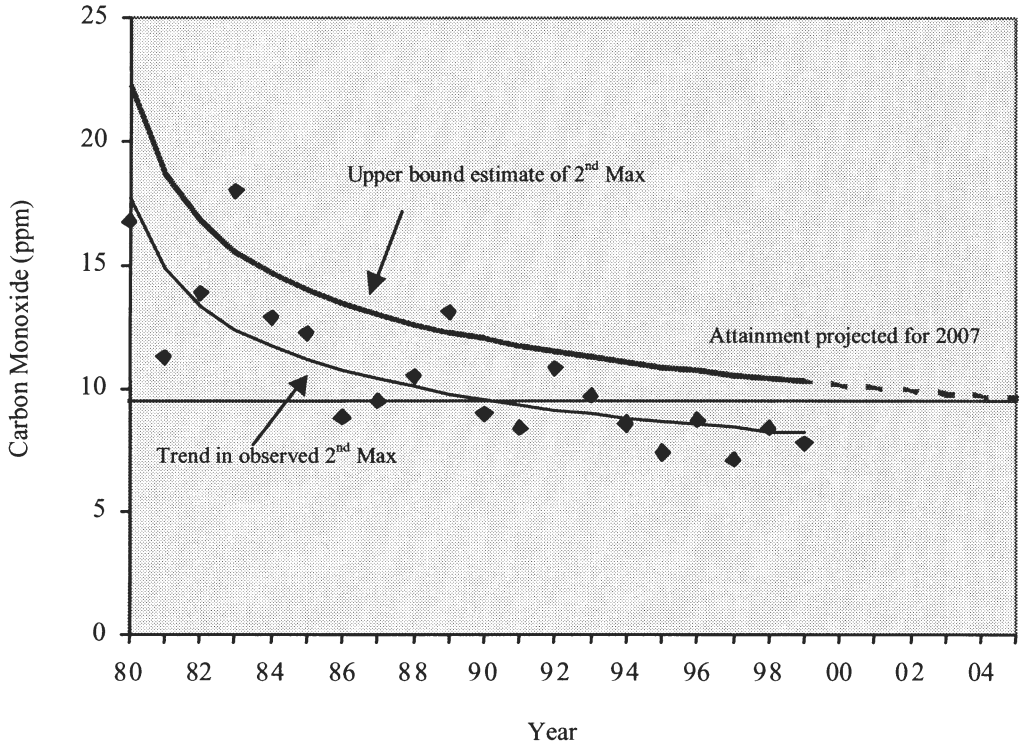

Figure 3.2.a Trend and Forecast for Attainment at Garden Station 1980-2004, Anchorage – 2nd Maximum 8-hour Average CO (ppm) Concentration.

Source: Municipality of Anchorage 1999

Eagle River, located adjacent to FRA and 10 miles north of downtown Anchorage, is designated as nonattainment for PM_{10} (particulate matter). PM_{10} is high in Eagle River due to the number of unpaved roads (Table 3.2.d). Over 90% of the particulate matter in the area is generated by travel on paved and unpaved roads. Only 10% of the fugitive emissions result from industrial sources, wood stoves, or automobile exhaust (Municipality of Anchorage 1999). In 1987 a plan was implemented to pave or surface gravel dirt roads in the area. The state of Alaska modified winter road maintenance practices in the Anchorage and Eagle River areas to reduce the amount of traction sand on the road. Traction sand is believed to contribute to higher PM_{10} levels. No exceedances of the PM_{10} standard have occurred since 1987 (Municipality of Anchorage 1999).

Table 3.2.d Summary of Averages Reported for PM_{10} near Fort Richardson[1].

Calendar Year	Sampling Frequency	Annual Average (µg/m³)	Highest 24-hour Average (µg/m³)	2nd Highest 24-hour Average (µg/m³)	No. of Days Exceeding NAAQS
1994	1 in 6 days	21.9	94.0	60.0	0
1995	1 in 6 days	19.4	60.0	51.0	0
1996	1 in 6 days	19.4	91.0	49.0	0
1997	1 in 6 days	23.0	61.0	59.0	0
1998	1 in 6 days	17.7	59.0	55.0	0
1999	1 in 6 days	18.6	90.0	66.0	0

[1] Data recorded from two stations in Eagle River near FRA. Values are compared to EPA Air Quality Standards to determine the number of days the standard was exceeded.

Sources: Municipality of Anchorage 1999; AIRSData 2000

3.2.4.2 Fort Richardson Air Quality Status

FRA is in attainment with all criteria air pollutants and is therefore subject to the PSD regulations. The installation is a major source of criteria air pollutants and, until recently, was a major source for hazardous air pollutants. The facility has the potential to emit >250 tons of at least one criteria pollutant. FRA has submitted an application for a Title V Operating Permit to the ADEC and must comply with several NESHAPs for several hazardous hair pollutants and source categories. FRA also has to comply with 40 CFR 60.116b for fuel tanks. This standard requires maintaining records for the life of the tank. The records include a copy of the tank design, the capacity and the throughput.

FRA has decentralized the central heating and power plant and pursued an Alaska State Air Quality Control Plan (#237CP02) in order to install 523 small boilers and waters heaters. The boilers and heaters are distributed throughout the installation to provide heat. Any new buildings constructed at FRA will have to include the installation of a boiler to provide heat to the building.

FRA must comply with the permit conditions identified in its Air Quality Control Plan and the provisions in the Title V Permit Application (submitted by USARAK to the state in 1997). Compliance with the Air Quality Control Plan must be monitored and certified annually. Compliance with the Title V Permit Application's provisions must be monitored and reported annually. Compliance is monitored through internal Department of Army audits. The results of these audits are submitted to ADEC upon completion. A NESHAP applicability determination was conducted to identify the unpromulgated Most Available Control Technology standards that could apply to the USARAK installations if the standard(s) had been written within the legislated time frame.

There are 16 significant sources of air pollution listed in the emissions inventory section of FRA's Title V Operating Permit Application. In addition, there are many smaller insignificant sources listed in the inventory. Insignificant sources include small diesel generators used for back-up power in individual mission critical buildings, paint booths, small boilers, storage tanks, etc. The ADEC defines many air emission sources as insignificant and requires minimal information on these operations. The original state permit to operate (9421-AA006) imposes several limitations on the emission sources at FRA's central heating and power plant (Appendix E).

FRA coordinates prescribed burning activities with BLM. There is a prescribed burn plan in place for the installation. When necessary, USARAK and BLM coordinate with the state to obtain burn permits. USARAK adheres to the provisions in the burn permit.

The USARAK installations are currently subject to source category NESHAPs. FRA is subject to the National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities (40 CFR 63 Subpart M) because this NESHAP was regulated prior to FRA establishing a minor source status. FRA was subject to the Revised Standard for Hazardous Waste Combustors (40 CFR 60; 40 CFR 63-Proposed Rule) and the NESHAPs Off-Site Waste and Recovery Operations (40 CFR 63) while the deactivation furnace (EU13 in the Title V Permit Application) was in operation. The deactivation furnace was decommissioned and dismantled, and these requirements no longer apply at the facility. In a letter dated 16 February 2001 to the ADEC, this emission source was formally removed from FRA's list of significant sources in its Title V Permit Application. FRA is also subject to the asbestos NESHAP. The asbestos NESHAP establishes work practices to minimize the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos and asbestos containing material when a building is being demolished or renovated. The requirements and standards are described in 40 CFR Part 61, Subpart M.

FRA does not store hazardous chemicals above threshold amounts described in 40 CFR 68. Preparation of a risk management plan and a full risk assessment was therefore not required under the accidental release program.

FRA has two outstanding Clean Air Act notices of violations and one closed Clean Air Act notice of violation. One open violation pertains to the central heating and power plant while the other open violation involved the operation of the munitions deactivation furnace. The violation for the deactivation furnace was received before the emission source was decommissioned. The notice of violation associated with the dry cleaning plant pertained to recordkeeping violations, but the recordkeeping problems were resolved and the plant is currently in compliance with the provisions outlined in the Title V Permit Application. The notice of violation at the dry cleaning plant has since been closed through formal correspondence with the EPA Region 10 and ADEC.

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3.3 GEOLOGY RESOURCES

Topics discussed in this section include:

- Terrain of each installation
- Earthquakes and seismicity
- Mineral resources

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional geology information, including a description of geologic terms and ages, is provided in Appendix E.

3.3.1 Geology Topics

3.3.1.1 Terrain

In this section the general "lay of the land" is described. Important topographic features are noted such as high points, low areas, and general configuration of major drainage systems.

3.3.1.2 Earthquakes and Seismicity

Alaska is a very seismically active state. Faults, major earthquakes, and other seismic activities are described for each installation.

3.3.1.3 Mineral Resources

Mineral resources on U.S. Army Alaska (USARAK) lands are managed by Bureau of Land Management (BLM) under federal regulations found in 45 CFR 3000. The sale and/or use of mineral materials require National Environmental Policy Act review and military concurrence. The unauthorized use of mineral materials is considered trespass and is resolved jointly by the military and BLM.

3.3.2 Fort Wainwright

3.3.2.1 Terrain

From floodplains formed several hundred feet above sea level to mountainous areas that reach over 6,000 feet, the terrain of Fort Wainwright (FWA) is highly varied.

Main Post and Tanana Flats Training Area (TFTA) lie in a broad depression known as the Tanana Kuskokwim Lowland, bordered to the south by the Alaska Range and to the north by the Tanana River (Appendix A, Figure 3.3.a). Outwash fans from the Alaska Range slope northward at a gradient of 20 to 50 feet per mile. Braided, sediment-laden glacial streams continue to shape the landscape, incising 50 to 100 feet below the level of the lowland surface and forming large floodplains.

TFTA is underlain by stream gravels and floodplain deposits that are commonly dissected by abandoned meander channels. Permafrost is discontinuous in the area and creates a complex groundwater and surface water network. Wetlands, bogs, and fens compose 35% to 40% of the terrain (Jorgenson et al. 1999).

The Yukon Training Area (YTA) lies in the Yukon-Tanana Uplands, rising 500 to 1,500 feet above adjacent valley floors. Rounded, even-topped, unglaciated ridges with gentle side slopes and

valley floors ¼ to ½ mile wide are common (Appendix A, Figure 3.3.a). Ridges usually range in elevation from 3,000 to 5,000 feet, but domes can reach up to 6,800 feet. YTA is located in the Yukon River watershed, with streams typically draining southward and westward to the Tanana River and ultimately to the Yukon River (Wahrhaftig 1965).

3.3.2.2 Earthquakes and Seismicity

On November 3, 2002, a magnitude 7.9 earthquake rocked most of the state of Alaska, with ground motion felt greatest in the region north of the Alaska Range. The areas around YTA, FWA Main Post, TFTA, and Donnelly Training Area (DTA) were all in the moderate zone (V-VII) on the Mercalli Scale of earthquake intensity (see *http://pasadena.wr.usgs.gov/shake/ak/STORE/X20852/ciim_display.html* for more information.) Minor to moderate damage occurred to roads, runways, and some buildings. Support structures for the Trans-Alaskan pipeline were also damaged. Portions of the Richardson Highway between DTA and FWA were closed or partially closed for two days. The epicenter of this earthquake was located along the Denali Fault, about 40 miles south of DTA. Movement was felt in a large area from north of Fairbanks to the Kenai Peninsula south of Anchorage. This was the largest earthquake on record to strike the area.

FWA and DTA are located on a geologic terrain bounded to the north and south by active faults. Unlike the subduction zone tectonics that cause earthquakes in southern portions of the state (see FRA discussion), the activity along Denali Fault is strike-slip. The areas bounding this fault and the related Tintina Fault are characterized by seismic zones that likely are a result of block rotation between the larger faults (Tintina and Denali), ultimately driven by the collision of the North American and Pacific Plates further south in the state (USARAK 1999a; Page et al. 1995).

FWA and YTA are in the Salcha seismic zone, a distinct northeast-trending band of epicenters about 50 kilometers long (Page et al. 1991; USARAK 1999a). Although the epicenters form a conspicuous pattern, no associated fault movement has been identified (Page et al. 1991).

Earthquakes near TFTA are associated with the Fairbanks seismic zone, another northeast-trending band of activity. Averages of five or six earthquakes a year are actually felt in this zone, and micro-earthquakes often occur (Page et al. 1991).

The northwest corner of DTA is at the edge of the 200-mile wide Salcha seismic zone that extends from Fairbanks southward through Prince William Sound. The Fort Greely (DTA) installation lies immediately north of the active Denali Fault, which runs roughly west-northwest near the southern boundary of the West Training Area and the northern edge of the Alaska Range (USARAK 1999a). Slip on this fault is less than half an inch per year (USARAK 2002e).

Prior to the November 3, 2002 earthquake, only three earthquakes larger than magnitude 4 have been recorded in or immediately adjacent to the installation since 1973. Recent deposits of sand, gravel, and silt mask faults on DTA. Damage from the November 3, 2002 earthquake is still being assessed and repaired. Continuing research into this most recent and strong earthquake may reveal more information about the potential hazards along the Denali Fault and associated seismic zones to the north.

3.3.2.3 Mineral Resources

Tertiary basalts, some of which are found on FWA, are mined for crushed gravel, aggregate, and riprap. Industrial mineral uses in the area include sand and gravel that is extracted from floodplain deposits. Sand and gravel on the installation have been extracted by the Army for local road and runway construction. Thick peat deposits are common in the Fairbanks area and on FWA; these

deposits are occasionally mined for garden and landscaping materials (Newberry and Bundtzen 1996).

Although portions of YTA have a moderate to high potential for gold and tin deposits, there has never been significant mining activity on the training area. Placer mining has occurred south and east of YTA (USARAK 1999a). Historic placer mines are reported on Beaver Creek and Pine Creek.

3.3.3 Donnelly Training Area

3.3.3.1 Terrain

DTA is also located within the highly varied Yukon Tanana terrane. The training area lies in the northern foothills of the Alaska Range and on the alluvial plains north of the foothills. Much of the terrain consists of generally flat or gently sloping surfaces ranging from 1,200 to 1,600 feet above sea level (USARAK 2002e).

The foothills found on the southern half of DTA West (Appendix A, Figure 3.3.b) are composed of flat-topped, east trending ridges 2,000 to 4,500 feet in altitude and 3 to 7 miles wide. The foothills themselves are largely unglaciated, although glaciers from the Alaska Range have widened valleys.

In the southwestern portion of DTA West, elevations range from 4,000 to 6,200 feet, and some valley glaciers extend onto the installation. Rolling lowlands separate the foothills from the alluvial plains and are 700 to 1,500 feet in elevation and 2 to 10 miles wide. There are no active glaciers on the lowlands today, but the wide valleys were formed during glacial advances in the past.

The Alaska Range, south of DTA, consists of rugged snowcapped mountains rising to 10,000 feet. Glaciers as large as 5 miles wide and 40 miles long flow north from the mountains' front. At the terminus of the glaciers, rivers laden with sediment create broad braided stream valleys and alluvial fans en route to the Tanana River.

Alluvial plains slope toward the north at a gradient of 20 to 50 feet per mile and are covered with thick layers of stream sediments. Braided glacial streams spaced from 5 to 20 miles apart fan across the plains while porous gravel beds in the outwash areas allow for substantial infiltration. Extensive permafrost that controls groundwater movement has been found in the area (Wahrhaftig 1965).

Gerstle River Training Area lies in a relatively flat region north of the Alaska Range, about five miles south of the Alaska Highway and on the western edge of the Gerstle River. The terrain slopes from around 1,400 feet at the northern edge upward to nearly 2,000 feet toward the southern edge of the training area. Sawmill Creek and other creeks cross the training area to empty in the Gerstle River and, ultimately, the Tanana River.

The Black Rapids Training Area is located south of DTA in the Alaska Range and on the eastern edge of the Delta River. The western portion of the training center is around 2,000 feet in elevation. About two miles east from this point, the elevation climbs to over 5,000 feet. Several streams flow west from the highlands to empty in the river.

3.3.3.2 Earthquakes and Seismicity

DTA shares similar seismic and earthquake characteristics as FWA and is described above in Section 3.3.2.3, Earthquakes and Seismicity.

3.3.3.3 Mineral Resources

Many glacial deposits in the area are good sources of sand and gravel for aggregate or base coarse materials, and were used for construction of the Richardson and Alaska highways and the Trans-Alaska pipeline. In 1942, a gold and molybdenum deposit was found along Ptarmigan Creek in the southwestern portion of the DTA West. Ore was mined from this deposit, but it was never shipped out. Other deposits of gold, lead and tin have been reported from areas surrounding the post (BLM and U.S. Army 1994a).

Portions of DTA have moderate to high potential for placer gold deposits. Localized placer deposits may also occur in streams draining the Granite Mountains and Tertiary-age gravel benches (USARAK 1999a).

Four areas of DTA were described as having mineral potential (BLM and U.S. Army 1994a). The four areas include the Middle Tanana Basin (30% of the post), the Nenana Coal Basin (40% of Fort Greely and DTA), a nonbasin area between the two basins (20% of the post), and two igneous/metamorphic rock outcrops.

Granitic plutons occur near the eastern and western borders of Fort Greely and DTA. Elsewhere in Alaska, these features are associated with thermal springs. Fort Greely and DTA have moderate potential for geothermal resources (BLM and U.S. Army 1994a).

3.3.4 Fort Richardson

3.3.4.1 Terrain

Fort Richardson (FRA) lies in an alluvial plain, often referred to as the Anchorage Lowland, which is bordered on the east by the Chugach Mountains and on the north, south, and west by waters of the Cook Inlet. FRA is situated in a transitional zone on the eastern edge of the Anchorage Lowland and is inundated with four major drainages that originate in the Chugach Mountains. The topography of FRA has been highly influenced by glacial activity and the effects of stream deposition and erosion (Appendix A, Figure 3.3.c).

The Chugach Mountains rise rather abruptly to more than 5,000 feet along their front, facing the Anchorage Lowlands. Only a small western section of the Chugach Mountains is contained within the boundaries of FRA. The peaks of the Chugach Mountains are separated by a series of steep U-shaped valleys that generally run in a northwesterly direction. The peaks tend to be sharp-crested in the southern reaches of the Chugach Mountains, but then become rounded or smooth-crested in the northern reaches near the Knik Arm of the Cook Inlet (Hunter et al. 2000). The U-shaped valleys are occupied by major and minor drainages including Ship Creek, Eagle River, Campbell Creek, and Chester Creek. The mountains can be accessed by way of Arctic Valley Road that travels along the lower reaches of Ship Creek and traverses up to Alpenglow Ski Area and the former Nike Site Summit at an elevation of about 4,000 feet.

The Anchorage Lowland is characterized by rolling hills with 50 to 250 feet of relief in eastern areas along the Chugach Mountains (Hunter et al. 2000). Towards the west, the terrain flattens into an alluvial plain that is inundated with broad shallow channels and wetlands. This area is characteristic of glaciated terrain and contains various landforms, including moraines

(accumulations of earth and stones carried and finally deposited by a glacier), esker deposits (long narrow ridges or mounds of sand, gravel, and boulders deposited by a stream flowing on, within, or beneath a stagnant glacier), outwash plains (gravel and sand carried by running water from the melting ice of a glacier and laid down in stratified deposits), and estuarine sediments (accumulated deposits of silt and fine sand that may locally include thin beds of peat).

3.3.4.2 Earthquakes and Seismicity

The Fort Richardson area is seismically active and has experienced at least nine major earthquakes in the last 85 years, including the largest earthquake in U.S. history. Two faults, the Border Ranges Fault and the Bruin Bay-Castle Mountain Fault, border Anchorage. The Border Ranges Fault bisects FRA, running parallel to the base of the Chugach Mountains. The Castle Mountain fault zone is located between Anchorage and the Alaska Range. The Castle Mountain Fault is a recently active, high-angle fault that runs northeast to southwest for over 100 miles. Three of the top 10 earthquakes recorded in recent history occurred in Alaska. The earthquake of 1964 was the result of the northwestward motion of the Pacific Plate (compression) over a period of tens to hundreds of years that was relieved by the sudden southeastward motion of portions of coastal Alaska as they moved back over the Pacific Plate. The end result was the movement of the Pacific Plate under the North American Plate by about 9 meters on average. The epicenter of the earthquake was about 75 miles east of Anchorage, but the effects were far reaching. The area has also experienced tremors and ash fall from volcanic eruptions of Mount Spurr, Mount St. Augustine, and Mount Redoubt since 1954.

3.3.4.3 Mineral Resources

According to the USGS Alaska Resource Data File (*http://ardf.wr.usgs.gov*), there are no active mines in the local Anchorage area. This is probably due to the heavily glaciated terrain and the absence of placer deposits.

There could be isolated coal deposits located northeast of Eagle River Flats, but it is unlikely that these deposits would be substantial or economically viable. Tertiary sediments underlying most of Cook Inlet do produce oil and gas, but the sediments underlying FRA tend to be relatively thin and not viable producers of oil or gas. Throughout the northern areas of FRA, there are extensive sand and gravel deposits associated with glacial moraines and glacial outwash. The existence of many abandoned sand and gravel pits throughout the post indicates the availability of the resource. Presently, there are several gravel pits being mined on FRA, but the materials are only used locally on post.

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3.4 SOIL RESOURCES

Issue D: Maneuver Impacts. During the public scoping process, USARAK and the public identified the impact of the proposed action on soil as an issue of concern. It is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Soil characteristics
- Permafrost conditions

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional soil resources information is presented in Appendix E. For information on specific ongoing soil management programs, please see Appendix H.

3.4.1 Soil Topics

3.4.1.1 Soil Characteristics

Soil is a dynamic medium made of mineral and biological matter, organic material, water, and air. Soils are produced by the continual interaction of five soil-forming factors: climate, vegetation, organisms, parent material, and topography. Climate is the most important soil-forming factor for Alaska. Differences in soil composition and formation result in soils of differing properties, which are also continually altered by natural processes. Soil properties ultimately determine the natural and human activities that can take place in a given area.

In order to compile the engineering properties maps, a soil classification scheme was devised. Soil maps were compiled using the Unified Soil Classification System (USCS) in order to estimate soil engineering properties. These properties were used as input parameters for the maneuverability/trafficability study for Stryker vehicles conducted by the Cold Regions Research and Engineering Laboratory (CRREL). The model results were then used to determine limitations in terms of potential vehicle impacts to the soil (see Section 4.4). These USCS maps are provided in Appendix A, Figures 3.4.a, 3.4.b, and 3.4.c. The most detailed, landscape-scale information available for the training areas came primarily from a number of ecological land surveys published by CRREL and ABR, Inc. (Jorgenson et al. 1999, 2001, 2002). These classification schemes varied somewhat, but all included geomorphologic and vegetation surveys for each unit.

The geomorphic maps were then reclassified into five representative soil types from the USCS classification system. The five categories were chosen (Table 3.4.a) based on landform types or assemblages that would likely yield consistent soil or sediment properties. Soil moisture is another important input for estimating soil strength. Again, with little data on soil wetness in the training areas, standard wetness index values were assigned based on vegetation or “ecotype” classifications in the ecological land survey reports. The resulting soil property maps (Appendix A, Figures 3.4.a, 3.4.b, 3.4.c) were generated in GIS by overlying the vegetation and USCS soil maps.

Table 3.4.a Engineering Soil Categories and Associated Landforms.

Soil Category	USCS	Landform
Sand (well graded, poorly sorted)	SW	Outwash
Gravel with fines	GM	Glacial Moraines
Organic Silt	OL	Floodplains
Silt	ML	Loess
Peat	Pt	Peat

Source: Bullock 1994

3.4.1.2 Permafrost

Permafrost is defined as soil, silt, and rock that remain frozen year-round. Though a thin layer may thaw during summer months, the majority of permafrost remains frozen until the local climate changes due to natural climatic fluctuations, or it melts due to disturbance of the insulating peat and vegetation above it. Permafrost is a major factor influencing the distribution of vegetation and human activities in Alaska.

Permafrost typically exists in multiple layers of varying thickness ranging from less than one foot to more than 150 feet. In most undisturbed areas, the depth to permafrost varies from two to three feet (Williams 1970). The deepest point at which ground temperatures remain below 32°F throughout the year defines the base of the permafrost layer. The upper surface of the perennially frozen ground is called the permafrost table, and the active layer is the zone above the permafrost table that thaws in summer and freezes again in winter (Williams 1970). More information about permafrost and permafrost formation is available in the U.S. Army Alaska Legislative EIS (USARAK 1999a) and the National Snow and Ice Data Center's website (*http://nsidc.org/*). Appendix E, Wetlands, offers a further discussion of permafrost and its influence on surface water, groundwater, and wetland functions.

Permafrost has important influences on soil processes including cryoturbation, rapid runoff, subsidence and restriction of drainage. Cryoturbation is the mixing of soil due to freezing and thawing, which results in contorted and broken horizons. Runoff occurs on sloping soils with permafrost because the permafrost prevents the infiltration of water into the ground. Subsidence of the ground surface can occur if permafrost melts (Swanson and Mungoven 2001). The impermeable surface of the permafrost table can create a barrier to water flow and often causes permafrost areas to remain very wet or even saturated during the summer months.

Any activity that removes the insulating vegetation mat or destroys the active layer above the permafrost table allows the ice mass to melt and irregular subsidence to occur. Thermokarst is the term given to the process and range of features formed from irregular subsidence. These features may include hummocks and mounds, water-filled depressions, flooded forests, mudflows on sloping ground or other landforms. The thawing process is difficult to control and, once formed, thermokarst features are likely to persist (Berger and Iams 1996). The tendency for settling and frost action is proportional to the silt content of the soil. The amount of subsidence and collapse of the ground surface is dependent on the ice content of the ground.

3.4.2 Fort Wainwright

3.4.2.1 Soil Characteristics

As a result of a cold climate and the youth of parent materials, the soils of Fort Wainwright (FWA) are weakly developed. Therefore, soil properties are determined by the properties of their parent materials, usually consisting of alluvium, bedrock, and loess (Swanson and Mungoven 2001).

Nearly all soils on FWA have some organic layer, except where floods have occurred or humans frequently have disturbed the surface. Peat, surface organic matter, builds up on cold and wet soils when decomposition cannot keep pace with the annual accumulation of dead plant material. Cold temperatures and a lack of oxygen in wet areas inhibit decomposition. According to Swanson and Mungoven (2001), organic matter accumulation, oxidation and reduction of iron, and cryoturbation are the major soil-forming processes in the FWA area.

FWA's Integrated Natural Resources Management Plan (USARAK 2002g) indicated that military activity has its greatest impacts on soil productivity in the Main Post area due to construction. Soils in other areas have been impacted by military activities, localized around small arms ranges, roads, and other facilities. The Stuart Creek Impact Area may have had more severe erosion due to explosions and burning, but overall, soils on FWA have been relatively unaffected by military training (USARAK 2002g).

Most of the soils on the Main Post are Chena alluvium, formed in unconsolidated silt-gravel mixture with a permafrost layer at variable depths. In some areas of the Main Post, the discontinuous permafrost lies just beneath the surface. This soil type has a high bearing strength when frozen, but is subject to sliding and is difficult to compact when thawed (USARAK 2002g).

The northern portion of the Main Post is in the foothills of the Yukon-Tanana Uplands and consists of bedrock covered by muck (high in organic matter) and loess. Muck inhibits drainage when permafrost is present below the surface and has very low bearing strength when thawed (USARAK 2002g).

Swale deposits, which are comprised of poorly stratified silt, sand, and organic matter, are scattered along the Richardson Highway and southern parts of the Main Post. These deposits also have high ice content and freeze perennially (Nakata Planning Group 1987).

The *Ecological Land Survey for Fort Wainwright* (Jorgenson et al. 1999) divided the Tanana Flats and the Yukon Training Areas into geomorphic units of differing erosional and depositional environments. A description and map of the dominant units is provided in Section 3.8, Vegetation.

Soils at Tanana Flats Training Area (TFTA) are formed in various unconsolidated materials, and are distributed in broad basins and elongated meander scars. Deposits vary from coarse gravel at heads of alluvial fans nearest the Alaska Range, to sand and silt at the bases of fans in the northern part of the basin. Coarse sediments on upper fans are well drained, but fine-grained sediments of lower fans are poorly drained. Permafrost lies within 20 inches of the surface and is nearly 128 feet thick in some places (USARAK 2002g). Permafrost is absent beneath rivers and lakes, but common wherever surface water or circulating groundwater does not exist (Racine et al. 1990). TFTA is dominated by highly organic, wet, and cold soils (Rieger et al. 1979).

The south slopes of the mountainous Yukon Training Area (YTA) consist of well-drained silt loams that are generally free of permafrost. These silt loams vary from shallow, gravelly silt near ridge-tops, to silt loams on mid-slopes, to deep, moist silt loams on lower slopes. Drainage

bottoms and depressions consist of shallow gravelly silt loam covered with a thick layer of peat underlain by permafrost. Soils on north-facing slopes are shallow, gravelly, silt loams with thick covers and permafrost (BLM and U.S. Army 1994b).

The USCS soils map compiled for this study contained units dominantly of silt on the hills with wetter silty soils and more organic silty soils dominating the lower drainages (see Appendix A, Figure 3.4.a).

3.4.2.2 Permafrost

Permafrost soils in thick Pleistocene loess deposits have the greatest amount of ground ice and the greatest risk of thaw subsidence on FWA (Swanson and Mungoven 2001). Permafrost on FWA was originally discontinuous and present in lenses under the main cantonment area, but much of it was disturbed by the construction of Ladd Airfield (now Wainwright Army Airfield).

Most of TFTA is underlain by continuous or discontinuous permafrost. The active layer is as little as 20 inches deep in some places, but extends 23 to 50 feet to the permafrost table in other areas. Tanana Flats is experiencing rapid and widespread thermokarst as a result of degrading permafrost. It is estimated that 42% of permafrost areas in Tanana Flats have been affected by thermokarst. This process has probably been active since the end of the Little Ice Age climatic period that ended about 200 years ago. The rate of thermokarst and permafrost degradation has likely accelerated since the early 1900s and 21% increase of thermokarsted areas was observed between 1949 and 1995 at Tanana Flats (Jorgenson et al. 1999). This high rate of thermokarst is already having large impacts on ecosystem structure. Areas of birch trees are underlain by sediments with very high ice content and are subject to severe thermokarst and fen formation as ice melts. Spruce forests seem to be less susceptible to collapse (Jorgenson et al. 2001). It is expected that continued global warming and thermokarst will eventually dramatically alter the structure and function of ecosystems in permafrost dominated areas.

YTA is in the discontinuous permafrost zone of Alaska where perennially frozen ground is widespread (Appendix A, Figure 3.4.d). The permafrost is thickest in valley bottoms and on lower slopes and can extend to the summit of north-facing slopes. Sediments beneath the floodplain of the Tanana and Chena rivers can be frozen to depths of 265 feet. Permafrost is generally absent on hilltops and on most south-facing slopes. Unfrozen zones that penetrate the permafrost lie beneath most deep lakes and large to medium-sized rivers (Jorgenson et al. 1999; Williams 1970).

3.4.3 Donnelly Training Area

3.4.3.1 Soil Characteristics

The Natural Resources Conservation Service initiated a soil survey of Donnelly Training Area (DTA) in 1999 and completion is expected in 2004. Soils in DTA are primarily derived from glacial activities, modified by streams and discontinuous permafrost, and in many places overlain by loess. Few soils in DTA have been mapped in detail, with the exception of areas near the Main Post. The Soil Conservation Service (now the Natural Resources Conservation Service) has identified 12 soil associations in the area (Rieger et al. 1979). Soils in the northern, west-central, and eastern portions of DTA West were identified as silt-loam associations, while DTA East was described as a shallow silt-loam over gravelly sand.

The soils in the river floodplains consist of alternate layers of sand, silt-loam, and gravelly sand. Soils of muskegs are highly organic and wet, with a high water table. They may also be underlain by permafrost. The upland foothills have moist, loamy soils compared to mountain soils that are

rocky, steep, and unvegetated. Lowland soils were found to have moderate erosion potential while foothill soils have moderate to high erosion potential (USARAK 1979b).

The USCS maps compiled for this study and the maneuverability model (see Section 4.4) showed highly variable soils due to the diverse geomorphic landscape and sediments comprising it. Glacial moraines were typically classified as gravelly sand and silt with outwash terraces classified as well-drained, well-graded, gravelly sands. Loess forms siltier soils and lowland and riparian areas were classified as organic silts of varying wetness (Appendix A, Figure 3.4.b).

Rieger et al. (1979) described the soils at Gerstle River Training Area as poorly drained with a shallow permafrost table that occupies broad outwash plains. Beneath the thick surface mat of peat, the soils consist of mottled gray, very gravelly silt loam or sandy loam with a permafrost layer below a depth of 10 to 20 inches (Rieger et al. 1979).

The soils of the western side of the Black Rapids Training Area were developed in glacial till, with a thin mantle of volcanic ash or loess in places (Rieger et al. 1979). Bedrock outcrops on peaks and ridges and loose rubble occur in many high areas. Most soils are poorly drained. Well-drained soils have developed in very gravelly material at the foot of high ridges and on some south-facing slopes and hilly moraines at lower elevations.

The eastern portion of the training area is classified only as rough mountainous land in a 1979 exploratory survey. This classification is explained further as mostly stony and shallow over bedrock or boulder deposits (Rieger et al. 1979).

3.4.3.2 Permafrost

Permafrost is highly patchy and irregular on DTA, particularly in morainal areas where abrupt changes in slope and aspect occur (Jorgenson 2001). The highly variable sediment types, complicated topography, and micro-climatic variability make prediction of permafrost difficult. Isolated patches of permafrost are found in areas under DTA's sandy gravel from 2 to 40 feet below ground level. Thickness of permafrost varies widely from 10 to 118 feet. A relatively large portion of the landscape has discontinuous permafrost, but existing and abandoned river channels, lakes, wetlands, and other low-lying areas are likely permafrost-free (Williams 1970). Ecotypes on DTA where permafrost is likely to exist include Alpine Rocky Dry Dwarf Scrub, Alpine Wet Tussock Meadow, Alpine Wet Low Scrub, Upland Wet Needleleaf Forest, Lowland Wet Needleleaf Forest, and Riverine Wet Meadow (Jorgenson et al. 2001).

Only a small proportion of DTA is presently affected by permafrost degradation, which is indicated by the presence of thaw ponds. Permafrost degradation at DTA appears to be less compared to FWA due to the cooler climate and higher elevations, and the prevalence of thaw-stable, gravelly soils at DTA. However, areas dominated by loess or other silty sediments may be more vulnerable to permafrost degradation. Continued climatic warming or disturbance of the ground surface may increase the amount of thermokarst at DTA.

Permafrost conditions at Gerstle River and Black Rapids training areas are assumed to be similar to those of DTA.

3.4.4 Fort Richardson

3.4.4.1 Soil Characteristics

The soils of Fort Richardson (FRA) are shallow, immature, and deficient in primary plant nutrients, particularly nitrogen and phosphorous. They often exhibit low water retention capability

with coarse gravels and larger rock fragments from glacial till, making them a primary limiting factor for vegetative growth during dry periods. In depressions and saturated areas, such as wetlands, surface horizons may be covered with peat (USARAK 2002f). Parent materials for most of FRA's soils include sandy and gravelly glacial outwash, and loamy and gravelly glacial drift. Soil parent materials on floodplains and stream terraces include stratified sandy and silty alluvium of varying thickness over gravelly and sandy alluvium (Moore 2002). A recent soil survey of the Anchorage area from the Natural Resources Conservation Service identified two distinct climatic zones along with their associated soil types (Moore 2002). These areas include the lowlands surrounding Anchorage (including FRA) and the adjacent Chugach Mountains.

Along the tidal plains, Cook Inlet soils consist of silty and clayey sediments. Poorly-drained bogs and fens occupy broad depressions spread throughout the area (Moore 2002). Lowland soils typically have less developed horizons due to lower precipitation, localized winds, and mid-winter thaws. However, in wind protected and forested areas, soils have better developed horizons. Acidic spodosols with a thin gray, leached surface horizon over reddish brown subsoils are common in these areas (Moore 2002).

Many uplands throughout the area are covered with a layer of silty loess, the source of which is the fine glacial sediments from floodplains and volcanic ash. The thickness of loess varies throughout the survey area and continues to accumulate today (Moore 2002). In the Chugach Mountains, high annual precipitation, deep snowfall, strong localized winds, and deep annual frost influenced the weathering and leaching of soil minerals. This further developed the mountain soils into distinct horizons.

The USCS soil map compiled for this EIS shows a wide variety of engineering soil types on FRA. Glacial moraines, outwash, tidal flats and peat bogs all provide a wide variety of parent material for soils. The distribution of the USCS soil types used in maneuverability models (Section 4.4) are shown in Appendix A, Figure 3.4.c.

3.4.4.2 Permafrost

Jorgenson et al. (2002) have found permafrost in less than 1% of FRA. It occurs primarily in patches of forested bogs near Muldoon Road, with some permafrost persisting at high elevations. Although thermokarst is present in the forested bog areas, the effects of thermokarst have been negligible (<0.1% of the area over 200 - 300 years) (Jorgenson et al. 2002).

3.5 SURFACE WATER

Topics discussed in this section include:

- Surface waters on each installation
- Quantity and flow rates
- Current water quality conditions

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional surface water information is presented in Appendix E.

Surface water on Army lands in Alaska includes both flowing and standing bodies of water. Significant rivers, streams and lakes have been studied and monitored for flow and quality data and trend analysis. In addition, water bodies with pollutant concerns are rigorously studied and monitored for safety. For information on U.S. Army Alaska's (USARAK) existing surface water management programs, please see Appendix H. Definitions of surface water terminology are in Table 3.5.a.

Table 3.5.a Definitions and Descriptions Used in This Section.

Average Flow	Average flow is the determined at selected intervals and divided by the number of intervals (i.e., average flow per month over a one-year span).
Base Flow	Base flow is the amount of continuous, reliable water flow occurring between water input events, such as rainfall. Base flow comes from groundwater discharge to the surface waterway. This differs from average flow, and base flow is often expressed as a percentage of average monthly flow. Base flow changes from year to year, depending on rainfall and snowcover amounts. Base flow also varies throughout the year and by location, due to dynamics of groundwater availability.
High Flow/ Floodplains	High flow describes the maximum rate of water flow within a period of time, such as yearly average high flow. It also describes long-term high flow events, known as 100 and 500-year flood events. The floodplain areas describe the extent of land likely to be flooded under extreme high flow conditions. Floods usually occur during spring and summer, coinciding with both rain and snowmelt. The most severe floods usually involve both rapid snowmelt and spring rains. Flood potential is increased during spring when channel ice may still constrict many streams and rivers.
Low Flow/Aufeis	Low flow describes a stream's minimum discharge at a specific location. Low flow generally occurs between October and April, although this varies based on geography. Low flow is correlated to a lack of incoming water, and freezing temperatures that prevent snowmelt and solidify many streams. In smaller watersheds and basins, solidification of the entire stream channel leads to aufeis. Aufeis occurs when a channel's cross-section is frozen solid, thereby preventing further inflow from passing within the channel. Further streamflow spreads out of the channel and over the floodplain area, forming an ice sheet. Aufeis can become very thick and very extensive, and contains a large percentage of the total winter flow.
Runoff	Runoff is the overland flow and interflow that ultimately reaches surface streams, and is typically reported as the average water depth at a place of origin. Runoff includes rainfall, snowmelt, and meltwater from glaciers. Low runoff rates occur in lake and wetland areas where evapotranspiration rates are high (Anderson 1970).

National Wild & Scenic Rivers

The National Wild and Scenic Rivers System was established by Congress in 1968 through the Wild and Scenic Rivers Act (Public Law 90-542). The act declared that development of some rivers with dams and other construction needed to be complemented by protection of other rivers having outstanding natural, cultural, scenic, and recreational values in their free-flowing condition for the enjoyment of present and future generations (National Park Service 1999). Although no streams within the areas have been designated as wild and scenic, the upper reaches of the Delta River, the Tangle Lakes, and the Tangle River were designated as part of the National Wild and Scenic River System in 1980. The Delta River designation terminates approximately 15 miles upstream of Donnelly Training Area.

3.5.1 Surface Water Topics

3.5.1.1 Waterways

Streamflow information for each USARAK installation includes base flow, high flow, and low flow for major waterways. All major waterways on Army lands in Alaska can be classified as either non-glacial or glacial. Both stream varieties have high flows during the spring and summer and low flows during the fall and winter. However, streamflow on non-glacial streams exhibits sharp rises in discharge from snowmelt during May, a general recession during the summer months, a slight increase during the early fall rainy period, and low winter flows. In contrast, the maximum stream discharge on glacial streams occurs in June and July, which coincides with the peak melting of glaciers.

Table 3.5.b describes the relationship between area, precipitation, elevation, and runoff for the Tanana River basin, an interior glacial waterway. All interior Alaska USARAK properties fall within the Tanana Basin.

Table 3.5.b Tanana Basin Runoff.

Altitude (ft.)	Area		Precipitation	Evapotrans-pirative loss[1]	Runoff	
	Square miles	% Basin Area	Acre-feet ($x10^6$)	Acre-feet ($x10^6$)	Acre-feet ($x10^6$)	% Basin Runoff
<1,000	12,000	27.3	8.0	6.3	1.7	5.6
1-3,000	20,000	45.5	14.9	7.7	7.2	23.5
3-5,000	8,000	18.2	7.7	0.4	7.3	24.0
>5,000	4,000	9.1	14.2[2]	<0.1	14.2	46.7
Totals	44,000	100	44.8	14.4	30.4[3]	100.0

[1] Calculated from precipitation minus runoff

[2] Includes an estimated 1.4 x 10^6 acre-feet long-term ice storage loss

[3] Includes an estimated 3.5 x 10^6 acre-feet of groundwater underflow

Source: Anderson 1970

3.5.1.2 Lakes and Ponds

Lakes and ponds are an important component of the surface water resources on USARAK lands. These resources are commonly used as water supply sources, and also provide various benefits such as water storage, flood control, and recreational opportunities. Lakes and ponds on Army lands also provide habitat for numerous fish and wildlife species.

3.5.1.3 Ice Bridges

Winter ice bridges are built to provide vehicle and foot access to remote training areas. By constructing ice bridges across major rivers that do not freeze solid, the Army ensures the safety of its troops and protects both its equipment and the surrounding environment. Ice bridges are constructed by artificially thickening the ice sheet on top of the river at appropriate locations with slower flows. The ice thickness is determined based on the types of vehicles used and the volume of traffic expected to travel over the bridge.

3.5.1.4 Water Quality

Surface water quality is a measurement of chemical parameters of the creeks and rivers, which are used to determine the cleanliness and safety of the water. Common parameters include pH, dissolved gases, temperature, hardness, and dissolved solids. The water quality measurements help to identify the appropriate water quality classification for each waterway. The State of Alaska considers all freshwaters in Alaska to be in their original and natural condition, therefore they are also considered suitable to serve all the uses established under each of the three different water quality classes:

(A) Water supply
- (i) drinking, culinary, and food processing
- (ii) agriculture, including irrigation and stock watering
- (iii) aquaculture
- (iv) industrial

(B) Water recreation
- (i) contact recreation
- (ii) secondary recreation

(C) Growth and propagation of fish, shellfish, other aquatic life and wildlife

These classifications are effective as of June 26, 2003. If a water body is protected for more than one use class, the more stringent water quality criterion will apply (State of Alaska Water Quality Standards 18 AAC 70).

All waters within the withdrawal boundaries are protected by use classes (A), (B), and (C) as assigned by the State of Alaska. If the natural condition of a water body is of lower quality than the water quality criterion for the designated use classes and subclasses, and the natural condition will fully protect the designated uses, the natural condition constitutes the applicable water quality criterion.

The state, in conjunction with municipal, federal and private organizations, monitors water quality in selected water bodies. If any exceedances to the water quality standards are found, the state designates the water body, “water quality limited.” The state has a system of ranking the water body in tier categories once it is found to be water quality limited. The tier categories provide a framework for dealing with the water body, such as further assessments or recovery plans.

3.5.2 Fort Wainwright

3.5.2.1 Waterways

3.5.2.1.1 Chena River

The Chena River, a non-glacial river, originates in the non-glaciated Yukon-Tanana Uplands and passes through Fort Wainwright (FWA) Main Post before joining the Tanana River (Appendix A, Figure 3.3.a). The river derives its flow from precipitation, snowmelt, and possible groundwater exchange. The drainage area covers 1,995 square miles, and the river flows 155 miles from its origin to the Tanana River.

The U.S. Geological Survey (USGS) maintains a gaging station on the Chena River, 11 miles from the confluence with the Tanana River. The average annual discharge was 1,353 cubic feet per second (cfs) from 1948-1999 (USGS 2002), with high flow usually occurring during May when flows averaged 3,802 cfs. The highest recorded flow occurred on August 15, 1967, at 74,400 cfs (USGS 2002). The lowest average monthly flow of 263 cfs occurred during March. Bankfull flow on the Chena River is approximately 12,000 cfs.

3.5.2.1.2 Little Chena River

The Little Chena River flows into the Chena River northeast of Fort Wainwright Main Post and northwest of Yukon Training Area (YTA). Average high flow of 588 cfs occurs in May, while the average low flow of 31 cfs occurs in March. The average annual flow is 213 cfs. The highest measured flow occurred on August 13, 1967, at 17,000 cfs. Surface water flow data can be found in Appendix E.

3.5.2.1.3 Tanana River

The Tanana Flats Training Area (TFTA) is within the Tanana River watershed, and the river comprises the eastern and northern boundary of the training area (Appendix A, Figure 3.3.a). The drainage area of the glacially-fed Tanana River encompasses 44,500 square miles and includes watersheds of the Wood, Delta, Chena, and Salcha rivers, in addition to many streams and rivers located apart from military lands. Crooked, Willow, Clear, McDonald, and Bear creeks also drain TFTA.

The average annual streamflow for the Tanana River is estimated at 37,000 cfs at the confluence with the Yukon River, with the lowest average monthly flow occurring during March (Anderson 1970). Based on upstream data, the low flow is estimated at 11,359 cfs. Aufeis does not usually occur along the Tanana River because it does not typically freeze solid in the winter. Approximately 85% of the discharge from the river originates in the Alaska Range as glacial melt, while the other 15% comes from the non-glacial Yukon-Tanana Uplands.

3.5.2.1.4 Wood River

The Wood River forms the western border of the TFTA and has a drainage area of 855 square miles. This river is a glacial stream that originates at the base of the Yanert Glacier in the Alaska Range. The river also receives inflow from non-glacial streams from the northern foothills of the Alaska Range, including Fish, Saint George, Gold King, and Bonnifield creeks. The Wood River was measured by the USGS from 1969-1978, 16.8 miles upstream of the confluence with the Tanana River. The average annual discharge was 467 cfs, and the peak discharge of 5,510 cfs was

recorded on August 13, 1976. The average high flow occurs in August, at 1,276 cfs, while the low flow of 91.4 cfs occurs in March. Surface water flow data for the TFTA can be found in Appendix E.

3.5.2.1.5 Other Waterways

All streams on YTA originate in the Yukon-Tanana Uplands, which are non-glaciated hills with elevations under 2,000 feet. Streams in the northern portion of the training area, including Hunts Creek and Horner Creek, drain directly into the Chena River (Appendix A, Figure 3.3.a). Stuart, Beaver, and Globe creeks drain into the South Fork Chena River. Streams originating in the southeastern portions of the YTA, such as Ninety-eight Creek, drain into the Salcha River. Waterways in the southwestern and western regions of the training area, such as the Little Salcha River, French and Moose creeks, drain directly into the Tanana River or Piledriver Slough. Approximately 15% of the Tanana River's total discharge at the Yukon River originates in the Yukon-Tanana Uplands. The Salcha and Chena rivers contribute approximately 8% of the total flow of the Tanana Basin.

Flows on YTA are estimated using the data available from the Chena and Salcha rivers (Appendix E). Downstream of the area, the Salcha River is measured at Salchaket Slough by the USGS. The Salcha River basin is 2,170 square miles, with an average annual discharge of 1,600 cfs for the period 1949-1999, and a highest recorded flow occurring on August 14, 1967, at 97,000 cfs (USGS 2002).

3.5.2.2 Lakes and Ponds

FWA Main Post has no significant standing water resources, although several man-made water bodies, such as numerous water-filled gravel pits, can be found on the post. Many of the small lakes and ponds on FWA freeze solid during winter. The northern part of the cantonment area contains wetlands areas. Lakes and ponds comprise 107 acres on FWA Main Post.

Numerous small lakes and ponds exist on TFTA. The only significant bodies of open standing water on Tanana Flats are the Blair Lakes, a group of lakes located near the southern boundary of the training area. Most of Tanana Flats is listed as wetlands. Lakes cover 2,718 acres on TFTA. For a complete description of the wetlands on Tanana Flats, see Section 3.7, Wetlands.

Many small lakes and wetlands are located in the northwestern portion of YTA, and these cover approximately 498 acres. No physical data or water quality data are available for these lakes.

3.5.2.3 Ice Bridges

Ice bridges are currently used by USARAK on TFTA. At FWA, ice bridges are constructed over the Tanana River to access TFTA directly from the Main Post. The bridges are constructed from the east end of Goose Island, connecting the north and south parts of the Bonnifield Trail onto TFTA. Another ice bridge is built across the Tanana River near Harding Lake. Additional bridges are permitted within TFTA, including various points across Salchaket Slough, McDonald Creek, Dry Creek and Clear Creek.

3.5.2.4 Water Quality

Overall surface water quality on FWA is good. The Chena River has been classified as Class A, Class B, and Class C. The pH of the Chena River varies seasonally from slightly above neutral to slightly below neutral. Monthly samples collected over three years provide a pH range from

6.6 to 7.9. Iron concentrations, which stem from natural sources, exceed state secondary water standards. Sediment loads are low. Appendix E has USGS data for the Chena River.

Due to its remote location, surface water quality data are not collected for much of TFTA. Surface water quality data for the Wood River and the Tanana River upstream and downstream of the area are available, and are used to estimate quality on TFTA (Appendix E). However, it is expected that water quality parameters would differ greatly between these rivers and the streams originating within the training area, as the streams are surface-water and spring-fed, not glacier-fed.

At the Delta River confluence, the Tanana River had a pH range between 6.6 and 7.9, which is within the state water quality standards (Appendix E). Hardness, as calcium carbonate, was 148 milligrams per liter (mg/l). Silica in the Tanana River was 15 mg/l, and iron was only 0.01 mg/l. Total dissolved solids were measured to be 187 mg/l (Anderson 1970). This sample was taken in December. Another indicator of water quality for the training area is the high productivity of the fens in the northern part of the area. This indicates increased levels of phosphorus, nitrogen, and potassium in the fens.

Water quality on YTA is very good. Due to a lack of human development and activity on the training area, the surface waters are relatively pristine. The waters meet primary drinking water standards along all parameters measured, and iron is the only parameter to exceed the Alaska state secondary drinking water standards.

Water bodies originating within YTA flow into the Chena River, which has been assigned site-specific water quality criteria. The Chena River from its confluence with Chena Slough to the confluence of the Chena River and Tanana River has been classified as (1)(A)(ii), (1)(A)(iii), (1)(A)(iv), (1)(B), and (1)(C).

The pH values of the Salcha and Chena rivers consistently fall within the acceptable state standards of 6.5-8.5. This trend also occurs in smaller tributaries within YTA. Some water quality data for the Salcha and Chena rivers are shown in Tables 3.5.h and 3.5.i of Appendix E.

YTA is also characterized by naturally occurring, high levels of iron. Iron levels in YTA surface waters often exceed the recommended drinking water quality limits. The secondary limit is set at 0.3 mg/l. One possible source of the increased levels of iron in the lower part of the Chena River is the wetlands at the northwest corner of the YTA.

Dissolved oxygen levels in both the Salcha and Chena rivers exceed the state minimum requirement of 4.0 mg/l. Dissolved oxygen measurements from the Salcha River range from 9.4-14.2 mg/l. Dissolve oxygen levels for the Chena River range from 5.8-11.7 mg/l. The high concentration of dissolved oxygen indicates a low level of biological oxygen demand and a low chemical oxygen demand in the Salcha and Chena rivers.

All of YTA's surface waters have low rates of primary and secondary productivity, possibly due to low levels of phosphates in the water, which is a limiting nutrient for biological productivity. The presence and concentration of oligotrophic benthic macroinvertebrates in the water serve as another indicator of the low productivity and high water quality.

3.5.3 Donnelly Training Area

3.5.3.1 Waterways

3.5.3.1.1 Delta River

The Delta River flows northward 80 miles from its headwaters to its confluence with the Tanana River and runs through Donnelly Training Area (DTA) for approximately 30 miles. It drains an area of approximately 1,650 square miles (Appendix A, Figure 3.3.b). Due to the combination of glacial and non-glacial inputs, the Delta River is difficult to classify as specifically glacial or non-glacial in nature. The river originates as a non-glacial waterway at the Tangle Lakes, approximately 50 miles south of the southern boundary of DTA. As the river flows through the Alaska Range, it receives significant meltwater from Cantwell, Castner, Gulkana, College, Eel, Jarvis, McGinnis, Augustana, Eureka, and Black Rapids glaciers, and several smaller glaciers.

Downstream from Black Rapids Creek, the Delta River broadens and the gradient is reduced (Ferrick et al. 2001). Upon entering DTA, the river flows across a north-sloping alluvial fan, where the channel becomes braided and complex. With the exception of Jarvis Creek, the Delta River has no tributaries once it leaves the Alaska Range.

Low flow for the Delta River usually occurs between October and April. Flow increases dramatically during May, with high flows occurring between June and August. The highest recorded flow for the Delta River occurred on July 18, 1967, when the river reached flows of 9,930 cfs.

Modeling of the Delta River indicates an expected 1-year average high flow of approximately 8,000 cfs, and flow from a 1000-year flood of 90,000 cfs. Independent calculations support this as the amount required to flood the Washington Range floodplain (Ferrick et al. 2001).

Studies of the Delta River also indicate a diurnal variation in flow due to temperature fluctuations and associated melting rates from water sources (Ferrick et al. 2001). The river has a 0.3-foot variation in depth, with the daily high depth occurring during the morning on the lower Delta River, and lows occurring approximately 12 hours later. The lag time on the lower Delta River is between 18 and 24 hours. Variation has also been observed due to rainfall events involving greater than 0.5 inches of precipitation.

