APPENDIX E

AFFECTED ENVIRONMENT

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3.2 AIR QUALITY

Regulatory Framework

The Clean Air Act (CAA) was created in 1967 by the United States Environmental Protection Agency (EPA). Amendments to the CAA were promulgated in 1970, 1977 and again in 1990. The most significant amendments to the act, collectively referred to as the Clean Air Act Amendments (CAAA-90) occurred in 1990. These amendments resulted in the most significant changes to the CAA. One of the major changes that resulted from the CAAA-90 was the creation of a permitting program for major stationary sources (Title V Operating Permit Program). The EPA was granted enforcement powers, and states were given primacy for implementing air quality regulations. States were subsequently required to develop state implementation plans (SIPs) in order to demonstrate how a state would implement CAAA-90 legislation. These amendments are described in 40 CFR Parts 50 through 93.

The CAAA-90 is subdivided into seven titles.

1. Title I identifies six criteria air pollutants and sets National Ambient Air Quality Standards for each of these pollutants. The criteria air pollutants include carbon monoxide (CO), particulate matter with a diameter of 10 micrometers or less (PM_{10}), nitrogen oxides (NO_x), sulfur dioxides (SO_x), ozone (O_3) and lead (Pb).
2. Title II establishes standards and programs for vehicles.
3. Title III establishes standards for hazardous air pollutants, which are a series of pollutants not included in Title I.
4. Title IV addresses acid rain and limits the emission of key criteria air pollutants associated with acid rain production (SO_2 and NO_x).
5. Title V outlines the operating permit program, and requires states to implement the Title V Operating Permit Program.
6. Title VI addresses stratospheric ozone protection.
7. Title VII identifies the enforcement provisions associated with the CAAA-90.

TITLE I: NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Title I defines the NAAQS and evaluates the air quality within a given region. Regions are subdivided into geographical areas. The attainment status within each geographic area is assigned for each criteria air pollutant (CAP). Attainment status is based on an area's ambient air concentration of a given CAP in relation to the NAAQS. Areas that are in violation of a NAAQS are designated as a nonattainment area CAP. Nonattainment areas are further subcategorized according to their deviation from the NAAQS. The standards for these CAPS are presented in Appendix Table 3.2.a.

Appendix Table 3.2.a National Ambient Air Quality Standards for Criteria Air Pollutants.

Pollutant	Averaging Period	Concentration	Unit
Carbon monoxide (CO)	8-hour[1] 1-hour[1]	9.0 35.0	ppm
Particulate matter ≥10 µm diameter (PM_{10})	Annual Arithmetic Mean 24-hour[2]	50.0 150.0	µg/m^3
Particulate matter ≥ 2.5 µm diameter ($PM_{2.5}$)	Annual Arithmetic Mean 24-hour[3]	15.0 65.0	µg/m^3
Lead (Pb)	Maximum Quarterly Average	1.5	µg/m^3
Sulfur dioxide (SO_2)	Annual Arithmetic Mean 24-hour	30.0 140.0	Ppb
Ozone (O_3)	One-hour[2]	120.0	Ppb
Nitrogen dioxide (NO_2)	Annual Arithmetic Mean	53.0	Ppb
Ammonia (NH3)[4]	8 Hour Average	2.1	µg/m^3
Reduced Sulfur (RS)[4]		50.0	µg/m^3

[1] Not to be exceeded more than once per calendar year.
[2] Not to be exceeded more than three times in any three-year period.
[3] Not to be exceeded on more than 2% of days monitored.
[4] Alaska Standards

Source: Municipality of Anchorage 1999

New Source Review/Prevention of Significant Deterioration of Air Quality (NSR/PSD)

These regulations are designed to prevent further degradation of air quality in nonattainment areas that do not meet the NAAQS for ambient air and to control growth in attainment or unclassifiable areas that meet or exceed the NAAQS. Under the NSR program, Alaska was divided into four Intrastate Air Quality Control Regions (AQCRs) based on common meteorological, industrial, and socioeconomic factors. Baseline contaminate levels were determined for each region. These contaminate levels were used to calculate allowable increases (increment) from existing or new facilities emitting pollution in areas that are in attainment for specific air contaminants. The subset of regulations governing nonattainment areas is referred to as New Source Review (NSR). These regulations are more stringent because they are designed to improve the overall ambient air quality and attainment status. The regulations referred to when assessing areas in attainment for specific CAPs are called PSD regulations.

Attainment areas are further subcategorized into Class I, II, or III areas. The level of protection required to prevent deterioration of air quality was established for each Class. National parks and wildlife refuges are considered Class I areas and receive the most protection. Class II areas are described as unclassifiable lands and receive the least scrutiny. All of the USARAK lands are considered Class II areas (USARAK 1999a). In order to ensure the maintenance of ambient air quality sustainable development principles were employed and allowable increases were set. The allowable increases pertinent to Class II areas are described in Appendix Table 3.2.b.

Appendix Table 3.2.b Maximum Allowable Increases Under the PSD Regulations that are Applicable to USARAK Lands (Class II areas) in Attainment.