3.5.3.1.2 Jarvis Creek

Jarvis Creek originates at the terminus of Jarvis Glacier on the north side of the Alaska Range and flows northward for 40 miles through a narrow valley before passing through DTA East. The creek drains an area of 248 square miles and receives glacial meltwater from Riley and Little Gold creeks. McCumber Creek and Morningstar Creek are non-glacial streams that enter Jarvis Creek from Granite Mountain. As it passes through DTA, Jarvis Creek flows across the same alluvial fan as the Delta River before converging with the river.

3.5.3.1.3 Other Streams

Granite Creek, a non-glacial stream, flows from Granite Mountain to form the eastern border of DTA. The remaining streams of DTA are glacier-fed and originate within the Alaska Range.

Buchanan Creek forms the southwestern border of DTA and eventually combines with the West and East Forks of the Little Delta River to form the main stem of the river. The East Fork receives meltwater from the Hayes and Gilliam glaciers, and the West Fork receives meltwater from

unnamed glaciers near Mount Deborah. The Little Delta River constitutes the remainder of the West Training Area border and empties into the Tanana River.

Delta Creek drains the interior portion of DTA West. It receives meltwater from the Trident and Hayes glaciers and the Alaska Range, and flows directly into the Tanana River. Several other small tributaries originate in the Alaska Range, flow through DTA, and ultimately empty into the Tanana River or another large tributary (Appendix A, Figure 3.3.b).

3.5.3.2 Lakes and Ponds

Lakes are abundant on DTA, but information on their water quality is scarce. Water samples collected from Bolio Lake had a pH of 8.8 to 9.2, which is beyond acceptable alkalinity levels as defined by the State of Alaska. Most nitrogen in Bolio Lake is in organic forms (0.98 mg/l), with low concentrations of nitrates and nitrate nitrogen (0.02 mg/l). Samples collected from Bolio Lake in August 1975 had dissolved oxygen concentrations of 9.8 mg/l near the surface and 10.0 mg/l at a depth of 15 feet.

Alaska Department of Fish and Game manages 16 lakes for recreational fishing and stocks these lakes with sport fish (Section 3.9, Wildlife and Fisheries). These stocked lakes are situated within the loop confines of Meadows Road and Old Richardson Highway (Appendix A, Figure 3.3.b). Bolio Lake is the largest of these, at approximately 2.5 miles in length. Most other lakes on DTA are not suitable for stocking, due to poor accessibility or their susceptibility to freezing. Lakes and ponds cover 8,752 acres on DTA.

3.5.3.3 Ice Bridges

Ice bridges are constructed across the Delta River and Jarvis Creek on DTA (Appendix A, Figure 3.3.b). These bridges allow access to winter training areas, which otherwise would be unreachable from the ground. The Delta River ice bridges are constructed west of Fort Greely. The Jarvis Creek ice bridges are located at 12-Mile Crossing and Bear Crossing.

3.5.3.4 Water Quality

In a site-specific study of water quality in streams flowing through DTA (United States Army Environmental Hygiene Agency 1990), water and sediment samples were collected upstream and downstream of DTA. Upstream values indicate the background or natural water quality of DTA. Appendix E lists water quality and characteristics for the Delta and Tanana rivers, respectively.

Surface water quality values on DTA meet the primary standards set by the Alaska Drinking Water Standards (18 AAC 80). However, aluminum, iron, and manganese concentrations were higher than the state's secondary standards. DTA water is of the calcium carbonate type and is slightly basic. The pH measurements collected on DTA ranged from 7.9 to 8.4, which are within the limits established by the state's standards (6.5-8.5).

Iron may occasionally exceed the secondary drinking water standard of 0.3 mg/l for waters used as potable water sources. High iron concentrations are typical in streams that drain wetland areas high in organic matter (Anderson 1970). Dissolved oxygen values measured at DTA were above the state's minimum level of 4.0 mg/l. Dissolved oxygen values ranged from 9.7 mg/l at the Delta River to 12.1 mg/l at Jarvis Creek.

The U.S. Army Corps of Engineers recently completed a study of Jarvis Creek, which runs through the most heavily used part of the training area (Bristol Environmental and Engineering Service 2003). Arsenic levels ranged from 2.1 to 35.8 micrograms per liter, which is within

state and EPA standards. The pH levels were consistently between the state standards of 6.5-8.5. Dissolved oxygen ranged from 1.15 to 19.90 mg/l, while the state standard is between 4 and 17 mg/l. Temperature ranged from 5 to 16° C, with higher temperatures dominating the shallow, braided parts of the creek. Alaska state standards are less than 15° C for drinking water, or 20° C for general supply. All other parameters measured were within or below the state's criteria.

Streams from the Alaska Range tend to have a higher sulfate and magnesium content than other streams in the Tanana Basin, although the levels are below the state's standards.

The average annual suspended sediment yield for the Delta River is 1,200 tons per square mile (Dingman et al. 1971), and the sediment load ranges from 100 to 1,000 mg/l during the open-water season. In-stream sediment samples from the Delta River and other similar streams yielded the following particle size distribution:

- clay size – 10-25% of suspended material
- silt size – 40-50% of suspended material
- sand size – remainder (25-50%) of suspended material

Most of the clay and silt-sized material at glacial endpoints is rock silt, which is found in layers at the bottom part of most glaciers. Rock silt forms in the glacial bed by rock being ground into fine particles by glacial movement. These particles are transported to receiving waters by melting and freezing cycles at the bed-glacier interface.

High stream flows tend to have lower concentrations of dissolved solids. Typical of the Alaska Range, the streams that contain the highest dissolved solids during low flow periods are those that drain areas of mineralized bedrock (Dingman et al. 1971). Sediment load concentrations also change rapidly with changes in stream discharge. Thus, more than 99% of the annual sediment load is transported during the summer, and it is evenly distributed during this time period (Anderson 1970).

Delta River bedload consists mostly of particles larger than sand size, which move by rolling, bouncing, and drifting just above the streambed. Thus, the bedload contains channel and floodplain material with a mixture of gravel particles (averaging about 1.6 inches in diameter), sand, and silt. Total basin yield of bedload for the Delta River cannot be estimated (Dingman et al. 1971).

3.5.4 Fort Richardson

3.5.4.1 Waterways

3.5.4.1.1 Eagle River

Eagle River is a glacial waterway that originates at the base of the Eagle Glacier in the Chugach Mountains. Its drainage area is approximately 231 square miles, 12% of which is covered by glaciers at the headwaters (Munter and Allely 1992). Eagle River meanders across Fort Richardson (FRA), where it flows over an alluvial base of glacial outwash (Appendix A, Figure 3.3.c). Eagle River Flats is a 2,200-acre estuarine tidal marsh located at the mouth of Eagle River on FRA.

Stream discharge on Eagle River is generally high from June through early September; a mid-summer peak coincides with the maximum melting of Eagle Glacier, followed by a later peak due to precipitation during early fall (Appendix E). The USGS measured flows on the river from 1965 to 1981, east of the Glenn Highway. During this period, annual discharge was 528 cfs;

highest monthly discharge occurred during July and August, when glacier melt and precipitation combined for peak discharges above 4,000 cfs (USGS 2002). A record historical flow of 14,000 cfs was recorded on September 21, 1995, when precipitation exceeded a 100-year flood event. Base flow for Eagle River is estimated at 57.8 cfs, or 11.2% of the average. Low flows in Eagle River generally occur in March when groundwater seepage is the primary source of flow.

3.5.4.1.2 Ship Creek

Ship Creek, a non-glacial stream, originates at Ship Lake in the Chugach Mountains and flows 25 miles to the Knik Arm. The stream is diverted by a water supply diversion dam located at the base of the Chugach Mountains on FRA, approximately 10 miles from the mouth of the river (Appendix A, Figure 3.3.c). The watershed encompasses 90.5 square miles above the diversion dam.

Water is diverted for FRA, Elmendorf Air Force Base, and the Anchorage Municipality, and it is used on the post to cool the power plant, to supply the fish hatchery, and for recreation (Alcorn and Dorava 1995). Ship Creek leaves FRA at the border with Elmendorf Air Force Base.

The USGS maintains a gaging station 800 feet downstream from the diversion dam. Average annual discharge was 144 cfs over the period between 1946 and 1996. Average monthly discharge was highest in June, at 455 cfs, and lowest in March, at 16 cfs (USGS 2002). The highest recorded daily discharge at the gage below the Ship Creek Dam was 1,420 cfs on August 9, 1971. Eleven peak daily flow events exceeding 1,000 cfs have been recorded, including recent events in 1989, 1995, and 1998 (Ferrick et al. 2001).

3.5.4.1.3 Other Streams

Chester Creek is located south of Ship Creek and flows through the southwestern portion of FRA (Appendix A, Figure 3.3.c). The creek flows into a marsh wetland at the base of the Chugach Mountains on FRA, but rechannelizes near the western boundary of the post. Most of the flow in Chester Creek in the lowland area is derived from marshes, springs, and small tributaries. Base flow for Chester Creek is estimated at 11.4 cfs or 56.4% of average flow; the high base flow is due to influx from the wetland areas that the stream passes through. Low flows for Chester Creek usually occur in February. The highest daily discharge of 345 cfs occurred on August 26, 1989, at Arctic Boulevard. Most years, peak flows reach 50 cfs at Arctic Boulevard. Chester Creek also flows through highly urbanized environments, which increases the dynamics of flow magnitude during events.

North Fork Campbell Creek, a non-glacial stream, emerges from Long Lake in the Chugach Mountains and flows three miles across the southwestern corner of FRA. This portion of the creek is an important source of recharge for the ground water aquifer (Cederstrom et al. 1964). Campbell Creek has a base flow of about 19 cfs, or 28% of the average flow. Low flows for Campbell Creek generally occur during March when groundwater is the primary water source. The highest daily discharge of 1,250 cfs occurred on August 26, 1989. Peak flows typically reach 200 cfs or more.

McVeigh Creek begins near the base of the Chugach Mountains and drains the slopes below Site Summit. The creek flows initially westward before turning southwest, roughly parallel to the Glenn Highway. McVeigh Creek has been modified through channel excavation, and it resembles a drainage ditch as it flows through the FRA small arms range. The creek flows into McVeigh

Marsh, the channel narrows, and the flow becomes nearly stagnant. McVeigh Creek continues southwest of the marsh, flows through a culvert under Arctic Valley Road, and drains into Ship Creek upstream from the Glenn Highway bridge. McVeigh Creek freezes solid during the winter.

Snowhawk Creek is a non-glacial, perennial tributary to Ship Creek. It drains Tanaina Lake, a small cirque lake in the Chugach Mountains on the southern portion of the post, and flows northwest through Snowhawk Valley. Snowhawk Creek joins Ship Creek about six miles further downstream, upstream of the Ship Creek Dam and Reservoir (USARAK 1984). No independent data on flow characteristics are available. Snowhawk Creek is considered to be a tributary of Ship Creek.

Clunie Creek is a small stream that flows from wetlands located south of Clunie Lake into Eagle River Flats, where the water forms ponds that drain into Knik Arm. Clunie Creek is a seasonal stream that does not flow during the winter months.

Otter Creek is a small, perennial stream that flows from Otter Lake into the Eagle River at Eagle River Flats.

Numerous seasonal tributaries exist, and these feed into the streams mentioned above. FRA also has several drainage ditches.

3.5.4.2 Lakes and Ponds

FRA has 12 named lakes and ponds and several unnamed water bodies. The combined area for the named lakes and ponds is 359 acres. Five relatively large lakes, Clunie, Otter, Gwen, Thompson, and Waldon, are managed for recreational fishing.

Clunie Lake (116 acres), the largest lake on the post, is situated in the northern moraine area of FRA. The maximum depth of Clunie Lake is approximately 33 feet. The lake drains into Clunie Creek (USARAK 1984).

Otter Lake (93 acres), the post's second largest lake, is stocked annually and receives the highest fishing pressure on the post. This lake is fed by a small creek on its southern end and drains into Otter Creek on its northern end. It attains depths of 23 feet (USARAK 1984).

Gwen Lake (10 acres), located two miles north of the cantonment area, is a shallow lake with a maximum depth of 11 feet. Due to its small size and lack of depth, Gwen Lake cannot support fish over winter (USARAK 1984).

Thompson Lake (8 acres) is smaller than Gwen Lake, but attains a depth of 21 feet and can support fish over winter (USARAK 1984). This lake is the smallest of the actively managed lakes on Fort Richardson.

Waldon Lake (approximately 50 acres) is only about eight feet deep and does not support fish during some winters. However, Waldon Lake is easily accessed.

The other seven lakes and ponds on Fort Richardson include: Chain Pond, Web Pond, Lake Kiowa, Dishno Pond, Cochise Lake, Diablo Pond, and Tanaina Lake. Tanaina Lake is located in the southeastern corner of FRA and is the largest and least accessible of the seven. Dishno Pond is the only one of these that supports a fishery, which is stocked annually with catchable-sized rainbow trout for fly-fishers.

3.5.4.3 Ice Bridges

USARAK does not construct ice bridges on FRA, and no permits exist for creating ice bridges. Permanent bridges exist as necessary at all maneuver trail crossing points over Eagle River, Ship Creek, and the smaller waterways on FRA.

3.5.4.4 Water Quality

The waters on FRA are protected by freshwater use classes (A), (B) and (C) as assigned by the State of Alaska. Two stream segments on FRA have been listed as water quality limited by Alaska Department of Environmental Conservation (ADEC) (ADEC 1996). Eagle River Flats was listed as a Tier II water body, and a comprehensive water quality assessment to determine the best methods for restoration and recovery has been implemented. Ship Creek is listed as a Tier I water body by ADEC (ADEC 1998), and it is currently being assessed to determine the degree to which it exceeds water quality standards (Appendix E).

Eagle River Flats is categorized as Tier II because of white phosphorous contamination. The tidal marsh has been used as a military impact area since the 1940s, and the current pollutants are the result of prior military activities. White phosphorus was determined to be the primary factor in the death of waterfowl on the Eagle River Flats, and the chemical is no longer used by USARAK. Remediation activities began in 1999 and are ongoing. No other portions of the Eagle River are water quality limited. Data can be found in Appendix E.

The USGS measured Eagle River water quality upstream of the FRA boundary until 1981. Based on water quality parameters, the Eagle River was found to be typical of a pristine glacial-fed stream in Alaska. Total suspended sediment concentrations vary seasonally and peak during mid-June as meltwater from the Eagle Glacier increases. The peak continues through July and August. Electrical conductivity increases during the winter and spring when contributions of groundwater and local runoff are not diluted by meltwater (Lawson et al. 1996). Dissolved oxygen levels, measured in 1981, ranged from 11.8 mg/l to 12.9 mg/l. Both values are above the state minimum of 4.0 mg/l. Since 1970, the pH has been between 6.6 and 8.0 (USGS 2002).

Per the ADEC Section 303 list, Ship Creek is water quality limited from the Glenn Highway bridge down to its mouth (ADEC 1998). The upper portions of Ship Creek, above the dam on FRA, are considered pristine. Intermittent water quality monitoring conducted from 1948-1975 by the USGS downstream of the dam, and at the Fort Richardson Fish Hatchery, found all inorganic parameters to be within the state's standards.

Water quality data collected by the Municipality of Anchorage indicated the maximum water quality parameters for drinking water and contact recreation had been exceeded at various times between 1989 and 1994 for sites downstream of FRA. Specifically, fecal coliform and trace levels of petroleum products were present in the water column. ADEC prepared a draft Water Quality Assessment of Ship Creek in 1996 as a result of these findings, which determined that fecal coliform bacteria, petroleum products, and biological community alteration exceeded water quality standards (ADEC 1996). According to ADEC studies, most of the pollutants entered Ship Creek as non-point sources from surface water runoff and groundwater downstream of the post, where the watershed is increasingly urbanized. After compiling and reviewing the data, the state concluded that no cumulative or increasing water quality degradation was occurring in the lower portion of Ship Creek (ADEC 1996). There are currently no restoration plans for Ship Creek.

3.6 GROUNDWATER

Topics discussed in this section include:

- Groundwater flow, which indicates the amount of groundwater underlying each installation
- Quality of groundwater

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional groundwater information is presented in Appendix E.

Groundwater is water that is found below the earth's surface. It is comprised of water that percolates through the soil from the surface. Groundwater can be found almost everywhere and has variable quantities at different locations. The water table may be deep or shallow and may rise or fall depending on many factors such as heavy rains, melting snow, or extended dry periods. These can also affect the pressure of groundwater, called the "hydraulic head pressure," and yield (often measured in gallons per minute). Groundwater collects in formations called aquifers in layers of substrate. The rate at which groundwater flows (hydraulic conductivity) depends on the hydraulic head pressure, the size of the spaces in the soil or rock (porosity), and how well the spaces are connected (Groundwater Foundation 2002). A confined aquifer has limited vertical movement due to a confining layer above, while an unconfined aquifer is attached to other aquifers, and water can flow easily into and out of the aquifer.

3.6.1 Groundwater Topics

3.6.1.1 Groundwater Flow

Groundwater flow is relevant to understanding the amount available for diversion or use, as well as the recharge rates for groundwater withdrawals. Flow gradient indicates the direction in which groundwater is flowing, thereby allowing better understanding and planning in the events of area-specific withdrawal, recharge, or contamination.

Flow data may also indicate the type of groundwater system or systems located within an area. For example, many areas in interior Alaska contain both an upper overlaying water table, known as an unconfined aquifer, and a deeper groundwater pool known as a confined aquifer. The terms 'unconfined' and 'confined' refer to the possibility and rate of groundwater movement into or out of these aquifers.

3.6.1.2 Groundwater Quality

Groundwater quality describes the presence and concentrations of various minerals and pollutants found in the groundwater. This data is useful in determining the level of hazard or health risk (environmental or human) associated with groundwater, as well as in determining the possible range of uses for an area's groundwater resources.

3.6.2 Fort Wainwright

3.6.2.1 Groundwater Flow

Groundwater on Fort Wainwright (FWA) Main Post is classified as an alluvial aquifer, fed primarily from the Tanana River, with additional contribution from the Chena River. Flow rates

from wells increase relative to proximity to the Tanana River, where groundwater flows can reach 3,000 gallons per minute at less than 200 feet deep.

Groundwater on Tanana Flats Training Area (TFTA) is classified as an alluvial aquifer, which is recharged primarily through percolation from source waters along the Alaska Range. The low-angle alluvial fan flows generally northwest from the foothills of the Alaska Range and discharges to the Tanana River. The flow also approaches the surface with increasing distance from the Alaska Range. Because of this, surface waterways tend to lose volume to groundwater through the upper portions of the stream, and gain volume from groundwater through the lower portions, where the aquifer is near the surface. Flow rates tend to increase relative to proximity to the Tanana River, where groundwater flows can reach 3,000 gallons per minute at depths of less than 200 feet.

Groundwater on Yukon Training Area (YTA) exists in variable quantities among the different groundwater areas (Appendix A, Figure 3.6.a). There are three distinct groundwater areas: the Tanana-Chena rivers floodplain, the valley bottoms of the central YTA creeks, and the hills and uplands.

The Tanana-Chena rivers floodplain covers the northwestern parts of YTA. This region's aquifers are characterized by layers and lenticular deposits of alluvial silt, sand, and gravel. This geology, in combination with limited topographic variation and moderate permafrost, allows for high permeability and rapid recharge rates. In addition, the water table is shallow, which makes the Tanana-Chena rivers floodplain the highest quality groundwater source on YTA.

A second source of groundwater is found along several creek valley bottoms, which are located throughout the central portion of YTA. This aquifer is characterized by unfrozen gravel deposits just above the bedrock. Recharge rates within these areas are slow due to the high organic content in the soil as well as localized permafrost within the valley bottoms.

The hills and uplands of YTA form the third geographic source of groundwater. These hills are distributed throughout most of the training area, with greater concentrations in the central and eastern portions of the area. This region is characterized by dynamic topography that involves well-drained, unfrozen silt soils. The topography and the drainage rates in the silt combine to slow recharge rates and thus reduce the potential water yield. In addition, the presence of permafrost on north-facing slopes limits groundwater availability on those slopes. Wells in these areas can produce up to 50 gallons per minute.

3.6.2.2 Groundwater Quality

Groundwater in the FWA area contains high levels of metals, especially iron and arsenic. Elevated arsenic levels are prevalent in the upland areas. These are naturally occurring levels and are not related to human-caused pollution (U.S. Army Corps of Engineers 1994).

Army-related and industrial activity on Main Post has caused groundwater pollution associated with underground storage tanks, chemical storage facilities, and chemical dump sites. These have been identified and they are monitored intensively. Pollution at the sites is localized, and monitoring indicates no deep groundwater pollution. Army restoration projects have mitigated damage to groundwater quality, and practices that led to contamination have been discontinued. For example, underground storage tanks have been removed, and all petroleum, oils, and lubricants are now stored in aboveground tanks surrounded by containment berms.

Due to past contamination within a number of localized areas on Main Post, FWA is classified as a Comprehensive Environmental Response, Compensation, and Liability (CERCLA, i.e., "Superfund") site. Groundwater management consists of restoration projects associated with individual sources of pollution, generally associated with the CERCLA designation. Pollutants at these sites generally consist of petroleum hydrocarbons and chlorinated solvents. For more information on the contaminated sites, see Section 3.17, Human Health & Safety.

The water quality of the TFTA alluvial aquifer has naturally occurring, elevated levels of some metals. However, arsenic levels are much lower than in other areas of FWA, such as the uplands. No known areas of contamination exist on TFTA, and no "Superfund" sites are found on the training area.

No groundwater monitoring wells have been placed on YTA. Therefore, groundwater quality on the training area is estimated using data from three nearby monitoring wells, shown in Appendix A, Figure 3.6.a.

Iron was the only measured parameter exceeding state water quality standards at the surrogate sites, where sampling indicated higher concentrations than recommended under secondary drinking water standards. The State of Alaska secondary standard is 0.3 mg/l. Concentrations at well G-14 were 7.11 mg/l, while well G-16 concentrations were 25.0 mg/l.

Sodium, sulfate, nitrate, chloride, and fluoride were all within Alaska state standards. Dissolved solids ranged from 135 mg/l at well G-14, to 429 mg/l at well G-16, which was below the standard of 500 mg/l.

3.6.3 Donnelly Training Area

3.6.3.1 Groundwater Flow

Groundwater data for Donnelly Training Area (DTA) West are lacking due to the remoteness of the area. As a result, aquifer characteristics and groundwater occurrence, recharge, and discharge are inferred from characteristics of the DTA East groundwater system.

The regions of DTA West that appear to have the greatest groundwater potential are the floodplain alluvium along the Little Delta River, Delta Creek, and the broad alluvial fans extending along the north flanks of the Alaska Range (Appendix A, Figure 3.6.b). Groundwater potential is high in these areas because of the extensive saturated thickness and abundant recharge of the unconsolidated alluvial deposits. In general, groundwater potential decreases with distance from the alluvial deposits. Well yields have been estimated to be greater than 50 gallons per minute for wells located in glacial moraines, and less than 50 gallons per minute for wells located in bedrock (Anderson 1970). Similar to DTA East, the aquifers are recharged from surface streams. Small amounts of infiltration of precipitation may also contribute to aquifer recharge.

The alluvial aquifer system underlying DTA is believed to be composed of several aquifers that are separated by leaky confining layers. However, data supporting this hypothesis are lacking and, as a result, this system is classified as a single aquifer with varying local confinement. Silty sediments and glacial till may be the source of local confinement. The aquifer is known to be unconfined near Clearwater Creek, which is east of DTA. Areas near the Tanana River, 18 miles upstream from the Gerstle River, are also unconfined.

Well data within DTA indicate that permafrost does not generally extend into the saturated zone and usually does not act as a confining layer. Stratification due to deposits of silt, sand, gravel, and boulders causes permeability within the alluvial sequence to vary widely. The presence of

silty sediments in many areas may cause some sections of the aquifer to have low transmissivity values. The thickness of the alluvium and the presence of sand and gravel lenses result in high transmissivity for the alluvial aquifer. Well yields in DTA are as high as 1,500 gallons per minute (Wilcox 1980). Figure 3.6.b in Appendix A shows the location of groundwater within the eastern part of DTA.

The alluvial aquifer system underlying part of DTA East is recharged from streams and from infiltration of precipitation. Jarvis Creek and the Delta River lie above the aquifer and water from these streams filters through their streambeds to the aquifer. The Tanana River, eight to ten miles north, also contributes to groundwater recharge through its streambed. To the east, water from the Gerstle River is lost through the streambed to the aquifer, where the river flows onto an alluvial fan. Several small creeks draining the north face of the Alaska Range also commonly lose all their flow into the ground. The volume of groundwater recharge from DTA is directly related to the amount of surface flow (Wilcox 1980); thus, recharge is greatest during annual high flow periods.

In the northern, western, and eastern portions of DTA East, as the aquifer approaches the surface and the Tanana River, water is discharged from the alluvial aquifer system to the surface water system. Clearwater Creek and Clearwater Lake are almost entirely spring fed. This is supported by the fact that these areas are unfrozen during the winter months because of the inflow of relatively warm (4° C) groundwater. Springs are also present near the mouth of the Delta River. The annual groundwater discharge rate in DTA East is estimated to exceed 1,200 cubic feet per second, not including the unmeasured seepage rates to the Tanana River (Wilcox 1980).

In this region, the water table is generally located closer to the land surface with increasing distance from the Alaska Range. For example, the water table rises from more than 400 feet below the land surface near the front of the Alaska Range to 150 to 200 feet near DTA, 50 to 100 feet near the city of Delta Junction and to less than 10 feet near Clearwater Creek and Big Delta (Wilcox 1980). The water table near eastern DTA slopes north at gradients ranging from 1 to 25 feet per mile.

Seasonal fluctuation varies from 20 to 60 feet in response to recharge from river and stream channels, and from precipitation. Data from the northern portion of DTA East indicate that water levels are lowest in late May or early June, after which recharge from surface waters reaches the aquifer. The groundwater levels rise through the summer and peak in October, after which the rivers freeze and recharge ceases (Wilcox 1980).

3.6.3.2 Groundwater Quality

Population density near DTA is sparse. Few wells have been drilled on the installation, and data for groundwater quality are limited to areas in the immediate vicinity of DTA's Main Post. Most of the available groundwater quality data were obtained during the early 1950s through the 1970s. Data appear to provide a reasonable estimate of the region's natural groundwater quality. Note that some groundwater wells within Fort Greely were drilled in response to specific chemical or waste spills or hazardous materials operations. Limited groundwater monitoring wells have been drilled on DTA specifically to monitor for and measure explosive contaminants, and limited groundwater quality data are available for the impact areas. Groundwater data can be found in Appendix E.

According to the available data, groundwater quality is good on the training area. All measurements were below concentrations recommended by the Alaska Drinking Water Standards. For example, pH values were within the acceptable range of 6.5 to 8.5, and sodium values ranged from 5.1 mg/l at Donnelly Flats to 3.2 mg/l at Black Rapids, all within the standard of 250 mg/l.

Sulfate, chloride, fluoride, nitrate, and iron values are also within state standards. Dissolved solids values ranged from 153 mg/l at well G-13 to 225 mg/l at well G-10, and these values are within the standard.

3.6.4 Fort Richardson

3.6.4.1 Groundwater Flow

Groundwater on Fort Richardson (FRA) is located in both an unconfined and a deeper, confined aquifer. Water recharges the groundwater on FRA and the Anchorage Bowl in several ways. Along the mountains, groundwater seeps from bedrock fractures into the sediments. In the foothills and lowlands, water flows from streams into the unconfined aquifer where the water table is above the stream elevation. In the lowlands, rain and snowmelt percolate from the surface into the groundwater.

The hydrogeology of FRA is complicated due to deposits from multiple glacial advances through the region. There are multiple confined aquifers and an unconfined aquifer that connect in some places. The unconfined aquifer is generally composed of poorly sorted, sandy gravel with varying amounts of silt. It is underlain by low-permeability layers containing clay and sand as well. The clay is present at depths ranging from 30 to 175 feet (Astley et al. 2000). The low-permeability clays create a lower boundary for the unconfined aquifer and an upper boundary for the confined aquifer. The confined aquifer joins the unconfined aquifer just north of the Davis Highway, where the clay layers end. The hydraulic gradient of the unconfined aquifer trends northwesterly, generally following the area's topography surface elevation. The overall trend in flow direction in the confined aquifer is to the northwest, except to the north of Bryant Airfield where groundwater flow patterns are unclear.

Perched groundwater tables are common on FRA. They form when water from precipitation infiltrates the ground surface and forms pools on top of discontinuous layers of low-permeability silt and clay layers. These perched groundwater tables are found at a higher elevation than the main unconfined groundwater table. Contaminants that enter the ground from the surface can also pool on discontinuous, low-permeability layers. Several monitoring wells on FRA are screened in perched water tables.

Measured groundwater depths on FRA range from near the surface near Ship Creek to 200 feet near Bryant Airfield (Astley et al. 2000).

Ship Creek loses more than 16 million gallons per day to the unconfined aquifer between the reservoir at the base of the mountains and the eastern boundary of Elmendorf Air Force Base (Barnwell et al. 1972). Therefore, the aquifer is greatly influenced by stream discharge (Astley et al. 2000). During the low-flow period of some winters, the creek loses all of its water to the unconfined aquifer and is dry near the eastern boundary of Elmendorf Air Force Base (Brabets et al. 1999). The influence of Ship Creek on the unconfined groundwater table diminishes rapidly with distance from the creek bed.

In general, wells on the main cantonment away from Ship Creek experience an annual peak in water levels in late January to early February, and an annual low in water levels between May and June (Astley et al. 2000). The delay between summer snowmelt and precipitation and peak groundwater elevation is attributed to the time it takes for summer groundwater recharge in the Chugach Mountains to reach the main cantonment area.

3.6.4.2 Groundwater Quality

Industrial activities associated with USARAK's use of FRA have had some effects on groundwater. Monitoring has found pollution associated with underground storage tanks, chemical storage facilities, and chemical dumpsites. FRA has been identified as a CERCLA site. Specific areas are currently monitored intensively, and no indication of deep groundwater pollution has been detected. Pollution has been minor and localized, and no significant risks to human health have been found. Water quality has improved recently due to Army restoration projects to mitigate previous damage to the groundwater quality.

Well samples on FRA from 1999 indicate groundwater hardness levels to be 110 mg/l, in terms of calcium carbonate. Calcium itself was measured at 35.8 mg/l, and magnesium was at 6.08 mg/l. Dissolved solids were measured at 138 mg/l. All of these measurements were above 1973 levels. However, seasonal fluctuations could account for most of the change (USGS 2002).

3.7 WETLANDS

Issue C: Wildlife and Habitat. Issue D: Maneuver Impacts. During the public scoping process, USARAK and the public identified the impact of the proposed action on wetlands as an issue of concern. It is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Background on the importance of wetlands
- Classifications used to determine wetland types
- Current wetlands management and training restrictions
- Wetland types and amount of coverage at each installation

This information serves as baseline data for the analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional wetlands information is presented in Appendix E.

Wetlands are transitional ecosystems where the water table is at or near the soil surface and the presence of the high water during the growing season heavily influences the types and distribution of soils and plants (Cowardin et al. 1979). The National Research Council (1995) defines wetland characteristics:

> The minimum essential characteristics of a wetland are recurrent sustained inundation or saturation at or near the surface and the presence of physical, chemical, and biological features reflective of recurrent inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation.

Wetlands provide habitat for wildlife and fish. Important ecological functions include flow regulation, erosion control, sediment retention, nutrient uptake, and contaminant removal. Some factors that influence the formation of wetlands are the local climate, topography, the ratio of watershed area to wetland volume, and the physical properties of substrate materials (Ford and Bedford 1987).

Nearly one-half of Alaska is classified as wetland (Ford and Bedford 1987), and wetlands are sociologically, ecologically, and economically important in the state. Alaskan wetlands are unique compared to wetlands in lower latitudes because of features such as permafrost and aufeis (overflows of ice that occur when a section of stream channel freezes completely). The presence of permafrost provides an impermeable layer, resulting in saturated surface soils. Appendix E has a detailed description of the unique hydrologic conditions of Alaskan wetlands.

Types of wetlands in Alaska include floodplains, lower elevation areas with standing water for at least 10% of the growing season, areas periodically flooded by tides, and other areas supporting wetland plant communities. Army lands in Alaska have both saltwater and freshwater wetlands. Saltwater wetlands include tidal flats and estuaries. Freshwater wetlands include freshwater marshes, bogs, and fens, which are distinguished by water source and/or vegetation types.

Marshes are covered by water most of the time, and these types of wetlands lack woody vegetation. Both tidal and non-tidal marshes exist in Alaska.

Bogs recharge their water systems through rainfall or snowmelt, and are often found in depressions that are poorly drained. Bogs tend to have a deep peat layer and are covered with sphagnum moss. These areas are acidic and nutrient poor.

Fens are types of bogs, but they differ by being fed through groundwater systems. Fens have a shallower peat layer and are less acidic than bogs. The vegetation tends to be more diverse in fens.

This document follows the five major divisions of the wetland classification system used by the U.S. Fish and Wildlife Service (Cowardin et al. 1979) (Table 3.7.a). Palustrine shrub wetlands are the most common wetland types found on U.S. Army lands in Alaska. These sites, also called bogs or muskegs, occur on the edges of marshes and in poorly-drained depressions. The water tables are either exposed or are a few inches deep. Permafrost is often less than 30 inches below the surface. Vegetative cover is characterized by dense accumulations of mosses, lichens, sedges, rushes, liverworts, fungi, herbaceous hydrophytes and woody shrubs. Tree species are occasionally found, such as stunted black spruce, willow and dwarf birch (USARAK 1980).

Table 3.7.a U.S. Fish & Wildlife Service Wetland Classification.

Wetland Type	Description
Marine	Exposed to oceans where salinity is greater than 30 parts per thousand; includes high tide zones, seaward limit of emergents, trees, and shrubs, and the seaward limit of estuarine systems.
Estuarine	Partially enclosed by land with sporadic exposure to the ocean and dilution with fresh water.
Riverine	Contained within a river channel except for sites dominated by trees, shrubs, or persistent emergent plants.
Lacustrine	Found within topographic depressions or dammed river channel. Usually associated with lakes. Sites lack trees, shrubs, or persistent emergent vegetation. These sites are larger than 20 acres and/or have a depth greater than 6.6 feet at low water.
Palustrine	Non-tidal and freshwater wetlands that have trees, shrubs, and emergent vegetation. These sites include non-vegetated sites smaller than 20 acres and/or have depths less than 6.6 feet at low water.

Source: Cowardin et al. 1979.

Modification of wetlands is controlled by the federal government through Section 404 of the Clean Water Act. Appendix E discusses relevant wetland legislation, including the Clean Water Act.

Wetlands Management on U.S. Army Alaska (USARAK) Lands

USARAK classifies wetlands as “high-function” or “low-function.” Note that these classifications are used for management purposes and are not mandated by federal or state policies. High-function wetlands include riverine, permanent emergent, semi-permanent emergent areas, riparian areas, and other sensitive wildlife habitats that lie within any wetland areas. Low-function wetlands include all other wetland types.

USARAK has obtained a five-year wetland permit to conduct military training in wetlands at Fort Wainwright (2000-2005) including Fort Wainwright Main Post, Tanana Flats Training Area,

Yukon Training Area, and Donnelly Training Area. This permit allows limited maneuver or other military activities to occur in some wetland areas, where in the past, no activity was permitted at all. USARAK may not damage more than 40 acres per year of wetlands. If that amount is exceeded, training in wetlands will be prohibited and individuals may be liable for fines and other penalties. Restoration of all damage is mandatory.

The environmental limitations overlays were developed as a tool for planning military training activities and managing wetlands (Appendix A, Figures 3.7.a, 3.7.b, and 3.7.c). Each overlay is available in a summer and winter version with approved and restricted activities listed in three color-coded categories. The summer version is the more restrictive of the two and is provided in Appendix A. These overlays are available at Range Control or the Integrated Training Area Management (ITAM) office where staff can provide instructions on how to use them. See Appendix E for tables of specific training activities that are approved and restricted under the wetland permit.

During summer, the green, yellow, and red categories on the environmental limitations overlays include the following restrictions:

- *Green.* No environmental restrictions. However, all normal procedures outlined elsewhere in USARAK Regulation 350-2 should be followed.
- *Yellow.* Notify Range Control when planning to train in yellow areas. Environmental / ITAM staff must pre-survey area. Stream crossings are permitted at 90 degree angles only.
- *Red.* Notify Range Control when planning to use red areas. Environmental / ITAM staff must pre-survey red area to determine on-the-ground limits of each red area. Open water and streams have a 50 meter buffer. Only foot maneuvers are allowed in buffer. Vehicular maneuver is not allowed except during stream crossings, which must be crossed at a 90-degree angle to the direction of the stream flow. No stream crossing at shear or cut banks. Earth moving, mechanical digging, bivouacs, assembly areas, fighting positions, timber cutting, laundry and bath sites, portable latrines, slit trenches, vehicle decontamination, smoke generation, and any Petroleum, Oil, and Lubricant (POL) distribution are restricted.

During winter, the green, yellow, and red categories on the environmental limitations overlays include the following restrictions:

- *Green.* No environmental restrictions. However, all normal procedures outlined elsewhere in USARAK Regulation 350-2 should be followed.
- *Yellow.* Notify Range Control when training in yellow areas. Environmental / ITAM staff must pre-survey these areas. Stream crossings at 90 degree angles only. Use caution when snow plowing. Minimum of six inches of snow pack must remain on trails or other clearings to minimize damage to vegetation and soils. Activities limited include tracked and wheeled maneuvers, bivouacs, assembly areas, defensive fighting positions and timber cutting. These activities may be approved on a case-by-case basis by Range Control and ITAM if there are no seasonal wildlife restrictions.
- *Red.* Notify Range Control when using red areas. Environmental / ITAM staff must pre-survey areas to determine on-the-ground limits of each red area. Open water and streams have 50 meter buffer. Only foot maneuvers are allowed in buffer. Vehicular maneuver is not allowed except during stream crossings, which must be crossed at a 90-degree angle to the direction of the stream flow. No stream crossing at shear or cut banks. Earth moving, mechanical digging, bivouacs, assembly areas, fighting positions, timber cutting,

laundry and bath sites, portable latrines, slit trenches, vehicle decontamination, smoke generation, and any POL distribution (fuel farms and tankers) are restricted.

3.7.1 Wetlands Topics

The coverage and types of wetlands for each post are discussed below.

3.7.2 Fort Wainwright

3.7.2.1 Main Post

Approximately 42% (6,500 acres) of the Main Post is classified as wetland, with palustrine, riverine, and lacustrine types (Lichvar and Sprecher 1998a). Bogs, fens, and marshes are distributed over the post. Three types of bogs found on the Main Post are sphagnum (*Sphagnum* spp.), sedge (*Carex* spp.), and sheathed cottonsedge (*Eriophorum vaginatum*). Common understory vegetation is comprised of dwarf birch (*Betula nana*), bog rosemary (*Andromeda polifolia*), Labrador tea (*Ledum palustre*), low bush cranberry (*Vaccinum uglinosum*), and willows (*Salix* spp.) (Racine et al. 1997). Appendix A, Figure 3.7.d shows the distribution of wetlands at the Main Post.

3.7.2.2 Tanana Flats Training Area

Wetlands comprise about 74% (483,500 acres) of Tanana Flats Training Area (TFTA) (Lichvar and Sprecher 1998a). Appendix A, Figure 3.7.d shows the wetland delineation at TFTA. Using the Ecological Land Classification System described by Jorgensen et al. (1999) and Lichvar and Sprecher (1998a) the most prevalent types of wetlands, along with their approximate coverage, include:

Lowland Tussock Bog (3%) – Characterized by poorly drained and acidic soils, underlain by permafrost. Sites are dominated by open canopy of shrubs and tussocks of cottonsedge.

Fens (7%) – Wet organic soils that are poorly drained. Vegetation dominated by floating mats of sedges, grasses, horsetails (*Equisetum arvense*), and herbaceous broadleaf forbs, emergents, and submergents. Occasional willows and birches (*Betula* spp.) may be present along transition areas.

Lowland Wet Needleleaf Forest (25%) – Wet or loamy to organic soils. Dominated by black spruce (*Picea mariana*) with occasional tamarack (*Larix* spp.) and white spruce (*Picea glauca*).

Lowland Forest and Scrub Thermokarst Complexes (27%) – These thermokarst ecotypes are associated with abandoned floodplains and collapsed bog scars. A variety of forest, scrub, bog, and fen plant communities dominate, characterized by hydrophytic (water loving) plants.

Riverine and Lacustrine Complexes (9%) – Moist, loamy soils, dominated by forest (needleleaf, broadleaf, or mixed), shrubs (willows and alders), or meadows.

Other Wetlands (3%) – A variety of wetlands are interspersed with various upland ecotypes.

3.7.2.3 Yukon Training Area

Approximately 17% (42,600 acres) of Yukon Training Area (YTA) is classified as wetland (Lichvar and Sprecher 1998a). Appendix A, Figure 3.7.e shows the delineation and location of wetlands at YTA. The prevalent wetland types and approximate coverage include:

Shrub Wetlands (2%) – These wetlands have poorly-drained soils, which may or may not be underlain by permafrost. Dominant vegetation includes alder and willow. Shrub wetlands are found along South Fork Chena River lowlands, the Stuart Creek Impact Area, and the French-Moose Creek area.

Lowland Wet Needleleaf Forest (11%) – Characterized by wet loamy to organic soils that are slightly acidic and poorly drained. Black spruce and ericaceous shrubs dominate these wetlands, which are found in low-lying areas and creek floodplains.

Riverine and Lacustrine Complexes (4%) – Moist, loamy soils, dominated by forest (needleleaf, broadleaf, or mixed), shrubs (willows and alders), or meadows.

In addition, Lichvar and Sprecher (1998a) classified 27% (68,650 acres) of YTA as wetland/upland complex. Most middle and lower portions of north-facing slopes in the wetland/upland complex of YTA will probably be wetlands. Thus the authors suggested that site visits be conducted prior to any construction on north-facing slopes in YTA.

3.7.3 Donnelly Training Area

Approximately 68% (431,940 acres) of Donnelly Training Area (DTA) is wetland (Lichvar 1998), with palustrine, riverine, and lacustrine types included. The palustrine shrub wetlands are the most common types of wetlands found on DTA. The Delta River glaciated lowlands, lower Delta Creek lowlands and upper Delta Creek lowlands ecosections support most of the wetlands at DTA. Appendix A, Figure 3.7.f shows the locations of wetlands at DTA.

The most prevalent types of wetlands at DTA include:

Alpine Tussock Meadow and Alpine Wet Low Scrub (6%) – Characterized by loamy soils, underlain by permafrost, that are moderately to strongly acidic. These areas are found above treeline, primarily in the southern portion of DTA West, along the foothills of the Alaska Range.

Lowland Wet Low Scrub and Lowland Tussock Scrub Bog (35%) – These palustrine wetlands are characterized by loamy soils that are poorly drained because of permafrost. The bogs contain sedges, tussock meadows, and lowland moist meadows with bluejoint reedgrass (*Calamagrostis canadensis*). Willows, dwarf birches, and forbs may also be present.

Lowland Wet Forests (12%) – Loamy soils that are poorly drained and moderately acidic. Broadleaf types dominated by paper birch (*Betula papyrifera*), needleleaf forests by black spruce, and mixed forests co-dominated by both species. Common along northern portion of the Lakes Impact Area and the Little Delta Training Area.

Riverine and Lacustrine Wetland Complexes (2%) – Moist, loamy soils, dominated by forest (needleleaf, broadleaf, or mixed), shrubs (willows and alders), or meadows. Wetlands located along the Delta and Little Delta rivers and Jarvis Creek are riverine systems.

No wetland surveys have been conducted at Black Rapids Training Area. Delineation results from Gerstle River are pending.

3.7.4 Fort Richardson

Wetlands comprise approximately 8% (4,990 acres) of Fort Richardson (FRA) (Lichvar and Sprecher 1998b). Wetland types on the post include estuarine, marine, palustrine, riverine, and lacustrine. Appendix A, Figure 3.7.g shows the locations of wetlands at FRA.

Eagle River Flats is the largest expanse of wetlands at FRA (2,165 acres). This site was identified by the EPA to be on the National Priorities List for investigation and clean-up of hazardous substances (USARAK 1998). As a result, an ecological risk assessment was conducted (USARAK 1998). Water birds, including dabbling ducks, swans, and shorebirds, were found to be at risk due to consumption of white phosphorus. No other wildlife, fish, or invertebrate species were deemed to be at risk. In addition, aquatic plants that grew in the contaminated area did not contain sufficient concentrations of white phosphorus to be considered a risk to the environment or the food chain. USARAK has not used white phosphorus munitions in wetlands since 1989, when a study was initiated to evaluate the ecological effects of these munitions. Use of white phosphorus munitions was banned in all impact areas in Alaska in 1991, and this explosive is no longer used in any wetlands throughout the United States. Clean-up operations at Eagle River Flats are ongoing.

Wetland types found on FRA include:

Coastal Halophytic Zone (3%) – The marine wetland ecosystem includes the shoreline tidal flats and Eagle River Flats, a 2,165 acre estuarine marsh. The tidal flats are typically barren except for some areas of rye grass (*Leymus mollis*) and lyngebye sedge (*Carex lyngbyei*). Approximately 30% of Eagle River Flats is composed of barren mudflats, an additional 30% is dominated by lyngebye sedge. The remaining 40% would include glasswort (*Salicornia europea*), alkali grass (*Puccinellia hultenii*), maritime arrow grass (*Triglochin maritima*), goose tongue (*Plantago maritima*), sedges and rye grass communities (Lichvar et al. 1997).

Lowland Forest Wetlands (3%) – These are palustrine wetlands. Open black spruce wetlands comprise about 62% of the lowland forest wetland. The understory is dominated by bluejoint grass, oak fern (*Gymnocarpium dryopteris*), red raspberry (*Rubus idaeus*), lowbush cranberry (*Vaccinium vitis idaea*), and red currant (*Ribes triste*). Graminoid/herbaceous wetlands cover about 21% of lowland forest wetlands; bluejoint reedgrass and sedges (*Carex* spp.) dominate. Sweetgale-ericaceous shrub wetlands cover about 11% of the lowland forest wetland type. These wetland types are found bordering Ship Creek, McVeigh Marsh, in the Fossil Creek bottomlands, areas southwest of Eagle River Flats, and drainages south and west of Clunie Lake.

Lacustrine Wetlands (1%) – These areas surround open water and are vegetated with sedges (*Carex rhynophysa* and *Carex kelloggii)*. These wetlands also contain marsh five-finger (*Potentilla palustis*), marsh (*Equisetum palustre*) and woodland horsetail (*Equisetum sylvaticum*), Cahmiss' cottongrass (*Eriophorum russeolum*), shore sedge (*Carex limosa*), and sphagnum moss (*Sphagnum* spp.) (Lichvar et al. 1997).

Alpine and Subalpine Wetlands – Alpine and subalpine wetlands comprise about 0.3% of FRA. Bluejoint meadow wetlands, found in subalpine areas, are the most common of these.

3.8 VEGETATION

Topics discussed in this section include:

- Vegetation terms
- Vegetation studies
- Vegetation types and management issues at each installation

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional vegetation information is presented in Appendix E.

Most lands used by the U.S. Army in Alaska (USARAK) were relatively undisturbed when they were withdrawn for military use in the early 1950s. Little or no data exist on most plant species prior to the last 15 years, and the effects of military presence on biological diversity are not known. Military activities may have resulted in localized changes in ecosystems, and may have affected abundance of certain species for short periods, but probably have not affected the overall diversity of species. The greatest losses of habitat are associated with construction and urbanization of the cantonment areas.

3.8.1 Vegetation Topics

3.8.1.1 Vegetative Cover

The distribution of plant communities is influenced by factors such as climate, physiography, geomorphology, hydrology, soils, and fire. The major attributes of plant communities include growth form and structure, diversity, species dominance, and relative abundance (Krebs 1994).

In this section, vegetation is categorized using a hierarchical scale, from broad regional characteristics to localized cover types, and to species associations based on dominance classes. The lands used by USARAK can be broadly classified into four terrestrial ecosystems: barren lands, tundra, scrub lands, and forests (Table 3.8.a). Within each of these ecosystems a number of cover types exist, and these will be discussed in further detail for Fort Wainwright (FWA) and associated lands (Section 3.8.2.1), Donnelly Training Area (DTA) (Section 3.8.3.1), and Fort Richardson (FRA) (Section 3.8.4.1). See Appendix E for a conceptual framework for the classification of vegetation and ecosystems.

A fifth ecosystem, wetlands, is transitional and was more fully discussed in Section 3.7.

Table 3.8.a Terrestrial Ecosystems of USARAK Lands.

Vegetative Cover Type	Description
Barren Lands	These areas are bare of vegetation. Includes glaciers, snowfields, exposed rock, and recently deposited gravel bars in rivers.
Tundra	Areas of tundra occur above treeline, beginning at about 2,500' up to 4,500'. Tundra is composed of hardy vegetation with short growing seasons. Vegetation in alpine and moist tundra has a low or dwarf growth form. Vegetation includes sparse and scattered grasses, sedges, lichens, club mosses, mat-forming plants. Woody perennials rarely exceed 3'.

Table 3.8.a cont. Terrestrial Ecosystems of USARAK Lands.

Vegetative Cover Type	Description
Scrub Lands	Scrub cover includes high and low growing shrubs. Lower elevation scrub lands occur adjacent to waterways, between forests and barren areas; high elevation scrub lands, just above tree line. Vegetation consists of small to medium-sized woody plants (<20 feet). Alder, willows, cottonwood, birch, mountain ash, and dwarf white spruce are common. Floodplains have little or no ground cover. In subalpine settings ground vegetation consists of grasses, mosses, forbs, low shrubs, and lichens.
Forests	Forests range from pure stands of spruce or hardwoods (birch, quaking aspen, and balsam poplar) to spruce/hardwood mixtures. White spruce/balsam poplar occur on level floodplains, low river terraces, and south-facing slopes. Black spruce occurs where drainage is poor, along flat valley bottoms, lakesides, and muskegs.

Sources: USARAK 1980, 1999a; Jorgensen et al. 1999, 2001, 2002

3.8.1.2 Floristic Inventory

Plant surveys were conducted at FWA and associated lands (Racine et al. 1997), Section 3.8.2.2; DTA (Racine et al. 2001), Section 3.8.3.2; and FRA (Lichvar et al. 1997), Section 3.8.4.2.

3.8.1.3 Ecological Land Classification

A four-tiered ecological classification system developed by Bailey (1995) is used by federal agencies, including the Department of Defense. The system describes geographical areas from regional to more localized ecosystem categories: Domain, Division, Province, and Section (Table 3.8.b). Vegetation can then be categorized further according to ecosystems, terrestrial cover types, and species associations.

Table 3.8.b Classification of USARAK Lands According to Bailey's Ecoregion Classification System[1].

Location	Domain	Division	Province	Section
Fort Wainwright: MP, TFTA, YTA	Polar	Subarctic	Upper Yukon Taiga Meadow	Upper Yukon Highlands
Donnelly Training Area, Gerstle River, and Black Rapids	Polar	Subarctic	Alaska Range Humid Taiga-Tundra-Meadow	Alaska Mountains
Fort Richardson	Polar	Subarctic	Coastal Trough Humid Taiga	Cook Inlet Lowlands

[1] MP=Main Post, TFTA=Tanana Flats Training Area, YTA=Yukon Training Area

Source: Bailey 1995

The lands used by USARAK are within the Polar Domain (Table 3.8.b), which is characterized by low temperatures, severe winters, and relatively low precipitation. These lands are also within the Subarctic Division, which is influenced by cold snowy climate. The dominant forests in the Subarctic Division are boreal subarctic type forests, open lichen woodlands, and taiga. Ecosystem

Divisions are further subdivided into ecosystem Provinces and Sections, depending on vegetative features. Table 3.8.b provides classification of the Ecosystem Provinces and Sections in relation to the respective Army posts in Alaska. See Appendix E for additional description of ecological features for relevant Provinces and Sections.

Bailey's general classification system is further detailed through an Ecological Land Classification System, described by Jorgensen et al. (1999, 2001, 2002). This system links the vegetation cover types to specific ecological districts within each post. The lands used by USARAK – including FRA and FWA, Tanana Flats Training Area (TFTA), Yukon Training Area (YTA), and DTA – were intensively surveyed from 1998 to 2000. The maps created for the ecological land classification demarcate ecodistricts, ecosubdistricts, and ecotype classes (Jorgenson et al. 1999, 2001, 2002):

> ***Ecodistricts*** are large physiographic units (1:500,000 scale) within a climatic region that have similar moisture regimes, radiant solar energy exposure, geology, geomorphology, and hydrology. Names of ecodistricts are based on prominent geographic features and broad land forms.
>
> ***Ecosubdistricts*** are smaller physiographic units (1:100,000 scale) that have similar associations of vegetation, soils, permafrost characteristics, water, and fauna. These also tend to be named after prominent geographic features.
>
> ***Ecotype classes*** are the smallest descriptive units (1:20,000 scale), and these have associated species lists. Ecotype classes represent vegetation types or successional stages within a uniform soil and geomorphic class.

Ecological land surveys were conducted at FWA and associated lands (Jorgenson et al. 1999), Section 3.8.2.3; DTA (Jorgenson et al 2001), Section 3.8.3.3; and FRA (Jorgenson et al. 2002), Section 3.8.4.3.

3.8.1.4 Forest Management

The Sikes Act (Public Law 105-85) requires USARAK to prepare and implement Integrated Natural Resources Management Plans. These five-year planning documents include management of forest resources. Forest management is required to protect, maintain, and enhance military training environments. Maintenance of tree density, ground cover, and forest ecosystem function are critical to the accomplishment of the Army's mission. In addition, sustainable management of forest ensures maintenance of biological diversity, wildlife habitat, and continued development of outdoor recreation.

Details for management of timber resources are found in the Integrated Natural Resources Management Plans for each post (USARAK 2002e,f,g). Forestry management planning includes the development of plans, budgets, contracts, and organization necessary to implement the forestry program.

Forest resources are managed jointly by USARAK and the Bureau of Land Management (BLM). The BLM retains responsibility for the sale of forest products on most lands used by USARAK. Most forests on withdrawal lands fall under the BLM's restricted category for management. Any manipulation of lands where the BLM retains vegetation rights must be approved by the agency. Although the public is allowed to harvest timber, timber resource decisions are primarily under the discretion of the U.S. Army. Members of the public may approach the BLM for permits to purchase timber on withdrawn lands, but the Army must approve each timber sale.

Timber removal and other forest management practices are coordinated with USARAK's Range Control to minimize disruption of military training. Harvest schedules usually are prepared three to six months in advance. Appropriate NEPA documentation is required prior to implementation of timber stand improvement projects.

3.8.2 Fort Wainwright

3.8.2.1 Vegetative Cover

The ecological survey by Jorgensen et al. (1999) of FWA, including TFTA and YTA, indicated that these areas included forest (53.4%), scrub lands (17.5%), tundra (<0.1%), barren lands (0.4%), meadows, bogs, and fens (22.6%), miscellaneous plant community complexes (5.4%), and water (0.8%) (Appendix E).

White spruce (*Picea glauca*), paper birch (*Betula papyrifera*), and quaking aspen (*Populus tremuloides*) dominate the well-drained areas on lower and south-facing slopes. Black spruce (*Picea mariana*) is found where permafrost is present at higher elevations and on north-facing slopes. Black spruce is common on lower slopes with impeded drainage. Scrub communities of alder (*Alnus* spp.) are also common. Above tree line, the lands are typically barren or tundra, which are characterized by sedges and mosses in poorly-drained sites and low-growing shrubs on drier sites (Bailey 1995; McNab and Avers 1994).

3.8.2.1.1 Forests

Jorgensen et al. (1999) classified 41.5% of TFTA and 83.3% of YTA as forest. Due to the variable climate, as well as physiographic and geographic patterns throughout the region, a wide variety of forest types (i.e., stands with similar composition and development) exist at these areas. Forest cover in interior Alaska is categorized into six types (Table 3.8.c). The distribution and characteristics of these forest types at the Main Post, TFTA, and YTA are:

- ***White Spruce:*** White spruce is a climax tree species that is found in areas of well-drained soils absent of permafrost. Although pure stands do occur along the Tanana River, these stands are rare due to anemic soils and frequent wildfires.
- ***Paper Birch:*** Paper birch is the second most widely distributed tree species in the region. Pure stands are common on well-drained uplands and ridge tops. Stands are widely distributed in the TFTA and are also found on the YTA uplands.
- ***Balsam Poplar:*** Balsam poplar (*Populus balsamifera*) stands are found along alluvial deposits of the Tanana River and bottomlands of smaller floodplains in YTA.
- ***Black Spruce:*** Black spruce stands cover vast areas of the landscape of the installation, especially in the northern and western portions of TFTA. Pure stands of black spruce are common around lake and bog margins on TFTA and YTA. Open black spruce forest (16.3%) and closed spruce/paper birch forest (6.5%) are the most common forest cover types on TFTA and YTA.
- ***Spruce/Hardwood:*** Most forests on FWA are mixtures of spruce (white and black) and hardwoods (paper birch, quaking aspen, and balsam poplar). Stands are common along the Chena and Salcha rivers and in the floodplains of the tributaries including Ninetyeight, Little Salcha, Moose, South Fork Chena River, Beaver, and Stuart Creeks (USARAK 1980; Jorgenson et al. 1999). Tamarack (*Larix laricina*) is also associated with spruce in riverine areas.
- ***Quaking Aspen:*** Aspen is limited to uplands of YTA on relatively dry southern or southwestern exposures. Pure stands are located on well-drained uplands and ridges.

Quaking aspen is common on south slopes, well-drained benches, and creek bottoms throughout FWA below elevations of 3,000 feet (Jorgenson et al. 1999; Racine et al. 1997).

Table 3.8.c Major Forest Types Found on USARAK Lands[1].

Forest Type	Description
White Spruce	These forests contain >70% white spruce. The even-aged forests are typically located on dry and well-drained soils. Elevation range 1,150' to 2,350'.
Paper Birch	Dominated by paper birch and represent an early successional stage. Typically even-aged, these forests occur on well-drained, level to sloping sites. Frequently birch stands grow after disturbances (e.g., fire).
Quaking Aspen	These forests of quaking aspen are generally even-aged. The stands occur on warm, dry, south-facing slopes.
Balsam Poplar	Typically found on poorly-drained sites. Black cottonwood is common in some floodplain areas. Elevation range up to 1,000'.
Black Spruce	These are often pure stands found on cold and poorly-drained sites. The black spruce/hardwood is the most common forest cover type in interior Alaska. Elevation range from 1,300' to 2,500'.
Spruce/ Hardwood	Characterized by mixed stands of white spruce, paper birch, quaking aspen, and balsam poplar. Typical sites are well drained, and level to sloping. Includes dry slopes, floodplains, and low river terraces.

[1] Viereck et al. 1992

3.8.2.1.2 Scrub Communities

Alder and willow (*Salix* spp.) communities are common at the Main Post, TFTA, and YTA. These scrub types occur on exposed river bars and along riparian areas. Some permanent alder/willow scrub fields also occur at high elevations, in stream valley bottoms, and on disturbed sites. These communities also grade into open balsam poplar and birch communities. Krummholz (dwarf) spruce communities are common in high-elevation scrub fields and nearby areas.

Scrub communities also occur near Eielson Air Force Base, along major streams, and in burned areas (USARAK 1980). Xeric sites, also known as tundra steppe communities, are located along Sagehill on Main Post and Woodriver Buttes in the southwest portion of TFTA. Vegetative communities are dominated by sagebrush (*Artemisia frigida*), juniper (*Juniperus communis*), grasses (e.g., *Calamagrostis purpurascens, Festuca lenensis*) and forbs (e.g., *Elytrigia spicata, Pulsatilla patens, Cnidium cnidiifolium,* and *Antennaria rosea*). Species such as bluejoint reed grass (*Calamagrostis canadensis*), ticklegrass (*Agrostis scabra*), foxtail barley (*Hordeum jubatum*), Kentucky bluegrass (*Poa pratensis*), and clovers (*Trifolium* spp.) sometimes invade early successional scrub sites (Racine et al. 1997).

3.8.2.1.3 Barren Lands and Tundra

Barren lands occur above the tundra, especially along high ridgelines. Barren sites also exist along rivers and consist of exposed stream channels of silt, sand, and gravel bars (Racine et al. 1997).

Alpine tundra occurs at altitudes above 2,500 feet in YTA. In these zones, sparsely scattered grasses, dry land sedges, lichens, club mosses, and low mat-forming herbaceous and woody plants (<3') can grade into barren tors (USARAK 1980). Viereck et al. (1992) and Racine et al. (1997) described four types of tundra communities for the region:

- ***Dwarf Birch Low Shrub Tundra:*** Usually found just above tree line of spruce forests.
- ***Crowberry/Blueberry Dwarf Shrub Tundra:*** These are the most common types of tundra on the post. Although these two species intermingle, blueberry tundra sites tend to be more exposed.
- ***Cassiope Dwarf Shrub Tundra:*** Occurs on moist alpine sites, commonly on north-facing slopes.
- ***Dryas-Sedge-Lichen Dwarf Shrub Tundra:*** Found on many of the higher ridges and slopes.

3.8.2.2 Floristic Inventory

Racine et al. (1997) completed a floristic inventory of the Main Post, TFTA, and YTA. Although the survey did not include every possible taxa in these lands, it is the most comprehensive to date. Plants identified included vascular plants, ferns and fern allies, common mosses, liverworts, and lichens. This inventory documented 561 vascular species (491 taxa including subspecies and varieties), in 72 families and 227 genera, which represents about 26% of Alaskan vascular plants, as identified by Hultén (1968). The authors also documented 10 significant range extensions of vascular plants. The inventory of non-vascular flora found 217 taxa (including subspecies and varieties), represents 11 hepatic, 115 lichen, and 91 moss taxa (Racine et al. 1997).

3.8.2.3 Ecological Land Classification

The Main Post, TFTA, and YTA lie within the Upper Yukon Taiga-Meadow Province and the Upper Yukon Highlands Section (Bailey 1995) (Table 3.8.b). Jorgensen et al. (1999) listed three ecodistricts that overlap TFTA and Main Post: the Tanana Floodplain, the Tanana-Wood River Flats, and the Steese-White Mountains. The Tanana Floodplain has nine ecosubdistricts; the Tanana-Wood River Flats has eight. YTA is within the Steese-White Mountains ecodistrict, and has four ecosubdistricts. See Appendix E for descriptions of the ecosubdistricts.

Forty-eight ecotypes are found within FWA. Within TFTA and Main Post, 45 ecotypes are found (Appendix A, Figure 3.8.a), and 31 ecotypes are within YTA (Appendix A, Figure 3.8.b). See Appendix E for description of the ecotypes at these posts. The four most prominent ecotypes classes on FWA include: lowland wet needleleaf forest (20.9%), lowland wet low shrub (11.4%), lowland forest-thermokarst complex (8.4%) and lowland scrub-thermokarst complex (10.6%). See Jorgensen et al. (1999) for detailed descriptions of the structure and composition of communities within the ecotypes.

Sensitive wetlands include riverine, permanent emergent, and semi-permanent emergent areas.

3.8.2.4 Forest Management

Forest management areas of TFTA and YTA are described in USARAK 2002f. A 1993 forest inventory included the Main Post, the periphery of TFTA, and YTA (excluding closed areas). The survey covered 325,169 acres of the Main Post and TFTA, 290,308 acres on YTA. Forty-eight percent of TFTA (156,927 acres) and 75% of YTA (217,751 acres) were classified as forested land. The remainder was classified as non-forest land, rivers, or water.

Based on inventory data, potential harvests at TFTA include 229 acres/year of white spruce sawtimber and approximately 251 acres/year of hardwoods. At YTA the potential annual harvest level of white spruce sawtimber was 123 acres/year, with 317 acres/year for hardwoods. Ecosystem management of forests on Fort Wainwright requires that factors such as wildlife values must be considered prior to timber harvest.

Only a small portion of the forested land area at FWA and associated lands are currently available for harvest of fuel wood and Christmas trees (or any commercial harvest by the Army). Use of forest resources has not been widespread at these areas even before the lands were withdrawn for the U.S. Army. However, the capability of FWA to support commercial forestry is increasing as the forests in many areas have matured.

3.8.3 Donnelly Training Area

3.8.3.1 Vegetative Cover

The ecological survey of DTA by Jorgensen et al. (2001) reported aerial cover profile of the post, which included areas of forest (29.0%), scrub lands (58.1%), tundra (4.4%), barren lands/partially vegetated (3.6%), human disturbed (0.6%), and water (4.3%) (Appendix E).

3.8.3.1.1 Forests

Forests cover at DTA is diverse and includes pure stands of spruce, hardwoods, and spruce/hardwood mixtures. The dominant types include white spruce, paper birch, quaking aspen, balsam poplar, black spruce, and spruce/hardwood. Descriptions and general distribution of the forest cover types at DTA are as follows (Jorgenson et al. 2001):

- ***White Spruce:*** White spruce, the dominant upland species at DTA, occurs on well-drained upland sites that lack permafrost. White spruce stands also exist on waterlogged sites or dry, sunny slopes. On north and east-facing slopes, white spruce is confined to drainage ways and the tops of slopes.
- ***Paper Birch:*** Paper birch is found primarily on upland sites and occurs on most exposures, except north-facing slopes. Paper birch can tolerate conditions underlain by discontinuous permafrost.
- ***Quaking Aspen:*** Quaking aspen is common on south slopes, well-drained benches, and creek bottoms to an elevation of about 3,000 feet. The most vigorous stands occur on warm, dry slopes. It is almost completely absent from wet, north-facing slopes.
- ***Balsam Poplar:*** Poplar stands are found along alluvial river deposits. Poplar is well adapted to river bars, stream bends, and lakeshores, where it may form nearly closed stands. Stands are common along the Tanana, Delta and Little Delta rivers.
- ***Black Spruce:*** Black spruce, the most common forest cover type on DTA, dominates areas where permafrost is near the soil surface. Typical sites are cold, wet, poorly aerated and poorly drained. Lakes and bogs often have surrounding stands of black spruce characterized by short and narrow-crowned growth forms. Black spruce stands on DTA are also found on dry sites that have gravelly soils and thin organic layer.
- ***Spruce/Hardwood:*** Spruce/hardwood forests predominate on lowland forest areas. White spruce/balsam poplar stands are found in floodplains, low river terraces, and south-facing slopes. White spruce is also found mixed with paper birch on high ridges and with quaking aspen at lower elevations. Tamarack is found with white and black spruce in riverine areas and occasionally with paper birch.

3.8.3.1.2 Scrub Communities

Scrub communities occur at high mountain elevations, in small stream-valley bottoms, and as "pioneer" vegetation on disturbed sites. Typical scrub fields are composed of alder, willow, and dwarf birch. Krummholz spruce stands are relatively common at higher elevations. Dense thickets of scrub communities, dominated by willow and alder, exist along floodplains or disturbed sites such as gravel pits, road shoulders, rights-of-way, and military trails (USARAK 1980).

3.8.3.1.3 Barren Lands and Tundra

Most barren areas on DTA are located on gravel bars along the Delta River, the Little Delta River Delta Creek, Jarvis Creek, and Granite Creek (Jorgensen et al. 2001). Barren lands also occur above tree line, along ridges, and adjacent to rivers and streams. Barren sites are also located near the small portion of Trident Glacier that lies within DTA.

Higher elevation sites along the southern portion of DTA support moist tundra, which grades into alpine tundra, and then into barren land. These areas occur on MacArthur Mountain, Patton Mountain, Molybdenum Ridge, and Trident Glacier (USARAK 1980; Jorgenson et al. 2001). Small areas of tundra also exist in the northwest portion of DTA at elevations above 3,500 to 4,000 feet. Tundra communities on DTA are very similar to those on FWA and are described by Viereck et al. (1992) and Racine et al. (1997):

- ***Dwarf Birch Low Shrub Tundra:*** Usually found just above tree line of spruce forests.
- ***Crowberry/Blueberry Dwarf Shrub Tundra:*** This is the most common type tundra on DTA. Although these two species intermingle, blueberry tundra sites tend to be more exposed.
- ***Cassiope Dwarf Shrub Tundra:*** Occurs on moist alpine sites, commonly north-facing slopes on the post.
- ***Dryas-Sedge-Lichen Dwarf Shrub Tundra:*** Found on many of the higher ridges and slopes.

3.8.3.2 Floristic Inventory

Racine et al. (2001) completed a floristic inventory of DTA. Although the survey did not include all possible taxa on the post, it is the most comprehensive survey to date. The inventory documented 497 vascular taxa (including subspecies and varieties) in 64 families and 198 genera. About 26% of vascular plants found in Alaska (Hultén 1968) were identified in the survey of DTA. The authors also documented approximately 22 vascular plant range extensions (Racine et al. 2001).

3.8.3.3 Ecological Land Classification

DTA is within the Alaska Range Humid Taiga-Tundra-Meadow Province and the Alaska Mountains Section (Table 3.8.b). The province is characterized by dense bottomland stands of white spruce and balsam poplar on floodplains. Black spruce forests can be found at higher elevations, north-facing slopes and on lowland poor drainage sites. White spruce forests and spruce/hardwood forests are typical on lowland well-drained areas and south-facing slopes. These forests generally contain an understory of low shrubs, forbs, grass, ferns, and moss (Bailey 1995; McNab and Avers 1994).

Jorgenson et al. (2001) classified five ecodistricts within DTA: Hayes Mountains, Gakona Mountains, Delta Highlands, Delta Lowlands, and Middle Tanana Floodplains (Appendix E).

The Hayes Mountains and Gakona Mountains each have one ecosubdistrict (Appendix E); five ecosubdistricts are located within the Middle Tanana Floodplains ecodistrict (Table 3.8.h); the Delta Lowlands ecodistrict included eleven ecosubdistricts, and the Delta Highlands included seven ecosubdistricts (Appendix E). Within the 25 ecosubdistricts on the post there are 37 ecotype classes (Appendix A, Figure 3.8.c and Appendix E).

The most prevalent ecotypes are lowland tussock scrub bog (21.2 %), lowland wet scrub (13.8%), and lowland needleleaf forest (11.5%) (Appendix E). Jorgenson et al. (2001) provides detailed descriptions of these ecotypes.

Sensitive wetlands include riverine, permanent emergent, and semi-permanent emergent areas.

3.8.3.4 Forest Management

Forest management areas for DTA are described in USARAK (2002e). Many potential timber stands at DTA are not harvestable because they are located in impact areas contaminated by unexploded ordnance. Current commercial potential for the remainder is limited to firewood and sawtimber and half-log white spruce markets.

About 60% of DTA (391,851 acres), as well as the Gerstle River Training Area, were inventoried for forest resources in 1993 (Tanana Chiefs Conference Inc. 1993). Cover types were classified according to their commercial forest potential. Approximately 40% (158,000 acres) of the surveyed area at DTA had commercial forest potential, while 54% was classified as non-forested land, 3% as rivers, and 3% as other waters. Sawtimber stands at DTA covered 1,555 acres and pole timber stands comprise 58,102 acres. Approximately 132 acres of white spruce sawtimber could be harvested annually. Hardwood harvest could occur on 219 acres/year (Tanana Chiefs Conference Inc. 1993).

The Gerstle River and Black Rapids training areas lie with the Alaska Range Humid Taiga Province and the Alaska Mountains Section (Bailey 1995). Detailed ecological surveys have not been conducted at Gerstle River. The vegetation, floristics, and ecosystem are very similar to DTA East. Several large fires in recent decades have affected the seral stage of Gerstle River forests. For example, the 1994 Hajdukovich fire burned 11,320 acres (55%) of the Gerstle River Training Area. A 2001 forest inventory report indicated that 36% of the area was forested and 64% nonforested (most of that was early post-fire succession) (Buzby and Rees 2001). Of the forest types, white spruce/birch/aspen (34.8%), aspen (17.3%), and white spruce (10.5%) were most common.

For forest resources sawtimber covers approximately 3.8% (292 acres) of Gerstle River, and pole timber 27.3% (2,050 acres). An estimated 27 acres per year of white spruce could be harvested for sawtimber on Gerstle River Training Area, and 18 acres a year would be available for pole timber (Buzby and Rees 2001).

Black Rapids Training Area, along lower elevations of the Alaska Range, is located east of the Delta River. Open white spruce/scrub communities dominate along the lower elevations, which are within a kilometer of the Richardson Highway. As elevation increases, scrub and tundra dominate and barren ground/tundra are found on the far eastern portion of Black Rapids Training Area. The site was surveyed during the summer of 2002 for the Land Condition Trend Analysis program (Jeff Mason, personal communication 2002).

3.8.4 Fort Richardson

3.8.4.1 Vegetative Cover

An ecological survey of FRA conducted by Jorgensen et al. (2002) indicates the 61,972-acre post is covered by forest (55.3%), scrub lands (23.7%), barren lands (5.5%), human disturbed lands (13.1%), bog and wetland (1.6%), meadow (0.7%) and water (0.5%) (Appendix E).

3.8.4.1.1 Forests

Forests in the FRA area closely resemble the boreal forest of interior Alaska, but some tree species typically found in the coastal spruce/hemlock forest also occur. The distribution of forest types at FRA is heavily influenced by elevation, which ranges from sea level to over 5,000 feet in less than 15 km. The lowland interior forest zone exists below approximately 1,500 feet. The subalpine zone of intermittent forest, shrub, and meadow habitats exists from approximately 1,500 feet to 2,500 feet elevation. The forest cover reflects the transitional nature of the climate between maritime and continental (Gabriel and Tande 1983). The major forest types at FRA include:

- ***White Spruce:*** White spruce forests cover only a small portion of the post (<450 acres). Two stands, one at the south end of Clunie Lake and the other on a north-facing slope above the Eagle River, are old growth and are estimated to be 200-225 years old.
- ***Paper Birch:*** Paper birch forests are the second most common forest type found on FRA. These tend to be younger stands (<125 years) that are found in upland areas, north of the Eagle River and south of the golf course.
- ***Quaking Aspen:*** Aspen stands occur on the western edge of Fossil Creek near Gwen and Kiowa lakes, around McLaughlin Range, the Fossil Creek drainage, Eagle River bluffs, and areas near Ship Creek.
- ***Balsam Poplar:*** Cottonwood/balsam poplar forest occurs along the banks of Eagle River, on the Ship Creek floodplain, along Otter Creek, and the North Fork of Campbell Creek.
- ***Black Spruce:*** These stands dominate in bogs along the Muldoon border, Fossil Creek lowlands, and depressions southwest of Eagle River Flats, and along lakes and ponds.
- ***Spruce/Hardwood:*** These are the dominant forests of FRA. Forest cover on the Elmendorf Moraine is dominated by mixed forest of paper birch-white spruce (Gabriel and Tande 1983). Spruce/hardwood forests are common along the northern boundary of Clunie Lake, Eagle Bay, and many higher elevation sites from the Glenn Highway to tree line (Lichvar et al. 1997).
- ***Forest Understory:*** Dry and mesic site forest cover on FRA typically supports an understory of prickly rose (*Rosa acicularis*), thinleaf alder (*Alnus tenufolia*), lowbush cranberry (*Vaccinium vitis-idaea*), bunchberry (*Cornus canadensis*), cloudberry (*Ribes arcticus*) and other low-growing shrubs. Herbaceous plants in the understory include woodland horsetail (*Equisetum silvaticum*), meadow horsetail (*Equisetum pratense*), labador tea (*Ledum palstre groenlandicum*), northern bedstraw (*Galium boreale*), toadflax (*Comandra umbellata*) and cow parsnip (*Heracleum lanatum*). Alder, willow, and other ericaceous shrubs frequently inhabited wet areas, and ferns, grasses, and sedges comprise the herbaceous components of wet areas (Lichvar et al. 1997).

3.8.4.1.2 Scrub Communities

At upper elevations, graminoid forb meadows, alder, and dwarf birch (*Betula glandulosa* and *B. nana*) dominate. Grasses, herbs, willows, and alders dominate the vegetation in a narrow band

along Cook Inlet and at elevations above 1,500 feet on the Chugach Mountain slopes. Wetlands are predominantly black spruce tree bogs and treeless bogs with a variety of low shrub and graminoid forb communities. Alder shrub is a dominant type of the Lowland Interior Forest Zone.

3.8.4.1.3 Barren Lands and Tundra

Low shrubs and dwarf shrubs occupy wet and mesic to dry habitats. The latter include mesic to dry vegetated sites and dry non-vegetated sites such as rock talus and blockfields. Wetter habitats include late-melting snowfields and snowbeds. Viereck et al. (1992) and Lichvar et al. (1997) provide detailed descriptions of tundra sites.

- ***Dwarf Birch Low Shrub Tundra*** – Dominant vegetation includes dwarf and ericaceous shrubs.
- ***Crowberry/Blueberry Dwarf Shrub Tundra*** – This is the most common type of tundra on FRA.
- ***Cassiope Dwarf Shrub Tundra*** – The cassiope dwarf shrub tundra occurs on moist sites.
- ***Dryas-Sedge-Lichen Dwarf Shrub Tundra*** – This type occurs on exposed areas where vegetation is dominated by grasses, sedges, and dwarf shrubs.
- ***Snowbeds*** – Snowbeds occur in depressions or below outcrops. Sites include the west slopes of Nike Summit, the valleys below Tanaina and Temptation Peaks, to the east of Long Lake, and the head of the North Fork of Campbell Creek drainage.

Disturbed Lands

The cantonment area includes utility corridors, roadsides, railroad rights-of-way, borrow pits, woodcutting areas, small arms ranges, firing points, landing zones, and other human-modified areas.

Coastal Halophytic Zone

This area is influenced by salt water, and includes shoreline tidal flats and the 2,137-acre Eagle River Flats estuarine marsh on Cook Inlet.

3.8.4.2 Floristic Inventory

A floristic inventory of FRA included vascular plants, ferns and fern allies, the more common mosses, liverworts, and lichens (Lichvar et al. 1997). The inventory found 561 vascular species (588 taxa including subspecies and varieties), in 75 families and 246 genera. At least 75 species collected represented extensions in known ranges. Approximately 30% of Alaska's vascular flora were found on FRA (Lichvar et al. 1997). The inventory of non-vascular flora documented 239 species (256 taxa including subspecies and varieties), which represented 19 hepatics, 112 lichens, and 108 mosses (Lichvar et al. 1997).

3.8.4.3 Ecological Land Classification

FRA is within the Cook Inlet Lowlands Section of the Coastal Trough Humid Taiga Province, according to Bailey's Ecoregions of the United States (McNab and Avers 1994; Bailey 1995) (Table 3.8.b). Common community associations include lowland spruce/hardwood forests, bottomland spruce poplar forests, with wetland thickets of alder and willow. Moraines support white spruce forests, and cottonwood/tall bush communities are common on floodplains. Lowland black spruce forests dominate the Cook Inlet Lowlands Section. Bottomland areas include

riparian spruce/poplar forests along with willow and alder shrubs. Wet tundra areas exist along the coastline.

Jorgenson et al. (2002) classified three ecodistricts that overlap into FRA: the Mat-Su Lowlands, Cook Inlet Coast, and Northern Chugach Mountains. Within the Mat-Su Lowlands lie three ecosubdistricts, the Anchorage Glaciated Lowlands, the Knik Glaciated Lowlands, and the Northern Chugach Floodplains (Appendix E). The only ecosubdistrict within the Cook Inlet Coast is a portion of the Upper Cook Inlet Coast. This area is essentially synonymous with Eagle River Flats. The Northern Chugach Mountains include the Eklutna Mountain Hillsides, a section of the Northern Chugach Floodplains, and the Eklutna Mountains (Appendix E). Appendix A, Figure 3.8.d maps the distribution of FRA's ecotypes. Appendix E provides the aerial coverage of the ecotypes. Jorgenson et al. (2002) provides additional information about ecological land classification at FRA.

Sensitive wetlands include riverine, permanent emergent, and semi-permanent emergent areas.

3.8.4.4 Forest Management

Forest management areas for FRA are described in its Integrated Natural Resources Management Plan (USARAK 2002f). The quality and quantity of marketable timber at FRA is limited. Damage from spruce bark beetles (*Dendroctonus rufipennis*) exists in many older stands on the post, and other stands are in a degraded condition (USARAK 2002f). Enhancing timber marketability would require intensive timber stand improvement and several decades for regrowth. Presently, there is little justification to improve forest resources at FRA.

3.9 WILDLIFE AND FISHERIES

Issue C: Wildlife and Habitat. During the public scoping process, USARAK and the public identified the impact of the proposed action on wildlife, fisheries, and habitat as an issue of concern. It is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Wildlife (including mammals, birds, and amphibians)
- Fisheries

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional information on wildlife and fisheries is presented in Appendix E. Current U.S. Army Alaska (USARAK) wildlife management practices, as outlined in the Integrated Natural Resources Management Plans (USARAK 2002e, f, g), are described in Appendix H.

3.9.1 Wildlife and Fisheries Topics

3.9.1.1 Wildlife

With 322 million acres, Alaska's public lands support a wide diversity of wildlife species (Alaska Division of Tourism 2002). Forty-three species of mammals, 173 species of birds, and one amphibian species exist on lands managed by USARAK (Appendix E).

Wildlife management on USARAK lands has traditionally supported recreational use, maintenance of populations and habitats, and preservation of biological diversity. The wildlife and their habitats are managed cooperatively by USARAK, the Alaska Department of Fish and Game, and the U.S. Fish and Wildlife Service. Management entails developing population and habitat management plans as well as inventorying and monitoring populations and habitats.

The Alaska Department of Fish and Game is responsible for managing game populations on Alaska's Army lands and establishing population and habitat management goals. The U.S. Fish and Wildlife Service is primarily responsible for managing nongame populations of fish and wildlife, and management of migratory bird species. USARAK works with these two agencies to conduct habitat management on Army lands.

The Army's specific goals for wildlife include improving habitat quality for game and nongame species, using nesting structures to improve productivity of birds, and maintaining sustainable harvest of game populations. In addition USARAK manages vegetation to ensure that the age class is diversified. The natural resources program encourages Watchable Wildlife by constructing viewing platforms and nest boxes, and it strives to integrate ecosystem management into planning (USARAK 2002e,f,g).

Records on trapping, hunter harvest, and black bear baiting are available from 1975 to present. Records from Donnelly Training Area (DTA) include recent trapping and moose harvest. Note that complete records for each post are not available. Use of this information is compatible with the Army's goal to ensure a sustainable harvest of game species. However, monitoring and habitat use indices were not collected, and the harvest data should not be considered as a population index.

The Federal Subsistence Board uses the same game management units to regulate subsistence take of customary and traditional use of game species. In Section 3.15, Subsistence, Tables 3.15.a through 3.15.d describe hunting and trapping regulations of customary and traditional use species from Game Management Units 20 and 14C. The Alaska Department of Fish and Game divides the state into Game Management Units, which are subdivided into Game Management Subunits. All of the Army's lands in interior Alaska are located in Game Management Unit 20.

3.9.1.2 Fisheries

Fisheries management on USARAK lands has traditionally supported recreational fishing, maintenance of fish populations, and preservation of biological diversity. The fisheries populations and their habitats are managed cooperatively by USARAK, the Alaska Department of Fish and Game, and the U.S. Fish and Wildlife Service. Management entails developing population and habitat management plans, as well as inventorying and monitoring fish populations and habitats. Indicator species such as salmon and trout are monitored closely.

The Alaska Department of Fish and Game produces a "Statewide Stocking Plan for Recreational Fisheries" each year, and this document establishes objectives and stocking plans for the subsequent five years (Alaska Department of Fish and Game 2002b). The stocking plans are subject to revision. For example, stocking of rainbow trout fingerlings has been reduced in recent years because fewer fish are being raised in the Anchorage fish hatchery than in past years, and stocking schedules have been altered to increase efficiency of the stocking operation (Alaska Department of Fish and Game 2002b).

Fisheries resources on USARAK lands in interior Alaska, including all lakes associated with Fort Wainwright's (FWA's) Main Post, Tanana Flats Training Area (TFTA), Yukon Training Area (YTA) and DTA, are managed within the Region III Tanana River drainage plans. Fisheries at FRA are managed within the Anchorage Bowl drainage, under Region II. Stocking programs are funded through the Federal Aid to Sport Fish Restoration funding (from Dingle-Johnson/Wallop-Breaux funds), and the plans involve input from the general public and state and federal agency biologists.

3.9.2 Fort Wainwright

3.9.2.1 Wildlife

TFTA lies within Game Management Subunit 20A, and the FWA Main Post and YTA are within Game Management Subunit 20B (Appendix A, Figure 3.9.a). See Table 3.9.a for a summary of harvest management regulations in Subunit 20A, and Table 3.9.b for Subunit 20B. Appendix E provides a species list of mammals and birds at FWA and associated Army lands.

Table 3.9.a Harvest Management Regulations for Unit 20A (1 July 2002 – 30 June 2003).

Game Management Unit 20A Tanana Flats Training Area and Donnelly Training Area West			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	Residents and Nonresidents	No closed season	3

Table 3.9.a cont. Harvest Management Regulations for Unit 20A (1 July 2002 – 30 June 2003).

Game Management Unit 20A Tanana Flats Training Area and Donnelly Training Area West			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Brown Bear	Residents and Nonresidents	Sept 10 – May 31	1 every four regulatory years
Caribou	Residents and Nonresidents	Aug 10 – Sept 20	1 bull
Dall Sheep	Residents and Nonresidents	Aug 10 – Sept 20	Drawing; 1 ram with full curl or larger
Moose	Residents	Sept 1 – Sept 20	1 bull[1], or 1 antlerless, or 1 calf
	Nonresidents	Sept 1 – Sept 20	1 bull[2]
Coyote	Residents and Nonresidents	Aug 10 –Apr 30	10
Fox, Red	Residents and Nonresidents	Sept 10 – May 31	10 (no more than 2 before Oct 1)
Hare	Residents and Nonresidents	Sept 1 – Apr 30	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	2
Wolf	Residents and Nonresidents	Aug 10 –Apr 30	5
Wolverine	Residents and Nonresidents	Sept 1 – Mar 31	1
Grouse	Residents and Nonresidents	Aug 10 – Mar 31	15 per day; 30 in possession
Ptarmigan	Residents and Nonresidents	Aug 10 – Feb 28	20 per day; 40 in possession
Trapping			
Beaver	Residents and Nonresidents	Nov 1 – Apr 15	No limit
Coyote	Residents and Nonresidents	Nov – Mar 31	No limit
Fox, Red	Residents and Nonresidents	Nov 1 – Feb 28	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	No limit
Marten	Residents and Nonresidents	Nov 1- Feb 28	No limit
Mink & Weasel	Residents and Nonresidents	Nov 1 – Feb 28	No limit

Table 3.9.a cont. Harvest Management Regulations for Unit 20A (1 July 2002 – 30 June 2003).

Game Management Unit 20A Tanana Flats Training Area and Donnelly Training Area West			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Muskrat	Residents and Nonresidents	Nov 1 – Jun 10	No limit
Otter	Residents and Nonresidents	Nov 1 – Apr 15	No limit
Wolf	Residents and Nonresidents	Nov 1 – Apr 30	No limit
Wolverine	Residents and Nonresidents	Nov 1 – Feb 28	No limit

[1] 1 bull with a spike fork or 50 inch antlers or with 3 or more brow tines on at least one side.

[2] 1 bull with a spike fork or 50 inch antlers or with 4 or more brow tines on at least one side.

Source: Alaska Hunting Regulations No. 43, Alaska Trapping Regulations, Effective July 1, 2002 – June 30, 2003.

Table 3.9.b Harvest Management Regulations for Unit 20B (1 July 2002 – 30 June 2003).

Game Management Unit 20B Fort Wainwright Main Post and Yukon Training Area			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	Residents and Nonresidents	No closed season	3
Brown Bear	Residents and Nonresidents	Sept 1 – May 31	1 every four regulatory years
Caribou	Residents and Nonresidents	Aug 10 – Sept 20	1 bull, or 1 caribou (either sex) by permit
Dall Sheep	NA	NA	NA
Moose	Residents and Nonresidents	Sept 1 – Sept 20	1 bull
Bison	NA	NA	NA
Coyote	Residents and Nonresidents	Aug 10 –Apr 30	10
Fox, Red	Residents and Nonresidents	Sept 10 – May 31	10 (no more than 2 before Oct 1)
Hare	Residents and Nonresidents	Sept 1 – Apr 30	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	2
Wolf	Residents and Nonresidents	Aug 10 –Apr 30	5

Table 3.9.b cont. Harvest Management Regulations for Unit 20B (1 July 2002 – 30 June 2003).

Game Management Unit 20B Fort Wainwright Main Post and Yukon Training Area			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Wolverine	Residents and Nonresidents	Sept 1 – Mar 31	1
Grouse	Residents and Nonresidents	Aug 10 – Mar 31	15 per day; 30 in possession
Ptarmigan	Residents and Nonresidents	Aug 10 – Feb 28	20 per day; 40 in possession
Trapping			
Beaver	Residents and Nonresidents	Nov 1 – Apr 15	No limit (note no open season at portions of Chena River and at Creamers' Field Migratory Wildlife Refuge)
Coyote	Residents and Nonresidents	Nov – Mar 31	No limit
Fox, Red	Residents and Nonresidents	Nov 1 – Feb 28	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	No limit
Marten	Residents and Nonresidents	Nov 1- Feb 28	No limit
Mink & Weasel	Residents and Nonresidents	Nov 1 – Feb 28	No limit
Muskrat	Residents and Nonresidents	Nov 1 – Jun 10	No limit
Otter	Residents and Nonresidents	Nov 1 – Apr 15	No limit
Wolf	Residents and Nonresidents	Nov 1 – Apr 30	No limit
Wolverine	Residents and Nonresidents	Nov 1 – Feb 28	No limit

[1] 1 bull with a spike fork or 50 inch antlers or with 3 or more brow tines on at least one side.

[2] 1 bull with a spike fork or 50 inch antlers or with 4 or more brow tines on at least one side.

Source: Alaska Hunting Regulations No. 43, Alaska Trapping Regulations, Effective July 1, 2002 – June 30, 2003.

3.9.2.1.1 Mammals

Large Mammals

Black Bear – Due to sub-optimal habitat conditions, black bear (*Ursus americanus*) densities are lower in interior Alaska than other regions of the state (USAF 1995). The Alaska Department of Fish and Game estimates densities of 12-18 adult bears per 100 square miles in Tanana Flats

(Alaska Department of Fish and Game 2000a). Surveys have not been conducted at YTA (USAF 1995). Reproductive rates in interior Alaska also appear to be lower than in other regions of the state (USAF 1995). Since 1974, black bear harvest on TFTA has varied (Appendix E).

Grizzly Bear – Population densities of grizzly bears (*Ursus arctos*) are lower in spruce and mixed hardwood conifer forests, and higher near the mountains (USAF 1995). At TFTA, which has relatively poor habitat, population densities are estimated to average about 2.5 bears per 1,000 square miles (Alaska Department of Fish and Game 1998, 1999a). No grizzly bears have been taken on TFTA since 1992 (Steve Reidsma, personal communication 2002). YTA has low densities of grizzly bears, where estimates range from 1-3 bears per 1,000 square miles, depending on habitat quality (Alaska Department of Fish and Game 1999a). During the past decade only a few grizzly bears have been harvested at YTA (Appendix E).

Moose – Moose (*Alces alces*) are distributed throughout most of Units 20A and 20B, which include TFTA and YTA. TFTA covers approximately one-fifth of the Alaska Department of Fish and Game's Unit 20A, which supports the state's largest moose population and is a world class resource area for moose (Alaska Department of Fish and Game 2000c). Population estimates for Unit 20A have ranged from 10,100 to 13,300 since the 1990s (Alaska Department of Fish and Game 2000c). The population density is estimated to range from approximately 2.2-2.4 moose per square mile (USAF 1995).

TFTA is an important calving area for moose in Units 20A and 20B. Spring and summer moose densities increase two to four-fold on TFTA, with eastern migrants from the Chena and Salcha River drainages, and southern migrants from the northern foothills of the Alaska Range (Appendix A, Figure 3.9.b) (Don Young, personal communication 2003). During fall and winter, a large portion of TFTA's summer population migrates to outlying areas. According to Alaska Department of Fish and Game surveys, areas with higher densities include Salchaket Slough, the 1957 burn area on TFTA, the 1980 Blair Lakes Burn area, Japan Hills, and the Alaska Range Foothills east to Dry Creek, and upper 100 Mile Creek. During winters with high snow depth, the moose often migrate closer to TFTA. Management issues of concern include poor nutritional status, low productivity, and low bull-cow ratios (Alaska Department of Fish and Game 2000c).

At TFTA, approximately 600 bulls and 70 cows are harvested each year, and the Alaska Department of Fish and Game has issued plans to begin an annual calf harvest, in addition to issuing antler restrictions in order to increase the population of 2 to 3-year-old males (Mowry 2002).

High use areas at YTA include Moose Creek and the Chena River floodplain, Hunts and Horner creeks, the South Fork Chena River drainage and Beaver Creek, Ninety-eight Mile Creek, and the Little Salcha River drainage as it enters the YTA boundary (USARAK 1980, 1999a).

YTA is within Unit 20B. Population densities range from 1.3 to 1.9 moose per square mile along the drainages of the Chena and Salcha rivers, which includes portions of YTA (USAF 1995). Surveys from Minto Flats Management Area, also in Unit 20B, indicate an increasing population, but additional surveys are needed to determine the population status of moose at YTA (Alaska Department of Fish and Game 2000c).

Caribou – The distribution and size of caribou (*Rangifer tarandus*) populations have varied in interior Alaska. Historically, the Fortymile herd used portions of YTA but this herd has declined in population and range over the past 50 to 60 years. The eastern portion of YTA is within potential wintering areas of the Fortymile herd, but sightings are not common.

Portions of the Delta caribou herd have used parts of TFTA for winter range (USAF 1995). The herd grew from about 4,200 to 10,700 during the 1970s and 1980s, but decreased through the early 1990s. The population remained relatively stable from 1995 to 1999, at about 4,100 (plus or minus 500) (Alaska Department of Fish and Game 1999b). Herd size is currently estimated at 3,200 (Alaska Department of Fish and Game 2002a). See Section 3.9.3.1.1 for additional description of history and management of the Delta Caribou herd.

Furbearers and Small Mammals

Fifteen species of furbearers inhabit TFTA and YTA (Appendix E). The Alaska Department of Fish and Game manages furbearing species on a sustainable basis. Although the records are not complete and do not necessarily reflect wildlife population levels, USARAK has maintained harvest records of 11 species at TFTA and YTA (Appendix E).

Wolverines – Reliable population indices of wolverines (*Gulo gulo*) are not available for the region. Although the density of wolverines in the region is low, populations are considered to be stable (USAF 1995).

Coyotes – Coyote (*Canis latrans*) populations appear to be stable at both TFTA and YTA.

Lynx - Lynx (*Lynx canadensis*) are common throughout the region (USAF 1995). Lynx populations fluctuate in cycles that reflect the 8-10 year population cycles of their prey, the snowshoe hare (Elton and Nicholson 1942).

Red Fox – Similar to the lynx, red fox (*Vulpes vulpes*) populations will fluctuate with the prey base.

Pine Marten – Pine marten (*Martes americana*) populations appear to be stable (Alaska Department of Fish and Game 2000b).

Wolves – Wolf (*Canis lupus*) populations appear to be stable or increasing in the region. Wolf densities on TFTA are approximately18-40 wolves per 100 square miles (USAF 1995). According to the Alaska Department of Fish and Game, approximately 25 wolf packs inhabit Unit 20A, with 6-9 wolf packs inhabiting TFTA. Densities at YTA range from approximately 14 to 26 wolves per 100 square miles, and the area typically supports 2-4 packs of wolves (USAF 1995).

Snowshoe Hare – Snowshoe hare (*Lepus americanus*) populations are highly cyclic and fluctuations are reflected in harvest records (Elton and Nicholson 1942; Steve Reidsma, personal communication 2003). Data from TFTA are not available. At YTA, harvests dropped from 874 in 1991 to 37 in 1994, but rebounded by the late 1990s (Appendix E).

Red Squirrel – Red squirrels (*Tamiasciurus hudsonicus*) appear to be abundant at TFTA and YTA.

Other Species – Other furbearers include four species of weasel (*Mustela* spp.), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), and river otter (*Lutra canadensis*). Weasels, muskrats, and beaver appear to be fairly common and have stable populations in suitable habitats (USAF 1995). River otters are not considered to be common in the region (USAF 1995).

Few small mammal surveys have been conducted at TFTA and YTA. Known species include five voles (*Microtus* spp., *Cleithrionomys* spp.), two lemmings (*Lemmus* spp., *Synaptomys* spp.), two species of mice (*Peromyscus* and *Zapus* spp.), and four species of shrew (*Sorex* spp.). The little brown bat (*Myotis lucifugus*) is found in wooded areas and in abandoned buildings. Anderson et al. (2000) reported the masked shrew and meadow vole to be the most abundant small mammals

in a survey conducted in 1998. Introduced mammals such as the house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), and woodchuck (*Marmota monox*) also exist in the cantonment area of the Main Post.

3.9.2.1.2 Avian Species

The American Ornithologists Union recommends capitalizing the common name of birds (American Ornithologists Union 1998). However, to ensure stylistic consistency with the identification of other categories of fauna and flora discussed in this EIS, the common names of birds will not be capitalized.

Upland Game Birds

Spruce grouse (*Dendragopus canadensis*), ruffed grouse (*Bonasa umbellus*) and ptarmigan (*Lagopus* spp.) are common in the region. Population sizes for these species are unknown but they are considered to be stable or increasing.

Grouse hunting is popular at YTA, but these birds are also harvested on FWA Main Post (Appendix E).

Waterfowl and Cranes

Waterfowl – The Tanana River floodplain, on the east portion of TFTA, is identified as a waterfowl concentration area, which is used by breeding waterfowl (Appendix A, Figure 3.9.c) (USARAK 1980, 1999a).

At least 25 species of waterfowl use the Main Post, TFTA, and YTA (Appendix E). Waterfowl are numerous throughout much of TFTA and in the Chena floodplain of YTA, and an estimated two million waterfowl migrate through the area each spring, followed by five million birds in the fall.

The Alaska Military Operations Areas EIS indicated that TFTA comprises about one-third of an important waterfowl breeding area (W-2) (USAF 1995). Approximately 5,000 cranes, 10,000 geese, and 200,000 ducks inhabit W-2 during the breeding season (USAF 1995).

Several dozen trumpeter swan nests are also located within TFTA (USAF 1995). The distribution of swan nests has been monitored for over 30 years (Tony Payne, U.S. Army Alaska, personal communication 2003). Nesting and productivity surveys have indicated that swans continue to use the northern and western portion of TFTA (Appendix A, Figure 3.9.c).

A 1998 fall waterfowl survey at YTA indicated that waterfowl migration peaked in mid-September (Anderson et al. 2000). Mallards and northern pintails were observed most frequently. Trumpeter swans were not observed at YTA during this survey. Duck harvests have ranged between 76 and 176 birds per year (Appendix E) (USARAK 1999a).

Sandhill Cranes – TFTA and YTA are not important staging areas for sandhill cranes (Anderson et al. 2000). However, these areas and the overlaying airspace are within a major flight corridor for cranes, which migrate northwest during mid-May and return southwest during September.

Passerines

The variety of nongame birds on Army lands associated with FWA includes at least 58 perching birds (passerines). Benson (1999) observed 61 species of birds during a 1998 survey at TFTA. The dark-eyed junco (*Junco hyemalis*), yellow-rumped warbler (*Dendroica coronata*), and Swainson's thrush (*Catharus ustulatus*) were the most abundant. Using the ecotype classification

system of Jorgensen et al. (1999) (Appendix E), the lowland forest-thermokarst complex, lowland needleleaf forest and lowland scrub thermokarst complex supported the greatest number of bird species.

Although no threatened, endangered, or species of special concern were observed, several Priority Species for Conservation (Boreal Partners in Flight Working Group 1999) were observed. The observed species included the olive-sided flycatcher (*Contopus cooperi*), Western wood-pewee (*Contopus sordidulus*), Hammonds' flycatcher (*Empidonax alnorum*), varied thrush (*Ixoreus naevius*), Bohemian waxwing (*Bombycilla garrulus*), and blackpoll warbler (*Dendorica striata*).

Benson (1999) observed 36 nongame bird species at YTA. The dark-eyed junco, Lincoln's sparrow (*Melospiza lincolnii*), and orange-crowned warbler (*Vermivora celata*) were observed most frequently. Upland mixed forest, upland broadleaf forest, and lowland needleleaf forest had the highest species richness of birds. Priority bird species included the olive-sided flycatcher, Hammond's flycatcher, gray-cheeked thrush (*Catharus minimus*), varied thrush, Bohemian waxwing, and Townsend's warbler (*Dendroica towsendi*).

Breeding Bird Surveys at YTA have detected 59 passerine species on FWA (USARAK 1980; BLM and U.S. Army 1994b; USARAK 1999a). In addition, six species of woodpeckers (*Colaptes* spp., *Picoides* spp.), the rock dove (*Columba livia*), Rufous hummingbird (*Selasphorus rufus*), and belted kingfisher (*Ceryle alcyon*) have been observed on these lands.

Raptors

Twenty species of raptors have been observed in surveys, including two species of eagles, seven species of hawks, four species of falcons, six owl species, and the osprey (*Pandion haliaetus*) (BLM and U.S. Army 1994b). An estimated 12,000 raptors migrate through the area in the spring (April 10-May 20), and 23,000 in the fall (August 1-October 10) (USAF 1995). Bald eagle nests are found along the Tanana River (USAF 1995).

A raptor survey conducted at YTA in 1998 did not locate any cliff or tree nesting raptors (Anderson et al. 2000). However, the report indicated that peregrine falcons (*Falco peregrinus*) nest in areas adjacent to YTA. Note, however, Ritchie and Rose (1998) reported nests of peregrine falcons along the Tanana River, the lower Salcha River, and the lower Chena River.

Shorebirds, Gulls, Terns, and Loons

Twenty-six species of shorebirds, three gull species, and the Arctic tern (*Sterna paradisaea*) have been observed on the Army lands at the Main Post, TFTA, and YTA (USARAK 1999a). Four species of loon (*Gavia* spp.) and two types of grebes (*Podiceps* spp.) have been observed to use waterways on FWA and associated lands (USARAK 1999a).

Priority Bird Species

Boreal Partners in Flight has identified priority bird species for conservation in Alaska (Boreal Partners in Flight Working Group 1999). The rankings are based on conservation vulnerability. Listed in Table 3.9.c are priority bird species listed for central Alaska, including FWA. A listing of Alaska Species of Concern is presented in Section 3.10.

Table 3.9.c Listing of Boreal Partners in Flight Priority Bird Species, Habitats, and Management Concerns at FWA and DTA.

Species	Habitat	Management Concerns
Gyrfalcon[1]	Arctic and subarctic tundra	Development may increase disturbance during nesting season
Sharp-tailed Grouse[1]	Grassland and shrub habitats	Susceptible to disturbance but little data are available in Alaska
Great Gray Owl[1]	Spruce and mixed forests, with openings	Generally uncommon; nesting habitat susceptible to timber harvests
Boreal Owl[1]	Spruce or mixed forests	Nesting habitat susceptible to timber harvests
Black-backed Woodpecker[1]	Coniferous forest with dead or dying trees	Species is difficult to monitor: local populations fluctuate because new burns are used for breeding habitat
Hammond's Flycatcher[1,2]	Mature/old-growth aspen forest	Research on habitat requirements is needed; susceptible to large-scale harvest of aspen forest
American Dipper[1,2]	Riparian areas	Habitat loss or impacts from mining, forestry, pollution, water drawdowns
Varied Thrush[1,2]	Thick coniferous forest; old-growth	Habitat loss, especially due to logging
Bohemian Waxwing[1]	Coniferous and mixed forest	Inadequate monitoring; apparent decline during Christmas counts
Rusty Blackbird[1]	Wet coniferous and mixed forest	Inadequate monitoring; could be affected by mining or fire management
White-winged Crossbill[1]	Boreal forest (white/black spruce, tamarack)	Logging or beetle infestations could affect abundance; difficult to monitor because populations are transient

[1] Priority Species in Central Region

[2] Priority Species in Southeastern and Southcoastal Region

Source: Andres 2001

3.9.2.1.3 Reptiles and Amphibians

The wood frog (*Rana sylvestris*) is the only amphibian species found at the Main Post, TFTA, and YTA. No reptiles exist in these areas.

3.9.2.2 Fisheries

3.9.2.2.1 Fish Stocking

Most ponds or lakes on the Main Post, TFTA, and YTA do not support fish populations during winter. These lakes freeze completely or, when iced over, they lack sufficient dissolved oxygen for fish to survive through the winter. However, a stocking program allows the public to use the lakes for fishing. The Statewide Stocking Plan has recently emphasized the promotion of fishing opportunities near urban areas (Alaska Department of Fish and Game 2002b).

Stocked lakes include River Road Pond, Monterey Lake, Weigh Station Ponds 1 and 2, and Manchu Lake (Appendix E and Appendix A, Figure 3.3.a). These lakes range in size from two to five acres, and are managed through the Lower Tanana Valley Urban Lakes Sport Fishery Enhancement Plan. These lakes are categorized as Category 1 (lakes that are completely landlocked, where fish cannot escape and interact with wild fish populations). The three-acre Manchu Lake is managed under the Lower Tanana Valley Rural Lakes Sport Fishery Enhancement Plan, and is listed as Category 3 (where fish could escape and mix with wild populations, but the risks are relatively low). Records and stocking plans indicate four species of fish are stocked in the following lakes (see Appendix E for details):

- **Rainbow trout** – Manchu Lake, Weigh Station Ponds 1 and 2
- **Arctic char** – Manchu Lake
- **Grayling** – River Road Pond
- **Chinook salmon** – Monterey Lake

3.9.2.2.2 Wild Fisheries

At TFTA, the Tanana River supports seasonal populations of Arctic grayling (*Thymallus arcticus*), king salmon (*O. tshawytscha*), chum salmon (*O. keta*), sheefish (*Stenodus leucichthys nelma*), humpback whitefish (*Coregonus pidschian*), round whitefish (*Prosopium cylindraceum*), Arctic lamprey (*Lampetra japonica*), least cisco (*Coregonus sardinella*), Alaska blackfish (*Dallia pectoralis*) burbot (*Lota lota*), longnose sucker (*Catostomus catostomus*), northern pike (*Esox lucius*), slimey sculpin (*Cottus cognatus*), and lake chub (*Couesius plumbeus*). Due to sediment loads and winter freezing, the habitat for these fish is considered to be fair. Better fish habitat is found in several clear-running streams, including Clear Creek, Bear Creek, McDonald Creek, Crooked Creek, Willow Creek. These streams support wild fish populations.

At YTA, the Chena and Salcha rivers support Arctic grayling, king salmon, chum salmon, sheefish, humpback whitefish, round whitefish, Arctic lamprey, least cisco, Alaska blackfish, burbot, longnose sucker, northern pike, slimey sculpin, and lake chub. These rivers and clear-running tributaries are important spawning areas for summer chum and king salmon. Horseshoe Lake, located in the northwest corner of the YTA, supports a native population of northern pike (BLM and U.S. Army 1994a).

3.9.3 Donnelly Training Area

3.9.3.1 Wildlife

DTA West (west of the Delta River) is within Alaska's Game Management Unit 20A, and lands east of the Delta River are within Game Management 20D (Appendix A, Figure 3.9.a). Harvest management regulations for Subunit 20A are presented in Table 3.9.a, and regulations for Subunit 20D are in Table 3.9.d. See Appendix E for a species list of mammals and birds at DTA.

Surveys have been ongoing at DTA for the past 20 years. No wildlife surveys have been conducted at Gerstle River. The species present are expected to be very similar to those found in DTA East. A wildlife survey was conducted at Black Rapids during summer of 2002. Results of the survey are pending, but currently unavailable.

Table 3.9.d Harvest Management Regulations for Unit 20D (1 July 2002 – 30 June 2003).

Game Management Unit 20D Donnelly Training Area East and Gerstle River Training Area			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	Residents and Nonresidents	No closed season	3
Brown Bear	Residents and Nonresidents	Aug 10 – Jun 30	East of Gerstle River or North of Tanana River: 1 bear every year regulatory years
		Sept 1 – May 31	Remainder of Unit: 1 bear every four regulatory years
Caribou	Residents and Nonresidents	Aug 10 – Sept 20	1 bull, or 1 caribou (either sex) by permit
Dall Sheep	Residents and Nonresidents	Aug 10 – Sept 20	Drawing: 1 ram with full curl horn or larger by permit
Moose	Residents	Sept 1 – Sept 15	1 bull[1]
	Nonresidents	Sept 1 – Sept 15	1 bull[2]
Coyote	Residents and Nonresidents	Aug 10 –Apr 30	10
Fox, Red	Residents and Nonresidents	Sept 10 – May 31	10 (no more than 2 before Oct 1)
Hare	Residents and Nonresidents	Sept 1 – Apr 30	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	2
Wolf	Residents and Nonresidents	Aug 10 –Apr 30	5
Wolverine	Residents and Nonresidents	Sept 1 – Mar 31	1
Grouse	Residents and Nonresidents	Aug 10 – Mar 31	15 per day; 30 in possession
Ptarmigan	Residents and Nonresidents	Aug 10 – Feb 28	20 per day; 40 in possession
Trapping			
Beaver	Residents and Nonresidents	Nov 1 – Apr 15	No limit (note no open season at portions of Chena River and at Creamers' Field Migratory Wildlife Refuge)
Coyote	Residents and Nonresidents	Nov – Mar 31	No limit

Table 3.9.d cont. Harvest Management Regulations for Unit 20D (1 July 2002 – 30 June 2003).