Air Pollutant	Increase (Micrograms per cubic meter)
PM-10	
Annual Arithmetic Mean	17
24-hour maximum	30
Sulfur dioxide	
Annual Arithmetic Mean	20
24-hour maximum	91
3-hour maximum	512
Nitrogen Dioxide	
Annual Arithmetic Mean	25

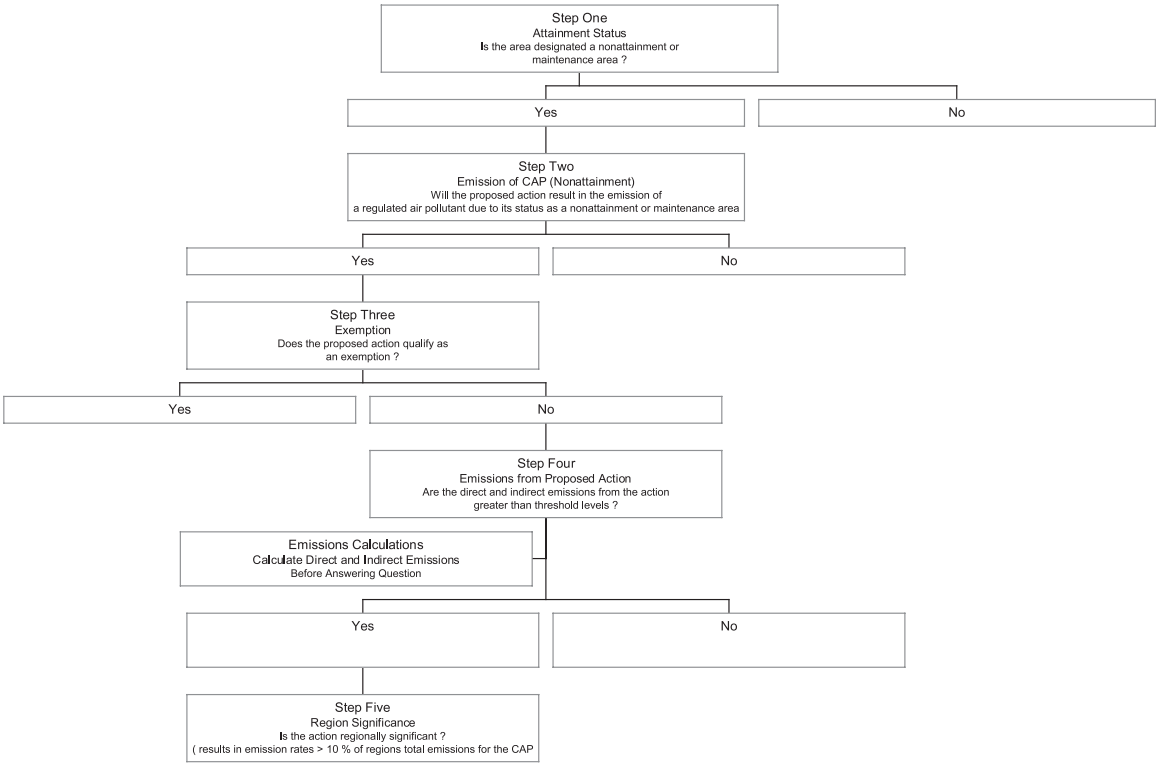
Source: State of Alaska 2002

New Source Performance Standards

New source performance standards (NSPS) were developed in association with the CAA with some of these standards being in affect since 1970. NSPS were developed for several types of sources including solid waste combustion, fossil fuel fired steam generators, incinerators, boilers and fuel tanks. The standards, contained in 40 CFR 60, are technology-based standards that set limits for CAPS. NSPS is broken down into two categories: general provisions and emission guidelines. The second category within the NSPS regulation includes monitoring and record keeping provisions as well. These standards apply to new, reconstructed, modified and existing sources. Fuel tanks are regulated under 40 CFR 60.116b (Subpart Kb). Subpart Kb applies to tanks with a capacity greater than 10,600 gallons and apply to multiple tanks in USARAK. Other NSPS regulations may apply to USARAK in the future; these NSPS regulations would include Subpart Dc for Industrial-Institutional-Commercial Boilers.

General Conformity

Section 176 (c) of the Clean Air Act is referred to as the General Conformity Rule; it requires USARAK to ensure any actions undertaken in nonattainment areas or maintenance areas do not weaken the Alaska State Implementation Plan (ASIP). In order to demonstrate compliance with conformity, a project analysis must show that it does not contribute to any new violations in the area, worsen the existing ambient air quality in an area, or hinder the area's efforts to reach attainment for a specific pollutant. This is accomplished by conducting a conformity review for all Federal actions. A conformity review must be performed when a Federal action generates air pollutants in a region that has been designated a nonattainment or maintenance area for one or more NAAQS (Polyak and Webber 2001). The steps used in a Conformity Review are illustrated in Figure 3.2.a (Polyak and Webber 2001).



Appendix Figure 3.2.a Steps associated with general conformity reviews.