Game Management Unit 20D Donnelly Training Area – East, Gerstle River Training Area			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Fox, Red	Residents and Nonresidents	Nov 1 – Feb 28	No limit
Lynx	Residents and Nonresidents	Dec 1 – Jan 31	No limit
Marten	Residents and Nonresidents	Nov 1- Feb 28	No limit
Mink & Weasel	Residents and Nonresidents	Nov 1 – Feb 28	No limit
Muskrat	Residents and Nonresidents	Nov 1 – Jun 10	No limit
Otter	Residents and Nonresidents	Nov 1 – Apr 15	No limit
Wolf	Residents and Nonresidents	Nov 1 – Apr 30	No limit
Wolverine	Residents and Nonresidents	Nov 1 – Feb 28	No limit

[1] 1 bull with a spike fork or 50 inch antlers or with 4 or more brow tines on at least one side.

[2] 1 bull with 50 inch antlers or with 4 or more brow tines on at least one side.

Source: Alaska Hunting Regulations No. 43, Alaska Trapping Regulations, Effective July 1, 2002 – June 30, 2003.

3.9.3.1.1 Mammals

Previous environmental impact statements relating to DTA (USARAK 1980; USARAK 1999a) make mention of high use habitats for grizzly bear, moose, Dall sheep (*Ovis dalli*), caribou, bison (*Bison bison*). A Cooperative Agreement for the Management of Fish and Wildlife Resources on Army Lands in Alaska (USARAK, USFWS, and ADFG 1979; 1986) established protection of sensitive habitats for bison, moose, caribou, and sandhill crane.

Large Mammals

Black Bear – Population densities of black bears are not known at DTA. Bears are common in suitable forested habitats throughout the region (USAF 1995).

Grizzly Bear – Surveys of the north slope of the Alaska Range in Unit 20A have estimated population densities of 14 to 17 bears per 1,000 square miles, which is considered high (Alaska Department of Fish and Game 1998a). Densities tend to decrease to the north, toward Fairbanks, and are probably medium (5 to 10 bear per square 1,000 miles) to low (1 to 3 bears per 1,000 square miles) in the lower elevations of DTA. Bear densities in Unit 20D, including DTA East, average about 10 to 12 bears per 1,000 square miles (Alaska Department of Fish and Game 1998a).

Moose – Moose are a highly visible and economically important wildlife species in interior Alaska. Region-wide surveys by the Alaska Department of Fish and Game estimate densities of

approximately 2.2-2.4 moose per square mile (USAF 1995). The area between the Delta River and Gerstle River, south of the Alaska Highway and north of the Alaska Range is considered a moose high density area (Steve DuBois, personal communication 2003) (Appendix A, Figure 3.9.b). A 1984 survey of DTA indicated a moose population of 384 (±20%), and a 1995 survey estimated 700 to 1,100 moose (USARAK 1999a). In the southern portion of DTA East, moose numbers appear to be slowly increasing (USARAK 1999a). See Appendix E for a summary of annual moose harvest at DTA.

Dall Sheep – Winter and summer range for Dall sheep exist on the southwest portion of DTA West, along the northern foothills of the Alaska Range (Appendix A, Figure 3.9.d). The Dall sheep that use DTA are at the northern limit for the Alaska Range herd. High use areas within DTA include MacArthur Mountain, Patton Mountain, and Molybdenum Ridge (Spiers and Heimer 1990; USARAK 1999a). MacArthur Mountain and Patton Mountain have both summer and winter range. Molybdenum Ridge is used for summer and winter range. Note that the actual migration route between summer and winter range was not documented in the study by Spiers and Heimer (1990).

Spiers and Heimer (1990) estimated that between 100-150 Dall sheep use DTA, approximately 150 animals during winter and 100 during summer. The animals inhabiting the area were part of a larger herd that consisted of five sub-populations. Although Spiers and Heimer (1990) did not identify migration routes, they speculated that the herd segment that winters on Molybdenum Ridge traveled south to Hayes Glacier and the southern portion of Whistler Creek in search of mineral licks.

The herd is part of Alaska Department of Fish and Game's Unit 20A population. The management goal is to maintain the herd at approximately 5,000 animals, although recent population estimates appear to be below that level (Alaska Department of Fish and Game 1999c). However, recent surveys indicate an increasing population with favorable ram: ewe ratios (Alaska Department of Fish and Game 1999c). DTA is one of only two military posts in the world inhabited by Dall sheep, and it is the only post open to hunting (Spiers and Heimer 1990).

Caribou – Pre-calving, calving, and post-calving areas of the Delta caribou herd have been identified to be on the southern portion of DTA West (Appendix A, Figure 3.9.e) (USARAK 1999a). Since about 2000, however, the majority of the Delta herd has calved south and west of DTA. The winter concentration area lies in the foothills on the north side of the Alaska Range. On DTA West this generally includes areas above 2,500 feet, especially the foothills north of Trident Glacier.

Caribou also frequent the area around Donnelly Dome and open areas in the southern portion DTA East. The majority of these animals are part of the Macomb herd according to tracking data; however, some caribou are from the Delta herd (Steve DuBois, personal communication 2003). The Macomb herd does not calve on DTA.

Caribou populations have declined in central Alaska during the 20th century. Lands that now encompass DTA and FWA were once within the historic range of the Fortymile herd. The population of this herd was believed to exceed 550,000 during the 1920s, but had declined to 36,000 by 2000. The Fortymile herd now ranges to the north of DTA, and the post is now occupied mostly by caribou from the Delta herd, as well as some animals from the Macomb herd (Figure 3.9.e) Portions of both herds winter in the southeastern portion of DTA West, and the southern portion of DTA East, from Fort Greely to north of Black Rapids Training Area (Figure 3.9.e). The Delta herd calving area is southwest of DTA, approximately from the headwaters of Healy Creek to southern foothills of the Alaska Range, north of the Denali Highway. Fall and

winter concentration areas also exist due west of DTA and through much of the southern portion of DTA West (Figure 3.9.e). Less is known about the distribution of the Macomb herd, but most animals from this herd are found east of DTA, from Granite Mountain to the Macomb Plateau.

The population of the Delta herd has fluctuated during the past four decades. The 2000 population was estimated at 3,200 (Alaska Department of Fish and Game 2002a). The cause of fluctuations appears to be related to predation and severe weather (USAF 1995; Valkenberg 2002). The Macomb herd consists of about 500-600 animals, and like the Delta herd, the Macomb population has fluctuated during the past 15-20 years.

Hunting is allowed on DTA but few caribou are taken on the post (USARAK 1999a). According to Alaska Department of Fish and Game harvest summaries (1997-98 through 2001-02), an average of 38.2 caribou per year were harvested from the Delta herd. The Delta herd is not managed as a state or federal subsistence herd. It is unknown if any Delta herd caribou are harvested on DTA (Jeff Mason, personal communication 2003).

Caribou harvest from the Macomb herd has averaged of 29.5 per year during the 1997-98 through 2001-02 period. The Macomb herd is not managed for federal subsistence use. However, the State of Alaska Board of Game has determined that the Macomb herd qualifies as a customary and traditional use herd. Alaska residents, regardless of location, are eligible to register for a permit to hunt the Macomb herd. The season is closed when approximately 25 animals have been harvested. A small portion of the Macomb herd harvest is on DTA but exact harvest numbers and locations are unknown.

Availability of winter range appears to be a limiting factor of the Delta herd. To avoid population fluctuations and migrations from current range due to habitat degradation, the management plans include maintenance of the herd at about 3,500 animals, with an annual harvest of 300-400 animals (Valkenburg 2002). Predation is considered to be the greatest limiting factor to the Macomb herd. The herd is managed by the state as an “intensive management herd” (Steve DuBois, personal communication 2003).

Bison – DuBois and Rogers (2000) summarized the history, natural history, economic impact of the herd, and management plans for the Delta bison herd. Bison were extirpated from Alaska 450-500 years ago, but were reintroduced into the Big Delta and Delta Junction area in 1928, when 23 bison were transplanted from the National Bison Range in Montana. The Delta bison herd is now one of four herds in Alaska. Historically this herd has ranged north to south from the Tanana River to the Alaska Range, and east to west from Healy Lake and to the Little Delta River (DuBois and Rogers 2000).

Bison tend to select early successional habitats that have forage and good visibility. The availability of such habitats is variable over time. Thus distribution and habitat use of bison will change, sometimes from year to year. Recent surveys (conducted during 2002 and 2003) indicate that spring/summer calving areas are distributed along the Delta River floodplain, from just north of Black Rapids Training Area to the Mississippi Range (Steve DuBois, personal communication 2003). Bison also inhabit recently burned areas west of the Delta River. The fall migration route travels from the Washington and Texas Ranges, along the Delta River, and passes northeast to agricultural fields that lie along the Alaska Highway between Gerstle River and Delta Junction (Appendix A, Figure 3.9.d). Note that although the winter and summer ranges of the bison herd are well documented (DuBois and Rogers 2000), the actual migration routes, as depicted in Appendix A, Figure 3.9.d, have not been recorded.

The Delta bison herd has been maintained at 300-500 animals during the past 50 years. Current objectives of the Alaska Department of Fish and Game are to maintain the Delta herd to a pre-calving population of about 360 animals, and to about 430-440 animals before fall hunting season (DuBois and Rogers 2000). In cooperation with Alaska Department of Fish and Game, USARAK voluntarily maintains 100 acres of food plots along Meadows Road.

Furbearers and Small Mammals

Furbearers – Estimates of wolf densities range from approximately 5-24 wolves per 100 square miles (USAF 1995). DTA typically has three or four wolf packs, although the structure, distribution, and numbers of packs in a given area are highly variable.

Detailed data on other furbearers at DTA are not available. Lynx, beaver, river otter, pine marten, mink, wolverine and four species of weasel are all found at DTA. Wolverines are rare in the region, whereas the other species are reasonably common (USAF 1995).

Wolverines, coyotes, lynx, red fox, pine marten, mink, the short-tailed weasel (*Mustela erminea*) and the least weasel (*Mustela nivalis*), muskrat, and beaver are trapped for fur on DTA, and harvest records of these animals have been maintained since the 2001-2002 trapping season.

Small Mammals – Anderson et al. (2000) conducted a small mammal survey at DTA. Eleven species of small mammals were found in this study. The masked shrew, tundra vole, meadow vole, and red-backed vole were captured most frequently. Although several species including the water shrew (*Sorex palustris*), Alaska tiny shrew (*S. yukonicus*), yellow-cheeked vole (*Microtus xanthognathus*), and long-tailed vole (*M. longicaudis*) were not captured in the survey, Anderson et al. (2000) suggested that these species should likely be found in interior Alaska.

In addition, small mammals have been surveyed by USARAK through the Land Condition Trend Analysis program (Jeff Mason, personal communication 2002).

3.9.3.1.2 Avian Species

Upland Game Birds

Several upland game species are found on DTA, including three species of both ptarmigan and grouse (Appendix E). USARAK does not maintain harvest records of these species.

Waterfowl and Cranes

An estimated two million waterfowl migrate through and near DTA during spring, and nine million return during fall (USAF 1995). The area surrounding Delta Junction has been identified as a waterfowl concentration area (USAF 1995) (Appendix A, Figure 3.9.c).

Ducks and Geese – Twenty-eight species of ducks and geese use lands and waterways on DTA. Although the survey by Anderson et al. (2000) was limited due to weather conditions, eight species of ducks were identified in addition to unidentified birds classified only as dabblers (total = 13) or divers (total = 246). Scoters (*Melanitta* spp.), mallards (*Anas platyrynchos*), and American widgeons (*Anas americana*) were observed most frequently.

Trumpeter Swans – Trumpeter swan surveys have been conducted at five-year intervals since 1975 (Conant et al. 1996). Although adult and cygnet counts have fluctuated, the long-term trend indicates an increase of trumpeter swans since 1990 (Anderson et al. 2000). A survey for trumpeter swans in 1983 found only eight individual swans on the installation. Although the 1998 survey by Anderson et al. (2000) was conducted later than what is considered ideal (July

compared to late May through mid-June), 66 trumpeter swans were observed, including 40 adults and 22 young.

Sandhill Cranes – Approximately 300,000 sandhill cranes, a large portion of the world's population, migrate through DTA from late-April through mid-May. Peak migration occurs during early May, when more than 2,000 birds per hour have been observed over or near the area (Anderson et al. 2000). The cranes' spring migration route takes a west to slightly northwest direction; in addition, many birds use lands on DTA for roosting (Appendix A, Figure 3.9.f) (Anderson et al. 2000).

Crane roosting areas exist along the Delta River and a portion of the Delta Creek floodplain as it runs north, toward the Tanana River (Appendix A, Figure 3.9.f) (USARAK 1999a). The Delta Creek Assault Landing Strip is located within this habitat. Restricted activity dates are 25 April-15 May and 1-30 September, when migrating cranes are present. The area along the Delta River as it runs through DTA West is important roosting habitat for migrating sandhill cranes. This habitat has a minimal disturbance period of 25 April-15 May and 1-30 September when migrating cranes are present.

Passerines

Anderson et al. (2000) reported sightings of several Priority Species for Conservation on survey routes. These included the black-backed woodpecker (*Picoides arcticus*), gray-cheeked thrush, varied thrush, bohemian waxwing, Townsend's warbler, blackpoll warbler, Smith's longspur (*Calcarious pictus*), and rusty blackbird (*Euphagus carolinus*).

Anderson et al. (2000) observed forty-three species at DTA. The dark-eyed junco, savanna sparrow, Wilson's warbler, and orange-crowned warbler were observed most frequently. The most productive ecotypes for birds were upland moist broadleaf forest, lowland moist tall scrub, lowland gravelly dry broadleaf forest, lowland wet mixed forest, and human modified.

Raptors

The Tanana River floodplain lies within an identified raptor breeding area (USAF 1995). Approximately 500 raptors are estimated to breed in the 200-mile stretch of the Tanana River from Tok to Eielson Air Force Base (Appendix A, Figure 3.9.c).

Although DTA has not been surveyed extensively for raptors, the area is within breeding range of peregrine falcons, gyrfalcons, golden eagles, and red-tailed hawks (Anderson et al. 2000). Anderson et al. (2000) reported three active golden eagle nests in the southwest portion of the DTA and inactive nests on Molybdenum Ridge and near Ptarmigan Creek.

No bald eagle nests were located in the survey, but the authors identified sites with "excellent" potential along the Little Delta River and Ptarmigan Creek, in addition to sites with "good" potential along the Little Delta River, Molybdenum Ridge, and Donnelly Dome. Estimates from migration survey indicate that approximately 25,000 raptors migrate through DTA during spring and 48,000 during fall (USAF 1995).

Other Birds

The variety of other birds found on DTA includes three loon species, two grebes, three gulls, one tern, one dove, one hummingbird, one kingfisher, and six woodpeckers. See Appendix E for a listing of bird species at DTA.

Priority Bird Species

Boreal Partners in Flight has identified priority bird species for conservation in Alaska (Boreal Partners in Flight Working Group 1999). The rankings are based on conservation vulnerability. The priority bird species at DTA are nearly identical to FWA (Table 3.9.c). The Hammond's flycatcher has been observed in surveys. In addition, the white-tailed ptarmigan is listed as a priority species for DTA, but not FWA. The ptarmigan prefers alpine habitats, and the management concerns are that these birds are susceptible to disturbance. However, little data are available in Alaska. A listing of Alaska Species of Concern is presented in Section 3.10.

3.9.3.1.3 Reptiles and Amphibians

Wood frogs are the only amphibians on DTA. No reptiles exist on the post.

3.9.3.2 Fisheries

DTA West is within the Fairbanks Management Area for fisheries and DTA East is within the Delta Junction Management Area.

3.9.3.2.1 Fish Stocking

Sixteen lakes on DTA, ranging from 3 to 320 acres, are stocked (Appendix E and Appendix A, Figure 3.3.b). With the exception of J Lake and Nickel Lake, these lakes are listed as Category 1 (completely landlocked lakes, where fish cannot escape and interact with wild fish populations). J Lake and Nickel Lake are Category 2 lakes that have an intermittent outlet, which may overflow with snowmelt some years, thus allowing some fish to escape. A rock gabion has been constructed on J Lake to prevent encroachment by longnose suckers.

Koole Lake, at 320 acres the largest stocked lake on the post, is managed under the Upper Tanana Valley Remote Lakes Sport Fishery Enhancement Plan. Stocking on the other 15 lakes is managed under the Upper Tanana Valley Rural Lakes Fishery Enhancement Plan.

Recent stocking plans indicate that the lakes on DTA have been stocked with the following six species of fish (see Appendix E for details):

- **Rainbow Trout** – Bolio, Bullwinkle Chet, Doc, Ghost, Koole, Mark, Nickel, No Mercy, North Twin, Rockhound, South Twin, and Weasel lakes
- **Arctic Char** – Chet, Ghost, J, Mark, Nickel, and Sheefish lakes
- **Lake Trout** – Chet, Ghost, Nickel, and North Twin lakes
- **Grayling** – Ghost, J, Luke, Nickel, and Sheefish lakes
- **Coho Salmon** – Mark Lake
- **Chinook Salmon** – Sheefish Lake (year 2000 only)

There is no fish stocking on the streams that pass through Gerstle River and Black Rapids. Rapids Lake, a 5-acre lake located at Black Rapids, is stocked with trout on even years (Alaska Department of Fish and Game 2002b).

Angler use varies between 1,200-1,500 people per year on the 15 stocked lakes that are readily accessible from the Richardson Highway (Steve Reidsma, personal communication 2002). Koole Lake is west of the Delta River and is inaccessible by road (USARAK 1999a).

3.9.3.2.2 Wild Fisheries

DTA West is bordered by Buchanan Creek on the southwest and the Little Delta River to the west and northwest. The East Fork of the Little Delta River and Delta Creek flow through the western portion of DTA West. Jarvis Creek flows through the DTA East, with Granite Creek bordering its eastern boundary. These waters are glacially fed, and flow from the north slope of the Alaska Range to the Tanana River. A few clear streams on the post provide summer habitat for grayling. A few clear streams flowing into these larger streams provide summer habitat for grayling, but none are important for spawning grayling (BLM and U.S. Army 1994a). Naturally occurring populations of lake chub, northern pike, sculpin, and longnose sucker are found in lakes on the post (BLM and U.S. Army 1994a).

Species in the Tanana River include year-round residents such as burbot, sheefish, humpback whitefish, and suckers. The Tanana River also supports overwintering migrant species, which reproduce elsewhere, such as grayling, round whitefish, and northern pike, as well as migratory species such as salmon and Arctic lamprey. The Delta River is important to the fall chum salmon and is also home to coho salmon, although cohos are more common in the Clearwater River. Major streams on DTA are generally silt laden and do not support fisheries.

The glacially fed Gerstle River borders the southeast side of Gerstle River Test Site, more than 20 miles from the confluence with the Tanana River. This river does not support large populations of fish. The Delta River passes adjacent to the west border of Black Rapids Training Area. Suzy Q and Falls Creek are on steep slopes. These streams do not support larger populations of fish.

3.9.4 Fort Richardson

3.9.4.1 Wildlife

FRA is within the Alaska Department of Fish and Game's Game Management Unit 14 and Game Management Subunit 14C (Appendix A, Figure 3.9.a). See Table 3.9.e for harvest management regulations for Subunit 14C, which includes FRA.

Table 3.9.e Harvest Management Regulations for Unit 14C/Fort Richardson Management Area (1 July 2002-30 June 2003).

Game Management Unit 14C Fort Richardson			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	Residents and Nonresidents	None	None
Brown Bear	Residents and Nonresidents	None	None
Caribou	Residents and Nonresidents	None	None
Dall Sheep	Residents and Nonresidents	None	None
Moose	Residents and Nonresidents	Sept 3 – Nov 15	1 bull by bow and arrow only

Table 3.9.e cont. Harvest Management Regulations for Unit 14C/Fort Richardson Management Area (1 July 2002 – 30 June 2003).

Game Management Unit 14C Fort Richardson			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Moose (late season)	Residents and Nonresidents	Dec 16 – Jan 15	1 bull by muzzleloader only
Coyote	Residents and Nonresidents	Sept 1 – Apr 30	2 coyotes
Fox, Red	Residents and Nonresidents	Sept 1 – Feb 15	2 foxes
Hare	Residents and Nonresidents	Sept 3 – Apr 30	5 per day
Lynx	Residents and Nonresidents	Dec 15 – Jan 15	2 lynx
Wolf	Residents and Nonresidents	Aug 10 – Apr 30	5 wolves
Wolverine	Residents and Nonresidents	Sept 1 – Jan 31	1 wolverine
Grouse	Residents and Nonresidents	Sept 3 – Mar 31	5 per day, 10 in possession
Ptarmigan	Residents and Nonresidents	Aug 10 – Mar 31	10 per day, 20 in possession
Trapping			
Beaver	Residents and Nonresidents	Dec 1 – Apr 15	20 beaver
Coyote	Residents and Nonresidents	Nov 10 – Feb 28	No limit
Fox, Red	Residents and Nonresidents	Nov 1 – Feb 28	1 fox
Lynx	Residents and Nonresidents	Dec 15 – Jan 15	No limit
Marten	Residents and Nonresidents	Nov 10- Dec 31	No limit
Mink & Weasel	Residents and Nonresidents	Nov 10 – Jan 31	No limit
Muskrat	Residents and Nonresidents	Nov 10 – May 15	No limit
Otter	Residents and Nonresidents	Nov 10 – Apr 15	No limit

Table 3.9.e cont. Harvest Management Regulations for Unit 14C/Fort Richardson Management Area (1 July 2002 – 30 June 2003).

Game Management Unit 14C Fort Richardson			
Species	**Eligibility**	**Open Season**	**Harvest Limits**
Wolf	Residents and Nonresidents	Nov 10 – Feb 28	No limit
Wolverine	Residents and Nonresidents	Nov 10 – Jan 31	2 Wolverine

Source: Alaska Hunting Regulations No. 43, Alaska Trapping Regulations, Effective July 1, 2002 – June 30, 2003.

3.9.4.1.1 Mammals

Large Mammals

Black Bear – Approximately 35 to 40 black bears, not including new cubs, live on FRA. Densities in the area are approximately 250-350 bears per 1,000 square miles of bear habitat (Bostick 1997). Bears are frequently observed near lakes, the cantonment area and Moose Run Golf Course. Major habitat for black bears on FRA occurs east of the Glenn Highway in the subalpine and "hillside" area of the post. Between 1990 and 1999, 67 black bears were killed in the Anchorage area through the "Defense of Life and Property" clause (Kleckner 2001); however, only two of these bears were shot on FRA.

Grizzly Bear – No scientific surveys of grizzly bears have been conducted at FRA, but Alaska Department of Fish and Game estimates that approximately 10 bears use lands on the post each year. Although the trends indicate population increases (Bostick 1997), density data for grizzly bears are not available for the region (USAF 1995). Salmon attract grizzly bears to FRA and Elmendorf AFB; Ship Creek and Eagle River are important travel corridors for these bears. These animals are not hunted at FRA.

Moose – Moose are common at FRA and in the highest demand among hunters and wildlife viewers (Gossweiler 1984). According to the Alaska Department of Fish and Game, the moose population around North Anchorage, including FRA and Ship Creek, has varied substantially over the past decade and has ranged from 622 in 1994 to 340 in 1996. Declines have occurred during extreme winters when snow packs are persistent and deep. The combination of high densities (>500 moose) and heavy snow pack (>3 feet for an extended period) can lead to population crashes. Bull: cow ratios during the 1981-2001 monitoring period averaged 73:100 and calf: cow ratios have averaged 31:100 (Quirk 2001).

Of the estimated 550 moose from the herd, approximately 38% are resident to FRA and 6% are resident to Elmendorf Air Force Base. The remaining moose migrate from the upper Ship Creek drainage (39%) and slopes of Chugach Mountains (17%) during late fall or winter, when snow depths exceed four feet (Quirk 2001). Populations on the post are highest during the late spring and early summer calving season. The distribution of moose at FRA and the Anchorage area is shown in Appendix A, 3.9.g.

Dall Sheep – Dall sheep are found most frequently in the southeast portion of the post, at tundra habitats above elevations of 2,500 feet. An estimated 30-40 Dall sheep use the Snowhawk Creek drainage for summer range. The population appears to be stable. A ground survey in July, 2002

counted 21 ewes, 5 lambs and 13 rams in Training Areas 14C and 13. Dall sheep are not hunted on the post.

Furbearers and Small Mammals

Small game and furbearers found on FRA include coyote, lynx, red squirrel, snowshoe hare, hoary marmot, pine marten, beaver, river otter, wolverine, red fox, porcupine, mink, beaver, muskrat, and ermine or short-tailed weasel. Red fox are relatively common throughout the post, including the cantonment area. Coyotes also exist throughout the post. Beavers are found in all post lakes, as well as Ship and Six-Mile creeks. Muskrats, river otter, and marten are more uncommon (however, river otters use the Eagle River Flats area commonly and are seen in Otter Lake), but are occasionally sighted in the Six-Mile Lake system.

Wolverines – Wolverines are found on FRA. Recent surveys have documented wolverines and wolverine tracks traveling in the Snowhawk Valley, near Davis Range, and the Malamute Drop Zone (Kellie Peirce, personal communication 2002). Sinnott (1996) estimated the wolverine population at 17 individuals for Game Management Unit 14C.

Wolves – Two wolf packs inhabit the east side of the Glenn Highway and another probably occupies the west side, near Eagle River Flats (Kellie Peirce, personal communication 2002). The Ship Creek pack occupies the eastern portion of FRA, and the Eagle River Flats pack occupies the western portion. The Eagle River Flats pack ranges as far north and west as Palmer Hay Flats (40 miles north of the base) and the Point Mackenzie area on the west shore of Cook Inlet. In addition, lone wolves or pairs are seen on occasion. Sinnott (1996) estimated 7.7 wolves/1,000 km sq. with a confidence range of 5.3-10.8 (90%) in Game Management Unit 14C, but the population seems to have increased in recent years.

Marine Mammals – Within recent years, beluga whales (*Delphinapterus leucas*) have been sighted within Eagle River Flats, as far as 1¼ miles up the Eagle River and in Cook Inlet adjacent to Elmendorf Air Force Base. Beluga whales have also been observed pursuing salmon along rivers (Quirk 1994b). Harbor seals (*Phoca vitulina*) and orca whales (*Orcinus orca*) are sighted occasionally.

Small Mammals – Cook and Seaton (1995) prepared a checklist of mammals at FRA, which includes both confirmed and suspected species. A small mammal survey was conducted in summer 1994 by the University of Alaska Museum (Cook and Seaton 1995), and another survey was conducted in 2001 (Peirce 2001). Sixteen species of small mammals have been identified on FRA from these surveys (Appendix E).

3.9.4.1.2 Avian Species

Upland Game Birds

Spruce grouse and ptarmigan are common at FRA.

Waterfowl, Shore Birds, and Cranes

Waterfowl – FRA is adjacent to a waterfowl concentration area, which was identified in the Alaska Military Operations Areas EIS (USAF 1995). During spring and fall migration, waterfowl use marsh habitats in upper reaches of Cook Inlet as staging areas. An estimated one million waterfowl pass over or near FRA during spring migration, and 1.2 million during fall. Waterfowl have been surveyed at Eagle River Flats (CH2M Hill 1994; Racine et al. 1993), and USARAK has conducted ground and aerial surveys of birds at Eagle River Flats, McVeigh Marsh, and

post ponds and lakes. These surveys have identified 75 species of birds in the tidal salt marsh, including 24 species of waterfowl. Waterfowl concentration areas and trumpeter swan nest sites at FRA and the Anchorage area are shown in Appendix A, figure 3.9.h.

Ducks – Mallards are the most common duck species found on FRA. Nesting occurs primarily on the Six-Mile Lake system. Some mallards also winter on Ship Creek. American widgeon (*Anas americana*), pintail (*Anas acuta*), ring-necked ducks (*Aythya collaris*), and blue teal (*Anas discors*) are uncommon but present. Green-winged teal (*Anas crecca*) are common. Northern shoveler (*Anas clypeata*), Barrow's goldeneye (*Bucephala islandica*), Scaup (*Aythya* spp.), and white-winged scoters (*Melanitta fusca*) have also been observed.

White phosphorus from unexploded ordnance has been implicated in waterfowl mortality at Eagle River Flats (USARAK 1998). Dabbling ducks including mallards, pintails, and teal are most susceptible because these birds consume phosphorus-contaminated particles. Cleanup efforts have involved draining ponds to allow drying of the white-phosphorus. After drying, the ponds will be capped and re-filled. The waterfowl populations at Eagle River Flats are monitored each year to evaluate mortality (USARAK 1998).

Geese – Canada geese (*Branta canadensis*) are common, particularly during the spring and fall migration seasons. Snow geese (*Chen* spp.) are uncommon, but observed occasionally.

Shorebird, Loons, and Cranes – Red-necked grebes (*Podiceps grisegena*) are the most common type of waterbird on the post lakes. The common loon (*Gavia immer*) and Arctic loon (*Gavia arctica*) nest on three different lakes on FRA. Observations indicate that, at the beginning of the breeding season, as many as six pairs of common loons and two pairs of Arctic loons may use lakes on FRA. Pacific loons (*Gavia pacifica*) are also found in the area.

Shorebirds are frequently found on the post's larger lakes. The most abundant species include yellowlegs (*Tinga* spp.) and common snipe (*Gallinago gallinago*). Spotted sandpipers (*Artitus macularia*), red-necked phalaropes (*Phalaropus lobatus*), and semi-palmated plovers (*Charadrius semipalmatus*) are also common. Gulls and terns include mew gulls (*Larus canis*), which are common, Bonaparte's gulls (*Larus philidelpia*), which are uncommon, and Arctic (*Sterna paradisaea*) and Aleutian terns (*Sterna aleutica*), which are rare. Gulls are found along the saltwater shoreline in the summer. Sandhill cranes (*Grus canadensis*) are common at Eagle River Flats on FRA, and use the area to nest. A pair of trumpeter swans has successfully nested in a wetland area near Otter Lake for the past two years.

Passerines

Approximately 40 species of passerines and neotropical migratory birds are found at FRA (Gossweiler 1984; CH2M Hill 1994; Andres et al. 2001; USARAK 2002f). Common passerines include the black-capped (*Poecile atricapillus*) and boreal chickadees (*Parus hudsonicus*), pine grosbeak (*Pinicola enucleator*), and common redpoll (*Carduelis flammea*). Townsend's warbler (*Dendroica townsendi*) is common. The downy, hairy and three-toed woodpeckers are observed, but these species are probably not common.

Three species on the list of Priority Species for Conservation are confirmed to be on FRA are (Boreal Partners in Flight Working Group 1999). These include the Northern shrike (*Lanius excubitor*), varied thrush, and blackpoll warbler. The golden-crowned sparrow (*Zonotrichia atricapilla*), also a priority species, is found on FRA.

Raptors

An inventory on FRA identified six raptor species including bald eagle, golden eagle, Northern harrier, red-tailed hawk, Harlan's hawk, and sharp-shinned hawk (Schempf 1995). Although no goshawks were found during this inventory, they are known to inhabit the dense forested areas of the post. Surveys conducted by the U.S. Fish and Wildlife Service have identified the great horned, saw-whet, and boreal owls.

Bald eagles are year-round residents, and are observed most frequently between May and October. The eagles use the lakes during summer to feed on fish in Ship Creek drainage during winter to feed on ducks. Golden eagles are also frequently observed on the post.

Occasional sightings of Swainson's hawks, peregrine falcons, and great gray owls (*Strix nebulosa*) have been reported on or near the post but these birds are uncommon.

Priority Bird Species

Boreal Partners in Flight has identified priority bird species for conservation in Alaska (Boreal Partners in Flight Working Group 1999). The rankings are based on conservation vulnerability. Listed in Table 3.9.f are priority bird species listed for south-coastal Alaska, including FRA. A listing of Alaska Species of Concern is presented in Section 3.10.

Table 3.9.f Listing of Boreal Partners in Flight Priority Bird Species, Habitats, and Management Concerns at FRA.

Species	Habitat	Management Concerns
Western Wood-Pewee[2]	Aspen, pine-oak, and riparian areas	Declining throughout range; loss of riparian habitat
Steller's Jay[2]	Coniferous forest	Potentially affected by timber harvest
American Dipper[1,2]	Riparian areas	Habitat loss or impacts from mining, forestry, pollution, water drawdowns
Golden-crowned Kinglet[2]	Coniferous and mixed forest	Vulnerable to intensive logging
Golden-crowned Sparrow[1,2]	Scrub habitats on hillsides and near tundra	Urbanization of winter habitat (west coast USA)

[1] Priority Species in Central Region

[2] Priority Species in Southeastern and South-coastal Region

Source: Andres 1999

3.9.4.1.3 Reptiles and Amphibians

One species of amphibian, the wood frog, is found on the post. The frog is common in bogs, freshwater and saltwater marshes, and lake margins. Wood frogs are important prey species for sandhill cranes (CH2M Hill 1994). Monitoring surveys began in the spring of 2002. No reptiles occur on FRA.

3.9.4.2 Fisheries

Ten species of fish are found in FRA's lakes and waterways. The post is part of the Anchorage Area Management Unit for fisheries.

3.9.4.2.1 Fish Stocking

Four lakes on FRA (Clunie, Gwen, Otter, and Walden) are stocked under the FRA Army Base Subdistrict Plan (Alaska Department of Fish and Game 2002b) (Appendix A, Figure 3.3.a). Otter Lake is listed as a Category 3 (a lake where fish could escape and mix with wild populations, but the risks are relatively low), and Clunie, Gwen, and Walden lakes are Category 1 (lakes that are completely landlocked, where fish cannot escape and interact with wild fish populations). Clunie Lake is stocked with rainbow trout, chinook salmon, and Arctic char. Gwen, Otter, and Walden lakes are stocked with rainbow trout (Appendix E).

In addition, chinook and coho salmon are stocked in Ship Creek under the Alaska Department of Fish and Game Enhancement Plan (Alaska Department of Fish and Game 2002b) (Appendix E). The objectives of this plan are to: (1) establish a return of 6,000-9,000 adult chinook and 12,000 coho salmon in Ship Creek while allowing 10% natural spawning, and (2) generate 50,000 angler days on Ship Creek.

3.9.4.2.2 Wild Fisheries

Wild populations of game fish include king salmon, chum salmon, silver salmon (*Oncorhynchus kisutch*), red salmon (*Oncorhynchus nerka*), pink salmon (*Oncorhynchus gorbuscha*), and Dolly Varden (*Salvelinus malma*). FRA's only significant nongame fish are the three-spine stickleback (*Gasterosteus aculeatus*) and the slimy sculpin. The nine-spine stickleback (*Pungitius pungitius*) has been found on Elmendorf Air Force Base and probably occurs on FRA.

All five Pacific salmon species return to base streams to spawn. Enhanced runs of king salmon and silver salmon occur on Ship Creek, as well as natural returns of chum and pink salmon. Although red salmon return in small numbers each year, they are probably pioneer fish from runs in other streams. Salmon return to the creek beginning in early June, with different species present through the end of September.

Six-Mile Creek has natural runs of all salmon species, with red and pink salmon occurring most frequently. Few king salmon males have been observed in recent years, indicating this species is present only as a pioneer. Silver and chum salmon are observed occasionally, with fewer than 200 counted each year. Red salmon return in late July and are present through late October. The other species of salmon return between July and September.

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3.10 THREATENED OR ENDANGERED SPECIES AND SPECIES OF CONCERN

Topics discussed in this section include:

- Categories for listed threatened or endangered species and species of concern
- Threatened or endangered plant and wildlife species and species of concern at each installation

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional information on threatened or endangered species and species of concern is presented in Appendix E. Current U.S. Army Alaska (USARAK) wildlife management practices, as described in the Integrated Natural Resources Management Plans (USARAK 2002e, f, g), are outlined in Appendix H.

Threatened or Endangered Species

The U.S. Fish and Wildlife Service (1999) has defined the following categories for listing of endangered species in the United States:

- **Endangered** – Species is in danger of extinction throughout all or a significant portion of its range.
- **Threatened** – Species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- **Proposed** – Species formally proposed for listing in the Federal Register as endangered or threatened.
- **Candidate** – Sufficient information exists on biological vulnerability and threat(s) to a species to support proposals as threatened or endangered.
- **Delisted** – Species has been removed form the list of threatened or endangered species. The U.S. Fish and Wildlife Service will monitor these species for at least five years following delisting.

Federally listed threatened, endangered, and delisted plant and animal species in Alaska are presented in Appendix E. No federally threatened or endangered species have been found on USARAK lands (USARAK 2002e,f,g).

Species of Concern

The State of Alaska has a cooperative agreement with the Alaska National Heritage Program to identify “species of concern.” Plants considered species of concern are vulnerable to extirpation at the global or state level due to factors such as restricted geographic range, small population size, low population density, specialized habitat requirements, loss of habitat, or extreme sensitivity to habitat disturbances (Alaska Natural Heritage Program 2002). This list considers rare vascular plants that may be imperiled but require further analysis (Appendix E). The State of Alaska’s listings of endangered species and species of concern do not provide legislative protection.

The State of Alaska also maintains a list of sensitive species, endangered species, and species of special concern for wildlife (Appendix E). Table 3.10.a below lists wildlife species of concern found on USARAK lands. Although species on this list may overlap those on the federal listing, the state listed species are not afforded the same legislative protection (Alaska Department of Fish and Game 1998b). Animal species may be imperiled but because their status requires further

analysis, the Alaska Natural Heritage Program monitors and evaluates these species (Alaska Natural Heritage Program 2002).

By definition, a Species of Special Concern is any species or subspecies of fish or wildlife or population of mammal or bird native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. The list of Species of Special Concern is an administrative listing established in May 1993 and amended in October 1998 by the Commissioner of Fish and Game (Alaska Department of Fish and Game 1998b).

Table 3.10.a State of Alaska Listing of Species of Concern Found on USARAK Lands.

Common Name	Scientific Name	USARAK Lands
Species of Concern[1]		
American peregrine falcon	*Falco peregrinus anatum*	Occasional FWA, DTA, FRA
Northern goshawk (southeast population)	*Accipter gentilis laingi*	Occasional FRA
Olive-sided flycatcher	*Contopus cooperi*	FWA, DTA, FRA
Gray-cheeked thrush	*Catharus minimus*	FWA, DTA, FRA
Townsend's warbler	*Dendroica townsendii*	FWA, DTA, FRA
Blackpoll warbler	*Dendroica striata*	FWA, DTA, FRA
Brown bear (Kenai Peninsula population)[2]	*Ursus arctos horribilis*	Possible FRA
Harbor seal	*Phoca vitulina*	Occasional FRA
Beluga whale (Cook Inlet population)[3]	*Delphinapterus leucas*	Occasional FRA

[1] In 1993 the State of Alaska created an administrative listing of species of special concern which identifies vulnerable species (Alaska Department of Fish and Game 1998b). Boreal Partners in Flight Working Group (1999) also created a list of vulnerable species, ranking each species as to the likelihood of extinction in the near future. This list, in conjunction with the state and federal lists of species, allows land managers to plan for conservation and habitat maintenance.

[2] Infrequently found on FRA and are minimally impacted by Army activities. Please also see Section 3.10.4.2.

[3] Analysis of this population does not greatly differ from the beluga whale analysis in Sections 3.9 and 4.9, Wildlife and Fisheries.

3.10.1 Threatened or Endangered Species and Species of Concern Topics

3.10.1.1 Vegetation

Conservationists in Alaska have become increasingly aware of the importance of rare plants and rare plant communities to ensure maintenance of biological diversity. Due to the vastness of the Alaskan landscape, the botanical profile in many areas is poorly understood. It is incumbent on land management agencies, including the Army, to survey, monitor, and conserve rare plants. The Alaska Natural Heritage Program helps agencies track rare plants. Moreover, the designations of rare, endangered, and species of concern are the same as with wildlife and fisheries.

3.10.1.2 Wildlife and Fish

Federal designations for animal species follow the same rankings as the plant species: endangered, threatened, proposed, candidate, and delisted. Listed species are managed and monitored by the U.S. Fish and Wildlife Service.

The State of Alaska also maintains a list of sensitive species, endangered species, and species of special concern for wildlife (Appendix E). Although species on this list may overlap those on the federal listing, the state listed species are not afforded the same legislative protection (Alaska Department of Fish and Game 1998b). Animal species may be imperiled but because their status requires further analysis, the Alaska Natural Heritage Program monitors and evaluates these species (Alaska Natural Heritage Program 2002).

3.10.2 Fort Wainwright

There are no known federally endangered or threatened species on FWA, but there are a number of rare, uncommon, or priority species (USARAK 2002g).

3.10.2.1 Vegetation

The 1997 floristic survey of FWA found twelve vascular plant species of concern that are being tracked by the Alaska Natural Heritage Program's Biological Conservation Database for interior Alaska (Racine et al. 1997) (Appendix E). USARAK has listed four plants of concern that are prioritized for the Army posts in interior Alaska. *Apocynum androsaemifolium* is listed because it is rare in Alaska. *Dodecatheon pulchellum pauciflorum* is imperiled in Alaska, and its taxonomy is questionable. *Festuca lenensis* is listed because this species is cause for concern globally and it is rare in Alaska. Although *Minuartia yukonensis* is apparently secure globally, it is uncommon in Alaska.

A 1978 survey of Black Rapids found one plant species, *Draba porsildi*, which is on the Alaska Natural Heritage Program's list of species of concern (Batten et al. 1979).

3.10.2.2 Wildlife and Fish

Observations of avian state and/or federal species of concern and sensitive species have been documented. TFTA is used by migrating trumpeter swans, American ospreys, peregrine falcons, olive-sided flycatchers, and blackpoll warblers (Boreal Partners in Flight Working Group 1999). American peregrine falcons and trumpeter swans nest along the Tanana River and on the Tanana Flats. YTA supports migrating olive-sided flycatchers, gray-cheeked thrushes and Townsend's warblers (Boreal Partners in Flight Working Group 1999). These migratory birds nest mainly in the coniferous forests of Alaska. The olive-sided flycatcher is also found in open woodlands, forest burns, boreal bogs, and muskegs. The gray-cheeked thrush nests in conifers and dense stands of alder or willow (USARAK 1999a, 2002g).

Moreover, USARAK has developed a priority list of species for each installation, based on conservation issues or importance as a game species (Section 3.9, Wildlife and Fisheries; Appendix E). This list also includes priority bird species. Table 3.10.b shows the wildlife sensitive species and species of concern, as identified by the State of Alaska, found on FWA.

Table 3.10.b Species of Concern and Sensitive Species Found on USARAK Lands.

Species	USARAK Lands	Habitat	Management Concerns
Olive-sided flycatcher[1,2]	FWA, DTA, FRA	Coniferous forest or mixed forest	Population decline throughout breeding range. Possible impacts from fire suppression in breeding range. Inadequate monitoring in Alaska, Canada, and along migratory route (Altman and Sallabanks 2000).
Gray-cheeked thrush[1]	FWA	Shrub thickets, riparian areas, and coniferous forests	Species more likely affected by habitat alteration during nonbreeding season - susceptible to habitat alteration in wintering habitat (tropical regions). Risk of collision mortality (tower kills) during migration (Lowther et al. 2001).
Townsend's warbler[1,2]	FWA, DTA, FRA	Mature coniferous forests (white spruce)	Habitat loss and fragmentation are indicated as the major threat to survivorship of this species. Inadequate population monitoring in Alaska, Canada, and along migratory route (Wright et al. 1998).
Blackpoll warbler[1,2]	FWA, DTA, FRA	Riparian woodland or coniferous, deciduous, or mixed forest	Documented population decline, possibly caused by tropical deforestation. Inadequate monitoring in Alaska, Canada, and along migratory route (Hunt and Eliason 1999).
American osprey	FWA, DTA, FRA	Riparian areas	Inadequate monitoring of Alaskan populations. Susceptible to disturbance during May-June nesting period which can cause abandonment of young. Adversely affected by stream or waterway alterations, specifically those which reduce fish populations or visibility in areas traditionally used as feeding areas. Susceptible to egg thinning by pesticide contamination (VanDaele 1994).
American peregrine falcon	FWA, DTA, FRA	Mountain ranges, river valleys, and coastlines.	Recovered and delisted in 1999 from federal list of endangered and threatened species. Five year monitoring period will determine long-term success of recovery.

[1] Priority Species in Central Region

[2] Priority Species in Southeastern and Southcoastal Region

Source: Alaska Department of Fish and Game 1998b

3.10.3 Donnelly Training Area

There are no known federally endangered or threatened species on DTA, but there are a number of rare, uncommon, or priority species (USARAK 2002e).

3.10.3.1 Vegetation

The 1999 floristic survey of Fort Greely found 21 species of rare vascular plants (Racine et al. 2001), and these are being monitored by the Alaska Natural Heritage Program's Biological Conservation Database for interior Alaska (Appendix E).

Two plant species of concern are ranked in USARAK's short-list of species of concern for ecosystem management (Appendix E). *Carex sychnocephala* is rare and critically imperiled

in Alaska. *Dodecatheon pulchellum pauciflorum* is imperiled in Alaska, and its taxonomy is questionable.

3.10.3.2 Wildlife and Fish

State and/or federal species of concern and sensitive species include the American peregrine falcon, gray-cheeked thrush, trumpeter swan, American osprey, Townsend's warbler, blackpoll warbler, and the olive-sided flycatcher. Suitable nesting habitat for peregrine falcons occurs along the bluffs of the Little Delta River on the western boundary of DTA and along the Salcha River north of the post (USARAK 1999a, 2002e; Anderson et al. 2000).

The olive-sided flycatcher, Townsend's warbler, blackpoll warbler, American osprey, and American peregrine falcon are sensitive species and species of concern, as identified by the State of Alaska, that are found at DTA. Habitat and management concerns are listed in Table 3.10.b.

USARAK has listed priorities for ecosystem management (Section 3.9 and Appendix E). The other species were selected due to factors such as conservation concerns, status as keystone or indicator species, or important prey species.

3.10.4 Fort Richardson

There are no known federally endangered or threatened species on Fort Richardson (FRA), but there are some rare, uncommon, and/or conservation priority species (USARAK 2002f).

3.10.4.1 Vegetation

The 1997 (Lichvar et al.) floristic inventory of FRA identified 26 rare plants on the post, and these are being tracked by the Alaska Natural Heritage Program's Biological Conservation Database (Appendix E).

A comprehensive survey of rare plants was included as part of a statewide floristic inventory conducted in 1994. Only one plant species on the federal endangered species list is known to occur in Alaska. FRA is not within the range of this species. However, the former candidate species *Taraxacum carneocoloratum* is found in alpine areas of the Chugach Mountains. This plant has been discovered at an increasing number of sites in Alaska, and its candidate status may be reevaluated.

FRA's alpine and wetland areas contain plant species that are considered rare in Alaska or globally imperiled (Lichvar and Sprecher 1998b) (Appendix E). The alpine ecosystem is the most sensitive in terms of plant species and the most vulnerable to effects of military training. A rare plant, the luminous moss (*Schistostega pennata*), has been found on FRA. This is the first documented occurrence of this cryptogam outside of southeast Alaska.

Three types of vascular plants are listed as species of concern by USARAK. *Viola selkirkii* is rare in Alaska. *Taraxacum carneocoloratum* is rare globally and in Alaska, and this plant is taxonomically questionable. Although the status of *Saxifraga adscendens oregonensis* is secure globally, it is considered to be rare and imperiled in Alaska.

3.10.4.2 Wildlife and Fish

Although no U.S. Fish and Wildlife Service federally endangered or threatened species are found on FRA, there have been confirmed sightings of several state and/or federal species of concern and sensitive species on the post (USARAK 2002f).

Beluga whales have been seen swimming in the Eagle River, approximately one mile from the Cook Inlet (Quirk 1994b). Harbor seals (*Phoca vitulina*) are sighted occasionally. Brown bears have also been seen on the post but the presence of Kenai brown bears has not been verified. The population of brown bears on the Kenai Peninsula has been listed as being a species of concern; however, these bears are not a designated subspecies. Research to evaluate the DNA of brown bears is being conducted to clarify the taxonomic status of the Kenai brown bear population.

Sightings of several avian species of concern and sensitive species have been reported at FRA (Andres et al. 1997). Trumpeter swans are fall and spring migrants through Eagle River Flats, and a pair has successfully nested for several years near Otter Lake. American ospreys are occasionally sighted on the post, although breeding sites are not confirmed. Olive-sided flycatchers are probable breeders on FRA but nest sites have not been confirmed. The blackpoll warbler is migrant and possibly breeds on the post. Although the primary habitat for the Townsend's warbler (mature white spruce forests) has been altered due to spruce bark beetle outbreaks, the species is a confirmed breeder on FRA (Andres et al. 1997).

The olive-sided flycatcher, gray-cheeked thrush (found on-site, but not a Priority Species in Region), Townsend's warbler, blackpoll warbler, American osprey, and American peregrine falcon are sensitive species and species of concern, as identified by the State of Alaska, that are found at FRA. Habitat and management concerns are listed in Table 3.10.b.

3.11 FIRE MANAGEMENT

Issue E: Fire Management. Fire was identified as an issue of concern during the public scoping meetings and is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Current U.S. Army Alaska (USARAK) fire policy
- Wildfire history of each installation
- Fuels management for each installation

The wildfire history and management descriptions provided in this section serve as baseline data for the analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences. For additional information on specific fire management programs, see Appendix H.

Many ecosystems require fire for function and productivity. Wildfires, however, are a concern for USARAK due to the potential impact on human activities and structures, and military operations.

3.11.1 Fire Management Topics

3.11.1.1 Fire Policy

Fire management on USARAK installations is required by the Sikes Act and by Army Regulation 200-3. Fire management plans are required by the Resource Management Plan, which is mandated under Public Law 106-65, the Military Lands Withdrawal Act. Additional direction regarding fire management is stated in a 1995 Memorandum of Understanding between the Bureau of Land Management (BLM) and USARAK as well as in the Army wildland fire policy guidance document (Department of Army 2002).

Wildland fire management in Alaska requires multi-agency cooperation. Fire management is a joint effort by USARAK and the BLM, Alaska Fire Service. The agencies have developed two inter-service support agreements, which establish the Alaska Fire Service's responsibility for all fire detection and suppression on installation lands (Alaska Fire Service and USARAK 1995a,b). In exchange, the Army provides the Alaska Fire Service with use of certain buildings, utilities, land, training services, air support, and other support services.

The Alaska Fire Service also has a Reciprocal Fire Management Agreement with the State of Alaska's Department of Natural Resources, Division of Forestry (Alaska Fire Service and State of Alaska 1998). Under this agreement, the agencies have implemented a coordinated fire suppression effort and have identified areas where each agency has agreed to provide wildland fire suppression, regardless of whether the lands are under state or federal ownership.

The Alaska Wildland Fire Management Plan, which is reviewed each year, designated wildland fire management areas and allowed land managers to establish fire management options according to land use objectives and constraints. The Alaska Wildland Fire Management Plan also established four fire management options: Critical, Full, Modified, and Limited (Appendix A, Figures 3.11.a, 3.11.b, and 3.11.c). Land managers may select among these options for different parcels of land, based on evaluation of legal mandates, policies, regulations, resource

management objectives, and local conditions (Alaska Wildland Fire Coordinating Group 1998). The fire management options are:

- **Critical Management Option** – These lands receive maximum detection coverage and are given highest priority for attack response, which is immediate and aggressive. Land owners/managers are notified of the situation as soon as possible. These areas receive priority over adjacent lands and resources in the event of escaped fires.
- **Full Management Option** – Areas receive maximum detection coverage as well as immediate and aggressive initial attack response. If initial attack is successful, or the fire is controlled within the first burning period, special agency notification is not required. If the fire escapes and requires additional suppression, affected land owners/managers are notified to develop further fire suppression strategies.
- **Modified Management Option** – This option provides a level of management equivalent to Full or Limited, depending on conditions. The level of management is assigned on an annual basis each summer. A high degree of protection is provided during critical burn periods, but decreases as risks are diminished. Initial attack action is based on the potential for damage, constraints on affected land, and/or discussions with the land owner/manager. If there is no initial attack, the land owner/manager is informed of the fire status daily, and unmanned fires are monitored.
- **Limited Management Option** – This option is used in areas where the resources at risk do not warrant the expense of suppression or in areas where natural fire is important to ecosystem sustainability. Fires within these areas receive routine detection effort. Attack response is based on the need to keep the fire within Limited management option areas and the need to protect Critical sites. Land owners/managers are immediately notified of the fire situation, and the status of unmanned fires is monitored.

In addition, two additional fire management option categories have been developed specifically for lands managed by USARAK. These categories include:

- **Unplanned Areas** – These lands are not officially designated but receive fire management equal to the Full management option. The Alaska Fire Service has responsibility for initial response in Unplanned Areas (USARAK 1999a).
- **Restricted Areas or Hot Zones** – These areas include impact areas and other locations where no “on the ground” fire fighting can be accomplished due to danger of unexploded ordnance. High hazard impact areas are managed as Hot Zones with Limited management. One small arms range that extends onto Army lands on FWA’s Yukon Training Area (YTA) is also listed as a Hot Zone. Fire in these areas is suppressed through backburning and aerial-dropped retardants (Alaska Wildland Fire Coordinating Group 1998).

3.11.1.2 Fire History

The Alaska Fire Service maintains incident reports for fires on the lands used by USARAK. Data from the reports were used to create maps and tables of fires for each installation. Record keeping has varied over the years. Some fires, therefore, have more information available than others do. The maps include most, but not all, fires greater than 1,000 acres that occurred between 1954 and 2001, as well as fires larger than 100 acres that occurred between 1993 and 1996 (Appendix A, Figures 3.11.d, 3.11.e, and 3.11.f).

Incendiary devices and lightning are the two major causes of fires on installation lands. Other less common causes of fire are field burning, exhaust, recreation, trash burning, and warming fires.

Large fires that have occurred on USARAK lands are listed in Appendix E, Tables 3.11.a, 3.11.b, 3.11.c, and 3.11.d.

3.11.1.3 Fuels Management

In fire-prone areas, climate, human activity, and types of vegetation (or fuels) determine the level of wildland fire risk. USARAK compiled fuel type maps for each installation (Appendix A, Figures 4.11.a, b, and c). Common fuels found on USARAK installations include the following (Musitano and Hayes 2002):

Black spruce – These stands are highly flammable and are generally located in wetter and cooler sites. Crown fires are common and typically result in extensive mortality.

White spruce – White spruce is less flammable and located in generally warmer and drier sites. Crown fires may occur during drought conditions.

Mixed spruce/hardwood stands – In these stands the conifers are generally white spruce with black spruce sometimes present. Black spruce is highly flammable and susceptible to crown fire while white spruce is both less flammable and less conducive to crown fire. The associated hardwoods are generally less flammable and may include birch, aspen, and/or cottonwood. Surface fuels include mosses, lichens, leaf litter, grasses, and shrubs. Fires in these mixed stands are generally of moderate intensity.

Bluejoint Reedgrass – This species occurs in patches on each of USARAK's installations. It may occur in association with hardwoods, mixed forest stands, or may predominate clearings. Fires with this grass start easily, spread quickly, and burn intensely when conditions are right.

Tundra – In these areas, very flammable grasses dominate. Dwarf birch and willow may be present and are generally highly flammable, especially if they have a high lichen content. In alpine tundra, short shrubs, mosses and lichens dominate. Vegetation in these areas is moderately to highly flammable.

To compile fuel maps, the vegetation described above was grouped into four fuel type categories that were based on the Canadian Forest Service fuel type designations (Table 3.11.a).

Table 3.11.a Canadian Forest Service Fuel Types Used for USARAK's Fuel Maps.

Fuel Type	Composition	Fuel Status
C-2 Boreal Spruce	Moderately well-stocked black spruce stands on both upland and lowland sites. Sphagnum bogs excluded.	Most likely fuel to burn.
O-1B Grass/ Herb	Continuous standing grass and accumulated litter.	Most likely to burn during spring and fall.
C-1 Spruce-Lichen Woodland	Open black spruce with dense clumps of white birch, well-drained upland sites.	Will burn only in high drought stress times, otherwise not too flammable.
M-2 Boreal Mixed wood	Boreal conifers and northern hardwoods.	Least likely fuel to burn. Fuel types are differentiated by season and percent conifer composition.

Three management actions are used to prevent wildfires. First, the likelihood of starting a fire is reduced by limiting military activities as imposed by the fire danger rating system. Certain military activities are restricted when thresholds of risk are reached. Weather readings are collected by the USARAK Fire Department and used to calculate the fire danger rating according to the Canadian Forest Fire Danger Rating System. The fire department provides the rating to Range Control, which restricts the level of munitions and pyrotechnics as the fire danger increases. All munitions may be prohibited during extreme fire danger conditions. Second, wildfire danger is lessened by decreasing fuel hazard through the mechanical removal of fuels and through prescribed burning. The third management action to help prevent wildfires involves constructing and maintaining fire or fuel wood breaks.

3.11.2 Fort Wainwright

3.11.2.1 Fire Policy

The Fort Wainwright Fire Department is responsible for fire suppression on the Main Post. The cantonment area is categorized as Critical fire management due to the urban and residential areas adjacent to it (Appendix A, Figure 3.11.a) (Alaska Wildland Fire Coordinating Group 1998).

The Alaska Fire Service is primarily responsible for Tanana Flats Training Area (TFTA). Currently the training area is classified for Limited fire suppression because relatively few resources are at risk from fire and because USARAK recognizes fire as a natural process in ecosystem function (Appendix A, Figure 3.11.a) (Alaska Wildland Fire Coordinating Group 1998). The Fire Management Plan for Fort Wainwright (FWA) stated that military and cultural resources at risk from wildland fire have been identified and mapped. The TFTA is bounded by allotments, private parcels, state lands, and Native Corporation lands (USARAK 2002c).

The eastern portion of YTA is under Limited fire management because it is too close to an impact area, few resources are at risk, and USARAK recognizes fire as a natural and desirable process for ecosystem function (Appendix A, Figure 3.11.a). The western portion of the training area is assigned Full fire management due to its proximity to developed residential areas, in addition to resources of value on adjacent military lands. The central portion of the training area is listed for Modified fire management, and this area acts as a buffer between the Limited and Full management areas (USARAK 2002c).

Military resources at risk from fire have been identified and mapped. Cultural resources potentially in danger from wildfire have been identified at YTA. Private parcels, state lands, borough lands, and other federally managed lands border YTA (USARAK 2002c).

3.11.2.2 Fire History

Fires are frequent in interior Alaska, and they play an important ecological role by making nutrients stored in undecayed, accumulated matter available to plants. Approximately 30% of FWA has burned since 1950 (Jorgenson et al. 1999), and a substantial portion of the area has burned more than once. Records of fire occurrences since 1950 indicate that about 1% of FWA has burned annually (Jorgenson et al. 1999). The average interval for fire recurrence on any given area at FWA varies from 100 to 150 years (USARAK 2002c).

Both natural and human-caused fires occur on the post (Appendix A, Figure 3.11.d). From 1980 through 2000, 148 wildfires were reported on FWA. Thirty-one of these fires were attributed to natural causes while 117 were attributed to human causes. Of the 117 fires resulting from human activities, 85 were attributed to military training activities (USARAK 2002c).

Records indicate that 16 fires of 100 acres or more burned on the YTA from 1959-2000. Three of these fires occurred between 1998- 2000 (Appendix A, Figure 3.11.d). The two largest of these fires happened in 2000. The fires were caused by lightning and affected a total of 4,538 acres.

3.11.2.3 Fuels Management

Prescribed burns and the mechanical thinning of fuels are planned at FWA. Thinning and branch cutting are planned for three areas along the boundary of the cantonment area. Six possible prescribed burn projects may take place over the next five years (USARAK 2002c). These projects include:

FWA Small Arms Range – The range is burned either every year or every other year to reduce fire hazards.

Ammo Bunkers – The FWA Ammo Bunker unit has been burned annually or biannually since 1991 to eliminate willow regrowth and to encourage the return of native perennial grasses. The burn is a one-day project usually conducted by personnel from the Alaska Fire Service hotshot crews.

Central Tanana Flats – Three to ten prescribed burns totaling 65,000 acres over the next ten years are proposed to promote moose habitat. A burn plan is being developed.

Manchu Small Arms Range – A burn plan was completed by BLM Alaska Fire Service. Burns are scheduled every third year to minimize grass fuel loads.

Husky Drop Zone – The proposed prescribed burn would allow for grass establishment on portions of the Drop Zone. A burn plan is being developed by USARAK and the Alaska Fire Service.

Grouse Project – A burn plan to reduce mature aspen stands and to promote regeneration of younger stands, thereby improving grouse habitat in YTA, is in progress.

3.11.3 Donnelly Training Area

3.11.3.1 Fire Policy

Most of Donnelly Training Area (DTA) West is classified for Limited fire management because few resources are at risk from fire and USARAK recognizes that fire is a natural process in ecosystem function (Appendix A, Figure 3.11.b) (Alaska Wildland Fire Coordinating Group 1998). A private hunting lodge, located along the extreme western boundary of DTA West, is given Full fire suppression status. The northern boundary of DTA West is classified for Modified fire management to provide a buffer to adjacent state lands that are classified under Full management status. DTA West is bounded by private parcels and state lands (USARAK 2002a).

Currently, DTA East is a Full fire management area due to the close proximity of the community of Delta Junction and the cantonment area of DTA (Appendix A, Figure 3.11.b). This area is subject to high winds and extreme fire behavior, further supporting the Full fire suppression status. The northern portion of the Main Post is a Critical fire management area due to the life and property at risk (Alaska Wildland Fire Coordinating Group 1998). The Army does have structures at risk throughout DTA East. These resources have been identified and mapped. DTA East also surrounds a portion of private and state land known as the “Key Hole” (USARAK 2002a).

Gerstle River Training Area is classified as an Unplanned fire management area due to risks of unknown ordnance and other weapons used on the site (Appendix A, Figure 3.11.b) (Alaska Wildland Fire Coordinating Group 1998). Neither fire management status nor plans for addressing wildland fires on the Gerstle River Training Area have been completed. Adjacent lands are classified for Limited, Modified, and Full fire management status. No resources at risk from wildland fire have been identified in the Gerstle River Training Area. The Gerstle River Training Area is bounded by state lands (USARAK 2002a).

The Black Rapids Training Area is classified under the Full fire management option in order to protect the resources of the site (Alaska Wildland Fire Coordinating Group 1998). The road corridor adjacent to Black Rapids is classified for Modified fire management status, while the training center is located within a Limited fire management area (Appendix A, Figure 3.11.b). The Army has structures at Black Rapids Training Center that are not mapped or assigned treatment options and could be at risk from fire. Black Rapids is bounded by federal and state lands (USARAK 2002a).

3.11.3.2 Fire History

Fires are also common at DTA. According to Jorgenson et al. (2001), 59% of DTA has burned since 1950, and a considerable portion has burned more than once. Approximately 16% of DTA has burned within the past 30 years, and, based on fires recorded on the installation since 1950, 1.2% of the area has burned annually.

From 1980 to 2000, 89 fires were reported at DTA (USARAK 2002a). Of these, 78 were caused by humans and 11 were due to natural causes. Eighty-eight percent of all reported fires were caused by military training activities. Two large fires occurred between 1997 and 2000. The first was a 2,500-acre fire caused by lightning in 1997, and the second was a 357-acre fire in 1998. The average interval for recurrence of fire for any given area varies from 100 to 150 years (USARAK 2002a). In 1999 the Donnelly Flats Fire burned approximately 18,000 acres of DTA East and Main Post.

The western portion of DTA East and the Main Post along the Delta River is an impact area used by the Army for small arms and submunitions. Cultural resources potentially at risk from wildfire have been identified in DTA East and Main Post, and management options related to wildland fire have been determined. DTA East and Main Post are bounded by allotments, private parcels, and state lands (USARAK 2002a).

Fires in the outlying training areas include a 1994 fire that burned a large portion (approximately 55%) of the Gerstle River Training Area. The last wildfire in the Black Rapids Training Area is believed to have been in 1954 (Dan Rees, personal communication 2002).

3.11.3.3 Fuels Management

Recent fuels management projects on DTA include the removal of dead spruce, the creation of a fuel break on the northern portion of DTA East, and a 3,000-acre prescribed burn on Texas Range.

3.11.4 Fort Richardson

3.11.4.1 Fire Policy

The north post of Fort Richardson (FRA) is classified for Full and Critical fire management options due the high value of resources at risk from fire, in addition to the post's proximity to Anchorage, Eagle River, and Elmendorf Air Force Base (Appendix A, Figure 3.11.c) (Alaska

Wildland Fire Coordinating Group 1998). Most of the north post is classified for Critical fire management. The training areas along Knik Arm are classified for Full fire management. Many military resources at north post are at risk from wildland fire. Cultural resources staff identified sites in the north post area, but management options related to wildland fire have not been determined. The north post is bounded by Elmendorf Air Force Base, private parcels, railroad lands, and Native Corporation lands (USARAK 2002b).

The south post has areas classified under Critical, Full, and Limited fire management. Most of the south post is under Full fire management because the area is mainly used for military training and small arms ranges. The alpine zones are classified for Limited fire management because of their remote location. Many military resources are at risk from wildland fire in the training areas of the south post, including two small arms complexes. Additional surveys are needed to ascertain sites where ordnance has been used and disposed. Cultural resources staff identified sites in the south post area, but management options related to wildland fire are pending. The south post is bound by private parcels and state lands (USARAK 2002b).

3.11.4.2 Fire History

Fire probably had a more important influence on ecosystem functions in the Anchorage area during presettlement times. Wildfires were found to be prevalent in the 1800s and early 1900s. Forty-eight percent of FRA over the past 200 years has been affected by fire (Jorgenson et al. 2002). This was indicated by the occurrence of early to mid-successional forest stages that have developed since the fires in the 1800s and early 1900s (Jorgenson et al. 2002). Although fires were relatively small and localized due to the weather and climate, settlement resulted in fire suppression and the development of road systems that further reduced natural fire frequency at FRA.

Although wildfires are a concern at FRA, they are rarely a significant problem. Numerous fires have been recorded in the Matanuska-Susitna Valley to the north, but no major fires have occurred on FRA since 1950 (Jorgenson et al. 2002). Severe drought conditions occur about once every 20 years, and, in normal years, there is an average of less than five wildfires. These fires are usually mission-related, small, and easily contained.

The FRA Fire Department provides the initial response for wildfire suppression, which has traditionally been confined to areas behind the small arms complex. Because of the extensive mortality of white spruce in the area, fire prevention activities were conducted in 1999 and 2000 to reduce fuel loads adjacent to the small arms ranges (USARAK 2002b).

When necessary, BLM reimburses the Alaska Division of Forestry to suppress wildfires in the southern half of the state, including FRA. The Division of Forestry also provides training for wildfire suppression at FRA. USARAK and Elmendorf Air Force Base have a mutual aid agreement for fire suppression (USARAK 2002b).

3.11.4.3 Fuels Management

There is some concern over the spruce bark beetle that killed most of the larger white spruce in the north and south post training areas. The dead spruce has resulted in high fuel load conditions on the forest floor. Additionally, the deaths of the larger spruce trees have allowed areas to be taken over by bluejoint reedgrass, another potential fire risk (USARAK 2002b). The absence of wildfires may be inhibiting the potential for optimal ecosystem development. The current infestation of spruce bark beetles in old-aged timber is one problem that may have been exacerbated by a lack of wildfires (USARAK 2002b).

To reduce this threat, 60 acres of dead spruce were removed along the Stuckagain Heights residential area, and 10 acres of dead spruce were removed near another housing area. Additionally, Grezelka Range was recently treated with a 15-acre prescribed burn to reduce fuel loads.

3.12 CULTURAL RESOURCES

Issue F: Cultural Resources. Impacts to cultural resources were identified as an issue of concern during the public scoping meeting, and are examined in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Prehistoric and historic periods
- Native cultural resources identified on each installation
- Previous consultations, reports, or surveys

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional cultural resource information is presented in Appendix E.

Historic properties include features and objects dating to prehistoric and historic periods that are found or are likely to be found as defined by the National Historic Preservation Act of 1966 (as amended). Historic properties relating to the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act are considered as a part of the EIS process. For purposes of this EIS, the term "cultural resources" is used to denote prehistoric and historic properties, as well as properties with traditional, religious or cultural significance (PTRCSs).

Archaeological resources are related to the systematic study of life, conditions, and cultures of a region's predecessors, and generally focus upon material evidence found primarily in surface and/or subsurface contexts. Cultural resources under the stewardship of U.S. Army Alaska (USARAK) consist of the material manifestations of the knowledge, beliefs, art, morals, laws, and customs particular to a people or society. Cultural resources may also be traditional cultural properties or sacred sites that have significance in present native cultures. North American archaeology has traditionally been subdivided into prehistoric and historic periods. Cultural resources are also divided according to two broad, temporal categories: prehistory and history.

Management of cultural resources on federal lands depends on eligibility of resources for inclusion in the National Register of Historic Places. The National Register classifies cultural resources in terms of five major categories:

- *District:* A district is a geographically definable area that possesses a concentration or continuity of buildings, structures, or objects united by past events, design, or physical development. It may contain individual elements separated geographically but linked by association or history. A district classification is typically used when structures of an area do not all contribute to the cultural significance of the property.
- *Site:* Sites are locations of significant events, prehistoric or historic occupations or activities, buildings or structures, whether standing, ruined, or vanished, where the location possesses historic or prehistoric value. A site may also hold significance related to traditional cultural values when it can be associated with a real property.
- *Building:* A building is a structure, such as a house, church, barn, or similar structure, erected to shelter any form of human activity. A building may also connote a historically related complex of buildings, such as a farmstead or an industrial complex, if all structures contribute to the significance of the property.

- *Structure:* A structure is an engineering project that aids man's activities. It includes all standing structures not made for shelter.
- *Object:* An object is a thing of functional, aesthetic, cultural, historical, or scientific value that may be, by nature or design, movable yet associated with a specific setting or environment.

3.12.1 Cultural Resources Topics

3.12.1.1 Prehistory

Prehistory refers to the investigation of cultures before the availability of written records. Alaskan prehistory varies by region due to conditions that enhanced or limited human occupation. The extent of glacial coverage, and the rate and directions of glacial retreat, largely influenced the availability of resources within each region to support prolonged human occupancy and activity. Interior Alaska was probably inhabited at least 13,000 years ago, and the coastal regions were probably inhabited later.

3.12.1.2 History

History designates that period following the introduction and use of written documents as a form of communication and preservation of knowledge, from which textural resources may also survive. The timing of the transition from prehistoric to historic periods varies from region to region. In interior Alaska, the historic period begins in the 1860s when traders began entering the area. In south-central Alaska, the historic period probably began in the late 1700s.

Table 3.12.a Summary of Prehistory and History Periods of Interior and South-Central Alaska.

Era	Dates	Description
Interior Alaska Prehistory		
Paleoarctic Tradition	12,000 - 8,000 BP	Early inhabitants camped on terraces and bluffs above treeless steppes, hunted large mammals such as bison and mammoth; tools fashioned from stone, bone, antler, and ivory; artifacts include microblades and microblade cores.
Northern Archaic Tradition	6,500 - 1,000 BP	Adaptations due to boreal forest expansion, such as side-notched projectile points; tools include bifacial knives, microblades, end scrapers, and side-notched points.
Athabascan Tradition	2,500 - 150 BP	Varied settlement patterns, often nomadic culture, subsisting primarily on terrestrial animals; subgroups exhibit distinct cultural characteristics.
Interior Alaska History		
Early Contact	1810 - 1880s	Contact between aboriginal groups and Russians or English, probably at trading posts.
Gold Rush	1880s - 1928	Period of influx of Euroamerican settlement in interior Alaska in response to multiple gold discoveries.
Development of Infrastructure	1890s - 1910s	Establishment of roads and railway connecting interior Alaska with other areas.
Military Activities	1890s - present	Increased military presence in interior, beginning with establishment of Ladd Field.

Table 3.12.a cont. Summary of Prehistory and History Periods of Interior and South-Central Alaska.

Era	Dates	Description
South-Central Alaska Prehistory		
Early Holocene	8,000 - 6,000 BP	Oldest known sites; earliest inhabitants probably entered from interior and practiced terrestrial hunting and gathering; tools found are similar to Denali Complex of interior Alaska.
Middle Holocene	6,000 - 3,000 BP	Probable shift in subsistence from terrestrial to marine resources; poorly represented archaeological record.
Late Holocene	3,000 - 1,000 BP	Pacific Eskimo cultural affiliation; Norton and Kachemak traditions represented; tools include pottery, transverse knife (ulu); multiple sites found throughout Cook Inlet.
Late Prehistoric	1,000 - 250 BP	Athabascan material culture; house depressions, cobble spall scrapers, fire-cracked stone; probable association with Denaina Athabascans.
South-Central Alaska History		
American Era	1867 - 1938	Alaska purchase and gold rushes increase Euroamerican presence; growth of Cook Inlet as port, and later rail, terminus.
Military Era	1939 - present	Fort Richardson established; World War II and Cold War led to military increases.

3.12.1.3 Properties of Traditional, Religious, and Cultural Significance

PTRCSs are those properties that are associated with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of that community. Examples of properties that may be considered as PTRCSs are locations associated with traditional beliefs of an Alaska Native group about its origins, its cultural history, or the nature of the world. Other locations include areas where Alaska Native religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice and a location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historical identity (National Park Service undated). PTRCSs are identified through consultation with Tribes that have knowledge of the geographical area of interest.

3.12.1.4 Archaeological Surveys

Archaeological survey is the process of looking at an area for potential archaeological material. This is performed through literature research to identify the potential of archaeological material existing in area of interest through survey work performed earlier, as well as looking at ethnographic, historic, and other research literature. Based on this information, a pedestrian survey is conducted over the area of interest with sub-surface examinations occurring either where the potential is high for archaeological material or based on a testing strategy. All sites identified through this method are further examined to determine extent and eligibility for listing in the National Register of Historic Places.

3.12.1.5 Architectural Surveys

Architectural survey is the process of looking at buildings and structures with the intent of identifying those that may be eligible for listing in the National Register of Historic Places. The process begins through archival and literature searches to determine the potential of finding historic properties in the area of interest followed by field surveys to record identified buildings and structures. Evaluations of buildings are performed under established historic contexts (i.e., World War II, Cold War Era) that have been identified as having significance as defined by the National Register of Historic Places. The survey's intent is also to determine whether identified buildings have historic integrity as required by the National Register of Historic Places.

3.12.2 Fort Wainwright

3.12.2.1 Interior Prehistory

Alaska's earliest inhabitants were nomadic hunters traveling in small bands. They arrived in interior Alaska at least 13,000 years ago, beginning a habitation that persisted through the arrival of European traders in the late 1810s. The region's ice-free, steppe-tundra environment during the Wisconsin Ice Age set the stage for this long habitation period (Pewe 1975).

The nomadic lifestyle of Alaska's earliest inhabitants, the organic nature of the materials they manufactured and used, and changed environmental conditions have made it difficult to find evidence of their cultures. Evidence is generally limited to lithic (stone) artifacts such as projectile points, cutting tools, scrapers, waste flakes from the manufacturing of these tools, and hearths. Archaeologists generally divide interior Alaska's prehistory into three broad archaeological themes according to the tools and tool-making technology of the three prehistoric groups that inhabited the region at various times. These are the Paleoarctic Tradition (12,000-8,000 years ago), the Northern Archaic Tradition (6,500-1,000 years ago), and the Athabascan Tradition (2,500-150 years ago).

Paleoarctic Tradition (12,000-8,000 years ago)

The Paleoarctic Tradition represents the earliest human group known to inhabit Alaska. More information on this period can be found in Appendix E. Archaeological sites containing prehistoric material have been found on Fort Wainwright (FWA). None contain datable material that can assign them to any specific time period.

Northern Archaic Tradition (6,500-1,000 years ago)

The Northern Archaic Tradition appeared about 6,000 years ago as an adaptation to the then-forested environment of Interior Alaska and may have persisted until about 1,000 years ago. More information on this tradition may be found in Appendix E. Archaeological sites containing prehistoric material have been found. None contain datable material that can assign them to any specific time period.

Athabascan Tradition (2,500-150 years ago)

Athabascans are generally divided linguistically and geographically into subgroups that inhabit or have inhabited interior Alaska and Canada. More information on this tradition can be found in Appendix E. Archaeological sites containing prehistoric material have been found. None contain datable material that can assign them to any specific time period.

3.12.2.2 History

The history of interior Alaska can be divided into four historic themes according to various kinds and levels of Euro-American activities. These are Early Contact (1810s-1880s), Gold Rush (1880s-1928), Development of Infrastructure (1890s-1910s), and Military Activities (1890s-present).

Early Contact (1810s-1880s)

First contact between the Athabascan and European cultures probably commenced with trade goods from Russian fur trading posts at Taral, on the Copper River, and Nulato, on the Yukon River (Hanable 1982), and a British trading post established where the Porcupine River joins the Yukon River in 1847. More information on this period can be found in Appendix E.

Several village sites associated with the early contact period have been reported near FWA Main Post, two just northwest of the fort's boundary and one near Fairbanks (Reynolds 1986).

Gold Rush (1880s-1928)

Gold discoveries in 1886 and 1894 northeast of Fairbanks led to an influx of Anglo-American settlements in the Tanana Valley (Appendix E). Further gold discoveries in 1902 and 1903 in the immediate vicinity of Fairbanks led to a dramatic increase in the town's population, to 15,000 in 1909 (Naske and Rowinski 1981). No sites associated with early mining have been found on Main Post (Neely 2001).

Development of Infrastructure (1890s-1910s)

The initial means of transport to interior Alaska was by riverboat along the Yukon River to the Tanana River, either upstream from St. Michael or downstream from Whitehorse in Canada. An overland trail was established in 1899, from Valdez to Eagle, and later to Fairbanks. The original Valdez/Fairbanks Trail crossed the Main Post and followed what is now Gaffney Road (Neely 2002). The Alaska Railroad was later completed, linking Fairbanks to Anchorage (Appendix E).

Military Activities (1890s-present)

Military aviation activities began in the Fairbanks area in 1913 (Cloe and Monaghan 1984). The town became the aviation hub for interior Alaska by 1928 (Cashen 1971; Robe 1970). Federal legislation in 1935 and 1937 established Ladd Airfield near Fairbanks, which became the home of the Cold Weather Detachment in 1940 (Cloe and Monaghan 1984).

Ladd Field was affected by World War II, following Japan's invasion of the Aleutian Islands in June 1942. The facilities at Ladd Field expanded rapidly due to increased activities of the Sixth Air Depot Group, the Cold Weather Test Station, and the Air Transport Command.

Ladd Field also served as the North American terminus of the Alaska-Siberia Lend-Lease program route, where Soviet pilots received U.S. aircraft and training before flying them to Siberia. Ladd Field was designated a National Historic Landmark in 1984 in recognition of its national significance during World War II and the Lend-Lease program.

In 1946, at the start of the Cold War, Strategic Air Command organized its first air unit at Ladd Field to begin developing a system of polar navigation (White 1994). After the formation of the U.S. Air Force in 1947, Ladd Field was designated Ladd Air Force Base.

However, the Army's mission at Ladd Field continued, with anti-aircraft and ground defense and cold-weather testing and training. The Army's cold-weather testing and training missions shifted from Ladd Field to Fort Greely in the mid-1950s. In 1961 the U.S. Air Force transferred Ladd Air Force Base to the Army, which was then renamed Fort Jonathan Wainwright.

With the introduction of the Intercontinental Ballistic Missile in the 1960s, FWA's anti-aircraft mission diminished, and the fort's primary mission became peacetime Army deployment, the defense of Alaska, and coordination of Army National Guard and Reserve activities in Alaska. In the 1970s Arctic training began to be emphasized.

In 1986 the 6th Infantry Division (Light) was activated at FWA to function as a rapid deployment force. New associated construction included a Post Exchange, gymnasium, medical center, and battalion headquarters. This was the first new construction on FWA since the early 1950s.

3.12.2.3 Properties of Traditional, Religious, and Cultural Significance

Consultation with Tribes to identify PTRCSs on FWA has not occurred. U.S. Army Alaska and the U.S. Air Force have contracted with Tanana Chiefs Conference, Inc. to identify PTRCSs on lands managed by the military in the Interior of Alaska. This is an ongoing project.

It is expected that this contract will, along with future consultations with Tribes, identify PTRCSs. This is expected to be manifested in Native place names of geographical features, places where berry collecting takes place, migratory routes of game important to the Tribes' subsistence practices, areas that were frequented as camps from which subsistence activities occurred, places associated with oral histories, and other cultural practices other then those centered on subsistence practices.

3.12.2.4 Archaeological Surveys

Five archaeological surveys have been conducted on FWA Main Post (Appendix E). These surveys have either focused on high potential areas of Fort Wainwright or were related to construction projects. Survey sites include the southern slopes of Birch Hill, various barrow sources just south of the cantonment area, and small arms ranges between Richardson Highway and Tanana River.

Six archaeological sites have been found on FWA Main Post, located north of Chena River and along the southern slopes of Birch Hill (Appendix E). Only one site has been evaluated for eligibility for inclusion in the National Register of Historic Places and it was determined not eligible. The remaining five sites have not been evaluated.

Two archaeological surveys have been conducted in the Tanana Flats Training Area (TFTA), beginning in 1973 (Appendix E). Forty-three sites have been found in three distinct areas on TFTA. Of these sites, 12 have been determined eligible for inclusion in the National Register of Historic Places, 20 are not eligible, and 11 have not been evaluated for eligibility.

Two surveys have been conducted on Yukon Training Area (YTA) (Appendix E). Eight archaeological sites have been found in there. Six of the sites are not eligible for listing in the National Register of Historic Places because they were located in highly disturbed areas. Two sites have not been evaluated for eligibility.

3.12.2.5 Architectural Surveys

The entire FWA Main Post has been inventoried and evaluated for eligibility for inclusion in the National Register of Historic Places under the World War II and the Cold War historic contexts. Under the World War II context, Ladd Field has been designated a National Historic Landmark. The Ladd Field National Historic Landmark includes 38 buildings and structures (Appendix E).

Under the Cold War context, Main Post has been identified and determined eligible for inclusion in the National Register of Historic Places, but it has not been formally nominated for listing. Seventy-one buildings and structures contribute to the Ladd Air Force Base Historic District (Appendix E). In 2000, the Center for Environmental Management of Military Lands developed a Cold War historic context for Ladd Air Force Base. Based on this study, all buildings on FWA were evaluated under this context. This resulted in the identification of the Ladd Air Force Base Historic District.

No building surveys have been conducted in the TFTA. Based on studies conducted by U.S. Army Alaska, no historic buildings are expected to exist on the training area (Neely 2001; Neely 2002; Price 2002).

Two Nike Missile sites existed on YTA, Site Mike and Site Peter. Each site consisted of a Battery Control Area and a Launch Area. Due to clean-up activities in the late 1980s and early 1990s, these sites no longer have historic integrity and are not eligible for inclusion in the National Register of Historic Places (Denfeld 1988; Denfeld 1994).

An early mining study indicates that no significant mining activities occurred on YTA (Neely 2001). The Pine Creek mining complex in the northeastern corner of YTA was listed as a potential historic property (Higgs et al. 1999); however, based on the early mining study (Neely 2001), it is ineligible for listing in the National Register of Historic Places. No other historic buildings are expected to exist on YTA.

3.12.3 Donnelly Training Area

Although cultural resources in all five National Register categories potentially exist on Donnelly Training Area (DTA), only one district is eligible for management under the National Historic Preservation Act.

3.12.3.1 Prehistory

Archaeologists generally divide interior Alaska's prehistory into three broad archaeological themes; the Paleoarctic, Northern Archaic, and the Athabascan Traditions. Sites representing each of these have been discovered on DTA. These three prehistoric groups are discussed under Section 3.12.2.1, Interior Prehistory, and are further described in Appendix E.

3.12.3.2 History

The history of interior Alaska can be divided into four historic themes: Early Contact, Gold Rush, Development of Infrastructure, and Military Activities. The history of DTA is discussed under Section 3.12.2.2, Fort Wainwright History, and in Appendix E.

3.12.3.3 Properties of Traditional, Religious, and Cultural Significance

Consultation with Tribes to identify PTRCSs on DTA has not occurred. U.S. Army Alaska and the U.S. Air Force have contracted with Tanana Chiefs Conference, Inc., to identify PTRCSs on lands managed by the military in the Interior of Alaska. This is an ongoing project.

It is expected that this contract will, along with future consultations with Tribes, identify PTRCSs. This is expected to be manifested in Native place names of geographical features, places where berry collecting takes place, migratory routes of game important to the Tribes' subsistence practices, areas that were frequented as camps from which subsistence activities occurred, places associated with oral histories, and other cultural practices other then those centered on subsistence practices.

3.12.3.4 Archaeological Surveys

Initial archaeological research in central Alaska resulted from isolated discoveries by area residents, road construction crews, scientists and others (Rainy 1939; Skarland and Giddings 1948). A total of 105 archaeological sites have been found on DTA, but less than 1% of the training area has been surveyed (Appendix E). Of these sites, 18 are eligible for listing in the National Register of Historic Places and 31 are not eligible for listing. The remaining 56 sites require further evaluation to determine their eligibility.

3.12.3.5 Architectural Surveys

No systematic surveys have been conducted to identify historic buildings and structures on DTA. Based on the site, context, and USARAK's early mining study (Neely 2001), Ptarmigan Cabin was deemed ineligible for inclusion in the National Register of Historic Places. The State Historic Preservation Office concurred with the Army's Ptarmigan Creek finding.

3.12.4 Fort Richardson

Given its geographic location and the nature and location of glaciation during the Ice Age, the prehistory and history of Fort Richardson (FRA) and south-central Alaska differ from that of interior Alaska. Although cultural resources in all five National Register categories potentially exist on FRA, only one district and one site have been determined eligible and are managed under the National Historic Preservation Act.

3.12.4.1 Cook Inlet Prehistory

Human occupation of the Cook Inlet region, in which FRA lies, became possible only after glacial retreat during the late Pleistocene era. Geologic evidence suggests that areas suitable for human occupation could have opened as early as 15,000 years ago (McMahan and Holmes 1996). However, the earliest known site in the Cook Inlet region, the Beluga Point site, is at most 8,000 years old. The prehistory of the Cook Inlet region is not understood as well as other Alaskan regions. The state of knowledge is based on cultural materials found at a few key sites.

Early Holocene Era (8,000-6,000 years ago)

The most significant site in the Cook Inlet region is the Beluga Point site on the northern shore of Turnagain Arm near Anchorage. Artifacts from Beluga Point are similar to those found at Long Lake in the upper Matanuska River Valley and at sites in the interior of the Kenai Peninsula (McMahan and Holmes 1996). Artifacts from these sites have been associated with the Denali Complex of interior Alaska (Bacon et al. 1986). Peoples occupying the region probably entered

from interior Alaska and practiced terrestrial hunting and gathering. No sites from this era have been identified on FRA.

Middle Holocene Era (6,000-3,000 years ago)

The period from 6,000 to 3,000 years ago is poorly represented in the region's archaeological record (McMahan and Holmes 1996). The most important finds are also from the Beluga Point site and date prior to 3,000 years ago. The findings suggest affiliation with the Ocean Bay Tradition (6,000-5,000 years ago), a cultural tradition associated with the Alaska Peninsula and Kodiak Island. People of the Ocean Bay Tradition were specialized for coastal life and practiced marine subsistence with emphasis on fish and marine mammals. No sites from this era have been identified on FRA.

Late Holocene Era (3,000-1,000 years ago)

Numerous sites in the Cook Inlet region dating from 3,000 to 1,000 years ago indicate Pacific Eskimo cultural affiliation. For example, a third component from the Beluga Point site, dating between 2,200 and 2,500 years ago, suggests affiliation with the Norton Tradition (3,000-1,000 years ago), a Pacific Eskimo tradition of the Bering Sea coast (Bacon et al. 1986). No sites from this period have been identified on FRA.

Other sites in the region suggest the influence of the Kachemak Tradition (3,500-1,000 years ago), which existed around the Pacific Rim from the Alaska Peninsula and Aleutians to present-day Washington State. Kachemak components have been found at the Fish Creek Site just south of Knik, the Cottonwood Creek site, and the Moose River site (McMahan and Holmes 1996).

Late Prehistoric Era (1,000-250 years ago)

Archaeological evidence suggests that people with an Athabascan material culture had entered the Cook Inlet region by 700 years ago. Many late prehistoric Athabascan sites exist in the region and are believed to be associated with the Tanaina, or Denaina, Athabascans who were in the region when Captain Cook arrived. No sites from this period have been identified on FRA.

3.12.4.2 History

In 1778 Captain Cook encountered the Denaina people in Cook Inlet. This event marked the first recorded contact of the native people with Europeans. However, Russian fur traders, who began operating in the Alaskan territory early in the 18th century, likely made earlier contact.

Denaina subsistence was based primarily on caribou and the five species of salmon, as well as Pacific harbor seal, moose, bear, mountain goat, squirrel, and Dall sheep (Townsend 1981). The Denaina apparently borrowed many cultural traits and tools, such as the kayak, from neighboring Eskimo groups (Bacon et al. 1986).

Several Denaina villages were located near FRA. Eklutna, approximately 10 miles from the post, is the only one still in existence. The most significant native village of the area was Knik, located near the mouth of the Knik and Matanuska rivers. A number of fish camps were used at Ship Creek, Fire Island, Point Woronzoff, and the mouth of the Eagle River (Bacon et al. 1986).

American Era (1867-1938)

The U.S. purchase of Alaska in 1867 led to greater Euroamerican influence in the region. Exploration and immigration by Anglo-American trappers, miners, and settlers increased after the

purchase, and increased further following discovery of gold in the late 1800s, in both southeast and interior Alaska.

The growth of Anchorage was closely associated with development of the Alaska Railroad, which began as a construction camp and headquarters of the Alaska Railroad in 1913. In 1912, a territorial government was established in Alaska, and the Alaska Railroad, linking Seward, Anchorage, and Fairbanks, was completed in 1923.

The Great Depression resulted in increased construction and development of social infrastructure throughout Alaska, including schools, bridges, trails, harbors, and water systems (Bacon et al. 1986). In addition, 202 families were relocated to agricultural land in the Matanuska Valley during the 1930s (Bacon et al. 1986), and in 1935 a highway was constructed, connecting the new agricultural colony with Anchorage. The remnant of this highway, the Old Richardson Highway, runs across Fort Richardson.

Military Era (1939-present)

FRA was established in 1939 as Elmendorf Field, and renamed Fort Richardson in 1940. During World War II, FRA served as a coordinating spot for the war efforts in Alaska. Military strength in Alaska had been less than 3,000 Soldiers, but soon grew to 7,800 at FRA, including the 4th Infantry, 81st Field Artillery, and 75th Coast Artillery.

After World War II, FRA was used for training and administrative support for Army forces in Alaska. The post became headquarters for the newly established U.S. Army Alaska in 1947. U.S. Army Alaska was superseded by the 172nd Infantry Brigade (Alaska) in 1974 and by the 6th Infantry Division (Light) in 1986. Following the Cold War, the 6th Infantry Division (Light) was deactivated, and Army forces were reorganized under U.S. Army Alaska.

3.12.4.3 Properties of Traditional, Religious, and Cultural Significance

Several locations on FRA have been identified as areas of traditional use by Denaina Athabascans (Davis 1994). While a number of these locations have not been positively identified in the field, it is likely that archaeological sites are associated with many of these. Traditional use locations include locations along Clunie Creek, coastal bluff locations north of Eagle River, and the Knik Arm shoreline of Training Area 1C (Davis 1994). Perhaps the most significant traditional use location is the School Fish Camp Site. This site, located on the shore of Knik Arm in the western portion of Training Area 1C, was the location of a subsistence fishing location used by a Bureau of Indian Affairs vocational school from about 1924 until 1946 (Davis 1994). Initial consultation with Tribes has also indicated that Eagle River Flats was an important subsistence resource area. Fish camps in this area were shared between Tribes.

3.12.4.4 Archaeological Surveys

Previous archaeological work at FRA includes at least seven projects since the late 1970s (Bacon 1979; Holmes 1979; Reynolds 1996; Shaw 2000; Steele 1979, 1980a; Veltrey 1978). Of these surveys, only Steele, Reynolds, and Shaw reported the discovery of archaeological sites (Appendix E). The works of Shaw and Steele indicate that moraine features, scattered across FRA and oriented roughly northeast by southwest, are more likely to contain archaeological sites.

In addition to the archaeological sites on FRA, several locations of historical and ethnographic significance exist. Although the exact locations are not known, historical and ethnographic documentation indicate that they all have the potential to be found.

The first two features are portions of the Iditarod Historic Trail: ANC-270, the Eagle River-Knik Trail, and ANC-280, the Girdwood-Ship Creek Connecting Trail. Although ANC-270 probably lies outside of the base, a connecting trail from Anchorage to ANC-270 existed. This connecting trail followed the Eagle River drainage from Knik Arm to Clunie Lake, and on to Birchwood (Neely 2001). This route probably followed Clunie Creek north from Eagle River to Clunie Lake. The route crosses one of the proposed (SBCT) ranges.

3.12.4.5 Architectural Surveys

Two building surveys have been conducted on FRA, and these addressed only Nike Site Summit (Alaska State Historic Preservation Office 1995), and select Cold War-era buildings (Blythe 2000). A 1995 survey addressed the property as a historic district and identified 25 contributing buildings and structures (Appendix E). The evaluation resulted in the nomination and subsequent listing of Nike Site Summit in the National Register of Historic Places.

In 2002 the Center for Environmental Management of Military Lands developed a Cold War historic context for FRA. Based on this context, only buildings associated with the Nike Site Summit were found eligible for inclusion in the National Register of Historic Places.

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3.13 SOCIOECONOMICS

Topics discussed in this section include:

- Alaska's socioeconomic environment
- Social and economic environments in the regions closest to U.S. Army Alaska (USARAK) installations
- Off-post military spending
- Recreational hunting and fishing from an economic perspective

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional information on socioeconomics is presented in Appendix E.

3.13.1 Socioeconomic Topics

This section places the Army posts of Fort Wainwright (FWA), Donnelly Training Area (DTA), and Fort Richardson (FRA) in the context of the statewide socioeconomic environment.

3.13.1.1 Demographics

Table 3.13.a lists some of the pertinent demographic characteristics of Alaska in comparison to the nation as a whole. Alaska has the smallest per square mile population in the country, at 1.1 persons per square mile in comparison to the national average of 79. Alaska also has a slightly higher population growth than the average as the economy has generally performed well since the recession of the mid-1980s. Alaska is a "younger" state as there is a higher proportion of younger individuals and less than half the national average of individuals over age 65. The harsh environment discourages retirement, but relatively attractive employment compensation attracts working-age individuals. Alaska has a lower proportion of both white and black persons because of the 15.6% population base of Alaska Natives. It also has a lower proportion of females.

The disparity between living in the bush (off the road system) and living on the road system is a primary distinction for communities in Alaska. Generally speaking, income, education, public services and employment levels are lower in the bush where poverty levels are higher. Utility systems in the bush, particularly wastewater treatment, are either expensive, inferior or nonexistent. In bush communities, subsistence plays a much more important role in the economy. Harvesting fish and game populations is the primary source of subsistence. It is difficult to place a value on these activities when the communities tend to reject market evaluation of them. These communities are off the road system and generally not in the region of influence where, for the most part, the military is housed and trains. There are a few bush communities in the region of influence near DTA.

Table 3.13.a State of Alaska and United States Demographic Data for 2000.

Demographic	Alaska	USA
Population, 2001 estimate	634,892	284,796,887
Population percent change, April 1, 2000-July 1, 2001	1.30%	1.20%
Population, 2000	626,932	281,421,906
Population, percent change, 1990 to 2000	14.00%	13.10%
Persons under 5 years old, percent, 2000	7.60%	6.80%
Persons under 18 years old, percent, 2000	30.40%	25.70%
Persons 65 years old and over, percent, 2000	5.70%	12.40%
White persons, percent, 2000	69.30%	75.10%
Black or African American persons, percent, 2000	3.50%	12.30%
American Indian and Alaska Native persons, percent, 2000	15.60%	0.90%
Asian persons, percent, 2000	4.00%	3.60%
Native Hawaiian and Other Pacific Islander, percent, 2000	0.50%	0.10%
Persons reporting some other race, percent, 2000	1.60%	5.50%
Persons reporting two or more races, percent, 2000	5.40%	2.40%
Female persons, percent, 2000	48.30%	50.90%
Persons of Hispanic or Latino origin, percent 2000	4.10%	12.50%
White persons, not of Hispanic/Latino origin, percent, 2000	67.60%	69.10%
High school graduates, persons 25 years and over, 1990	280,185	119,524,718
College graduates, persons 25 years and over, 1990	74,497	32,310,253
Housing units, 2000	260,978	115,904,641
Homeownership rate, 2000	62.50%	66.20%
Households, 2000	221,600	105,480,101
Persons per households, 2000	2.74	2.59
Households with persons under 18, percent, 2000	42.90%	36.00%
Median household money income, 1997 model-based estimate	$43,657	$37,005
Persons below poverty, percent, 1997 model-based estimate	11.20%	13.30%
Children below poverty, percent, 1997 model-based estimate	16.20%	19.90%

Source: U.S. Bureau of the Census, Year 2000

3.13.1.2 Housing

Housing is an integral part of Army planning and as such the subject undergoes continual annual study. This occurs at both Army-wide and facility levels. Housing is important as a quality of life issue for soldiers. In addition the Army's housing decisions affect the local community. Both FWA and FRA produce housing planning documents as well as assessments of the local rental housing market. FRA's Family Housing Community Plan of March 2001 received an award from the American Planning Association.

Some housing is either provided by the military on-post or through leased community housing neighborhoods off-post. Soldiers that are not assigned government housing are paid an allowance called a Basic Authorization for Housing (BAH), which is based upon an annual survey of local rental costs. The Department of Defense objective is to increase the BAH rates so as to eliminate out-of-pocket expenses for military tenants in civilian communities. This would allow military families to successfully compete in the Fairbanks and Anchorage rental markets.

Military home ownership and owner-occupied housing in Alaska are below national averages when compared to similar racial, age or income groups. These low rates are due to the transitory nature of military residents, the attractiveness of government-provided housing, affordability, and the greater flexibility associated with renting. According to Census 2000 statistics, the average Alaskan renter-occupied home has 2.49 occupants. Based on historical data, FWA shows approximately 1.4 and FRA 1.3 dependents per uniformed military (USARAK Public Information Office 1995-2002). Military household size (approximately 2.4 at FWA and 2.3 at FRA) is about the same size as the average Alaskan renter-occupied home.

Department of Defense surveys (Defense Manpower Data Center 2002) indicate that home ownership in the military increases dramatically with years of service, increasing from 14% home ownership rates for those with less than five years service to 53% for those with 20 or more years. It should be noted that many military home purchases occur where the purchasers plan to eventually retire, as opposed to purchasing at their current duty station.

3.13.1.3 Economic Activity

Table 3.13.b depicts the largest employers in Alaska. There are only four private sector firms on this list. The military is the largest single employer when looking at uniformed personnel. If non-uniformed employment at the various posts or bases in Alaska is included, the total employment figure for the military exceeds 24,000 statewide.

Table 3.13.b Alaska's Top Ten Public and Private Industry Employers for 2001.

Employer	Number of Employees
Uniformed Military	17,802
Federal Government	16,800
State of Alaska	16,152
University of Alaska	6,344
Anchorage School District	6,293
Providence Hospital	3.369
Safeway/Carrs	3,252
Municipality of Anchorage	2,950
Fred Meyers	2,262
Wal-Mart/Sam's	2,178

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section in Fried 2002.

Alaska's average monthly employment and earnings by standard industrial classification is illustrated in Table 3.13.c. It is important to note that uniformed military is not tracked regularly in labor publications because it does not participate in the unemployment compensation program. Uniformed military has been added in bold at the bottom of the table for comparison. Data provided by the Department of Labor in the table below do not include uniformed military in totals for the government and all industries categories.

Table 3.13.c Alaska Average Monthly Employment and Earnings by Industry Classification for 2000.

Industrial Classification	Average Monthly Employment	Average Monthly Earnings ($)
Total		
All Industries	280,693	2,893
Private Ownership	208,475	2,775
Government	72,218	3,232
By Industry		
Agriculture, Forestry and Fishing	1,618	2,178
Mining	10,140	7,198
Construction	14,088	3,924
Manufacturing	13,923	2,677
Transportation, Communication and Utilities	27,484	3,676
Total Trade	57,525	1,861
Finance, Insurance and Real Estate	11,524	3,046
Services	71,975	2,304
Federal Government	17,139	4,035
State Government	22,152	3,161
Local Government	32,927	2,862
Uniformed Military	**17,802**	**3,464**

Source: Alaska Department of Labor and Workforce Development 2001; USARAK Public Affairs Office 1995-2002.

If uniformed military was included, total government employment in Alaska would exceed 90,000 – over 30% of all jobs in total. The most significant "base" industries are mineral extraction (oil in particular), fisheries, tourism and government. The other sectors are secondary industries (services, construction, trade, transportation, communication, utilities, finance and so forth) consequent to the "base" industries in Alaska and are not themselves the source of economic activity.

Because the state owns nearly 100 million acres of land, it has derived over 80% of its revenues through resource extraction on state lands. Alaska is the only state in the nation with no state sales tax, income tax, or individual property tax. Residents in fact earn a yearly dividend from the state upon the earnings from excess oil revenues placed in a "Permanent Fund," which has grown to over $25 billion. The state uses oil revenues to generate an economy based upon public expenditures, the largest being education. It is recognized that although oil extraction is the

original source of these revenues, the Alaskan economy has come to rely on state expenditures as an economic "base."

Tourism has been cited as a major industry in Alaska, but it needs to be distinguished from the "visitor" industry that has been estimated as a $1.3 billion industry for 2001. The visitors to Alaska include business, mixed business and pleasure, visiting friends and relatives, and pure pleasure/vacation travelers. It appears that the great majority of expenditures by visitors are as tourists but contribution from the other components, including the military, is significant.

Total gross state product was $27 billion in 2000 (the most recent year of data available). By far the largest individual component was mining (which includes oil extraction) at $6 billion. The military contribution was $1.2 billion. Tourism and commercial fishing contributions are roughly equivalent to the military's contribution.

There are other components of the state's economy that deserve mention, such as logging and timber processing. However, this industry has been in decline for a decade and total employment in the lumber and processing sector was about 1500 in 2001. It follows that the majority of Alaska's economy hinges upon minerals, fisheries, tourism, and government (in particular, the military).

Alaska has had 13 consecutive years of growth and in 2001 it registered the second lowest level of unemployment in its history. A more balanced economy has developed and Alaska has not had the wild booms and busts of previous history. Presently, oil markets remain robust and a new natural gas pipeline is on the horizon.

3.13.1.4 Public Safety

Crime statistics for Alaska and the cities of Fairbanks and Anchorage were collected for the following categories of crimes: murder, rape, robbery, aggravated assault, burglary, larceny-theft and motor vehicle theft. These were compared to quarterly reports from USARAK's Provost Marshall Office for the years 1999 through 2002. All data was on a "reported crimes" basis (as opposed to convictions) and were compared on a "crimes per 1,000 population" basis.

In every category, the reported crimes from the Provost Marshall's office were below those for the State of Alaska and the cities of Fairbanks and Anchorage whether viewed from an on-post, off-post, or total perspective. They were also lower whether viewed from complaints regarding a uniformed military or total post personnel perspective.

The following categories of child protection statistics were compiled for the state and for FRA and FWA: mental injury, sexual abuse, physical abuse and neglect (USARAK Director of Community Activities 2002). The data was for fiscal year 2001-2002 (the most recent year available) and was arranged in a per capita format for comparison. In every category, FRA fell below statewide averages – far below for sexual abuse and neglect. Data for FWA showed that sexual abuse and neglect were also lower than statewide averages while levels of mental injury and physical abuse were significantly higher.

3.13.2 The Fairbanks North Star Borough and Fort Wainwright

3.13.2.1 Background

The Fairbanks North Star Borough is the second largest population area after Anchorage. There were 82,840 people in the borough as of December 2001, according to the Alaska Division of Community and Economic Development. The Fairbanks North Star Borough includes the

organized municipalities of Fairbanks and North Pole within its boundaries. Doyon, Ltd. serves as the regional Native Corporation for this area that is subject to the Alaska Native Claims Settlement Act. Appendix E lists village corporations within the Doyon region.

Eielson Air Force Base and FWA are also within the Fairbanks North Star Borough. Each has an important contribution to the economic and social history of the borough area. Together, they comprise the borough's largest economic engine.

3.13.2.2 Demographics

As with other metropolitan areas of the state, Fairbanks has a somewhat higher proportion of white individuals and lower percentage of Native individuals as compared to the statewide average (Table 3.13.d). The proportions are quite similar to Anchorage. The age distribution of Fairbanks' population reflects a higher than national average proportion of younger-aged individuals. In addition, there is a more significant difference in the male/female ratio. This is in part due to the relatively greater size of the military in proportion to the population of Fairbanks.

Table 3.13.d Fairbanks Population Profile for 2000.

Population by Race	Number	Percent
Population in 2000	82,840	100
White	64,439	77.8
Alaska Native, or American Indian	5,714	6.9
Black or African American	4,843	5.8
Asian	1,720	2.1
Hawaiian Native	245	0.3
Other Race	1,414	1.7
Two or More Races	4,465	5.4
Hispanic Origin (Any Race)	3,440	4.2

Source: Alaska State Department of Community and Economic Development, Year 2002.

3.13.2.3 Housing

There were over 33,200 housing units in the Fairbanks North Star Borough when the 2001 Family Housing Market Analysis for FWA (USARAK 2002i) was undertaken. FWA accounted for about 1,950 total housing units, including leased off-post housing neighborhoods. As total housing requirements were estimated at about 3,100, approximately 1,150 units of additional off-post housing units were required.

Census statistics for 2000 reflect only 48% owner occupation in Fairbanks residences, almost 20% below the national average. This is due to a sizeable proportion of the population without long-term residency agendas, including students of University of Alaska's main campus and FWA military families (who historically stay no longer than three years.)

The 2001 Family Housing Market Analysis for FWA estimated that (of the non-mobile home rentals) 10% of rental housing in Fairbanks proper and 10-20% of that in outlying areas is considered substandard (due to size, egress, code violations, lack of insulation, structural problems, or a lack of indoor plumbing.) The reliance on fuel oil as the primary heating source for Fairbanks homes (78%) was not considered to have an impact on the adequacy of housing.

A Rental Housing Market Assessment (Information Insights 2002) surveyed property managers and builders in the Fairbanks area on plans for future expansion of rental housing. The study identified cost of materials, lack of growing demand for rental housing, rental rate competition, and the boom-bust nature of the Fairbanks economy as being the most common detractors from any significant (i.e., greater than four-plex) growth in rental housing construction. The survey also revealed that long-term leases (20-25 years) may help remove many of the impediments to large-scale construction. The boom-bust nature of Fairbanks' economy has made builders very cautious and current rents are "low" relative to the risk. Long-term leases help eliminate that concern by removing those cyclical downturns in the rental market where apartments are vacant.

The Army intends to expand and upgrade its housing at FWA through a series of construction and revitalization projects detailed in the Family Housing Master Plan for Fort Wainwright (USARAK 2003b). An Environmental Assessment (EA) is currently underway to analyze these projects (USARAK 2003c). As a part of the FWA Family Housing Master Plan, all FWA housing units constructed prior to 1988 will be either revitalized or demolished and eventually replaced. Until these projects are completed, recurring shortages of on-post housing could result in increased demand for off-post rentals by Army personnel. Family Housing Master Plans, and the Family Housing Market Analyses which drive these plans, are required to be updated every three years.

3.13.2.4 Public and Social Services

Fairbanks serves as the major transportation hub for interior Alaska and for oil operations on the North Slope of Alaska. The Fairbanks International Airport Facility provides passenger and cargo service. The Alaska Railroad terminates in Fairbanks. The Richardson Highway starts in Fairbanks and joins with the Alaska Highway in Delta Junction to connect interior Alaska with Canada and the "lower 48." There are no roads from Fairbanks leading west.

Health care services are provided by two hospitals, several clinics and the Bassett Army Community Hospital on FWA. There are some smaller, specialized services both private and public. An emergency air carrier also operates in Fairbanks for transportation to Anchorage.

Due to level funding appropriations from the State of Alaska, coupled with increases in the demand for social and family services (including counseling, daycare, parenting classes, and investigation/intervention for abuse and neglect), family services are insufficient to meet current needs.

3.13.2.5 Public Schools

Fairbanks schools have a lower student-to-teacher ratio and a higher expenditure per pupil than the national average. They also have a higher proportion of Native Alaskan students than both the national and state averages. Fairbanks North Star Borough students score higher than the state and national averages on achievement tests. However, the 6.6% dropout rate is much higher than the national average. The school districts in Alaska are largely funded by the State of Alaska. In the well-developed economic regions of Fairbanks and Anchorage, local contribution to the school district's operating budget is around 30%. It is considerably less in rural areas with limited tax bases.

Federal Impact Aid for education is designed to offset the lack of local property taxes on federal properties within school districts. A partial payment is made for qualifying children living off-post while "full" payment is made for qualifying children on-post. It adjusts for more heavily impacted areas, number of children with disabilities, and the proportion of children in low-rent housing. A special provision of the Federal Impact Aid law allows Alaska to file a joint

application for the Anchorage and Fairbanks school districts. Additionally, each district applies for some funds separately. Doing so allows the state to maximize the amount of impact aid received (Marilyn Hall, personal communication 2002.) A full discussion of the Federal Impact Aid program is presented by the U.S. Department of Education (USDOE 2003).

Total annual cost of education per student is determined by a school district's operating cost and debt service. Operating costs are straightforward and cover expenses such as employee salaries, utilities, and building maintenance. Debt service is payment on money borrowed for school construction. Local school districts issue bonds for construction and then make annual debt service payments to bondholders. Looking at the capital project budget can be misleading since it might be 50 million one year and zero the next. Debt service is used in cost per student calculations since it reflects an annualized capital cost for construction. These payments are substantially reimbursed by the state at a rate of 70% to 90% depending on the legislature (Fairbanks North Star Borough Financial Plan 2003).

The Fairbanks North Star Borough School District operating budget is about $7,800 per student based on projected students for 2003-2004 (Fairbanks North Star Borough School District Financial Plan 2003). The total Fairbanks per-student cost, best viewed by the school district's operating costs and debt service, is about $8,600. The local property tax share is about $2,300 per student. Using the conservative 70% figure for debt reimbursement by the State of Alaska results in a total annual per-student cost for the local property taxpayer of at most $2,500 (Table 3.13.e).

Table 3.13.e Education Costs for the Fairbanks North Star Borough School District for Fiscal Year 2004.

Education Costs – Fairbanks North Star Borough School District	
School district operating budget per student	$7,800
School district debt service per student	$800
Total per student cost to local school district (operating budget + debt service)	**$8,600**
Local property tax contribution per student	$2,300
Local debt service payment (debt x .3) per student	$200
Total per-student cost to local property tax payers	**$2,500**
Federal Impact Aid per student living on post	**$3,752**

Federal Impact Aid has averaged $3,752 per on-post student at FWA over the past three years (Mindy Lobaugh, personal communication 2003). Students living off-post are on properties that contribute to the property tax base just as other local residents do. Federal Impact Aid has made an additional payment of about $60 per off-post student over the past two years. Impact Aid more than offsets the lack of property tax paid by students living on post.

However, Alaska carries an unusual burden for the cost of educating students associated with military presence because of Alaska's unique economy and tax structure. In other states, a state sales or income tax captures revenues from the stationing of military personnel. Oil revenues, permanent fund earnings, and legal settlements have financed the state operating budget for many years, so Alaska has not deemed it necessary to enact a state sales or income tax. Additional students, as a result of military expansion, compete for the same limited pool of state resources but add no additional state tax dollars.

3.13.2.6 Regional Economic Activity

Table 3.13.f shows that per-capita income in Fairbanks is slightly below the national average. It is significantly lower than Anchorage but above that for rural areas in Alaska. The poverty rate is below the national average. Fairbanks has enjoyed steady, consistent growth since the statewide recession of the mid-1980s. However, the spectacular incomes generated during the pipeline boom and subsequent flood of oil dollars are long past. Per-capita income figures are misleadingly low for Fairbanks and Anchorage because all military personnel receiving a Federal "Cost of Living Adjustment" do not have that adjustment counted as income. Military-provided housing is also not counted as income. Including these would place Fairbanks per-capita income at or above the national average.

Table 3.13.f Fairbanks Region Income and Poverty Statistics for 2000.

Per Capita Income	$21,553
Median Household Income	$49,076
Median Family Income	$56,478
Persons in Poverty	6,206
Percent of Population Below Poverty Level	7.80%

Source: Alaska State Department of Community and Economic Development 2002.

Average monthly employment and earnings in the Fairbanks North Star Borough indicate that influence of public expenditures is remarkably high. It is important to recognize that uniformed military is not tracked regularly in labor publications because it does not participate in the unemployment compensation program. Data provided by the Department of Labor in Table 3.13.g below does not include uniformed military in totals for the government and all industries categories. Uniformed military has been added at the bottom of the table for comparison.

Uniformed military at FWA and Eielson Air Force Base adds about another 7,000 employees, comprising almost 40% of the total government work force. This brings total industry employment up to about 40,500 with total government then contributing over 17,600 of that, or about 43%. This is a notably high degree of government employment.

Table 3.13.g Fairbanks Region Average Monthly Employment and Earnings Statistics for Year 2000.

Industrial Classification	Average Monthly Employment	Average Monthly Earnings ($)
Total		
All Industries	33,475	$2,706
Private Ownership	22,787	$2,534
Government	10,689	$3,074
By Industry		
Agriculture, Forestry and Fishing	133	$1,583
Mining	926	$5,823
Construction	1,750	$3,739
Manufacturing	598	$3,180

Table 3.13.g cont. Fairbanks Region Average Monthly Employment and Earnings Statistics for Year 2000.

Industrial Classification	Average Monthly Employment	Average Monthly Earnings ($)
Transportation, Communications and Utilities	3,132	$3,457
Total Trade	6,768	$1,703
Finance, Insurance and Real Estate	1,122	$2,829
Services	8,356	$2,172
Federal Government	3,376	$3,444
State Government	4,534	$2,860
Local Government	2,779	$2,974
Uniformed Military	**6,926**	**$3,262**

Source: Alaska Department of Labor and Workforce Development 2001; USARAK Public Affairs Office 1995-2002.

It is clear that as a single employer, the (uniformed) military dominates the employment scene. In terms of monthly earnings, the mining industry leads with an average of over $5,800. The Fort Knox gold mine, one of the largest mining operations in the country, has a significant impact here. There are several other gold mining prospects and operations in the area as well. The lowest level of monthly earnings in a single sector is seen in retail trade at just over $1,500 per month.

The monthly earnings of the government sector exceed those of the private sector. Uniformed military pay exceeds average Fairbanks/state monthly earnings by about 21%. It is higher than the average for both state and local employment as well. Economic activity attributable to FWA is presented in Table 3.13.h

Table 3.13.h Socioeconomic Impacts of Fort Wainwright for Year 2000.

Uniformed Personnel	4,047
Non-uniformed Personnel	1,753
Annual Total Payroll	$204,760,000
Non-personnel Expenditure	$137,700,000
Total Annual Employment Impact Including Multiplier	14,354
Total Annual Dollar Impact Including Multiplier	$678,100,000

Source: U.S. Army Alaska FY 2002 Demographics, provided by USARAK Public Affairs Office 1995-2002.

3.13.3 Southeast Fairbanks Census Region and Donnelly Training Area

The region of influence for DTA is greatly reduced from previous decades because of the tremendous reduction in personnel. The villages in this area (Dot Lake, Healy Lake, Tok, Northway, Tanacross, and Tetlin) are minimally impacted by military activities conducted at installations in interior Alaska.

3.13.3.1 Background

DTA is located within the Southeast Fairbanks Census Area. Most of the area is unincorporated and is not a well-defined region in terms of political, economic or social boundaries. For census

purposes, this Southeast Fairbanks area was defined to include the region surrounding the Alaska Highway between the Fairbanks North Star Borough and the Canadian border. Doyon, Ltd. serves as the regional Native Corporation for this area that is subject to the Alaska Native Claims Settlement Act (ANCSA). Appendix E lists village corporations within the Doyon region.

Historically, the community of Delta Junction was the closest community directly affected by DTA. At one time, DTA was the largest single employer in the region. In addition to uniformed personnel, there was an average of more than 300 non-uniformed personnel stationed at Fort Greely prior to its transfer to the Space Missile Defense Command. The region of influence extended beyond the immediate vicinity. As a part of the Base Re-Alignment and Closure process of the 1990s, the number of uniformed military personnel at DTA was dramatically reduced. Troops were transferred to FWA and exercises were conducted on DTA lands by troops transported from Fairbanks. In 2000, there were 13 uniformed personnel in residence at DTA and 100 non-uniformed personnel. With resident employment so dramatically scaled back, it is difficult to argue that the present region of economic influence for the Army's operations at DTA extend beyond Delta Junction.

The aggregate loss of uniformed and non-uniformed personnel was a dramatic change to employment in the region. Residents made strenuous efforts to attract a replacement industry. In the last year, DTA employment was rejuvenated as a consequence of the ground based missile defense system. This is discussed further in Section 4.20, Cumulative Impacts.

The economic impact of personnel using DTA for Future Force operations is mostly felt in the Fairbanks North Star Borough as these personnel are primarily stationed at FWA. There are some minor economic influences in the Delta Junction area as personnel that train or otherwise work on the lands pass through Delta Junction and frequent local establishments.

3.13.3.2 Demographics

Delta Junction's racial profile in Table 3.13.i indicates a higher proportion of white individuals and a lower proportion of Alaska Native individuals as compared with the statewide average. There is also a smaller proportion of black or Hispanic persons.

Table 3.13.i Delta Junction Region Population Profile for 2000.

Population by Race	Number	Percent
Population in 2000	840	100
White	768	91.0
Alaska Native, or American Indian	34	4.0
Black or African American	9	1.0
Asian	8	1.0
Hawaiian Native	0	0.0
Other Race	1	0.1
Two or More Races	20	2.0
Hispanic Origin (Any Race)	7	1.0
Not Hispanic (Any Race)	833	99.0

Source: Alaska State Department of Community and Economic Development 2002.

The age profile of Delta Junction contrasts with Fairbanks and Anchorage in that there is a larger proportion of older individuals – nearly twice as high a proportion over age 62. This results in a median age of 36 in contrast to Fairbanks at 29 and Anchorage at 32. There is a slightly higher proportion of males to females.

3.13.3.3 Housing, Social and Public Services, and Public Education

The effects of reductions in military personnel were seen in the housing market through the surplus of housing and depressed values after Fort Greely downsized. About 26% of houses were vacant according to Census 2000 data. That situation has recently reversed, with housing scarcity accompanying construction of the ground based missile defense system. Home values and rents were substantially lower in 2000 but have rebounded and now exceed previous levels. As with Fairbanks, there is a small proportion of homes without complete plumbing or kitchen facilities. Wood heat is more common. Because Delta Junction is a small and dispersed population, it does not have the public facilities that are available in larger metropolitan areas.

Some medical services are provided by the Delta Junction Family Medical Center, including emergency care, but for the most part Fairbanks provides medical services to residents.

The Delta School District shows a somewhat higher student/teacher ratio and lower expenditures per student than Fairbanks and Anchorage. Although it has a higher cost differential, it does not have the tax base that Anchorage and Fairbanks have to afford supplementing state educational expenditures. As a consequence, less is spent per student.

3.13.3.4 Regional Economic Activity

Income and poverty data displayed in Table 3.13.j indicate a substantially lower per-capita income and higher poverty level for Delta Junction. There is a slightly higher family income than in Fairbanks, indicating that single individuals in poverty are weighing down the per-capita average.

Table 3.13.j Delta Junction Region Income and Poverty Statistics for 2000.

Per Capita Income	$19,171
Median Household Income	$43,500
Median Family Income	$58,250
Persons in Poverty	163
Percent of Population Below Poverty Level	19.40%

Source: Alaska State Department of Community and Economic Development 2002.

Because of the Alaska Department of Labor privacy regulations on reporting employment and earnings, insufficient data exist to produce tables of employment and income in Delta Junction. The entire Southeast Fairbanks Census Area was used in order to have sufficient observations for reporting on most industries. About 40% of total jobs in the census area are governmental. The 13 uniformed military at DTA in 2001 had a monthly earnings average of $1,979. This is lower than pay in Fairbanks, Anchorage and during the previous history of Fort Greely where uniformed military pay exceeded the average for the area. Uniformed military is not tracked regularly in labor publications because it does not participate in the unemployment compensation program. Data provided by the Department of Labor in Table 3.13.k below does not include uniformed military in totals for government and all industries.

The average monthly earnings in the Southeast Fairbanks Census region in year 2000 were $2,559. The earnings for all personnel (mostly non-uniformed) on post at Fort Greely averaged $4,441. However, this was not a good year for historical comparison as it was the first year of major cuts in uniformed personnel. In the previous year, payroll averaged $3,041, almost 20% higher than the census area in general.

Table 3.13.k Delta Junction Region Average Monthly Employment and Earnings Statistics for Year 2000.

Industrial Classification	Average Monthly Employment	Average Monthly Earnings ($)
Total		
All Industries	1,600	2,559
Private Ownership	976	2,006
Government	624	3,423
By Industry		
Agriculture, Forestry and Fishing	3	*
Mining	18	*
Construction	39	2,529
Manufacturing	21	*
Transportation, Communications and Utilities	237	3,628
Total Trade	340	*
Finance, Insurance and Real Estate	14	1,733
Services	305	1,340
Federal Government	272	3,867
State Government	124	3,705
Local Government	228	2,739
Uniformed Military	**13**	**1,979**

* Data not available

Source: Alaska Department of Labor and Workforce Development 2001; USARAK Public Affairs Office 1995-2002.

Economic activity attributable to DTA is presented in Table 3.13.l

Table 3.13.l Socioeconomic Impacts of Donnelly Training Area for Year 2000.

Uniformed Personnel	13
Non-uniformed Personnel	100
Annual Total Payroll	$12,000,000
Non-personnel Expenditure	$13,500,000
Total Annual Employment Impact Including Multiplier	496
Total Annual Dollar Impact Including Multiplier	$50,500,000

Source: U.S. Army Alaska FY 2002 Demographics, provided by USARAK Public Affairs Office 1995-2002.

3.13.4 The Anchorage Area and Fort Richardson

3.13.4.1 Background

Anchorage is by far the largest city in Alaska with a total population of 260,283 (certified December 2001, by the Alaska State Department of Community and Economic Development). This represents over 40% the population of the entire state. It is located in south-central Alaska at the head of Cook Inlet. Cook Inlet Region, Inc. (CIRI) serves as the regional Native Corporation for this area that is subject to the Alaska Native Claims Settlement Act. Chugach Alaska Corporation and Ahtna, Inc. have peripheral interests in this region. Appendix E lists village corporations within these regions.

Elmendorf Air Force Base and FRA have played a pivotal role in the Anchorage economy for many years. Together, they represent the single largest economic engine in the area as can be seen from the employment and income data.

3.13.4.2 Demographics

Anchorage has become the state's center of commerce. The banking, insurance, transportation, communications, real estate, tourism and other major industry headquarters are found in Anchorage (the most important being the oil and gas industry.). State government revenues have primarily relied upon the oil and gas industry which financed over 80% of state budgets in the last quarter century. Although the state capital is in Juneau, many of the state government offices are found in Anchorage since Juneau is landlocked without road transportation, and because the primary economic and population base is centered in Anchorage.

Since Anchorage dominates the state in terms of population, its demographics are similar to the statewide averages. Table 3.13.m illustrates the distribution of population by race. Anchorage has a lower proportion of Natives and higher proportion of whites. Age distribution of the population shows figures more closely matching statewide averages. Although there is a larger proportion of males, it is not as large a differential as elsewhere in the state.

Table 3.13.m Anchorage Region Population Profile for 2000.

Population by Race	Number	Percent
Population in 2000	260,283	100
White	188,009	72.2
Alaska Native, or American Indian	18,941	7.3
Black or African American	15,199	5.8
Asian	14,433	5.5
Hawaiian Native	2,423	0.9
Other Race	5,703	2.2
Two or More Races	15,575	6.0
Hispanic Origin (Any Race)	14,799	5.7
Not Hispanic (Any Race)	245,484	94.3

Source: Alaska State Department of Community and Economic Development 2002.

3.13.4.3 Housing

Although Anchorage has a higher income, it has a lower proportion of owner-occupied housing than both the state average and the national average for equivalent-sized U.S. cities. This is due, in part, to the transitory nature of military residence, two universities, and a significant number of commuters from nearby communities.

The Family Housing Master Plan for FRA (USARAK 2003a) proposes nine phases of replacement, revitalization and housing construction to occur through 2021. As construction or renovation of FRA on-post housing occurs in successive phases, no more than 10% of the housing inventory will be unavailable at any time. Any temporary surges in off-post housing demand resulting from these construction projects would be easily absorbed by the Anchorage rental market. This Family Housing Master Plan, and the 2001 Family Housing Market Analysis (USARAK 2002h) upon which it is based, is required to be updated every three years.

The impact of the Army on housing demand in the Anchorage area is not large. FRA families have, in recent years, been offered government on-post housing soon after their arrival in Alaska. According to the Family Housing Master Plan, FRA has about 1,200 housing units in seven neighborhoods. The Family Housing Market Analysis suggests about 1,400 families live off-post with about 1,300 of those renting. This was in comparison to over 61,000 units in the Anchorage area.

3.13.4.4 Public and Social Services

Controlled airports include the state-owned Anchorage International Airport and Lake Hood Float Plane Base, the Municipality's Merrill Field, and U.S. Army and Air Force facilities. The port of Anchorage handles 85% of the general cargo for the areas served by the Alaska Railroad. Several barge and trucking companies are available. The Alaska Railroad connects Anchorage to Seward, Whittier and Fairbanks.

Health care for the Municipality of Anchorage is provided by numerous providers of public, private, general, and specialized care. Military health care facilities include the Elmendorf 3rd Medical Group, U.S. Army medical clinic at FRA, and the Air National Guard Medical Squadron.

3.13.4.5 Public Education

Schools in Anchorage are under the purview of the Anchorage School District. The drop-out rate and student-teacher ratio are much lower than the national average. Expenditures are far higher than the national average but lower than the statewide average. Anchorage students outperformed both the state average and the national average on college entrance examinations.

The school districts in Alaska are largely funded by the State of Alaska. In the well developed economic regions of Anchorage and Fairbanks, the local contribution to the school operating budget is around 30%. The local contribution for debt service on capital construction is about the same in these two areas. It is considerably less in rural areas with limited tax bases.

The Anchorage School District operating budget is about $7,200 per student based on projected students for 2003-2004 (Anchorage School District 2003). The total Anchorage per-student cost, best viewed by the school district's operating costs and debt service, is about $8,200. The local property tax share is about $2,300 per student. The conservative 70% figure for debt reimbursement by the State of Alaska results in a total annual per-student cost for the local property taxpayer of at most $2,600 (Table 3.13.n).

Table 3.13.n Education Costs for the Anchorage School District for Fiscal Year 2004.

Education Costs – Anchorage School District	
School district operating budget per student	$7,200
School district debt per student	$1,000
Total per student cost to local school district (operating budget + debt)	**$8,200**
Local property tax contribution per student	$2,300
Debt service payment (debt x .3) per student	$300
Total per-student cost to local property tax payers	**$2,600**
Federal Impact Aid per student living on post	**$3,752**

Federal Impact Aid has averaged $3,752 per on-post student at FRA over the past three years (Mindy Lobaugh, personal communication 2003). Students living off-post are on properties that contribute to the property tax base just as other local residences do. Federal Impact Aid has made an additional payment of about $102 per off-post student over the past three years. Impact Aid more than offsets the lack of property tax paid by students living on-post.

However, Alaska carries an unusual burden for the cost of educating students associated with military presence because of Alaska's unique economy and tax structure. In other states, a state sales or income tax captures revenues from the stationing of military personnel. Oil revenues, permanent fund earnings, and legal settlements have financed the state operating budget for many years, so Alaska has not deemed it necessary to enact a state sales or income tax. Additional students as a result of military expansion compete for the same limited pool of state resources but add no additional state tax dollars.

3.13.4.6 Regional Economic Activity

Table 3.13.o demonstrates Anchorage area's income and poverty statistics are significantly better than the statewide average. Median household income is slightly above the national average and poverty is significantly below the national average.

Table 3.13.o Anchorage Region Income and Poverty Statistics for 2000.

Per Capita Income	$25,287
Median Household Income	$55,546
Median Family Income	$63,682
Persons in Poverty	18,682
Percent of Population Below Poverty Level	7.40%

Source: Alaska State Department of Community and Economic Development 2002

Table 3.13.p lists average monthly employment by standard industrial classification in the Municipality of Anchorage. There are two important items to note. First, uniformed military is not included in the data provided by the Department of Labor and has been added at the bottom of the table for comparison. Uniformed military at FRA and Elmendorf Air Force Base adds about another 8,500 employees and comprise almost 24% of the total government work force. This

brings total industry employment up to about 140,000 with total government then contributing over 36,000 of that, or about 26%. This is a notably high degree of government employment.

The other item of note is the pay differential between private and public sectors. It runs opposite to the nationwide pattern. Uniformed military earnings are somewhat below the government average (Table 3.13.p). The average monthly earnings across all job classifications in the Anchorage Municipality are $3,037. Average monthly earnings for personnel on FRA are $3,550, about 10% higher.

Table 3.13.p Anchorage Region Average Monthly Employment and Earnings Statistics for Year 2000.

Industrial Classification	Average Monthly Employment	Average Monthly Earnings ($)
Total		
Total All Industries	130,902	3,037
Private Ownership	103,247	2,867
Total Government	27,655	3,674
By Industry		
Agriculture, Forestry and Fishing	776	1,813
Mining	3,016	8,394
Construction	6,959	4,089
Manufacturing	2,234	2,949
Transportation, Communications and Utilities	15,225	3,813
Total Trade	31,248	1,985
Finance, Insurance and Real Estate	6,789	3,316
Services	36,949	2,478
Federal Government	9,914	4,264
State Government	8,744	3,161
Local Government	8,997	3,523
Uniformed Military	**8,503**	**3,552**

Source: Alaska Department of Labor and Workforce Development 2001; USARAK Public Affairs Office 1995-2002.

Economic activity attributable to FRA is presented in Table 3.13.q

Table 3.13.q Socioeconomic Impacts of Fort Richardson for Year 2000.

Per Capita Income	$25,287
Median Household Income	$55,546
Median Family Income	$63,682
Persons in Poverty	18,682
Percent of Population Below Poverty Level	7.40%

Source: U.S. Army Alaska FY 2002 Demographics, provided by USARAK Public Affairs Office 1995-2002.

3.13.5 Military Expenditure Surveys

A detailed survey of FWA personnel was undertaken in the summer of 1998 to estimate the impact of military payroll on the local and state economy. A similar survey was conducted for FRA personnel in 2002. Results from these surveys give an accurate picture of the distribution of these expenditures in the Fairbanks and Anchorage regions. One of the key issues was to determine the proportion of wages and salaries spent off-post but still within the state.

According to survey results, FWA personnel spend 69% of their income off-post in the local economy. FRA personnel were found to spend 68% of their income off-post in the local economy. The proportion of off-post expenditures in the local economy has grown substantially during the years of military presence in Alaska along with the maturation of the local economies.

Total payroll for statewide U.S. Army operations at FWA, DTA, and FRA are about $356.2 million while the non-payroll expenditures account for about $294.5 million. Together, these total $650.7 million in economic activity for the State of Alaska.

One surprising result from the survey was the impact of post personnel on the visitor industry. In the FWA survey it was determined that 37% of respondents had visitors during the year. In the FRA survey, 41% indicated they had at least one visitor during the year, the average being around three. With an average stay of over 15 days, this represents almost 50 days total per visitor per year. Activities ranged from glacier cruises, the Alaska Railroad, skiing, fishing, hunting, hiking, white-water rafting, renting RVs, or just sightseeing in the local area. Respondents reported spending an average of $816 on their primary tourist activity.

In the most recent statewide Alaska visitor survey, an average of $648 was spent in-state per visitor per trip. While an exact comparison cannot be made between the military and statewide 2001 surveys, it appears that visitors to military personnel, on average, stayed longer. Using the more conservative $79 per day numbers from the statewide 2001 survey, the employees of FWA and FRA alone account for over $16 million in additional visitor revenues to the state.

When the economic impact of an industry is evaluated, there are two primary views taken – total industry dollars and total industry employment. The only industry that consistently generates more revenue for the state than the Army is the oil and gas industry. Given that employment is about the same, the oil industry is clearly more economically important than the Army. But as oil revenues have declined, the relative importance of the Army has increased. Whereas tourism and the commercial fishing industry are somewhat similar in size by one measure or the other, the military provides higher average earnings than tourism industry employment and provides more stable monthly employment than commercial fishing. Finally, the expenditure survey indicates a high proportion of the military dollar is spent in the local economy.

3.13.6 Recreational Activities: Fishing and Hunting

During the scoping meetings in spring 2002, sporting groups expressed concern over the military's effect on outdoor recreation opportunities based on two impacts from the military's presence in Alaska. First, the idea that the military would compete with local residents for natural resources and any increase in military personnel and their dependents due to transformation activities could place additional pressure on outdoor recreational activities such as fishing, hunting and trapping. The second concern was the possibility that the increased use of military lands for training exercises could negatively influence game populations (discussed in Sections 3.9 and 4.9, Wildlife and Fisheries) and restrict public access to natural resources (discussed in

Sections 3.14 and 4.14, Public Access and Recreation. The following analysis quantifies the value to Alaskans of fishing and hunting opportunities that may be affected by the Army.

Methodology and Research Design

All sampling was based on data obtained from the Alaska Department of Fish & Game 2001 licenses. Fishing and hunting questionnaires were mailed to 2000 Alaska fishing, hunting or combined licensees with mailing addresses on or near the primary road systems in south-central and interior Alaska. These locations were more proximate to the military bases and exercise areas that are the subject of this analysis. A study of rural subsistence uses has been viewed as requiring a different type of analysis.

This analysis examined the use of military lands for fishing, hunting and other outdoor pursuits. Since access to military lands is controlled and certain species harvest activities are monitored, usage statistics for some areas' activities by non-military users were obtained. Interior Alaska military lands contain a significant portion of accessible hunting, fishing and outdoor recreational resources. Accordingly, economic measures for principal outdoor activities traditionally undertaken by both military and non-military outdoor enthusiasts are reported.

3.13.6.1 Fishing Activities

Survey Results

The average respondent had 19 years of Alaskan fishing experience (median of 20) and an average of 19.5 (median of 14) days in the field. Based on these measures, the respondent sample represents a substantial amount of experience in Alaska and commits a significant portion of their leisure time to fishing and outdoor activities.

The importance of fishing is in part reflected by the amount of capital committed to the activity. The average amount reported by respondents was $14,323. The breakdown by type of equipment is as follows: aircraft averaging $72,500, (8.7%), river and air boats $12,813 (28.5%), ATVs $5,583 (15.7%), and snow machines at $5,565 (17.4%). Surprisingly, the "Other" category received the largest number of individual responses at 25.6% with an average of $13,655. While it is difficult to disentangle expenditures purely for fishing activities from other recreational pursuits, these amounts represent a significant commitment of household resources.

Average annual expenditures for fishing related activities were $1,134. This amount, combined with the reported average number of angling days in our survey, results in a daily average expenditure of nearly $60/day towards sport fishing and related activities. The respondents spent an average of 1.8% of their gross income on fishing related activities annually and committed 22% of gross income on capital equipment purchases. Favorite species and areas of fishing concern were surprisingly common among the majority of the respondents. Salmon ranked as the number one fish species (69%), halibut ranked as number two (25%), and trout took third (14%).

In terms of fish scarcity, king salmon, halibut and trout were clearly of greatest concern to respondents in almost identical proportions to those given in favorite species rankings. Given the reduced limits imposed for king and other species of salmon on the Kenai Peninsula over the past decade, the results are consistent with other survey results. The area where fishing pressure was of most concern was the Kenai Peninsula (68%), including both fresh and saltwater. This was followed by stocked lakes in the Matanuska-Susitna and interior regions (25%). The concern over stocked lakes is surprising given that they enjoy more liberal fishing regulations and limits. This

may be in response to the growing popularity of stocked lakes in close proximity to Anchorage and Fairbanks, coupled with the decline in hatchery production in recent years.

3.13.6.2 Hunting Activities

Analogous to the sport fishing analysis, it was assumed that the impact of the military on hunting could be examined in a probabilistic framework. Increasing hunting pressure or decreasing game populations could reduce the odds of success for the sportsman's hunt. For example, when one third of moose tags in a given year result in harvest, the overall odds become one in three. Adding more hunters would reduce the odds of success.

Survey Results

The average respondent had 21.5 years of experience, with a minimum of one year and a maximum of 55. The average respondent had 22.5 days in the field with a minimum of one and a maximum of 150. This respondent sample represents a substantial amount of experience in Alaska and commits a significant portion of their leisure time to hunting and outdoor activities.

The importance of hunting to Alaska residents is in part reflected by the amount of capital they have committed to the enterprise. For those responding, the average capital in place was approximately $24,000. The most common form of equipment was an ATV averaging $4,500. Of those responding to this category, 68% reported having an ATV for hunting. Snow machines were reported by 45% of respondents, and 36% reported ownership of a riverboat. Ownership of "other" equipment was reported by 31% and consisted of cabin cruisers, canoes, kayaks, or hunting shacks. Ten percent reported owning airplanes and 2.3% reported airboats. In addition to these capital expenditures, respondents reported spending on average $2,300 annually on hunting (median of $1,000). The average respondent spent about 4% of their pre-tax income on hunting or about 5% to 6% of post-tax income, depending on the respondent's tax bracket.

The most favored game species was moose. Caribou was the clear second choice and the third favorite game species was Dall sheep.

3.13.6.3 Comparison of Military and Nonmilitary Hunting and Fishing Distinctions

In surveying military personnel, similarities or differences in hunting and fishing patterns could be established. These survey results are very similar to the general licensee results with notable exceptions - although their participation rates were lower than the general population, they spent and average of twice as many days in both activities if they hunted or fished at all. While their hunting preferences were similar, a larger fraction of their income was spent on these activities.

Table 3.13.r examines the proportion of total licensees represented by residents of the military zip codes when attention is restricted to licensees on the road system. While this would not include those employees who live off-post, the numbers clearly show a very low proportion of total licensees. The actual proportion of military sportsmen (especially anglers) is lower when out-of-state sportsmen are included.

Table 3.13.r Fort Wainwright and Fort Richardson Licensees vs. Total Licensees on the Road System in Alaska for 2001.

Post	Military Licensees		Percent of Total Licensees in Alaska	
	Fishing	Hunting	% Fishing	%Hunting
Fort Wainwright	1,176	543	0.95%	1.15%
Fort Richardson	1,047	302	0.84%	0.64%
Total	2,223	845	1.79%	1.79%

Source: Alaska Department of Fish and Game 2001.

3.13.6.4 Use of Military Lands

Some military lands provide important areas for recreational activities such as hunting, fishing and other means of enjoying the outdoors. They house many stocked lakes and significant game populations in relatively close proximity to the more highly populated areas in Alaska. These lands include the immediate post lands and adjoining lands under military control for training.

Because these lands are restricted to all recreational users – both military and civilians – and access is provided generally via permit, some data is available on recreational use. These permits are in addition to required State of Alaska licenses and permits for hunting, fishing and trapping. Data on recreational use was obtained and summarized into three major categories: fishing, hunting and other recreation. The table below summarizes these activities for interior Alaska. General recreational usage data was unavailable for FRA (Table 3.13.s).

Table 3.13.s Recreational Use of Interior Alaska Military Lands (Fort Wainwright, Donnelly Training Area and Eielson Lands)[1].

Activity	Annual Average Users
Hunting	2,825
Fishing	1,839
Other	2,019
Total Users	6,683

[1] This data represents a synthesis of averages for 1996 through 2001.

Sources: FWA and DTA data obtained from Natural Resources Office, Fort Greely; Eielson data obtained from John Norgren, personal communication 2002.

The hunting category consisted of large game only. Fishing activities consisted of stocked lakes containing primarily trout and char species. The other category included hiking, camping, small game hunting, berry picking, woodcutting, dog sledding and other activities. Combining these categories was necessary due to inconsistencies in data collection and between military installations from year to year.

Hunting data on military lands for large game is maintained by the Alaska Department of Fish & Game. Permits are required for all large game hunting activities whether the hunting effort is successful or not. The following table summarizes this activity over the data period 1983-2001 for the top three favorite game species at FWA identified by the survey (Table 3.13.t). Over this same period, there were as an annual average of 133 hunters at FRA with 59 moose harvested at a

success rate of 44% (Brian Leib, personal communication 2003). Sheep harvesting on FRA is not permitted. No caribou exist on FRA.

Table 3.13.t Hunting Activity on Interior Alaska USARAK Lands.

Game Species	Average Annual Users	# Successful	% Successful
Moose	1505	334	22%
Caribou	34	14.6	42%
Sheep	4	1.3	33%

Source: Brian Lieb, personal communication 2002.

The analysis also considered the impact of military personnel's recreation activities on the generation of tax revenues and user license fees. The most significant public revenue generated is derived from Alaska license fees. Total licenses issued to military personnel produced approximately $69,275, excluding additional fees for big game hunting tags and fish and duck stamps. Federal excise taxes collected from the sales of recreational gear (fishing, hunting, boats) are primarily allocated to states based on geographic size. Consequently, Alaska already receives the maximum allocation of these revenues, and it would not be affected by changes in military populations within the state.

3.14 PUBLIC ACCESS AND RECREATION

Issue A: Access. Issue C: Wildlife and Habitat. Citizens voiced concern over increased competition for recreational sport fishing and loss of access to lakes with stocked sport fish populations. It is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Types of access available on the installations
- Land use areas on each installation.
- Types of recreational use occurring on U.S. Army Alaska (USARAK) lands

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional public access and recreation information is presented in Appendix E.

USARAK has a primary mission to maintain and enhance the combat readiness of its Soldiers. However, within the military mission priority, USARAK strives to allow public access to military lands, providing both civilians and military personnel with recreational and educational opportunities.

3.14.1 Public Access and Recreation Topics

3.14.1.1 Access

The public is required to obtain permission before entering military lands. Persons must first get a Recreational Access Permit before entering. With a permit, interested parties may call the USARTRAK automated check-in phone system to inform the military where they will be going. When individuals check in, the latest information on closures can be obtained. This information is also listed in weekly bulletins and radio announcements. More information on USARTRAK may be found in Appendix H.

Ground

Ground vehicles include standard cars and trucks. Ground access is allowed on USARAK lands, and is the most popular mode of access. Ground vehicle use is allowed on maintained roadways. Ground vehicles must obey all Army rules and regulations involving posted speed limits and are not allowed in restricted areas.

Boat

Boats are considered those aquatic vehicles that require open channels and waterways to operate. Boat access is allowed in some areas of USARAK. As boats are already limited to open waterways, there are only certain areas available for boat use. Boats may not operate in restricted areas, some of which may have waterways flowing through them.

Off-Road Vehicles

Off-road recreational vehicles (ORRV) include those motorized vehicles, such as snowmobiles, all-terrain vehicles (three- and four-wheeled), and airboats, that do not require maintained roads or open waterways. ORRV use is allowed on maintained roadways and trails in designated areas.

USARAK Regulation 190-13 describes the restrictions for each post. ORRVs are allowed on post for hunting, trapping, fishing, and other recreational purposes, provided that they are in compliance with all state and federal laws and applicable Army regulations. In addition, entrants may not use off-road vehicles to gain access to restricted areas. General guidelines state that during ice break-up, all areas are closed to off-road vehicle use because of spring thaw. Restricted dates are determined by the Environmental Resources Department.

ORRV use also varies seasonally. Three and four-wheeled all-terrain vehicles are common ORRVs during summer, while many recreators use snowmobiles on Army lands in winter. Off-road vehicles usually stay on clear trails, and snowmobiles often use frozen waterways in winter as corridors.

ORRVs are prohibited from designated ranges and training areas. Off-road recreational vehicle users must check with each post to determine which areas are open for off-road vehicle use.

Aerial Access

Aerial access involves small aircraft, such as single-engine planes and ultralights. Aerial access is allowed over USARAK lands, subject to restricted airspaces and closures. Aerial vehicles are prohibited from landing on restricted areas on USARAK lands. Federal Aviation Administration regulations require the military to generate “Notices to Airmen” when hazards exist to the safe flow of air traffic. USARAK Regulation 350-2 addresses use of restricted airspace over USARAK lands. Further information on airspace use over USARAK posts can be found in Section 3.19, Infrastructure. Many restricted airspace areas are conditionally available for public aerial access or overflight.

Unauthorized Access

Illegal entry onto USARAK is the most common form of trespass. Trespass involves entering USARAK properties without a valid Recreational Access Permit, and without calling in to indicate location of interest. Trespass is often the precursor to other illegal activities that occur on ranges. Most illegal activities can either directly or indirectly affect natural resources. In addition, trespass leads to serious safety concerns. Since trespass is often the first step to illegal range activity, reducing illegal trespass could also reduce illegal range activity.

Crossing the installation boundary or the internal boundary of an off-limits area without approval constitutes trespass. Only a small portion of each installation’s boundary is fenced or posted with installation boundary signs. Trespass is often premeditated and deliberate. Posting the boundary would reduce accidental trespass, but the effect on premeditated trespass would be minimal. Boundary marking can only be effective if associated enforcement efforts can prevent premeditated and deliberate trespass.

Another form of trespass involves structures built on USARAK lands without approval from the federal government. Generally, such structures are built as base camps for hunting and trapping. Problems with trespass structures on some Army lands were identified as early as 1982. The Army is currently working to locate these structures, identify their occupants or creators, and when necessary, destroy or remove the edifices from the Army lands.

3.14.1.2 Use Areas

Public use is limited on some areas of Army lands in Alaska. Some areas may be permanently closed to public access due to specific military activities associated with that area. Each post

can provide a listing and description of where and when such access restrictions exist within its property.

Temporary recreational use restrictions also exist on USARAK lands. These closures are due primarily to military training exercises on those properties that would conflict with recreational use and could possibly increase risk of accidental injury. In addition, seasonal closures are implemented during freeze or breakup. Users are encouraged to call both the Range Control Office and Environmental Resources Department to ensure that lands are available. This information is also available through the USARTRAK automated check-in phone system.

USARAK has defined five primary categories of use areas on its lands. These categories are Open Use, Modified Use, Limited Use, and Off-Limits areas. All of these recreational categories are subject to periodic change or restrictions. The Range Control Office for each installation is the authority in charge of temporary training closures, and should be contacted to verify recreational use at a given time.

Open Use Areas

Open Use areas are those areas that are available year-round for all forms of recreation. Ground and ORRV access and vehicular use is permissible here.

Modified Use Areas

Modified Use areas are those areas that are open year-round to all non-motorized forms of recreation. Motorized vehicular recreation or access is limited to those frozen periods with six or more inches of snowcover. Modified Use restrictions are largely applicable to USARAK's wetlands.

Limited Use Areas

Limited Use areas are open to all non-motorized forms of recreation year-round. However, no ORRV use is permitted in these areas at any time. Limited Use areas pertain primarily to locations with high average use levels, such as in or near cantonment areas.

Off-Limits Areas

Off-Limits areas are closed to all forms of recreation at all times. This is due primarily to either conflicts with military use and the primary military mission, or to human health and safety issues.

In addition to these, more specific use areas may be defined for each installation or training area. Limitations and restrictions on public access also depend on the type of designated military use for each area. Some common non-compatible uses of military lands include non-military structures, easements, and leases (USARAK 2002e, f, g). The four general categories of military land use affecting public access are:

- **Urban Areas:** Public access into urban areas is allowed depending on safety restrictions and military security, and when access does not impair the military mission. Compatible uses include natural resources management, habitat improvement, mineral or vegetative resource extraction, bird-watching, hiking, and skiing. Activities that are not compatible with urban areas include hunting and trapping. However, structures, easements, and leases are more compatible here.
- **Training areas and non-firing facilities:** Public access is allowed into training areas, subject to safety restrictions, military security, or when access does not impair the military mission. Compatible uses may include natural resources management, habitat

improvement, hunting, fishing, trapping, bird-watching, hiking, skiing, dog sledding, and off-road vehicle use.

- **Firing ranges, surface danger zones, and non-dudded impact areas:** Public access into firing ranges, surface danger zones, and non-dudded impact areas is normally not allowed due to conflicts with the military mission. However, there are times during the year when public use does not conflict with military training, and public access is allowed into these areas. Compatible uses generally include natural resources monitoring, range maintenance, fire prevention and suppression, hunting, fishing, and trapping.
- **Dudded impact areas:** Public access into dudded impact areas is prohibited because of the hazard of unexploded ordnance. Compatible uses include aerial monitoring of natural resources and military impacts, and prescribed burns to reduce fire hazards and improve habitat. Activities that are not compatible with dudded impact areas include any on-the-ground natural resources management, digging, mineral extraction, commercial timber sales, hunting, fishing, trapping, bird-watching, dog sledding, camping, and off-road vehicles of any kind.

Impact areas are those parts of military lands that are used for weapons targeting and firing practice. High hazard (dudded) impact areas are closed to the public. Dedicated impact areas are not permanently restricted, although permission to enter these areas is limited. Impact areas on all USARAK lands are shown in Appendix A, Figures 3.14.a, 3.14.b, 3.14.c, and 3.14.d. Information on closures can be obtained from the USARAK automated check-in phone system, Range Control, or the Military Police upon entering the post.

A two-mile-wide buffer zone surrounds each impact area, and these buffer zones are closed during firing maneuvers on that impact area. The role of the buffer zone is to contain the safety fan (i.e., the maximum firing or detonation range) of weapons used against targets within the impact areas. All or parts of these buffer zones may be temporarily closed to the public during firing. The buffer zone around Eagle River Flats is only 300 meters, due to Fort Richardson (FRA) land area constraints and the smaller safety fan of weapons used there.

The military is required to post warning signs near all permanently closed and/or dangerous areas. Chapter 5 of AR 350-2 states that all impact areas will be marked with warning signs, barriers and/or guards. Passing any of these hazard warnings without permission from the Range Control Office is forbidden.

3.14.1.3 Recreation

USARAK lands are available for a variety of recreational uses, such as hunting, fishing, trapping, off-road recreational vehicle use, hiking, picnicking, berry picking, bird-watching, skiing, and dog sledding. Due to their acreage, condition, and proximity to population centers, Army lands are popular recreational destinations for Alaska residents. According to Military Police records, an estimated 96,000 people legally accessed FRA in 2001 as a recreational destination. Historic recreational use numbers for Donnelly Training Area (DTA) are shown in Appendix E.

A Recreational Access Permit is required for everyone over 16 before entering Army lands. On FWA and DTA, these permits are free. There is a $5 cost associated with permits on FRA.

Hunting

Military lands host numerous game species, such as moose, bear, caribou, bison, and small game. Harvest data indicates a constant, annual interest in access to hunting opportunities on USARAK lands. Hunting data indicate that 21% of the interior Alaska moose harvest, the top large game

species, occurs on Army lands. In addition, 2.3% of the interior Alaska caribou harvest and 2.1% of the interior Alaska sheep harvest are on military-controlled lands. Hunters must hold state hunting licenses and follow all federal and state guidelines while hunting on Army properties.

Specific annual hunter access numbers do not exist for all Army properties. However, existing access data DTA can be used as a proxy guide for hunting access on Army lands (Appendix E).

Before hunting on Army lands, hunters must first take an approved firearm safety course (AR 210-21). Bow hunters only need their bow hunter proficiency course to hunt on Army lands. Hunters must call in to the USARTRAK call-in system before hunting on Army lands. On FRA, hunters must also check in each day with the Military Police.

Hunting occurs on USARAK lands throughout the year, with a disproportionate amount of use occurring in fall. Most big game seasons begin in August or September. Moose is the most popular big game species, and its season starts in September.

Trapping

Trapping does occur on military lands in Alaska. Trap lines are set at a number of locations on USARAK properties. Popular furbearer species for trapping include lynx, beaver, pine marten, fox, and others. Due to conflicting use and safety concerns on FRA lands, trapping has been banned on that installation. Trapping is also not allowed on FWA Main Post.

Trapping requires a recreation permit issued by the post on which trapping activity will occur. Trapping records for FWA and DTA are available (Appendix E).

Fishing

Fishing is a popular recreational activity on Army lands. In addition to naturally-existing populations of many sport fish, there are a number of stocked lakes on Army lands. The Alaska Department of Fish and Game is responsible for maintaining stocked fish populations on military lands. Stocking data can be found in Section 3.9, Wildlife and Fisheries. Fishing on Army properties requires a Recreational Access Permit issued by the post on which the fishing will occur.

Trail Use

Hiking opportunities exist within all USARAK locations. Hiking is most popular in mountainous or hilly terrain and much less popular through lowland and wet areas. Hiking on military lands usually occurs on the training and maneuver trails. Few other marked trails exist on Army lands and leaving these trails can be dangerous.

Other popular activities on Army lands include sightseeing, bird-watching, berry picking, skiing, and dog sledding. Many recreational activities are seasonal and occur in brief bursts each year. Records of non-extractive recreational use of military lands are unavailable for most Army lands.

Camping

Overnight camping on military lands is permitted within designated areas with the Recreational Access Permit. Camping is not permitted in the cantonment areas, except for designated fee campgrounds. In some areas, cabins are available along trail systems for overnight use in conjunction with hiking or skiing. Cabins exist on DTA at Twin Lakes and in Snowhawk Valley on FRA. Another set of cabins exists around Otter Lake on FRA.

3.14.2 Fort Wainwright

3.14.2.1 Access

Access is allowed on many parts of FWA Main Post. Roads and trails are both plentiful on Main Post.

Access to TFTA is more difficult than to other parts of FWA. TFTA is bordered by the Tanana and Wood rivers and there are no bridges to TFTA. Summer access is by boat or plane only. Ground vehicles can access TFTA in winter on constructed ice bridges. Most of the training area is wetlands and it is therefore largely categorized as a Modified Use area.

Yukon Training Area (YTA) is readily accessible from the ground. Access is primarily available via Manchu Road through Eielson Air Force Base. Additional access is possible via Johnson Road, which connects to the Richardson Highway further south.

3.14.2.2 Use Areas

There are no impact areas within FWA Main Post and the cantonment area (Appendix A, Figure 3.14.a). However, access is restricted on the small arms range complex in the southern part of the Main Post. This area also houses the firing points for the Alpha Impact Area on TFTA. Other areas on FWA Main Post are off-limits to many types of public use and recreation.

TFTA has two impact areas (Appendix A, Figure 3.14.a). Alpha Impact Area is a 22,899-acre impact area located in the north-central part of the training area, directly south of FWA Main Post. Salchaket Slough forms the northern boundary of the impact area. The 32,609-acre Blair Lakes Impact Area lies in the south-central part of the training area. It runs from southeast to northwest, across some of the headwaters for Willow Creek and Clear Creek. Blair Lakes Impact Area is used primarily by the U.S. Air Force as a bombing range. Both impact areas, as well as those lengths of Bear Creek and McDonald Creek within the Alpha Impact Area, are off-limits to public access.

On TFTA, signs have been posted, primarily on maintained approaches to the Alpha Impact Area and Blair Lakes Impact Area. Several maneuver trails run near or across parts of these impact areas, and these approaches have been heavily posted to indicate significant safety hazards on the impact areas. The Salchaket Slough, which provides the clearest approach to the Alpha Impact Area, is heavily posted with warning signs.

The winter sled trail entering the Blair Lakes Impact Area from the north is both gated and posted with warnings. This is the primary access route to the impact area, and warning signs are posted at lengths along the access route. Other warning postage around Blair Lakes Impact Area is sparse, due to lack of additional access and the remote location. Blair Lakes Impact Area access is managed by the U.S. Air Force.

The Stuart Creek Impact Area is the only impact area within YTA (Appendix A, Figure 3.14.b). This impact area covers 25,813 acres of central and northern YTA, just southwest of Beaver Creek, and is used as both a U.S. Air Force bombing range, as well as a target area for ground-based weapons. Stuart Creek, Globe Creek, and part of the South Fork Chena River all lie within the impact area. In addition, the Military Operations in Urban Terrain Site, the Air Force Technical Applications Center, Bravo and Charlie Batteries, and the Arctic Survival Training Site are all off-limits to public access and use.

On YTA, signs are posted at the two roads that pass into the Stuart Creek Impact Area. The restricted access signs state that the impact area is an active Army and Air Force bombing range and that the area contains unexploded munitions. Signs are placed every 200 meters around the perimeter of the Air Force Technical Applications Center on Transmitter Road. These signs state that the area cannot be entered without permission from the Air Force Technical Applications Center Commander.

3.14.2.3 Recreation

Hunting

Hunting is popular on TFTA, YTA and Main Post. Hunting is restricted on Main Post south of the Chena River. The most popular game species on FWA is moose, particularly on TFTA.

Trapping

Trapping is allowed on TFTA and YTA. Trapping is not allowed on Main Post. The number of trappers on FWA has historically been fairly constant, and the number of furbearers harvested each year can be found in Appendix E.

Fishing

Fishing is a popular public use of FWA, particularly on TFTA and Main Post. There are four stocked lakes and ponds on FWA Main Post, including Weigh Station Ponds 1 and 2, River Road Pond, and Monterey Lake. On YTA, Manchu Lake is stocked. There are no stocked lakes on TFTA, although Blair Lakes offer pike fishing opportunities. In addition, salmon runs on the Tanana River attract sportfishers.

Trail Use

ORRV use and hiking occur on FWA Main Post. The Birch Hill area hosts some popular trails, as well as berry-picking opportunities. Historically, ORRV use on TFTA has been high. ATVs are brought over by boat during summer months, and snowmobiles are used in winter. Changes in USARAK management to evaluate and curb damage to wetlands are expected to reduce the level of ORRV damage to wetlands on TFTA. Little hiking is known to occur on TFTA due to the widespread wetland areas throughout the training area and the lack of all-seasons ground access. Drier trails are remote and less accessible. The YTA contains approximately 90 miles of roads and trails used by the public primarily for ORRVs. The trails are not designated for hiking or biking although they do receive some use.

3.14.3 Donnelly Training Area

3.14.3.1 Access

Access is readily available to DTA, especially on and around eastern DTA. Access roads, including Meadows Road, Dome Road, Old Richardson Highway, and Fleet Street, connect directly to either the Richardson or Alaska highways. Additional access has historically been available through the Fort Greely cantonment area, which is managed by the Space Missile Defense Command.

In addition to ground access and roads, much of DTA is available to ORRV and aerial access. ORRV and winter trails exist across both the eastern and western parts of the training area. 33-

Mile Loop is one of the more popular trail systems on DTA East. DTA West is only accessible in winter when the Delta River is frozen over, or by air or boat.

Gerstle River Training Area, approximately 30 miles southeast along the Alaska Highway from DTA, is also accessible by ground transport.

3.14.3.2 Use Areas

DTA can be divided into three fairly distinct areas for access purposes. The eastern part of the training area is predominantly managed as Open Use, with the exception of some isolated wetland areas, as well as the Jarvis Creek channel, which are considered Limited Use areas. 33-Mile Loop runs through this area and contains a number of additional trails within its confines (Appendix A, Figure 3.14.c). Other access west of Richardson Highway includes Windy Ridge Road and Meadows Loop.

Central DTA, a region that straddles the Delta River and lies primarily west of the river, is dominated by impact areas. Because of this, most of the central area is managed as Off-Limits. Permanent, dedicated impact areas include Oklahoma, Delta Creek, Mississippi, Washington, and Texas, and the Allen Army Controlled Fire Area. USARAK has revised the designation of the Lakes Maneuver Impact Area, and it now considered an Off-Limits area, due to presence of unexploded ordnance. Modified and Open Use areas exist north and south of these designations, along the northern boundary of the training area and the foothills of the Alaska Range.

Most of DTA West is split between Open Use and Limited Use areas. The areas just west of the Delta River along the foothills of the Alaska Range and the southern boundary of DTA are primarily Open Use areas. West of the central impact areas, wetlands and sensitive areas are more prominent, and the lands adjacent to the southern, western, and northern boundaries are a mosaic of Open Use and Limited Use areas. This is primarily true for the lowland areas; the foothills along the Alaska Range, as well as areas around Dinosaur Ridge, are mostly Open Use.

DTA contains both high hazard and dedicated impact areas. The 48,494-acre Oklahoma Impact Area is the largest of the high hazard impact areas, and it is located in the center of the training area, between Delta Creek and One-Hundred Mile Creek, up to the confluence of these two waterways (Appendix A, Figure 3.14.c). The Delta Creek Impact Area covers 2,437 acres along Delta Creek and includes both banks, and it is adjacent to the Oklahoma Impact Area. These two impact areas are used primarily by the U.S. Air Force as bombing and gunnery ranges. Washington and Mississippi impact areas are contiguous elongated impact areas that cover 12,207 acres combined, and run along the Delta River for approximately 14.5 miles. These impact areas cover the river channel, as well as adjacent lands on both banks. North of these impact areas is the 8,146-acre Allen Army Controlled Fire Area.

The dedicated impact area on DTA consists of the Lakes Maneuver Impact Area. This parcel covers 75,565 acres, and is situated between the Oklahoma Impact Area and the Washington and Mississippi impact areas along the Delta River. The Texas Range and Washington Range areas, southeast of and adjacent to the Washington Impact Area, cover 8,961 acres to the east of the Delta River. In addition to these, the Cold Regions Test Center complex at Bolio Lake is off-limits to public access and use.

Warning signs have been placed on DTA, with the majority being west of the Delta River. Eleven gates have been constructed along the eastern boundary of the Delta River and one is located in the north portion of Allen Army Controlled Fire Area. The lands between Meadows Road and

the impact area boundary are off-limits and are posted accordingly. Warning postage exists on all probable approaches to restricted areas (Appendix A, Figure 3.14.c).

The only area of Gerstle River Training Area that is off-limits is the building area near the north edge of the training area. Otherwise, the area is managed entirely as Open Use for recreational purposes.

3.14.3.3 Recreation

Hunting

Hunting is a popular activity on DTA. The recorded data indicating hunting use by month indicates that moose is probably the most popular game species pursued on the training area (Appendix E). Other big game species hunted include caribou, bison, and bear. More data on wildlife populations on DTA can be found in Section 3.9, Wildlife and Fisheries.

Trapping

Trapping is allowed on DTA. Trapping use has been fairly constant on the training area, and trappers' lines are usually placed in the same general location each year.

Fishing

There are 16 lakes on DTA with stocked sportfish populations. Stocked lakes include Bolio, Bullwinkle, Chet, Nickel, J, Doc, Sheefish, Mark, North and South Twin, Rockhound, Luke, Ghost, and No Mercy lakes within the Meadows Road-Windy Ridge Road loop. Weasel Lake, near the southern boundary of the training area, and Koole Lake, in the northwest, are also stocked. Fish stocking data may be found in Appendix E.

Trail Use

DTA contains many trails east of the Delta River within the west part of the training area and throughout the east side of the training area. The most common hiking route at DTA is to the top of Donnelly Dome, east of the Washington Range along the Richardson Highway. Public access into the Gerstle River Training Area and the Black Rapids Training Area is allowed with a valid Recreational Access Permit, subject to closures, safety restrictions and military security. Some trails do exist on these properties.

3.14.4 Fort Richardson

3.14.4.1 Access

Access is available on much of FRA through conventional means. Road access onto the post is possible primarily from the Glenn Highway, at the main entrance or along Arctic Valley Road. The post is also accessible via Richardson Drive from Elmendorf Air Force Base. In addition, USARAK allows non-commercial rafting by permit along Eagle River to enter FRA.

Paved or improved roads cover much of the northern and central parts of the post. Two ORRV access trails also exist on post, connecting green spaces near the cantonment area to more remote locations. FRA is also bounded by Chugach State Park on along much of its southern borders, and trails exist connecting the post to the state park. Some trails also connect to southwestern FRA from Centennial Park, which was historically part of FRA.

3.14.4.2 Use Areas

Most of northern FRA is managed by USARAK as Open Use area (Appendix A, Figure 3.14.d). There are small Modified Use areas within the overall Open Use area. In addition, most of the lands adjacent to the northwestern boundary of the post and surrounding the Eagle River Flats are managed as Limited Use areas.

Central and southern FRA is comprised largely of Limited Use areas. Central post is dominated by the cantonment area, as well as several training ranges. In addition to the two ORRV access trails, a Dirt Bike Recreation Area is located just east of the cantonment area, adjacent to the Glenn Highway. The southern part of the post is Limited Use. There are few roads or trails, due in part to the increasingly mountainous terrain of southern FRA.

The Eagle River Flats Impact Area is the only impact area on FRA (Appendix A, Figure 3.14.d), and is Off-Limits to access. Covering 2,165 acres on the estuarine tidal marsh at the mouth of the Eagle River, Eagle River Flats has been used since the mid-1940s as an artillery shelling area. In addition, FRA has other non-dudded off-limits areas associated with small arms ranges.

Signs are placed on approaches to the Eagle River Flats Impact Area. Several signs exist around this area due to the volume of recreational use on FRA. In addition, warning postage has been placed on areas of FRA involving safety concerns, such as firing fans and ranges.

3.14.4.3 Recreation

Hunting

Recreational hunting occurs on FRA. Moose is the most popular game species, although other game species, such as snowshoe hare, are also hunted on post. The FRA moose population has averaged between 500 and 600 animals over the past seven years and is more thoroughly described in Section 3.9, Wildlife and Fisheries. Moose hunting on FRA requires a $125 moose hunt fee. Records have not been maintained regarding historic hunting numbers on FRA, but the new phone-in access system is expected to assist in future records maintenance.

Trapping

Trapping is no longer allowed on FRA, due to human health and safety concerns. Conflicting recreational and training land uses, and a generally high volume of use per area, have led USARAK to ban trapping on FRA.

Fishing

Ship Creek, which bisects FRA, is a popular salmon fishing river. Species that migrate up the river include silver, king, and pink salmon. In addition, there are five stocked lakes on FRA. These include Clunie, Gwen, Otter, Thompson, and Waldon lakes. Annual recreational fishing use is high for these lakes, given the close proximity of Anchorage.

Trail Use

Hiking is also popular on FRA. Due to its proximity to the population of Anchorage and its position next to Chugach State Park, a number of trails on FRA are utilized frequently by hikers. Some trails in the southern part of FRA connect directly to trails from Chugach State Park or Centennial Park.

3.15 SUBSISTENCE

Topics discussed in this section include:

- Description and definitions of subsistence
- Proximity and access to subsistence use by populations near U.S. Army Alaska (USARAK) installations
- Resources available to subsistence users on each installation

This information serves as baseline data for the analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS.

Subsistence plays a vital role for many people in Alaska. The practice of subsistence take for food and resources has survived in remote areas and is now protected by federal law under the Alaska National Interest Lands Conservation Act (ANILCA) of 1980. Since 1980, Native and non-Native subsistence use on federal public lands in Alaska has been regulated by Title VIII of ANILCA. Title VIII addresses the rights of customary and traditional subsistence users by giving rural Alaskans preference in the take of fish and wildlife on federal lands, particularly when resources are scarce (Public Law 96-487; Sec. 801, Sec. 802). Section 810 of ANILCA requires all federal agencies to evaluate the effects of their actions on subsistence uses and needs.

Under state law, all Alaska residents are equally eligible for subsistence hunting of game populations where subsistence use occurs. This difference between state and federal law resulted in a dual subsistence management system. The federal government regulates federal subsistence harvests on federal public lands and federally-reserved waters in Alaska (Wolfe 2000). The State of Alaska regulates state subsistence fisheries and hunts on all Alaska lands and waters, while the Division of Wildlife Conservation continues to have the responsibility to manage wildlife for all users on all lands within Alaska. Subsistence harvesters need to take into consideration both the federal subsistence regulation booklet and the state subsistence regulation booklet because there are overlapping state-federal jurisdictions in many areas (Wolfe 2000). For the purposes of this EIS, the subsistence concepts described in the text box below were considered.

Federal Definition of Subsistence	The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade.
Alaska Federation of Natives Definition of Subsistence	The hunting, fishing, and gathering activities which traditionally constituted the economic base of life for Alaska's Native peoples and which continue to flourish in many areas of the state today. Subsistence is more than the right to hunt and gather wild and traditional foods, it is about human beings. Subsistence is a way of life in rural Alaska that is vital to the preservation of communities, tribal cultures and economies. Subsistence, being integral to Native Alaskan's worldview, and among the strongest remaining ties to ancient cultures, is as much spiritual and cultural, as it is physical.

Subsistence issues as related to Alaska Native Tribes in particular are also discussed in Section 3.18, Environmental Justice.

3.15.1 Subsistence Topics

3.15.1.1 Proximity and Access

Regional populations with recognized subsistence interests on USARAK lands include the Native Village of Eklutna, Nenana, Healy Lake, Delta Junction, Big Delta, Dry Creek, Dot Lake, Cantwell, Minto, Tanana, McKinley Village and Fort Yukon. Gathering of information regarding subsistence activities on and around USARAK lands is ongoing.

See also Section 3.14, Public Access and Recreation for descriptions of when and where access to USARAK lands may occur. A description of USARAK's new call-in system, USARTRAK, for updated information on public access to USARAK lands can be found in Appendix H.

3.15.1.2 Resource Availability

Subsistence is generally associated with rural, remote areas that have less infrastructure and development, with little or no opportunity to purchase or receive commercially available resources such as food, drink, and other supplies. Subsistence resources have great nutritional, economical, cultural, and spiritual importance in the lives of rural Alaskans. Legally-sanctioned subsistence preferences for hunting and trapping apply to rural Native groups and villages, as well as to other rural dwellers. Subsistence most often involves the take or harvest of food resources from public lands. This occurs in the form of hunting, fishing, and trapping as well as the harvesting of nongame resources such as plants and berries.

Subsistence take of resources occurs for a number of reasons. Subsistence users do not have viable access to commercial sources of food and supplies on a regular basis. Subsistence is also based on tradition and culture for many of the people involved. There are essential cultural and spiritual values attached to subsistence hunting and fishing for Native villages in Alaska. In addition, subsistence harvest often involves a community effort, as some residents will harvest food for others in the community, as well as for themselves. For example, 60% of rural households harvest game while 86% of rural households consume harvested game (Alaska Department of Fish and Game 2000d). This widespread sharing of foods reflects core cultural beliefs.

Seasons, harvest limits, methods and means, and customary and traditional use determinations related to the taking of wildlife on federal public lands for subsistence uses is regulated by the Federal Subsistence Board. Subsistence management regulations are published by this board annually. The board determines which communities or areas have customarily and traditionally taken a wildlife population. If the board has determined a customary and traditional use for a wildlife population, it also designates which communities have federal subsistence priority for that species in that unit. If a determination of "no federal subsistence priority" is made then there are no federal subsistence seasons for that species and management unit. When no federal subsistence seasons are identified, hunting seasons, limits, and methods and means are regulated by the State of Alaska. All rural residents must possess a resident license to hunt or trap under the federal subsistence regulations. All Alaskan residents between the ages of 16 and 60 must possess a state of Alaska license to hunt, trap, or fish in Alaska.

Harvesting of nongame resources, such as edible or medicinal plants, is determined by when and where public access is permitted. Refer to Section 3.14, Public Access and Recreation for access opportunities and restrictions on USARAK lands.

Federal subsistence management units 14 and 20 include all of the USARAK properties discussed in this document. Management Unit 20 is subdivided into six subunits. These subunits are very large and USARAK properties make up a portion of each. Federal subsistence management regulations apply to all of Unit 20, while state regulations apply to Unit 14C (Appendix A, Figure 3.9.a).

3.15.2 Fort Wainwright

Fort Wainwright (FWA) training areas fall in the traditional lands of Tanana and Tanacross Athabaskans. Traditional settlement patterns focused on a widely mobile and seasonal lifestyle, with the fall caribou and moose hunt playing a pivotal role in subsistence preparations for the winter while summer activities were focused on fish camps, berry/root collecting and sheep hunting (McKennan 1981). Fish and moose continue to play a primary role in Interior communities near FWA training area lands (including Gerstle River and Black Rapids training areas; e.g., Martin 1983; Marcotte 1991; pers. comm. with tribal representatives from the Interior). Plant gathering continues to be a focus in the spring, summer and fall, with residents from Dot Lake, for example, traveling as far as Donnelly Dome, Delta Junction and Eielson to collect berries, roots, and plant resources (Martin 1983).

3.15.2.1 Proximity and Access

Nenana (population 486) lies along the Parks Highway, 55 miles southwest of Fairbanks (Alaska Department of Community and Economic Development 2002). The town is approximately 13 miles from the western boundary of Tanana Flats Training Area (TFTA). Residents practice subsistence lifestyles. Other communities with subsistence ties to FWA are Cantwell, Minto, and McKinley Village.

Subsistence users may access FWA under USARAK's current recreational use policy as described in Section 3.14, Public Access and Recreation. A description of USARAK's new call-in system for updated information on access to USARAK lands can be found in Appendix H.

3.15.2.2 Resource Availability

Wildlife resources are readily available on FWA, Yukon Training Area (YTA) and TFTA. Due to the size and relatively remote location of these areas, natural resources and wildlife populations are fairly well preserved.

All training areas at FWA host a variety of hunting and trapping activities. Customary and traditional use has been determined for the following species: brown bear, moose, beaver, coyote, red fox, hare, lynx, marten, mink & weasel, muskrat, otter, wolf, wolverine, grouse and ptarmigan. Subsistence permits can be obtained for the take of these species. Restrictions to season, take and which rural residents may participate are identified in Tables 3.15.a. b, c, and d.

3.15.3 Donnelly Training Area

3.15.3.1 Proximity and Access

Healy Lake residents (population 37) live a subsistence lifestyle (Alaska Department of Community and Economic Development 2002). The village is 29 miles east of Donnelly Training Area (DTA).

The towns of Delta Junction (population 840) and Big Delta (population 749) lie adjacent to DTA at the junction of the Richardson and Alaska highways. These towns are rural and therefore

qualify for subsistence preference under current law. The towns have a developed economic infrastructure.

Approximately 45 miles east-southeast of Delta Junction is the non-native community of Dry Creek (population 128). According to the Alaska Department of Community and Economic Development (2002), at least 15 adult residents rely on the exploitation of natural resources and a number of Dry Creek residents can be characterized as subsistence hunters/trappers.

The Native Village of Dot Lake is about 60 miles east-southeast of Delta Junction along the Alaska Highway. Most of the village's historic subsistence harvest areas end at the Gerstle River (Marcotte 1991). Some residents of Dot Lake, however, travel the extra distance to hunt on DTA.

3.15.3.2 Resource Availability

Subsistence resources are readily available on both DTA and Gerstle River Training Area. Due to the size and relatively remote location of these areas, natural resources and wildlife populations are well preserved.

DTA annually hosts a variety of hunting activities based on access and available big game populations. Customary and traditional use has been determined for the following species: brown bear, moose, beaver, coyote, red fox, hare, lynx, marten, mink & weasel, muskrat, otter, wolf, wolverine, grouse and ptarmigan. Subsistence permits can be obtained for the take of these species. Restrictions to season, take, and which rural residents may participate are identified in Tables 3.15.a, b, c, and d. Anadromous fish stocks are not available on the training areas, but other freshwater fish can be harvested. For more information on these resources, see Section 3.9, Wildlife and Fisheries.

Subsistence users may access DTA under USARAK's current recreational use policy as described in Section 3.14, Public Access and Recreation.

3.15.4 Fort Richardson

3.15.4.1 Proximity and Access

Fort Richardson (FRA) lies within the traditional lands of the Dena'ina, northern Athabaskan Tribes of Cook Inlet. The Dena'ina traditionally pursued a semi-permanent lifestyle, spending winters in permanent settlements and dispersing in the summer months with the onset of summer fish runs. Seasonal camps at favorable fishing locations were established along riverbanks, coastal edges, and lakeshores. A number of these traditional fish camp sites are known to lie within what is now FRA. Once salmon runs had ended, groups would often travel into the mountains to hunt caribou and mountain sheep. Moose, bear, mountain goats and Dall sheep were often hunted year-round in areas outlying winter village settlements.

The only Dena'ina village remaining in the FRA vicinity is the Native Village of Eklutna, located approximately 15 miles north of the cantonment area and post entrance. However, the Native Village of Knik and many other communities from further up Knik Arm traditionally traveled to the Anchorage area with the June king salmon runs. It is known that many communities in the Cook Inlet region traditionally used a wide variety of subsistence resources that are present today on FRA. Contemporary communities extend through kinship ties into Eagle River and Anchorage, for example. Any reference to specific communities here is based on current proximity of federally recognized tribal governments to USARAK managed lands. It is hoped that a better

understanding of subsistence use and traditional use areas on FRA will be gained through ongoing coordination efforts.

3.15.4.2 Resource Availability

The Federal Subsistence Board has delineated a FRA and Elmendorf Air Force Base Management Area (consisting of FRA and Elmendorf military reservations). Under the "special provisions" for Management Unit 14, the FRA and Elmendorf Management Area is closed to subsistence taking of wildlife (Subsistence Management Regulations 2002-2003). Subsistence take under the customary and traditional use determinations are permitted for areas in Management Unit 14C other than FRA and Elmendorf AFB. Hunting on FRA is permitted under State of Alaska regulations. See Table 3.9.e in Section 3.9, Wildlife and Fisheries for a summary of harvest management regulations for FRA. Restrictions to season, take, and which rural residents may participate are identified in Tables 3.15.a, b, c, and d.

Table 3.15.a. Subsistence Management Regulations for Unit 20A (1 July 2002 - 30 June 2003).

Game Management Unit 20A Tanana Flats Training Area, Donnelly Training Area – West			
Species	**Customary & Traditional Use Determination**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	No Federal Open Season		
Brown Bear	All Rural Residents	Sep 1 – May 31	1 bear/4yrs
Caribou	No Federal Open Season		
Sheep	No Federal Open Season		
Moose	Residents of Cantwell, Minto, Nenana, McKinley Village	Sep 1 – Sep 20	1 Antlered Bull
Bison	No Federal Open Season		
Coyote	All Rural Residents	Sep 1 – Apr 30	2 coyotes
Fox, Red	All Rural Residents	Sep 1 – Mar 15	10 foxes
Hare	All Rural Residents	Jul 1 – Jun 30	No Limit
Lynx	All Rural Residents	Dec 1 – Jan 31	2 Lynx
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Aug 10 – Apr 30	10 Wolves
Wolverine	All Rural Residents	Sep 1 – Mar 31	1 Wolverine
Grouse	All Rural Residents	Aug 10 – Mar 31	15/day 30/poss
Ptarmigan	All Rural Residents	Aug 10 – Mar 31	20/day 40/poss
Trapping			
Beaver	All Rural Residents	Nov 1 – Apr 15	No limit
Coyote	All Rural Residents	Nov 1 – Mar 31	No limit
Fox, Red	All Rural Residents	Nov 1 – Feb 28	No limit
Lynx	All Rural Residents	Dec 1 – Jan 31	No limit
Marten	All Rural Residents	Nov 1 – Feb 28	No limit
Mink & Weasel	All Rural Residents	Nov 1 – Feb 28	No limit
Muskrat	All Rural Residents	Nov 1 – Jun 10	No limit
Otter	All Rural Residents	Nov 1 – Apr 15	No limit
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Nov 1 – Apr 30	No limit
Wolverine	All Rural Residents	Nov 1 – Feb 28	No limit

Table 3.15.b Subsistence Management Regulations for Unit 20B (1 July 2002 – 30 June 2003).

Game Management Unit 20B Fort Wainwright – Main Post, Yukon Training Area			
Species	**Customary & Traditional Use Determination**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	No Federal Open Season		
Brown Bear	All Rural Residents	Sep 1 – May 31	1 bear/4yrs
Caribou	No Federal Open Season		
Sheep	No Federal Open Season		
Moose	Rural Residents of Unit 20(B), Nenana and Tanana	Sep 1 – Sep 20	1 Antlered Bull
Bison	No Federal Open Season		
Coyote	All Rural Residents	Sep 1 – Apr 30	2 coyotes
Fox, Red	All Rural Residents	Sep 1 – Mar 15	10 foxes
Hare	All Rural Residents	Jul 1 – Jun 30	No limit
Lynx	All Rural Residents	Dec 1 – Jan 31	2 Lynx
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Aug 10 – Apr 30	10 Wolves
Wolverine	All Rural Residents	Sep 1 – Mar 31	1 Wolverine
Grouse	All Rural Residents	Aug 10 – Mar 31	15/day 30/poss
Ptarmigan	All Rural Residents	Aug 10 – Mar 31	20/day 40/poss
Trapping			
Beaver	All Rural Residents	Nov 1 – Apr 15	No limit
Coyote	All Rural Residents	Nov 1 – Mar 31	No limit
Fox, Red	All Rural Residents	Nov 1 – Feb 28	No limit
Lynx	All Rural Residents	Dec 1 – Jan 31	No limit
Marten	All Rural Residents	Nov 1 – Feb 28	No limit
Mink & Weasel	All Rural Residents	Nov 1 – Feb 28	No limit
Muskrat	All Rural Residents	Nov 1 – Jun 10	No limit
Otter	All Rural Residents	Nov 1 – Apr 15	No limit
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Nov 1 – Apr 30	No limit
Wolverine	All Rural Residents	Nov 1 – Feb 28	No limit

Table 3.15.c Subsistence Management Regulations for Unit 20D (1 July 2002 – 30 June 2003).

Game Management Unit 20D Donnelly Training Area – East, Gerstle River Training Area			
Species	**Customary & Traditional Use Determination**	**Open Season**	**Harvest Limits**
Hunting			
Black Bear	No Federal Open Season		
Brown Bear	All Rural Residents	Sep 1 – May 31	1 bear/4yrs
Caribou	No Federal Open Season		
Sheep	No Federal Open Season		
Moose	No Federal Open Season		
Bison	No Federal Open Season		
Coyote	All Rural Residents	Sep 1 – Apr 30	2 coyotes
Fox, Red	All Rural Residents	Sep 1 – Mar 15	10 foxes
Hare	All Rural Residents	Jul 1 – Jun 30	No Limit
Lynx	All Rural Residents	Dec 1 – Jan 31	2 Lynx
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Aug 10 – Apr 30	10 Wolves
Wolverine	All Rural Residents	Sep 1 – Mar 31	1 Wolverine
Grouse	All Rural Residents	Aug 10 – Mar 31	15/day 30/poss
Ptarmigan	All Rural Residents	Aug 10 – Mar 31	20/day 40/poss
Trapping			
Beaver	All Rural Residents	Nov 1 – Apr 15	No limit
Coyote	All Rural Residents	Nov 1 – Mar 31	No limit
Fox, Red	All Rural Residents	Nov 1 – Feb 28	No limit
Lynx	All Rural Residents	Dec 1 – Jan 31	No limit
Marten	All Rural Residents	Nov 1 – Feb 28	No limit
Mink & Weasel	All Rural Residents	Nov 1 – Feb 28	No limit
Muskrat	All Rural Residents	Nov 1 – Jun 10	No limit
Otter	All Rural Residents	Nov 1 – Apr 15	No limit
Wolf	Rural residents of Units 6, 9, 10 (Umiak only), 11-13, Chickaloon and 16-26	Nov 1 – Apr 30	No limit
Wolverine	All Rural Residents	Nov 1 – Feb 28	No limit

Table 3.15.d Subsistence Management Regulations for Unit 14 (1 July 2002 – 30 June 2003).

Game Management Unit 14 Fort Richardson			
Species	**Customary & Traditional Use Determination[1]**	**Open Season[2]**	**Harvest Limits[2]**
Hunting			
Black Bear	Closed to Subsistence taking of Wildlife		
Brown Bear	Closed to Subsistence taking of Wildlife		
Caribou	Closed to Subsistence taking of Wildlife		
Sheep	Closed to Subsistence taking of Wildlife		
Moose	Closed to Subsistence taking of Wildlife		
Bison	Closed to Subsistence taking of Wildlife		
Coyote	Closed to Subsistence taking of Wildlife		
Fox, Red	Closed to Subsistence taking of Wildlife		
Hare	Closed to Subsistence taking of Wildlife		
Lynx	Closed to Subsistence taking of Wildlife		
Wolf	Closed to Subsistence taking of Wildlife		
Wolverine	Closed to Subsistence taking of Wildlife		
Grouse	Closed to Subsistence taking of Wildlife		
Ptarmigan	Closed to Subsistence taking of Wildlife		
Trapping			
Beaver	Closed to Subsistence taking of Wildlife		
Coyote	Closed to Subsistence taking of Wildlife		
Fox, Red	Closed to Subsistence taking of Wildlife		
Lynx	Closed to Subsistence taking of Wildlife		
Marten	Closed to Subsistence taking of Wildlife		
Mink & Weasel	Closed to Subsistence taking of Wildlife		
Muskrat	Closed to Subsistence taking of Wildlife		
Otter	Closed to Subsistence taking of Wildlife		
Wolf	Closed to Subsistence taking of Wildlife		
Wolverine	Closed to Subsistence taking of Wildlife		

[1] Subsistence taking of some species is permitted by rural residents in areas of Game Management Area 14C that do not include FRA or Elmendorf AFB management areas.

[2] Open season and harvest limits are available for some species under the Alaska Department of Fish and Game regulations and can be found in Table 3.9.e in Section 3.9, Wildlife and Fisheries.

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3.16 NOISE

Topics discussed in this section include:

- Federal and Army noise criteria
- Existing noise contours at USARAK installations
- Current management of noise issues

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS. Additional noise information is presented in Appendix E. Current noise management practices, as described in the Army Regulations 200-1, are described in Appendix H.

Sound is a small-scale fluctuation of air pressure that typically follows a repetitive pattern (Olishifski and Hartford 1975). Noise is unwanted sound that can cause behavioral change, impair speech and normal activities, and damage hearing. General audible noises are those sounds heard everyday.

Human response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. The military noise environment consists primarily of three types of noise: transportation noise from aircraft and vehicles, impulsive noise from armor and artillery firing and demolition operations, and noise from firing at small arms ranges.

Janssen (1980) described three levels of impact of noise to wildlife. Primary effects damage hearing organs and result in temporary or permanent loss of hearing. Secondary effects result in alteration of behavior (including startle response or movement away from the noise) or inducement of the physiological stress response. Tertiary effects result in population-level changes including increased mortality, reduced reproductive rate, or habitat abandonment. The effects of aircraft noise have been studied on a variety of wildlife species; less is known about the effects of artillery firing.

Sound levels are typically measured using a decibel, A-weighted scale (dBA). The lower threshold of human hearing is 0 dBA. The threshold of pain for the human ear is approximately 140 dBA. Table 3.16.a shows some common sound levels using the A-weighted scale.

Table 3.16.a Typical Decibel Levels for A-weighted Noise Levels.[1]

Type of Event	Sound Level (dBA)
Threshold of Hearing	0
Soft Whisper	30
Background Noise for Wilderness and Rural Areas	35-50
Freeway Auto Traffic	65
Jet Takeoff	120

[1] Assume noise source is adjacent.

Source: Thurman and Miller 1990; Powell and Forrest 1988

Sound can also be measured instantaneously. For example, a Swedish study by Sorensen and Magnusson (1979) used an A-weighted fast-time integrated maximum level (L_{Amaxf}) to measure sound levels from small weapons at different distances and angles from the weapons (Table 3.16.b).

Table 3.16.b Predicted Maximum Noise Levels, dBA (L_{Amaxf})[1] from M-16 and .50 Caliber Weapons.

Type of Weapon and Distance (feet)	Sound Level (L_{Amaxf})
M-16 Rifle (90° angle from firing)	
164	88-100
328	79-93
656	70-86
1,640	58-76
3,281	49-69
6,562	40-62
.50 Caliber Machine Gun (90° angle from firing)	
164	97-109
328	88-102
656	79-95
1,640	67-85
3,281	57-78
6,562	49-71

[1] A-weighted fast time integrated maximum level

Source: Sorensen and Magnusson 1979

The distance and angle of firing are also important considerations to predict the level of impact to communities (Table 3.16.c). Noise levels are loudest in front of a discharging weapon. Thus, the peak level (dBP) is higher when an observer is standing 45 degrees from a firing weapon than someone directly behind the weapon.

For example, at a distance of 1.24 miles (2 km) and an angle of 45 degrees from the direction of fire, the probability of exceeding 115 decibels (dBP), which results in a moderate risk of noise complaints, would be exceeded approximately 49% of the time. At a 90 degree angle, from the same 1.24 mile distance, the expected dBP would be 113, and annoyance threshold of 115 dBP would be exceeded about 42% of the time. If the firing was in the opposite direction (180 degrees), the expected dBP from 1.24 miles would be 101. And the 115 dBP annoyance threshold would be exceeded only 0.9% of the time. In addition, the 115 dBP threshold attenuates rapidly with distance. At 45 degrees noise levels exceed 115 dBP only about 15% of the time at a distance of 1.86 miles (3 km). Using data such as these, as well as weather factors, the Army can plan range use so as to minimize disturbance to nearby communities.

Table 3.16.c Expected Noise Levels From Detonating 105mm Artillery Rounds.

Distance (miles)	Direction of Fire (degrees from explosion)					
	45°		90°		180°	
	dBP Expected	% of time >115 dBP	dBP Expected	% of time >115 dBP	dBP Expected	% of time >115 dBP
1.24	115	49.0	113	42.0	101	0.9
1.86	108	15.0	107	11.0	95	0.1
2.48	103	5.0	102	3.5	90	<0.1
3.11	97	1.9	96	1.3	84	0.0
3.73	97	0.9	96	0.6	84	0.0
7.14	87	0	86	0.0	73	0.0

>115 dBP moderate risk of noise complaints

<115 dBP low risk of noise complaints

Source: Catherine Stewart, personal communication 2003, based on Pater 1976.

3.16.1 Noise Topics

Listed below are criteria for analyzing the effects of sound on humans. These measures are used by the Army to assess the impacts of noise to the public (Table 3.16.d).

- *Day-night average sound level (DNL)* – The DNL represents sound levels measured by totaling and averaging levels during a 24-hour period. A penalty of 10 decibels (dB) is assigned to noise events occurring between 10:00 p.m. and 7:00 a.m., which compensates for lower nighttime background noise levels and increased annoyance associated with events occurring at night.The DNL is a useful descriptor for noise because: (1) it averages continuous noise, such as a busy highway, and (2) it measures total sound energy over a 24-hour period. Thus, DNL effectively identifies a "noise dose" for a day.
- *A-weighted DNL (ADNL)* – Noise from transportation sources, such as vehicles and aircraft, and from continuous sources, such as generators, are assessed using the ADNL. Noise from small arms ranges is assessed using the ADNL.
- *C-weighted DNL (CDNL)* – These are impulse noises resulting from armor, artillery, and demolition activities. The CDNL is often used to characterize high-energy blast noise and other low frequency sounds capable of inducing vibrations in buildings or other structures. (Note that the Army uses the CDNL measurement to measure instantaneous noise, not the A-weighted fast-time integrated maximum level (L_{Amaxf}) used in Table 3.16.b).
- *Linear Peak (dBP)* – This is the maximum instantaneous (35/1,000,000 of a second reading) level that occurs during a time period. It can only be measured with a precision impulse sound level meter or a digital circuit that samples fast enough to capture the instantaneous peak of the pressure wave.

3.16.1.1 Noise Zones

3.16.1.1.1 Noise Zone I

This zone includes all areas around a noise source in which the day-night sound level is less than 65 dBA or less than 62 dBC. Area is usually suitable for all types of land use activities.

3.16.1.1.2 Noise Zone II

Includes areas where the day-night sound levels vary between 65 and 75 dBA or between 62 and 70 dBC. Exposure to noise within these areas is considered significant and land uses should normally be limited to activities such as industrial, manufacturing, transportation and resource production. However, if the community determines that lands must be used for residential purposes, then noise level reduction (NLR) features should be incorporated into the design and construction of the buildings.

3.16.1.1.3 Noise Zone III

This zone includes areas around noise sources where the day-night sound level (DNL) is greater than 75 decibels; A-weighted (dBA) for aircraft, vehicle, and small arms range noise, exceeds 70 decibels; or C-weighted (dBC) for noise from weapon systems larger than 20-mm. The noise levels are considered so severe that noise-sensitive land uses should not be considered.

See Table 3.16.d for associated noise levels for each zone. In fulfillment of AR 200-1, USARAK developed Installation Noise Management Plans for each installation in 2001 that assessed the noise environments and associated impacts.

Table 3.16.d Noise Limits and Zones for Land Use Planning.

Noise Zone	% of Population Highly Annoyed	Noise Source (Units)		
		Transportation (ADNL)	Impulse (CDNL)	Small Arms (dBP)
I	<15%	<65 dBA	<62 dBC	<87
II	15%-39%	65-75 dBA	62-70 dBC	87-104
III	>39%	>75 dBA	>70 dBC	>104

Source: 1997 Army Regulation 200-1 (Appendix H)

3.16.1.2 Army Noise Management

The Army's Environmental Noise Management Program is described in Army regulations (AR 200-1), which implement federal law concerning environmental noise generated by Army activities, including aircraft operations, range firing, and weapons testing (Appendix H). The goals of the program are to protect the health and welfare of people on and off installations affected by Army-produced noise and to reduce community annoyance from environmental noise. The program seeks to achieve compliance with applicable noise regulations in a manner consistent with an installation's military mission.

The Environmental Noise Management Program requires installations to implement environmental noise policies to identify and control the effects of noise. Among these policies

is the requirement to predict noise levels for long-range planning, including preparation of noise contour maps. The maps delineate up to three different noise zones, which are based on the expected percentage of the population that would be highly annoyed by environmental noise. These noise zones, described above, are determined through mathematical modeling and computer simulations.

3.16.2 Fort Wainwright

The existing noise environment for Fort Wainwright (FWA), including the Main Post, Yukon Training Area (YTA), and Tanana Flats Training Areas (TFTA), is documented in the FWA Installation Environmental Noise Management Plan (Montgomery et al. 2001b). Noise sources include traffic, aircraft, and large and small caliber weapons.

3.16.2.1 Noise Zones

3.16.2.1.1 Main Post

As part of the Installation Environmental Noise Management Plan process, computer noise models were used to generate noise contours for existing operations at FWA. The Zone II noise contour for large caliber weapons extends slightly off the installation along the eastern boundary, but there are no noise-sensitive land uses within this area. The Zone III contours are contained within the installation (Appendix A, Figure 3.16.a).

3.16.2.1.2 Tanana Flats Training Area

Existing operations that generate noise at TFTA are primarily maneuver training with occasional large caliber weapons firing and demolition activity. The noise contours for TFTA are contained well within the installation boundary (Appendix A, Figure 3.16.a).

3.16.2.1.3 Yukon Training Area

Existing YTA noise sources include demolition activity and artillery firing. The YTA noise contours are located towards the center of the training area, over four miles from the installation boundary. The YTA noise contours are found in Appendix A, Figure 3.16.b.

3.16.2.2 Noise Management

Fort Wainwright receives relatively few complaints each year from the surrounding community regarding environmental noise. Most of the complaints that have been logged are questions about the source of the noise and when the noise is expected to cease. The FWA staff has found that advance notice to the public on training schedules decreases the number of calls to the Public Affairs Office, the department responsible for managing noise complaints (Montgomery et al. 2001b).

3.16.3 Donnelly Training Area

Routine noise generating operations at Donnelly Training Area (DTA) involve rotary-wing aircraft, artillery training, and bomb detonation. In addition, other minor sources of noise include construction, traffic, and recreation. Some of the noise reported on and off the Army installation is due to Air Force aircraft flying over DTA airspace. The current noise environment at DTA is documented in the Installation Environmental Noise Management Plan that was prepared for Fort Greely in 2001.

3.16.3.1 Noise Zones

The DTA noise contours stay within the installation (Appendix A, Figure 3.16.c).

3.16.3.2 Noise Management

DTA receives relatively few complaints each year from the surrounding community regarding environmental noise. Most calls are from people with questions or requests for information. The few complaints logged recently are due to noise from large-scale training activities such as Northern Edge and Cope Thunder. To lessen noise-related problems, DTA has: (1) changed to newer, quieter equipment, and (2) changed timing and location of training activities to reduce noise impact on the public (Montgomery and Watson 2001). Also, DTA provides three-day notice to the public for noise generated by unusual flight patterns or training operations, atypical use of munitions, and atypical or new use of areas.

3.16.4 Fort Richardson

The existing noise environment for Fort Richardson (FRA) is documented in the Installation Environmental Noise Management Plan (Montgomery et al. 2001a). Noise sources include traffic, aircraft, and small and large caliber weapons. The Installation Environmental Noise Management Plan concluded that no significant noise problems were associated with existing operations at FRA.

3.16.4.1 Noise Zones

The noise contours for both small arms and larger caliber weapons are contained within military lands (FRA or Elmendorf Air Force Base), but some Zone II and Zone III contours do overlap a small portion of the ocean near Eagle River Flats (Appendix A, Figure 3.16.d).

3.16.4.2 Noise Management

FRA receives few complaints each year from the surrounding community regarding environmental noise. Most calls are from people with questions or requests for information. The few complaints logged recently are due to noise from rotary-wing flights and fixed-wing aircraft, typically from other installations in or approaching FRA airspace. To lessen noise-related problems, FRA has: (1) adopted newer, quieter equipment, and (2) changed timing and location of training activities to reduce noise impact on the public (Montgomery et al. 2001a).

3.17 HUMAN HEALTH AND SAFETY

Issue B: Traffic. Potential impact from increased military traffic was identified as an issue of concern during the public scoping meetings, and is therefore evaluated in this EIS (see Section 1.8, Scoping Issues of Concern).

Topics discussed in this section include:

- Traffic concerns in and around each installation
- Hazardous materials of note at each installation
- Contaminated sites at each installation
- Unexploded ordnance concerns

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS.

Human health and safety includes the facets of military activities and materials that potentially pose a risk to the health, safety, and well-being of military personnel or civilians. Risks involve hazardous materials and wastes, asbestos, radon, polychlorinated biphenyls (PCBs), solid wastes, pesticides, and lead-based paint, in addition to unexploded ordnance and other occupational safety hazards posed by U.S. Army Alaska (USARAK) activities.

3.17.1 Human Health and Safety Topics

Due to the regulatory nature of most human health and safety concerns, background information and regulations common to all USARAK properties is listed in the following sections. Property-specific information regarding each human health and safety issue can be found under the appropriate property.

3.17.1.1 Traffic

Traffic on Alaskan highways has risen steadily over the past decade. Traffic information is available from the Alaska Department of Transportation's (AKDOT) 1999-2001 statistical data (AKDOT 2002b). Vehicle counts along the Glenn Highway between Anchorage and the Matanuska Valley have increased as a result of development and commuting from the valley to Anchorage.

Accident information is available from AKDOT's year 2000 statistical data (AKDOT 2002a). Accidents have been divided into two categories: those involving either property damage only (PDO) or minor injuries, and accidents involving major injuries or fatalities. Overall, fewer accidents in Alaska occurred, based on vehicle miles traveled (VMT), on divided rural interstates (1.166 accidents per 100 million VMT) and undivided urban and rural interstates (1.282 accidents per 100 million VMT). These are also the roadways most likely to be impacted by "administrative road marches," involving military convoy traffic for deployment training. Currently, deployment miles are greatest between Fort Richardson (FRA) and Donnelly Training Area (DTA), while convoys occur most commonly between Fort Wainwright (FWA) Main Post and Yukon Training Area (YTA). Deployment miles may also include rail and air transport methods, such as airborne training flights.

AR 55-2 (Department of the Army 2001) provides detailed regulations for convoy preparation and implementation (Appendix H). Army convoys are subject to a permitting process in conjunction

with AKDOT. USARAK standard operating procedures call for large convoys to be broken into groups of no more than 20 vehicles. These groups are then separated by 30-minute gaps to alleviate traffic pressures on Alaska's highways. Highway speed for a military convoy is not expected to exceed 40 miles per hour with the exception of "catch-up speed" listed at 45 miles per hour. Convoys are normally not authorized to travel on post during peak traffic hours (USARAK 2001).

Table 3.17.a USARAK Current Deployment Miles.

Deployment	Deployment Miles
Fort Richardson to Donnelly Training Area	206,400
Fort Wainwright to Yukon Training Area	32,400
Fort Wainwright to Donnelly Training Area	192,800
TOTAL	437,600

Richardson Highway

Average daily traffic counts in 2001 along the Richardson Highway are only available in close proximity to Fairbanks, but do show a sharp decline in traffic levels from Fairbanks south to Harding Lake. Average daily traffic between Fairbanks and North Pole was 15,000 vehicles, while average traffic south of Eielson AFB towards Harding Lake was 2,600 vehicles per day. This translates into 5,475,000 vehicles annually between Fairbanks and North Pole, and 949,000 vehicles annually between Eielson AFB and Harding Lake. No vehicle counts are available for points further south along the Richardson Highway.

Accidents recorded along the Richardson Highway are from Alaska Department of Transportation's 2000 statistics. Between the Glenn Highway and Delta Junction, there were 22 PDOs and minor accidents, and 2 major accidents. Moose were involved in 7 of the accidents along this 151-mile stretch. Between Delta Junction and Eielson, there were 47 PDOs and minor accidents, and 2 major accidents. Moose were involved in 10 of these accidents. This stretch of the highway covers 76.9 miles. Between Eielson and Fairbanks, there were 111 PDOs and minor accidents, and 5 major and fatal accidents. Moose were involved in 20 of the accidents along this 17.4-mile stretch.

Parks Highway

Traffic along the Parks Highway has grown in the past decade. Average daily counts in 2001 along the Parks Highway near the junction with the Glenn Highway yielded 18,886 vehicles. This number declined rapidly after passing the Wasilla metropolitan area, with daily averages of 9,390 between Pittman Road and Big Lake Road, and 3,490 between the Little Susitna River and Willow. Daily traffic counts increased again with proximity to Fairbanks. Between Nenana and Ester, the 2001 average daily vehicle count was 2,200, and rose to 5,100 between Ester and Fairbanks.

Accidents along the Parks Highway are based on Alaska Department of Transportation's 2000 statistics. Between Talkeetna and Ester, there were 141 PDOs and minor accidents, and 11 major and fatal accidents. Moose were involved in 21 of the accidents along this 250.3-mile stretch. Between Ester and the Richardson Highway Ramp, there were 44 PDOs and minor accidents, and 3 major accidents. Moose were involved in 6 of these accidents. This length of the Parks Highway is 10.1 miles.

Between Wasilla (at Pittman Road) and the Talkeetna cutoff, there were 77 PDOs and minor accidents, and 3 major and fatal accidents. Moose were involved in 17 of the accidents along this 49.7-mile stretch. Within Wasilla, from the Glenn Highway to Pittman Road, there were 207 PDOs and minor accidents, and 14 major and fatal accidents. Moose accounted for 14 of these accidents. This stretch of the Parks Highway is 13.6 miles.

Glenn Highway

The 2001 average daily vehicle count for the Glenn Highway between Eagle River and Anchorage was 48,066 vehicles per day. That number dwindled to 22,411 at the Parks Highway junction, and decreased to 2,557 after Farm Loop Road. These numbers translate into 17,500,000 vehicles annually traveling between Eagle River and Anchorage, and 933,000 traveling the Glenn Highway past Palmer. No vehicle counts are available for further points along the highway.

Between Palmer and the junction with the Richardson Highway, there were 57 PDOs and minor accidents, and 4 major and fatal accidents in 2000. Moose were involved in 17 of these accidents. The length of this highway segment is 126.5 miles, from Jonesville Mine Road to Richardson Highway. Within Palmer, there were 33 PDOs and minor accidents, and 2 major and fatal accidents. Moose were involved in 6 of these accidents. This highway segment runs 14.5 miles, from Springer Inner Loop to Jonesville Mine Road.

From North Birchwood Overpass to Springer Loop Road, there were 131 PDOs and minor accidents in 2000, and 4 major and fatal accidents. This stretch is 19.8 miles, and 23 of these accidents involved moose. From FRA ramp to North Birchwood, there were 192 PDOs and minor accidents, and 8 major and fatal accidents. Moose were involved in 20 of the accidents along this 12.8-mile stretch of Glenn Highway.

3.17.1.2 Hazardous Materials and Wastes Management

Hazardous materials and waste management includes the applicable regulatory procedures and programs that are designed to ensure proper handling of hazardous materials or wastes. Most activities that use or generate hazardous materials on USARAK lands are conducted within the cantonment areas on FRA and FWA. Discussion in this section will be largely limited to those two areas.

This section provides an overview of hazardous materials management, including hazardous waste management, pollution prevention initiatives, Installation Restoration Program sites, use of storage tanks, asbestos, PCBs, lead-based paint, radon, and pesticides. Hazardous materials and hazardous waste management activities are governed by federal and/or state regulations. This includes substances that may present a substantial risk to human health and the environment. Solid wastes that possess specific characteristics of toxicity, ignitability, corrosivity, or reactivity are also considered hazardous. Solid and liquid waste can be defined as any discarded materials that are not specifically excluded by 40 CFR 261.4. Transportation of hazardous materials is regulated under 49 CFR.

The U.S. Army Pamphlet 200-1 governs all aspects of managing hazardous materials and regulated waste by military or civilian personnel and on-post tenants and contractors, at all Army facilities. This pamphlet establishes the policies, responsibilities, and procedures for complying with hazardous materials/regulated waste management regulations, decision documents, and Records of Decision established by the Department of Defense, Department of the Army, USARAK, Environmental Protection Agency, United States Department of Transportation,

Occupational Safety and Health Administration, Alaska Department of Environmental Conservation, and Alaska Department of Labor.

This regulation applies to all military commands and units, civilian activities, tenants, contractors, subcontractors, and consultants working at USARAK facilities, including FRA, FWA, and DTA.

The activities covered by Pamphlet 200-1 include:

- Hazardous materials storage
- Waste minimization and pollution prevention activities
- Activities of waste generators
- Institutional controls for excavation and other land and water uses

3.17.1.3 Storage Tanks

Storage tanks are considered a human health and safety risk due to the potential toxicity of contents in storage, and the potential for corrosion and leaks. Storage tanks are the most commonly used method of hazardous material storage and containment. USARAK participates in the State of Alaska mandated Third-Party Inspection that requires a comprehensive inspection of all underground storage tanks every three years.

3.17.1.4 Pollution Prevention

USARAK has developed and implemented Pollution Prevention Plans to eliminate or reduce hazardous waste, hazardous substances, pollutants, and contaminants. The Army recycles fuel and oil, batteries, antifreeze, and brass from shell casings. In addition, USARAK has purchased an aluminum can recycling machine and actively works to substitute products that pose environmental risks. The Army also has worked to replace ozone-depleting refrigerants and fire protection equipment. The Ozone Depleting Chemical Management Plans for USARAK detail compliance with international and federal laws that restrict the production, purchase, and use of certain ozone-depleting substances.

3.17.1.5 Asbestos

Most of the buildings on the posts contain some type of asbestos including floor tile, wall insulation, pipe insulation, wallboard, adhesives and mastics, and roofing materials. All buildings constructed prior to 1980 are considered to be at risk for asbestos. Building surveys to identify asbestos materials are conducted prior to the start of renovation and demolition work. All asbestos materials that are removed are documented for disposal in asbestos cells at local landfills.

3.17.1.6 Lead-based Paint

Lead-based paint was used extensively prior to 1960. In 1966, many manufacturers voluntarily reduced the level of lead added to paint, and in 1977, federal regulations officially limited the lead content of paint. Buildings that were constructed prior to 1978 have a high probability of having lead-based paint on both interior and exterior surfaces.

3.17.1.7 Pesticides

The use of pesticides has decreased significantly in recent years. Department of Defense guidelines stipulate three Measures-of-Merit for the Pest Management Program: (1) develop approved pest management plans by 1997, (2) reduce pesticide use by 50% against the 1993 baseline by 2000, and (3) have all pesticide applicators certified by end of fiscal year 1998.

USARAK has not met the goal of reducing pesticide use by 50% of the FY 1993 baseline, partly because of changes in climate and a subsequent increase in nuisance pests such as gnats, flies, and ants. The Army continually seeks alternative pest control agents and emphasizes non-chemical alternative methods where practicable.

USARAK has implemented Integrated Pest Management Plans. The goal of the plans is to provide guidance to operate and maintain effective programs that ensure effective and environmentally safe pest control. The pest management plans were written to comply with federal regulations, particularly the Federal Insecticide, Fungicide, and Rodenticide Act of 1972, state regulations (18 AAC 90, Pesticide Control), and Army regulations (Army Regulation 200-5, Pest Management).

3.17.1.8 Radon

Radon is a naturally occurring, slightly radioactive gas found throughout the world. Radon has some toxicity and in some areas can be present in concentrations sufficient to affect human health. Radon testing is common in many buildings throughout Alaska, including those on USARAK properties.

3.17.1.9 Contaminated Sites

USARAK administers an Installation Restoration Program to identify, investigate, and remediate contamination from regulated substances. The primary focus of the Installation Restoration Plan is remediation of contaminants such as chlorinated solvents, which are regulated by the Comprehensive Environmental Restoration, Compensation, and Liability Act (i.e., the "Superfund" Act). In addition, USARAK investigates and remediates contaminants such as PCBs, petroleum, and asbestos. These contaminants are not regulated under CERCLA, but are regulated by various other federal, state, and Army regulations.

Contaminant source areas are managed by interagency agreements designed to enact the Installation Restoration Program and address stakeholder concerns. The Army, EPA, and the State of Alaska have signed Federal Facility Agreements for both FRA and FWA. The agreements outlined how the Superfund Act clean-up process would be administered. In addition, Environmental Restoration Agreements between the State of Alaska and the Army were developed to outline clean-up processes at non-Superfund sites.

3.17.1.10 Unexploded Ordnance

Unexploded ordnance (UXO), or duds, refers to explosive munitions that have failed to detonate properly or completely, leaving potentially explosive munitions or hazardous materials at or near the point of impact. Dud munitions are a present hazard within impact area boundaries on many USARAK properties, as a variety of actions could possibly cause them to detonate, such as pressure, weight, or heat.

The approximate rate of munitions failure (i.e., ordnance that completely fails to detonate) is between 2.75 and 3.5%. The approximate rate of "low order detonation", or partially exploded ordnance, is between 0.25 and 0.3% (Dauphin and Doyle 2000, 2001). However, these rates may vary depending on a number of factors, such as age of the munitions being fired, variations in lot production, and ambient conditions. Snow-covered impact areas are also more likely to cause dudding than areas without snow. Given the nature of USARAK's impact areas and the frequency of winter training, it is expected that the dud rate could exceed 3.5%.

The Army is conducting an inventory of all closed, transferring, and transferred ranges to include a comprehensive history of all sites with UXO, discarded military munitions, and/or munitions constituents. The inventories have not yet been completed, but should be available to the public in 2003.

3.17.2 Fort Wainwright

3.17.2.1 Traffic

USARAK currently deploys regularly from FWA to YTA and DTA. Deployments to YTA occur 108 times per year, and may occur at the same time. These are platoon-sized training deployments, consisting of six vehicles each. The total annual military vehicle count from FWA Main Post to YTA is 648, or 1,296 including return traffic. Table 3.17.a summarizes USARAK's annually scheduled deployment miles.

Training deployments between FWA and DTA also occur regularly. USARAK deploys troops 26 times per year from Main Post to DTA, and these may occur at the same time. This includes 24 company-sized deployments involving 30 vehicles and two battalion-sized deployments involving 122 vehicles. The total annual military vehicle count between Main Post and DTA is 964, or 1,928 including return convoy traffic.

3.17.2.2 Hazardous Materials and Wastes Management

FWA is registered with the Environmental Protection Agency as a "Large Quantity Generator" of hazardous waste, per the Resource Conservation and Recovery Act (42 U.S.C 6901). Hazardous wastes at FWA are associated with equipment maintenance (e.g., vehicles, boats, aircraft) and facilities operation. Hazardous materials include petroleum-contaminated absorbent pads, batteries, light ballasts, mercury-containing light bulbs, non-recyclable oils and fuels, compressed gas, non-recyclable hydraulic fluid, lead-based paint, paint, paint thinners and solvents, pesticides, photo-developing chemicals, sandblast residue, solvents and degreasers, thermostats with mercury ampoules, and non-recyclable transmission fluid.

The wastes are temporarily stored in drums at satellite accumulation points located around FWA. Satellite accumulation points are located where wastes are generated on a continual basis. Other locations or facilities that do not generate wastes are subject to on-call collection of hazardous wastes.

Currently, Building 3489 on FWA serves as the centralized hazardous waste collection site for the post. All hazardous wastes that are collected on post are brought to this facility to be processed for off-post disposal. During 2001, FWA generated 468,500 pounds of hazardous waste.

3.17.2.3 Storage Tanks

FWA has 13 aboveground storage tanks with capacities ranging from 300 to 13,000 gallons. All of these tanks are located within the cantonment area and contain diesel fuel, gasoline, aviation fuels (JP-8), and heating oil. Ten of the tanks are double walled. Three 13,000-gallon tanks located at the Forward Area Refueling Point are single walled, but contained within secondary earthen dikes.

The smaller tanks are monitored and visually inspected annually, and tanks at the Forward Area Refueling Point are inspected daily. The total fuel capacity stored at FWA does not exceed 420,000 gallons, so an Oil Discharge Prevention and Contingency Plan is not required. However,

FWA does have a Spill Prevention, Control and Countermeasures Plan that details spill response and prevention measures for all fuel storage areas.

Fifty-nine underground storage tanks are located on FWA. Underground storage tanks at FWA were inspected in 2000. All underground storage tanks conform to the applicable Army, State of Alaska, and EPA guidelines. Each tank is monitored monthly, and is equipped with electronic monitoring devices designed to detect leaks and overfills. Tanks are double-walled steel and are protected from rust and corrosion.

3.17.2.4 Asbestos

Limited asbestos surveys were conducted on family housing units on FWA (HartCrowser 1997b). Asbestos-containing materials, such as floor tile, linoleum, mastic (adhesive), wallboard, pipe insulation, pipe-fitting insulation, and tarpaper, were found in most family housing units surveyed. Most material appeared to be in good condition, and any asbestos-containing material that was damaged was either abated or removed. Neighborhood revitalization programs have resulted in the removal of asbestos from many housing units.

With the exception of the housing units, few buildings on FWA have been surveyed for asbestos. USARAK has developed an Asbestos Management Plan for FWA in accordance with Army Regulation 200-1. This is designed to reduce exposure to occupants and workers on post, and to ensure compliance with federal laws.

3.17.2.5 Lead-based Paint

Lead-based paint surveys (HartCrowser 1997b) and risk assessments were also conducted in representative family housing units at FWA. The results of the survey indicated that lead hazards were present in most family housing units, the most common type being deteriorating lead-based paint. Some of the surveyed units were identified with elevated lead levels in dust or exterior soils.

Some testing has been conducted on other buildings outside of family housing. All buildings inspected have had lead-based paint on interior and/or exterior surfaces.

3.17.2.6 Pesticides

USARAK has implemented an Integrated Pest Management Plan for FWA. The goal of the plan is to provide guidance to operate and maintain programs that ensure effective and environmentally safe pest control. The function of the Integrated Pest Management Plan is to provide acceptable management of pests, including:

- stinging and biting insects
- parasitic insects
- stored-product pests
- real-property pests
- general household pests
- miscellaneous pests
- undesirable vegetation
- pests of trees and plants

3.17.2.7 Radon

All Army installations are required, under the Army Radon Reduction Program (AR 200-1), to maintain and update records pertaining to radon assessments. A radon survey was conducted at FWA during the period from 1989 to 1990. Survey results for FWA indicated acceptable levels of radon, below the 4 picocuries per liter (pcl) regulatory limit.

3.17.2.8 Contaminated Sites

USARAK conducted investigations and performed clean-up at 127 sites on FWA. All of the sites were investigated under the Federal Facilities Agreement or the Two-Party Agreement that covers petroleum, oil, and lubricant sources. Thirty-eight sites were grouped into various Superfund operable units, where investigations and clean-up were conducted under Superfund authority. Of these, 28 have been closed and no further remedial action is planned. Ten are still active, and clean-up by the Army is ongoing. Records of Decision have been signed for all of the operable units (Operable Units 1, 2, 3, 4, and 5) on FWA. The Records of Decision stipulated the remediation and clean-up objectives for all sites listed.

Clean-up and investigation at the remaining 89 sites was conducted under the Two-Party Agreement. The Army has completed investigations and clean-up at 70 sites, and is conducting long-term monitoring or has established institutional controls at 18 sites. One site is currently being investigated. Appendix A, Figure 3.17.a details these sites.

Soil and groundwater contamination has resulted from facility operation and maintenance on FWA. The majority of contamination resulted from operation of power generation equipment, landfills, facility repair and maintenance, vehicle and aircraft maintenance, and other repair activities. These activities generated used oils, solvents, and fuels that were, at times, reportedly discharged to septic systems, dry wells, and sewer systems. Waste solvents were also reportedly dumped onto the ground as a means of disposal. Waste oils, solvents, and contaminated fuels have also been incinerated at the central heating and power plant. Waste oils were used for dust control on roads and parking lots and for firefighter training exercises.

Pesticides (insecticides, herbicides, fungicides, and rodenticides) have been used to maintain grounds and to prevent pest-related health problems. Pesticides were reportedly handled or stored in such a way as to allow inadvertent releases to the soil.

Institutional controls on 31 sites (both active and closed) prohibit excavation and groundwater use. The institutional controls were established because contamination exceeded the requirements for clean closure after remediation efforts were completed. Sites with such controls are tracked using a geographical information system that includes maps, site descriptions, and contaminant data. One institutional control is the requirement to obtain an Excavation Clearance Request prior to excavating. If the proposed excavation is in an area where institutional controls have been established, permission will not be granted to excavate, or the entity performing the excavation will be required to sample and remediate any contamination encountered during excavation.

3.17.2.9 Unexploded Ordnance

All impact areas on Tanana Flats Training Area (TFTA) and YTA are surrounded by a two-mile buffer zone. Both the impact area and its buffer zone are off-limits to unauthorized personnel. In addition, impact areas are posted with warning signs indicating the potential risks of unexploded ordnance on the impact area.

3.17.3 Donnelly Training Area

DTA has few issues relating to human health and safety. Due to the lack of a cantonment area, housing, and potential waste-generating facilities, DTA is not considered a USARAK property having significant human health and safety issues. Traffic to and unexploded ordnance on DTA are the sole relevant human health and safety risks associated with the training area.

3.17.3.1 Traffic

USARAK currently deploys troops for training between its properties. This requires use of the Alaska and Richardson highways for convoys from FWA and FRA to the training areas. Convoy sizes vary based on the echelon deploying for training. Large convoys are usually segmented to reduce traffic impacts.

Battalion and brigade-sized training exercises occur approximately four or five times per year, and occur primarily on TFTA and DTA. Deployment for these exercises may also include rail and air transport. Current deployment miles are shown in the Table 3.17.a.

3.17.3.2 Unexploded Ordnance

All impact areas on DTA are surrounded by a two-mile buffer zone. Both the impact area and its buffer zone are off-limits to unauthorized personnel. In addition, impact areas are posted with warning signs indicating the potential risks of unexploded ordnance on the impact area.

3.17.4 Fort Richardson

3.17.4.1 Traffic

USARAK currently deploys troops for training between its properties. This requires use of the Glenn and Richardson highways for convoys from FRA to DTA. Convoy sizes vary based on the echelon deploying for training. Large convoys are usually segmented to reduce impacts to traffic on the public roads.

Battalion and brigade-sized training exercises occur approximately four or five times per year, and occur primarily on TFTA and DTA. Deployment for these exercises may also include rail and air transport. Current deployment miles are shown in Table 3.17.a.

3.17.4.2 Hazardous Waste Management

FRA is registered with the U.S. Environmental Protection Agency as a “Large Quantity Generator” of hazardous waste, per the Resource Conservation and Recovery Act (42 U.S.C 6901). Hazardous wastes at FRA are associated with equipment maintenance (e.g., vehicles, boats, aircraft) and facilities operation. Hazardous materials include petroleum-contaminated absorbent pads, batteries, light ballasts, mercury-containing light bulbs, non-recyclable oils and fuels, compressed gas, non-recyclable hydraulic fluid, lead-based paint, paint, paint thinners and solvents, pesticides, photo-developing chemicals, sandblast residue, solvents and degreasers, thermostats with mercury ampoules, and non-recyclable transmission fluid.

The wastes are temporarily stored in drums at satellite accumulation points located around post. Satellite accumulation points are located where wastes are generated on a continual basis. Other locations or facilities that do not generate wastes are subject to on-call collection of hazardous wastes.

Currently, Building 45-125 on FRA serves as the centralized hazardous waste collection sites. All hazardous wastes that are collected on post are brought to this facility to be processed for off-post disposal. During 2001 FRA generated 4,959,080 pounds of hazardous waste. The amount of hazardous waste generated at FRA was artificially high due to off-site disposal of PCB-contaminated soil in the amount of 4,895,467 pounds. On average, hazardous waste generated at FRA would be under 100,000 pounds.

3.17.4.3 Storage Tanks

FRA has 22 aboveground storage tanks with capacities ranging from 300 to 50,000 gallons. All of these tanks are located within the cantonment area, and contain diesel fuel, gasoline, aviation fuels (JP-8), and heating oil. Twenty-one of the tanks are double walled. The exception is the 50,000-gallon tank located at the power plant, which is single walled but contained within a secondary earthen dike.

The smaller, double-walled tanks are monitored and visually inspected on an annual basis, and the 50,000-gallon tank undergoes a monthly visual inspection. The total fuel capacity stored at FRA does not exceed 420,000 gallons, so an Oil Discharge Prevention and Contingency Plan is not required. However, FRA does have a Spill Prevention, Control and Countermeasures Plan that details spill response and prevention measures for all fuel storage areas.

Forty-two underground storage tanks are located on FRA. These tanks were inspected in 2002. Only a few of these storage tanks are located outside of the main cantonment area, but these are associated with activities on Bryant Army Airfield, Camp Carrol, and Camp Denali, all of which are National Guard facilities located within the confines of FRA. All of the underground storage tanks conform to the applicable Army, State of Alaska, and U.S. Environmental Protection Agency guidelines. These tanks are monitored monthly, and are equipped with electronic monitoring devices designed to detect leaks and overfills. Each is constructed of double-walled steel and protected from rust and corrosion.

3.17.4.4 Asbestos

Limited asbestos surveys were conducted on family housing units on FRA (HartCrowser 1997a). Asbestos-containing materials, such as floor tile, linoleum, mastic (adhesive), wallboard, pipe insulation, pipe-fitting insulation, and tarpaper, were found in most family housing units surveyed. Most material appeared to be in good condition, and any asbestos-containing material that was damaged was either abated or removed. Neighborhood revitalization programs have resulted in the removal of asbestos from many housing units.

With the exception of the housing units, few buildings on the posts have been surveyed for asbestos. USARAK has developed an Asbestos Management Plan in accordance with Army Regulation 200-1. This is designed to reduce exposure to occupants and workers on post, and to ensure compliance with federal laws.

3.17.4.5 Lead-based Paint

Lead-based paint surveys (HartCrowser 1997a) and risk assessments were also conducted in representative family housing units at FRA. The results of the survey indicated that lead hazards were present in most family housing units, the most common type being deteriorating lead-based paint. Some of the surveyed units were identified with elevated lead levels in dust or exterior soils.

Some testing has been conducted on other buildings outside of family housing. All buildings inspected have had lead-based paint on interior and/or exterior surfaces.

3.17.4.6 Pesticides

USARAK has implemented an Integrated Pest Management Plan for FRA. The goal of the plan is to provide guidance to operate and maintain effective programs that ensure effective and environmentally safe pest control. The function of the Integrated Pest Management Plan is to provide acceptable management of pests, including:

- stinging and biting insects
- parasitic insects
- stored-product pests
- real-property pests
- general household pests
- miscellaneous pests
- undesirable vegetation
- pests of trees and plants

3.17.4.7 Radon

All Army installations are required, under the Army Radon Reduction Program (AR 200-1), to maintain and update records pertaining to radon assessments. A radon survey was conducted at FRA during the period from 1989 to 1990. The survey indicated that many structures at FRA exceeded the 4 picocuries per liter (pcl) regulatory limit and required mitigation actions to reduce radon levels.

Radon records for FRA were inadvertently destroyed, but radon monitoring and mitigation continue to be conducted in an effort to replace documentation that was previously destroyed. Radon surveys are conducted for all newly constructed facilities.

3.17.4.8 Contaminated Sites

The Army has investigated and conducted clean-up operations at 114 sites on FRA. Contamination at 65 of these sites was related to spills or leaks from underground storage tanks. Seventeen of these sites were grouped into five operable units (investigated as one action) under Superfund authority. Records of Decision have been signed for four of the operable units (A, B, C, and D) and the remedial investigation for Operable Unit E began in 2002 (Appendix A, Figure 3.17.b).

The Army is currently conducting ongoing clean-up operations at 13 sites:

- Operable Unit B, Poleline Road Disposal Area
- Operable Unit C, Eagle River Flats Impact Area
- Operable Unit E, Building 35-752
- Operable Unit E, Armored Vehicle Maintenance Area
- Building 762, UST site
- Building 986, POL Lab Dry Well
- Building 987, UST and Fuel Facility
- Building 35620, UST site
- Building 45-070, UST site
- Building 47-220, UST site

- Building 28-008, UST site
- Building 59-000, UST site
- Nike Site Summit

Groundwater and soil on some parts of FRA have been impacted by contaminant releases from a variety of sources. Maintenance operations in motor pools, aircraft hangars, and other industrial operations generate most of the hazardous waste on the post. Major sources of contaminants include releases of petroleum products, chlorinated solvents, white phosphorus, and PCBs.

Areas impacted by this contamination include the Eagle River Flats Impact Area (an estuary contaminated with white phosphorus), Poleline Road Chemical Disposal Area (buried chemical agent identification sets and release of chlorinated solvents), former fire training areas, fuel storage facilities, disposal areas, and former PCB storage sites. All known or suspected major sources of contamination are located in either remote, unpopulated areas of FRA or in industrial operations areas. No off-site migration by any contaminant of concern has been detected.

All of the currently active sites, as well as 27 closed sites, are controlled to prohibit excavation of soil or use of groundwater. These institutional controls are implemented to manage access to the sites. The controls were established because contamination exceeded requirements for clean closure of the sites after remediation efforts were completed. All sites where institutional controls were established are tracked using a geographical information system that includes maps, site descriptions, and contaminant data for each site.

Any entity performing work on FRA must obtain permission, in the form of an Excavation Clearance Request, from the Army prior to excavating. Permission to excavate is granted only after a review of the environmental conditions. If proposed excavations are in areas where controls have been established, permission to excavate may be denied. Otherwise, the entity performing the excavation will be required to sample and remediate any contamination encountered during excavation.

3.17.4.9 Unexploded Ordnance

Eagle River Flats Impact Area is surrounded by a 300-meter buffer zone. Buffer zones are typically two miles in width; however, due to land constraints and the smaller safety fan of weaponry used there, the Eagle River Flats buffer zone is 300 meters. Both the impact area and its buffer zone are off-limits to unauthorized personnel. In addition, impact areas are posted with warning signs indicating the potential risks of unexploded ordnance on the impact area.

3.18 ENVIRONMENTAL JUSTICE

Topics discussed in this section include:

- General overview of topics important to environmental justice
- Description of regions of influence
- Identified environmental justice issues at U.S. Army Alaska (USARAK) installations

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS.

In 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* This executive order directs each federal agency to identify and address any disproportionately high and adverse environmental effects of its programs, policies, and activities on minority populations and low-income populations. Environmental effects include effects on human health, cultural resources, and socioeconomics.

The Presidential Memorandum accompanying Executive Order 12898, sent to heads of departments and agencies, specifically recognizes that environmental justice concerns should be identified and addressed under the procedures required by the National Environmental Policy Act (NEPA). Additionally, the Department of Defense Strategy on Environmental Justice requires implementation of Executive Order 12898, principally through compliance with the provisions of NEPA.

In addition, Executive Order 13045, *Protection of Children From Environmental Health Risks and Safety Risks*, requires the identification and assessment of environmental health and safety risks that may disproportionately affect children.

3.18.1 Environmental Justice Topics

Environmental justice analysis seeks to ensure that minority and low-income communities do not bear a disproportionate share of negative environmental consequences resulting from federal agency activities. In particular, Executive Order 12898 directs agencies to pay special attention to subsistence issues when dealing with environmental justice, since these communities often rely heavily on hunting, fishing, and gathering for their primary dietary/nutritional needs. Moreover, agencies are reminded to consider the environmental consequences of their actions in the context of cumulative effects stemming from all other activities – past, present, and future – that have impacts on the community. Subsistence is discussed in Section 3.15.

3.18.1.1 Region of Influence

For purposes of this environmental justice analysis, demographic research focused on the census areas where each installation is located. In addition, since census areas in Alaska cover broad geographic regions, individual communities in close proximity to the installations were analyzed separately to identify potential environmental justice issues. The region of influence for environmental justice analysis was established by determining the most geographically far-reaching potential effect and including communities within that area in the analysis.

3.18.1.2 Minority and Low-Income Communities

Statistics on ethnicity and poverty levels from the 2000 Census were compiled by the Alaska Department of Community and Economic Development. Minority populations are identified

using U.S. Census Bureau data to delineate areas where the percentage of minority individuals exceeds the state average by five percent. Minorities were defined as members of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (Council on Environmental Quality 1997b). It should be noted that the issue of environmental justice has been considered separately from government-to-government consultations with Alaska Native tribal government entities (which are documented in Appendix B).

Low-income communities are identified using the 2001 U.S. Department of Health and Human Services Poverty Guidelines for the State of Alaska. Individual census tracts were reviewed to determine the percentage of households within the census tract that had incomes below the poverty level for Alaska. Communities where the percentage of households with incomes below the poverty level exceeded the percentage of low-income households statewide by five percent are defined as low-income communities.

3.18.1.3 Impacts on Children

According to the Task Force on Environmental Health Risks and Safety Risks to Children, four priority areas of concern regarding children's health and safety are: childhood asthma, unintentional injuries, developmental disorders, and childhood cancer. With these priorities in mind, analysis of potentially disproportionate effects on children from transformation activities will focus on the areas of air quality, water resources and human health and safety.

3.18.2 Fort Wainwright

3.18.2.1 Region of Influence

Fairbanks North Star Borough is the census area encompassing Fort Wainwright (FWA). Because this borough covers a broad area, several small communities surrounding FWA are analyzed separately in Table 3.18.a to achieve a more accurate representation of the potentially affected populations. The region of influence for FWA is based on the analysis of effects on air quality, the most geographically far-reaching potential effect. Communities within a 70-mile radius of the installation are included in this analysis (Appendix A, Figure 3.18.a). In addition, the communities of Nenana, Cantwell, Minto and McKinley Village are included due to their subsistence ties to Fort Wainwright (Section 3.15, Subsistence).

3.18.2.2 Minority and Low-Income Communities

Based on the 2000 U.S. Census data, the Fairbanks North Star Borough had a population of 82,840. Of that total, 18,401 persons (22.21%) were minority and 6,206 persons (7.50%) were low income.

3.18.2.3 Impacts on Children

In accordance with the mandates of Executive Order 13045, training plans and construction site maps for projects undertaken on FWA are reviewed to ensure no dangerous or hazardous activities occur near schools or child care facilities.

Table 3.18.a Minority and Low-Income Percentages for Fairbanks North Star Borough Communities.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
State of Alaska	*636,932*	*30.7*	*15.6*	*11.2*
Cantwell	222	34.7	27.0	2.1
College	11,402	22.2	12.4	8.2
Eielson	5,400	18.3	1.5	6.0
Ester	1,680	12.6	7.8	8.1
Fairbanks	30,224	33.3	13.3	10.5
Fox	300	12.3	9.7	8.7
Harding Lake	216	6.5	2.8	0.0
McKinley	142	7.0	3.5	11.5
Minto	258	92.2	92.2	26.4
Moose Creek	542	11.6	4.2	9.4
Nenana	402	49.3	47.3	17.8
North Pole	1,570	19.0	7.2	8.7
Pleasant Valley	623	12.0	8.3	7.0
Salcha	854	12.1	5.6	3.9
Two Rivers	482	11.4	6.6	0.0

Source: Alaska Department of Community and Economic Development 2002

3.18.3 Donnelly Training Area

3.18.3.1 Region of Influence

Donnelly Training Area (DTA) is located in the Southeast Fairbanks Census Area. The Southeast Fairbanks Census Area covers a large region, and a number of communities are analyzed separately in Table 3.18.b. These communities were chosen based on their inclusion in the Alaska Department of Fish and Game's Game Management Unit 20D to reflect their subsistence ties to this region (Appendix A, Figure 3.18.b). In addition, the communities of Fort Yukon and Tanana have been included, due to their subsistence interests in the area (Section 3.15.1.1, Subsistence).

3.18.3.2 Minority and Low-Income Communities

Based on census data from 2000, the Southeast Fairbanks Census Area had a population of 6,174. Of that total, 1,297 persons (21%) were minorities and 1,136 persons (18.4%) had incomes below poverty level.

3.18.3.3 Impacts on Children

In accordance with the mandates of Executive Order 13045, training plans and construction site maps for projects undertaken on DTA are reviewed to ensure no dangerous or hazardous activities occur near schools or child care facilities.

Table 3.18.b Minority and Low-Income Percentages for Southeast Fairbanks Census Area Communities.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
State of Alaska	*636,932*	*30.7*	*15.6*	*11.2*
Big Delta	749	4.5	2.1	30.0
Delta Junction	840	8.6	5.6	19.4
Deltana	1,570	8.4	3.8	15.1
Dot Lake	19	15.8	5.3	5.6
Dot Lake Village	38	76.3	73.7	19.1
Dry Creek	128	0.0	0.0	69.4
Fort Greely	461	34.3	2.0	10.4
Fort Yukon	595	89.2	88.7	18.6
Healy Lake	37	73.0	73.0	9.1
Tanana	308	82.1	81.5	23.0

Source: Alaska Department of Community and Economic Development 2002

3.18.4 Fort Richardson

3.18.4.1 Region of Influence

Fort Richardson (FRA) lies nine miles east of Alaska's largest city, in the Municipality of Anchorage. Directly outside of Anchorage, and also relevant to this environmental justice analysis, is the Matanuska-Susitna Borough. In addition to communities from the Matanuska-Susitna Borough, a few nearby communities within the Kenai Peninsula Borough are listed due to their proximity to FRA. The region of influence for FRA is based on the analysis of effects on air quality, the most geographically far-reaching potential effect. Communities within a 70-mile radius of the installation are included in this analysis (Appendix A, Figure 3.18.c).

3.18.4.2 Minority and Low-Income Communities

Based on U.S. Census statistics from 2000, Anchorage had a population of 260,283 people. Of that total, 72,274 (27.77%) were minorities and 18,682 (7.18%) had incomes below poverty level. Based on year 2000 statistics, the population of the Mat-Su Borough was 59,322, with 7,384 people, or 12.45%, identified as minority; 6,149 people, or 10.82%, reported incomes below the poverty level. Table 3.18.c presents information on minority and low-income communities in Anchorage, Table 3.18.d for the Matanuska-Susitna Borough, and Table 3.18.e for the Kenai Peninsula Borough.

3.18.4.3 Impacts on Children

In accordance with the mandates of Executive Order 13045, training plans and construction site maps for projects undertaken on FRA are reviewed to ensure no dangerous or hazardous activities occur near schools or child care facilities.

Table 3.18.c Minority and Low-Income Percentages for Municipality of Anchorage.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
State of Alaska	*636,932*	*30.7*	*15.6*	*11.2*
Anchorage	260,283	27.8	10.4	7.4
Eagle River[1]	29,896	12.5	3.8	--
Eklutna[2]	394	21.6	13.2	2.4
Girdwood	1,817	5.4	1.8	--

[1] Eagle River statistics include the communities of Chugiak, Birchwood, Peters Creek, Thunderbird Falls, and Eklutna. Separate census data is available for only one of these communities, Eklutna.

[2] The majority of non-Native residents of Eklutna are employed in Anchorage, with incomes averaging $31,679 per capita, according to the 2000 U.S. Census. Eklutna's Danaina residents, however, have significantly lower incomes – averaging $19,494 per capita.

Source: Alaska Department of Community and Economic Development 2002

Table 3.18.d Minority and Low-Income Percentages for Matanuska-Susitna Borough Communities.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
State of Alaska	*636,932*	*30.7*	*15.6*	*11.2*
Big Lake	2,635	12.9	10.6	14.6
Buffalo Soapstone	699	10.3	7.4	22.2
Butte	2561	7.5	5.5	9.8
Chickaloon	213	22.1	16.9	2.8
Farm Loop	1,067	7.0	5.3	7.2
Fishhook	2,030	8.6	5.0	8.5
Gateway	2,952	11.6	7.4	7.2
Houston	1,202	16.0	12.3	17.1
Knik River	582	14.3	11.5	15.3
Knik-Fairview	7,049	12.1	8.7	11.1
Lakes	6,706	10.5	7.0	6.9
Lazy Mountain	1,158	7.3	4.7	7.8
Meadow Lakes	4,819	12.1	8.1	17.1
Palmer	4,533	19.1	12.5	12.7
Point MacKenzie	111	8.1	5.4	22.7
Skwentna	111	7.2	7.2	5.8
Susitna	37	10.8	10.8	16.1
Sutton-Alpine	1,080	32.5	25.9	11.3
Tanaina	4,993	12.1	7.7	7.5

Table 3.18.d cont. Minority and Low-Income Percentages for Matanuska-Susitna Borough Communities.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
Trapper Creek	423	12.3	11.3	24.7
Wasilla	5,469	14.5	9.1	9.6
Willow	1,658	7.6	6.0	22.1
Y	956	14.1	11.2	17.4

Source: Alaska Department of Community and Economic Development 2002

Table 3.18.e Minority and Low-Income Percentages for Kenai Peninsula Borough Communities.

Area	Total Population	Percent Minority	Percent Native	Percent Low-Income
State of Alaska	*636,932*	*30.7*	*15.6*	*11.2*
Beluga	32	25.0	25.0	--
Cohoe	1,168	9.8	7.7	12.2
Cooper Landing	369	8.4	4.9	2.2
Crown Point	75	12.0	9.3	15.6
Funny River	636	6.3	3.5	3.5
Hope	137	8.0	5.8	11.7
Kalifornsky	5,846	10.2	7.4	7.9
Kenai	6,942	17.2	12.1	9.8
Lowell Point	92	7.6	4.3	28.4
Moose Pass	206	12.6	10.7	0.0
Nikiski	4,327	12.8	10.1	11.4
Primrose	93	8.6	6.5	0.0
Ridgeway	1,932	12.2	7.9	9.4
Salamatof	954	28.2	22.3	11.9
Seward	2,830	27.9	20.9	10.6
Soldotna	3,759	11.9	6.9	6.6
Sterling	4,705	7.3	4.6	10.0
Sunrise	18	11.1	11.1	0.0
Tyonek	193	95.3	95.3	13.9

Source: Alaska Department of Community and Economic Development 2002

3.19 INFRASTRUCTURE

Topics discussed in this section include:

- Various land uses on each installation
- Rights-of-way, easements and leases
- Land status and management
- Installation support facilities

This information serves as baseline data for analysis and comparison of the proposed transformation and alternatives discussed in Chapter 4, Environmental Consequences, of this EIS.

3.19.1 Infrastructure Topics

3.19.1.1 Land Use

This section discusses the current land use, roadway networks and traffic patterns, airfields, airspace and port facilities within the U.S. Army Alaska (USARAK) vicinity.

Existing land use boundaries are defined for major land use categories identified in the U.S. Army Corps of Engineer's Master Planning Instructions. These have been established as the framework for future land use decisions. Each land use category is evaluated against the established criteria to determine compatibilities, constraints and opportunities. Land use categories are assumed to be compatible with adjacent land uses. Table 3.19.a lists the USARAK land use categories and the number of acres categorized as such at each post.

Table 3.19.a Acres of USARAK Land Use Planning Categories.

Location	Facilities								
	Trans-portation	Housing	Community	Installation Support	Range and Training Land	Mainte-nance	Outdoor Recreation	Miscella-neous	Total
Fort Wainwright	883	538	288	40	922,587	1,652	1,428	465	928,017
Donnelly Training Area[1]	0	0	0	0	661,944	0	0	0	661,944
Fort Richardson	339	336	187	40	54,416	2,091	901	2,828	61,376
Total	1,222	874	475	80	1,638,947	3,743	2,329	3,293	1,651,337

[1] Includes Gerstle River and Black Rapids training areas.

Source: Information based on data in USARAK 1999a,b,c.

Land use is further broken down into the following categories: rights-of-way, easements and leases; transportation; housing; community facilities; installation support facilities; training and range facilities; and airspace and airfields.

3.19.1.1.1 Rights-of-Way, Easements and Leases

Installation lands that the Army has granted other entities to use, through a lease or use agreement, are called outgrants. USARAK has a total of 126 outgrants, generally in the form of easements, leases, permits, and other grant instruments (Nakata 2001).

3.19.1.1.2 Transportation

Rapid deployment is a key element of the USARAK mission. Although Alaska's transportation infrastructure is limited by terrain, climate, and a relatively small population, it is more than sufficient to meet the needs of USARAK. USARAK deployment capabilities are by air, rail, road, and sea (Nakata 2001).

3.19.1.1.3 Housing

Housing on USARAK installations is organized in the following categories: family housing, enlisted unaccompanied housing, and non-enlisted unaccompanied housing. Off-base housing is addressed in Section 3.13, Socioeconomics.

3.19.1.1.4 Community Facilities

Community facilities is a broad term encompassing a variety of activities ranging from shopping, banking, education and recreation activities to police, fire protection and health care facilities. Land use areas set aside for these purposes are critical as outdoor recreation plays an important part in maintaining morale and relieving everyday stress for installation residents.

3.19.1.1.5 Installation Support Facilities

Installation support facilities include range maintenance, vehicle maintenance, administrative support, and supply and storage facilities. It also includes discussion regarding utilities on USARAK lands: power and heating, water supply, wastewater treatment, and solid waste collection and disposal.

3.19.1.1.6 Training and Range Facilities

Range and training land facilities are defined as areas of land or water set aside, managed, and used to conduct research; develop, test, and evaluate military munitions, explosives, other ordnance, or weapon systems; or to train military personnel in their use and handling of weapons systems. USARAK range and training land facilities information is summarized in the Range and Training Land Development Plan (Nakata 2001) and the Army Range Inventory Database.

The number of acres classified as range and training land at USARAK is listed in Table 3.19.b. Quality of maneuver lands are described in terms of capability, training requirements as compared to capacity, and condition.

Table 3.19.b Acres of USARAK Range and Training Land Facilities.

Post	Small Arms Ranges	Major Weapons System Ranges	Non-Live Fire Ranges	Maneuver Training Areas	Total
Fort Wainwright					
Main Post	143	5,793	22	5,151	11,109
Tanana Flats Training Area	0	58,828	0	595,370	654,198
Yukon Training Area	2,386	25,854	5	229,035	257,280
Donnelly Training Area					
Donnelly Training Area	8,539	146,721	4	481,335	636,599
Gerstle River Training Area	0	0	0	20,589	20,589
Black Rapids Training Area	0	0	0	4,213	4,213
Fort Richardson	330	2,884	116	51,086	54,416

Source: Army Environmental Center 2001a,b,c.

Training Ranges

Capability

Small arms ranges are semi-permanent or permanent facilities used for small arms weapons firing. Associated with small arms ranges are firing fans and/or surface danger zones. A small arms surface danger zone may be permanently designated as a dedicated small arms impact area. Small arms marksmanship ranges are used to qualify or train individual Soldiers on rifles, pistols, sniper rifles, shotguns, and machine guns. Collective live-fire ranges are used for collective training events, such as infantry squad and platoon battle courses, urban assault courses, and aerial gunnery ranges. USARAK small arms ranges meet Army standards (Nakata 2001). Table 3.19.c shows acres of small arms facilities managed by USARAK.

Table 3.19.c Acres of USARAK Small Arms Range Facilities.

Post	Marksmanship	Collective Live Fire	Dedicated Impact Areas	Total
Fort Wainwright				
Main Post	124	19	0	143
Tanana Flats Training Area	0	0	0	0

Table 3.19.c cont. Acres of USARAK Small Arms Range Facilities.

Location	Marksmanship	Collective Live Fire	Dedicated Impact Areas	Total
Yukon Training Area	0	11	2.375	2.386
Donnelly Training Area	149	244	8,146	8,539
Black Rapids Training Area	0	0	0	0
Gerstle River Training Area	0	0	0	0
Fort Richardson	256	74	0	330

Source: Army Environmental Center 2001a,b,c.

Major weapons system ranges are semi-permanent or permanent facilities used for major weapons systems, which may utilize potential dud-producing munitions. Associated with major weapons system ranges are firing fans or surface danger zones and dedicated impact areas. Acres of major weapons system facility types are listed in Table 3.19.d.

Table 3.19.d Acres of USARAK Major Weapons System Ranges.

Post	Marksmanship	Collective Live Fire	Indirect Fire Artillery	Spec. Live Fire	Dedicated Non-Dudded Impact Area	Dedicated Dudded Impact Areas	Total
Fort Wainwright							
Main Post	59	0	1	3	0	5,730	7,793
Tanana Flats Training Area	0	0	1	0	32,609	26,218	58,828
Yukon Training Area	0	19	25	0	0	25,810	25,854
Donnelly Training Area	8,962	0	41	15	74,565	63,138	146,721
Black Rapids Training Area	0	0	0	0	0	0	0
Gerstle River Training Area	0	0	0	0	0	0	0
Fort Richardson	198	0	169	34	0	2,483	2,884

Source: Army Environmental Center 2001a,b,c.

Non-live fire training facilities are used to train Soldiers without the use of weapons, i.e., rappel towers; obstacle courses; nuclear, biological, and chemical chambers; hand grenade qualification ranges; and other facilities not covered under traditional range categories.

Training Requirements vs. Capacity

Based on the analysis conducted in the 2001 Range and Training Land Development Plan (Nakata 2001), USARAK identified a need for sniper ranges and squad and platoon live-fire ranges. This requirement was based on 172nd SIB training requirements. Two sniper ranges, one combined arms collective training facility, and squad and platoon live-fire ranges are currently being constructed to meet the shortfall.

The 2001 Range and Training Land Development Plan analysis also identified a need for major collective ranges for 172nd SIB to meet mission requirements. Shortfalls in the types of ranges required by current USARAK units to train effectively are being addressed through the military construction program.

Condition

The condition of USARAK's small arms range facilities is classified as good (Nakata 2001).

The condition of USARAK's major weapons system training ranges is classified as adequate to good, with its impact areas being classified as good. Additionally, the overall natural and cultural resources within major training ranges (including impact areas) remain in excellent condition. Localized impacts from munitions in impact areas occur, but have not significantly changed the overall condition of the ranges. Preliminary data indicate that no contaminants (explosive residue or heavy metals) are migrating outside impact areas (Palazzo et al. 2002). These studies are explained in further detail in Sections 4.4, Soil Resources, and 4.5, Surface Water.

Maneuver Training Land

Capability

Maneuver training areas are used to conduct force-on-force maneuver training and situational training exercises. Areas are classified as light or heavy depending on the type of training they can support. (Note: Lands classified as heavy maneuver areas can also be used to train light forces.) Maneuver training area is not restricted for light infantry within Alaska.

Training Requirements vs. Capacity

Maneuver areas are used for tactical movements, movement to contact, relocations, defending assigned areas, establishing new areas of operations, trail construction, mobility and counter mobility operations, reducing obstacles with equipment, and constructing obstacles with equipment. Other types of maneuver training land include bivouac, drop zones, landing zones, and assault airstrips. Acres of training land categories are shown below in Table 3.19.e.

Table 3.19.e Acres for USARAK Maneuver Training Land Categories.

Location	Light	Heavy	Bivouac	Drop Zones/ Landing Zones	Assault Air Strips	Total
Fort Wainwright						
Main Post	5,135	0	0	16	0	5,151
Tanana Flats Training Area	594,745	0	0	313	312	595,370
Yukon Training Area	23,276	205,060	228	429	42	229,035

Table 3.19.e cont. Acres for USARAK Maneuver Training Land Categories.

Location	Light	Heavy	Bivouac	Drop Zones/ Landing Zones	Assault Air Strips	Total
Donnelly Training Area						
Donnelly Training Area	401,252	71,736	0	8,205	142	481,335
Gerstle River Training Area	20,589	0	0	0	0	20,589
Black Rapids Training Area	4,756	0	0	0	0	4,756
Fort Richardson	32,293	17,833	155	785	20	51,086
Total	1,082,046	294,629	383	9,748	516	1,387,322

Source: Amy Environmental Center 2001a,b,c.

Range capacity is calculated by multiplying the total number of lanes or firing points for the appropriate range type by the number of iterations per hour; then multiplying the result by the number of hours available per training day (Nakata 2001). For example, an installation has three M16 zero ranges with a total of 150 lanes. The number of iterations per hour is one (60 minutes per iteration), and the available hours per training day is 8. Therefore, the capacity for M16 zero range is 1,200 Soldiers per day to get the Soldier capacity per year.

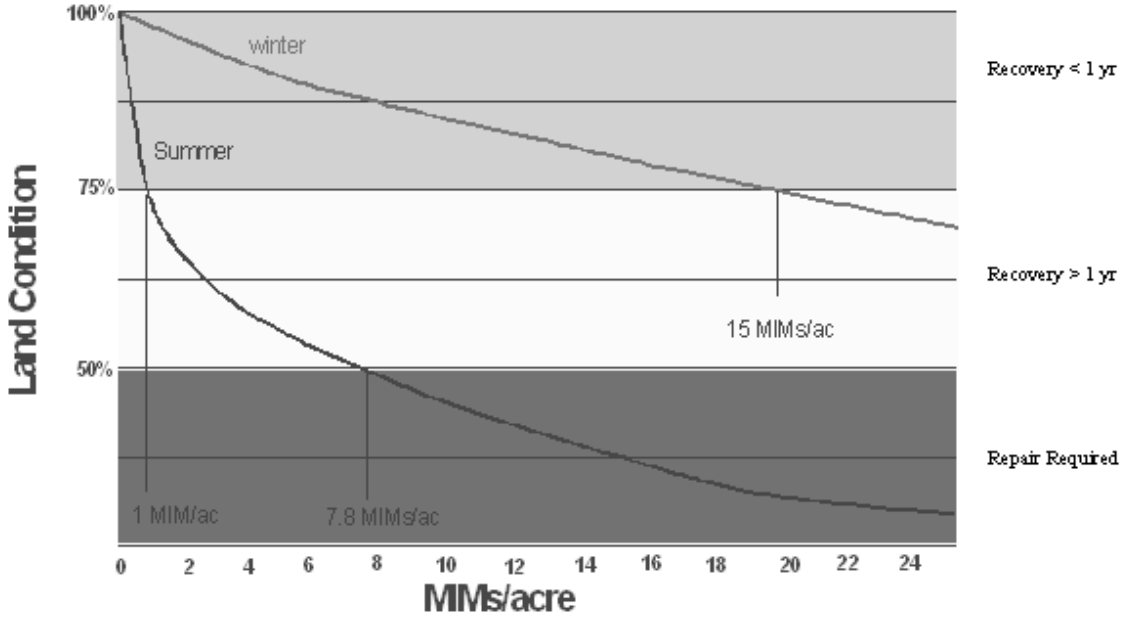
The capacity for maneuver training areas can be expressed in terms of square kilometer days (km^2 days). This is calculated by converting the number of acres of each maneuverability type by 242 available training days per year.

Training load capacity is a measure of the total capacity of a given parcel of land to support military training. Army Training and Testing Area Carrying Capacity measures training load in terms of maneuver impact miles (Section 4.4, Soil Resources).

Condition

Land condition is an index of ecological integrity and is measured in terms of erosion status, vegetative cover, and disturbance. It is expressed in terms of percent, 100% being the best condition and 1% being the worst. Additional information on land condition can be found in Appendix F.

Land condition curves estimate the change in land condition based on the amount of training load applied to an area. The curve is constructed based on soil type, vegetation type and the ability of an area to recover. The curve shows response in land condition over a range of potential training load. The differing shades of background in the graph below describe land condition thresholds. If the amount of training load corresponds to a point on the curve in the top shaded portion, the training land can recover on its own in one year. The light shading in the center portion of the graph denotes that an area cannot recover on its own in one year and must be rested for a number of years or be repaired. Once the curve crosses into the dark shaded portion on the bottom, the area must be repaired because it cannot recover on its own. The curves for winter and summer use are shown in Figure 3.19.a.



Source: Stout 2003a

Figure 3.19.a Land Condition Curve.

3.19.1.1.7 Airspace and Airfields

The definition of airspace includes vertical and horizontal boundaries and time of use. The Federal Aviation Administration (FAA) manages all airspace within the United States, including Alaska. In addition to airspace, the FAA manages the air navigation system, equipment, airports, and the rules and regulations relating to powered flight. The FAA is responsible for managing the airspace for commercial airliners and air carriers, general aviation, and government agencies, including the U.S. military.

Use of airspace is required for the successful operation of the U.S. military. Some military flight activities are not compatible with civilian uses of airspace, and some military activities potentially conflict with other uses of military airspace. Airspace restrictions are needed within military installations to ensure safety and to avoid possible conflicts of airspace use.

Most military operations are conducted within a designated airspace, where specific procedures are followed to maximize flight safety for both military and civilian aircraft. The designated airspaces include special-use areas (which includes MOAs and restricted airspace) and controlled airspace (which defines different types of airspace use).

MOAs are air spaces designated for non-hazardous military flight training, and they were established to minimize interaction between high-speed military aircraft and civilian air traffic. These areas include horizontal coordinates (i.e., latitude and longitude), vertical zones (i.e., base and ceiling), use restrictions, and exclusions. Hazardous military activities, including firing of live weapons, occur at certain times in restricted airspace areas. Flights from non-participating civilian or military aircraft are prohibited during certain training exercises.

Using units schedule maneuver areas/restricted areas with the appropriate Range Control. Once scheduled, the appropriate Range Control office includes the dates/times of aircraft operations on the weekly Notices to Airmen that are faxed to the Traffic Management Unit at the FAA Regional

Office. If the aircraft would fly in a MOA to get to a restricted area, the unit would schedule that MOA with the Joint Scheduling Office, 353rd Combat Training Squadron, Eielson AFB. Prior to any departure from the restricted area, the operating units monitor and then broadcast intended recovery on the Allen Army Airfield Common Traffic Advisory Frequency. If an operational tower is open, the tower also broadcasts the intended recovery. Safety procedures are detailed in USARAK Aviation Flight Regulation 95-1.

3.19.2 Fort Wainwright

3.19.2.1 Land Use

3.19.2.1.1 Rights-of-Way, Easements and Leases

The Northern Intertie Project (Golden Valley Electrical Authority) involves the installation of a 230 kV transmission line near the northeastern boundary of TFTA (BLM 1998). This transmission line has a right-of-way of 150 to 300 feet wide and 90 to 170 miles long.

The Trans-Alaska Pipeline System right-of-way extends through YTA. Its width is 50 feet plus the ground area occupied by the pipeline, which is approximately four feet. The 50-foot-wide Alaska Natural Gas Transportation right-of-way lies adjacent to the pipeline. The Army and the BLM approved an additional right-of-way for the proposed Trans-Alaska Gas System. This right-of-way will run parallel with the pipeline and existing natural gas line.

3.19.2.1.2 Transportation

Fairbanks is the transportation hub for much of central, northern, and northwest Alaska, providing road, rail, and air transportation services. Fairbanks is connected to other regions of Alaska by two all-weather highways: the Richardson Highway and the Parks Highway.

Two primary roads lead onto the installation. Four other primary roads also exist on the installation. Additionally, secondary roads are an important part of FWA's transportation network. Acting as collectors and feeders to the primary roads, these should be of sufficient size and capacity to substitute for the primaries in certain situations. Further discussion regarding traffic can be found in Sections 3.17, Human Health and Safety.

The Alaska Railroad provides rail service to FWA. The Alaska Railroad's main line passes through the central cantonment area, with spur tracks serving the central heating and power plant and warehouse circle. The track also connects with the Fairbanks industrial spur. The Alaska Railroad provides year-round passenger, freight, and vehicle service between Anchorage and Fairbanks. Most northbound freight arrives by sea at either the port of Anchorage or the port of Whittier for transfer to the railroad. The Alaska Railroad provides a connection to Seward, 80 miles to the south of Anchorage, the nearest port with intermodal capability.

3.19.2.1.3 Housing

The family housing land use areas on FWA encompass six specific neighborhoods. The land use areas are compact, totaling 1,549 units on 407 acres. They are isolated from noise and pollution-generating activities such as vehicle maintenance.

Because of the age of most family housing units (prior to 1960), FWA has embarked on a revitalization and new construction program to upgrade and/or replace substandard facilities. To date, a number of units in two neighborhoods, Northern Lights and Southern Lights, have undergone or are undergoing reconstruction/rehabilitation.

Housing for FWA's enlisted unaccompanied personnel lies in three primary areas, one in north post and two in south post.

Three other non-enlisted unaccompanied personnel housing land use areas exist on Main Post: the visitor quarters on Gaffney Road, housing facilities for medical personnel east of Bassett Hospital, and housing for BLM's smoke jumpers. All facilities are relatively old (circa 1948).

3.19.2.1.4 Community Facilities

Generally concentrated around unaccompanied personnel and family housing units, facilities include shops, recreational faculties, restaurants, post office, a credit union, and other service facilities.

Two elementary and two middle schools provide educational opportunities for children. High school students attend off-post at Lathrop High School. Other community facilities include the child development center and the police station.

Bassett Army Community Hospital is the hub for medical care for more than 10,000 military personnel north of the Alaska Range. This facility provides a variety of medical services for all military and eligible civilians. Two other troop medical/dental facilities exist as well, one in South Post and one in North Post.

On FWA, outdoor recreation land uses provide a variety of recreational opportunities, such as the Chena Bend Golf Course, Birch Hill Ski Area and Lodge, and forested areas for cross-country skiing. Both the Chena and Tanana rivers have facilities for a variety of summer water sports, as well as ice fishing and skating in winter. Venues for picnics, camping and various land and water sports are also available.

3.19.2.1.5 Installation Support Facilities

Eleven separate supply/storage locations are scattered throughout the cantonment and include two ammunition storage facilities. The largest is along Birch Hill Loop Road, and the smaller facility is along Montgomery Road.

The remaining supply/storage land use areas are all used for storage of inert supplies, equipment and/or material, or are unused.

3.19.2.1.6 Training and Range Facilities

Table 3.19.b shows the acres of range and training land facilities at Fort Wainwright (FWA).

3.19.2.1.7 Airspace and Airfields

Aviation is an essential component of the transportation system in the Fairbanks and FWA region. Besides Fairbanks International Airport, which serves the civilian community, FWA has Wainwright Army Airfield and uses nearby Eielson Air Force Base (AFB) for large-scale deployments. Wainwright Army Airfield and Eielson AFB, about 17 miles south of FWA, can support any type of military aircraft including C5 Galaxies. The Fairbanks International Airport, five miles west of FWA, is the nearest commercial airport. It is one of two international airports in Alaska and is served by most U.S. and many international airlines.

Wainwright Army Airfield has one active runway; several ancillary taxiways, parking aprons, and hangar facilities; an operations building; fuel tanks and a tower. The field provides sufficient space for the limited air operations currently conducted. The runway is classified as Class D,

Airspace. Wainwright Army Airfield is also of historic significance and is part of a National Historic Landmark because of its involvement in the Alaska-Siberia lend-lease route operation during World War II.

The majority of YTA is within the Yukon 1 MOA. Special-use airspace limits are from 100 feet above ground level to 17,999 feet above sea level. The Viper A and B MOAs cover the eastern portion of YTA (Appendix A, Figure 3.19.b). The Viper A special-use airspace limits extend from 500 feet above ground level to 10,000 feet above sea level, and Viper B limits range from 10,001 to 17,999 feet above sea level (USAF 1995).

Restricted Area R2205 covers the eastern portion of YTA and includes the Stuart Creek Impact Area. R2205's vertical limit is surface to 20,000 feet above sea level (USARAK 1999a) (Appendix A, Figure 3.19.b). Complete restricted area descriptions can be found in the 1997 U.S. Department of Transportation, Federal Aviation Administration Order 7400.8.

A small section of TFTA is under Eielson MOA. Under special-use airspace conditions, flights 100 feet above ground level to 17,999 feet above sea level are restricted (USAF 1995). The R2211 Restricted Airspace overlays a southern portion of TFTA.

The Special Use Area Information System is a 24-hour service provided to civilian pilots to assist the planning of flights through or around MOAs and restricted airspace at FWA (Fairbanks) and Donnelly Training Area (USAF 1995). When MOAs are not in use, Eielson Range Control can clear civilian aircraft through these areas. Eielson Range Control can also clear military aircraft out of any airspace if required by civilian aircraft for emergency operations such as an air ambulance mission.

3.19.3 Donnelly Training Area

3.19.3.1.1 Rights-of-Way, Easements and Leases

The Trans-Alaska pipeline transports crude oil from Prudhoe Bay to Valdez, and the pipeline passes through Donnelly Training Area (DTA) West. The right-of-way is 50 feet wide plus a four-foot ground area occupied by the pipeline (USARAK 1999a). Other rights-of-way include the natural gas lines (Trans-Alaska Gas System), the Richardson Highway, and various power transmission lines.

3.19.3.1.2 Transportation

The only transportation resources available to serve DTA and the Delta Junction area are the Richardson and Alaska highways and the Allen Army Airfield. Both two-lane highways are maintained year-round. In addition, a maneuver corridor connecting the southern corner of TFTA and the northern corner of DTA has been established for training purposes (Nakata 2001). Further discussion regarding traffic impacts can be found in Sections 3.17 and 4.17, Human Health and Safety.

There is no rail service to DTA. The nearest rail service is at FWA or Eielson AFB, about 100 miles to the north. The Alaska Railroad provides a connection to Seward, the nearest port with intermodal capability.

3.19.3.1.3 Housing

No family housing or enlisted unaccompanied personnel housing exists on DTA.

3.19.3.1.4 Community Facilities

No community facilities or outdoor recreation facilities exist at DTA.

3.19.3.1.5 Installation Support Facilities

One range maintenance building (Beales) is located at DTA.

3.19.3.1.6 Training and Range Facilities

Table 3.19.b shows the acres of range and training land facilities at DTA, Gerstle River Training Area, and Black Rapids Training Area.

3.19.3.1.7 Airspace and Airfields

Buffalo MOA overlays DTA East (Appendix A, Figure 3.19.b). The special airspace limits range from 300 feet above ground level to 6,999 feet above sea level.

Most of DTA West is within the Restricted Area R2202 (Appendix A, Figure 3.19.b). The western two-thirds of DTA West, including the Oklahoma and Delta Creek impact areas, lie under R2202B and R2202C. The remainder of DTA West lies under the restricted areas R2202A and R2202C. The Oklahoma and Delta Creek impact areas, which are under R2202 B and C, are used for military aircraft training and are designated as air restricted areas (Appendix A, Figure 3.19.b). The areas are closed to all civilian aviation during periods of scheduled activity. Complete restricted area descriptions can be found in the 1997 U.S. Department of Transportation, Federal Aviation Administration Order 7400.8.

At DTA, Allen Army Airfield can support C5/C141 aircraft in winter and C130 aircraft at all other times. In addition, there is a small, unpaved light aircraft landing strip north of Delta Junction.

3.19.4 Fort Richardson

3.19.4.1 Land Use

3.19.4.1.1 Rights-of-Way, Easements and Leases

The rights-of-way on Fort Richardson (FRA) include the Alaska Railroad and the Glenn Highway as well as power transmission lines.

3.19.4.1.2 Transportation

The location and physical characteristics of the Anchorage and FRA have helped define the role both play in Alaska's transportation network and economic life. Anchorage is accessible by air, rail, road, and sea. Anchorage has two primary paved highways. The Glenn Highway provides access to FRA from the northeast and connects with the Parks Highway in Palmer. This highway continues on to Glennallen where it connects with the Richardson Highway, a primary route connecting ultimately with Fairbanks and FWA. Discussion regarding traffic impacts can be found in Sections 3.17 and 4.17, Human Health and Safety.

On FRA, the transportation infrastructure includes two gates to the main cantonment area; four primary roads; and secondary roads including Quartermaster Road, Arctic Valley Road, First Street, Warehouse Street, Fourth Street, portions of Sixth Street and a segment of Dyea Avenue. Two other small sections include Davis Highway between First and Second Streets and the HQ The Alaska Railroad provides rail service to FRA (Appendix A, Figure 3.19.c). Its main line

crosses the post north of the cantonment area, and a spur extends to a loading facility and an ammunition storage complex. The railroad provides freight and passenger service with access to Fairbanks, the port of Whittier, and the port of Seward.

Because of Alaska's geographic separation from the contiguous United States, the sea has long been the state's most important outside link. The Port of Anchorage handles almost 1.8 million tons of cargo each year and is capable of handling all types of military cargo. The port also serves 80% of Alaska's populated area, including FRA and Eielson AFB, by means of rail, road, and air cargo connections. Ice is a problem during the winter and occasionally causes the port to close. However, the ports of Whittier and Seward farther south are ice-free year-round and are connected by the Alaska Railroad to Anchorage and FRA. These ports provide facilities to support bulk petroleum transfer, roll-on and roll-off of vessels, unitized barge loads, break bulk vessels, container ships, and rail barges (Nakata 2001).

3.19.4.1.3 Housing

The family housing areas on FRA consist of seven specific neighborhoods. The land use areas are compact, totaling 1,435 units on 273 acres. The neighborhoods are bound on the south and east by hills and a large forested area, blocking potential noise and pollution from the nearby Glenn Highway.

Similar to FWA, FRA is implementing a housing revitalization and new construction program. Units in both the Independence Park and Fireweed neighborhoods have undergone or are undergoing reconstruction/rehabilitation.

Enlisted unaccompanied personnel housing, or barracks, is the Army's number one housing facilities priority. An evaluation of USARAK's barracks and other troop facilities found that barracks facilities at FWA and FRA needed improvement and recommended a major revitalization program to construct new barracks and support buildings, as well as renovation of many existing facilities.

FRA's enlisted unaccompanied personnel area lies in the heart of the Main Post, consisting of 14 two-story buildings. Three other non-enlisted unaccompanied personnel housing land use areas exist in the cantonment area. Two areas are used as distinguished visitor quarters, and the third area contains facilities for the Non-Commissioned Officers (NCO) Academy.

3.19.4.1.4 Community Facilities

Community facilities at FRA are dispersed throughout the Main Post area. This location is mid-way between the largest inhabited portions of FRA. Primary facilities include the commissary, post exchange, child development center, theatre, and a Burger King.

Secondary community facilities include the gas station, credit union, chapel, police station, fire station, post laundry and education center/MOS library. Three elementary schools are nearby, and high school students attend Bartlett High School located partially on the installation near the entrance to Elemendorf AFB. Other community facilities include the fitness center, auto hobby shop and car wash, and the youth development center. The FRA National Cemetery is located north of the airfield.

Outpatient and routine medical/dental services are provided to all active duty military, family members and retirees at the Troop Medical and Gemini Clinic.

Moose Run Golf Course, Arctic Valley Ski Bowl, and Otter Lake are important recreation areas on FRA. The main cantonment area contains hard surfaced courts, manicured fields and simple open spaces. A fitness center and three parks are also used for recreation.

3.19.4.1.5 Installation Support Facilities

Eight individual supply/storage areas (three large and five small) exist within the extended main cantonment area. Two of the large areas are used for ammunition storage. The other large area contains facilities for general purpose storage, cold storage, deployment equipment storage and general shipping/receiving.

The five smaller areas are used for supply and storage facilities, but none of these areas exhibit any land use incompatibilities.

3.19.4.1.6 Training and Range Facilities

Table 3.19.b shows the acres of training ranges at FRA.

The overall condition of impact areas is good. Studies conducted in 1988 at Eagle River Flats determined that there was no potential risk to human health as a result of munitions residues from firing into the Eagle River Flats Impact Area. However, unoxidized white phosphorus trapped in sediments was taken up by dabbling waterfowl and resulted in their mortality. USARAK implemented a prohibition on the firing of munitions containing white phosphorus in the early 1990s. Remediation of white phosphorus in the Eagle River Flats Impact Area has been ongoing since then. Preliminary findings from Palazzo et al. (2002) found minimal contamination from explosive residues and heavy metals as a result of munitions firing into Washington and Delta Creek impact areas at DTA.

Further, preliminary results indicate that no contaminants are migrating outside of impact areas in surface water, groundwater, soils, or in plant uptake (Palazzo et al. 2002). Physical impacts from high explosive munitions have resulted in cratering. Cratering causes both positive and negative effects (Houston 2002). These impacts are discussed in greater detail in Sections 4.4, Soil Resources, and 4.5, Surface Water.

3.19.4.1.7 Airspace and Airfields

No MOAs are located above FRA, but Restricted Area R2203 covers portions of the post (Appendix A, Figure 3.19.c). This restricted area is divided into three subunits. R2203A covers the southern tip of Eagle River Flats Impact Area, as well as central parts of FRA training areas. R2203B covers the eastern half of Eagle River Flats and extends across the northern portion of FRA. R2203C covers the western half of Eagle River Flats. The vertical limits for R2203A and R2203B are from ground level to 11,000 feet above sea level, and R2203C's vertical limits range from surface to 5,000 feet above sea level (USARAK Regulation 350-2 1998).

Military deployment requirements are met by Elmendorf AFB, one of the largest airfields in Alaska. It is a critical refueling point and personnel and cargo transfer point along the shortest air traffic route between military installations in the United States and the Far East. Elmendorf AFB is located adjacent to FRA and roughly two miles from the center of the cantonment area. The airfield can support any type of military aircraft, including C5 Galaxies.

Bryant Army Airfield, located adjacent to the cantonment area and the Glenn Highway, has a main, hard-surfaced, north/south runway, which is 3,000 feet in length. It also has a hard-surfaced

crosswind runway oriented east/west. Bryant Army Airfield is used primarily by the Alaska Army National Guard as a base for its fixed-wing and rotary aircraft.

Anchorage International Airport, 15 miles southwest of FRA, is the nearest commercial airport. It is the largest airport in Alaska for both passenger and air cargo operations. More than 30 carriers provide passenger service in the recently renovated airport. It is the largest air cargo handler and transfer site in the United States.