If, after conducting a conformity review, the requirements of the General Conformity Rule do not apply to the proposed action, a Record of Non-Applicability (RONA) is prepared. Compliance with the rule is presumed if the emissions associated with the federal action are below the relevant threshold emission levels for the region in which the action is proposed. According to Army policy, a RONA must be written to formally present those findings (Polyak and Webber 2001). These records are kept on hand to demonstrate compliance with the General Conformity Rule.

TITLE II: MOBILE SOURCES

Title III regulates mobile sources. There are categories of vehicles that are exempt from the I/M testing. These exceptions include brand new and very old vehicles, vehicles that are very large (with an unladen weight of 12,000 pounds or more), motorcycles, snow machines, etc. (State of Alaska 2002b). Military tactical vehicles are also exempt from I/M requirements. The military exemption only indicates that tactical vehicles are not required to undergo emissions testing. This exemption does not exempt the tactical vehicles from being included in the mobile source budget for general conformity purposes.

TITLE III: NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The USEPA was required to regulate major, stationary sources for hazardous air pollutants (HAP) in accordance with Section 112 of the CAAA-90. A major source of HAPS is defined as a facility or group of facilities within a contiguous area that emits or has the potential to emit 10 tons per

year or more of any HAP or 25 tons per year or more of any combination of HAPS. The EPA was mandated by law to author standards that identified emission limitations and the Maximum Achievable Control Technology (MACT) appropriate for controlling the HAP emissions produced by a source category to reduce these emissions. MACT standards are technology-based standards developed from the level of emissions control achieved by the best-performing 12% of similar facilities in operation. This evaluation results in the establishment of the "MACT Floor."

Currently, the EPA has identified 188 HAPS. The original list of HAPS is found in Section 112(b)(1) of the CAAA-90. EPA has the authority to review and revise the list, and has done so. Revisions to the list of HAPS are found in 40 CFR Part 63, Subpart C. As stipulated in 112(c), the USEPA identified 174 source categories for the 188 HAPS identified in 112(b) and began to write National Emission Standards for Hazardous Air Pollutants (NESHAPS) for source categories. All source category NESHAPS were required to be promulgated within 10 years of the promulgation of the CAAA-90. Provisions were included in section 112(j) stipulating that if a source category NESHAP was not established by the final promulgation date of 15 November 2000, the owner or operator of each major source with emission units in that source category would be required to submit a case-by-case MACT determination to the Title V Operating Permitting authority.

This provision is often referred to as the "Equivalent Emission Limitation by Permit Rule" or "MACT Hammer" and is designed to incorporate emission standards for un-promulgated MACT standards into the major source's Title V Operating Permit. The standards for implementing 112(j) can be found in 40 CFR 63 Subpart B (63.50-63.56). The State of Alaska adopted 40 CFR 631.51-53 and 63.55-56 by reference in 18 AAC 50.040. The state adopted these regulations by reference as written in the Federal Register on July 1, 1999. The 40 CFR 63.53 outlines the process associated with incorporating emission standards into an individual facility's Title V Operating Permit. This process is accomplished through the submission of a two-part application. The first part of the application is due 15 May 2002 and provides basic applicability information to the permitting authority. In the case of the USARAK the permitting authority is the ADEC. The second part of the application provides greater detail to the permitting authority and is due to the ADEC and EPA after submission of the first part of the application. A copy of both the first and second part of the application must also be submitted to the EPA Region 10.

TITLE IV: ACID RAIN PROGRAM

The acid rain program primarily impacts industrial power plants. Regulating pollutants associated with acid rain production is the main focus of Title III. Emission limitations for NOx and SOx are imposed on industries to reduce acid rain. Pollution from emission sources in operation in the Midwest migrates and impacts the east coast of the United States.

TITLE V: OPERATING PERMITS

The Title V Operating Permit regulations of the CAAA-90 established a federal permit program for all major stationary sources of air pollution. This program is currently administered by the ADEC. Title V Operating Permit applications include compliance schedules, facility-wide and emission unit specific applicable requirements, and record keeping and monitoring requirements. Penalty fees can be assessed with any violation of a condition in the operating permit application or operating permit when issued. When the ADEC prepares a draft permit document, the permit is made available to the public for review prior to being issued by the ADEC.

Compliance Assurance Monitoring Rule
The intent of the Compliance Assurance Monitoring (CAM) rule is to require owners and operators to monitor the operation and maintenance of their mechanical control equipment. It requires periodic evaluation of the performance of control devices and reporting of its effectiveness in meeting established emission standards under Title V of the CAAA-90. The CAM rule will apply to the central heat and power plant at Fort Wainwright when the 6 individual baghouses are installed and operational (construction completion is estimated for Sept 04).

Prescribed Burning
Smoke, from wildfires and prescribed burns result in the production of small particulates (PM_{10}, $PM_{2.5}$), volatile organic compounds, carbon monoxide, carbon dioxide, and water vapor. Prescribed burn plans designed to burn greater than 40 acres annually require written approval from the ADEC. The ADEC may, in its discretion, require public notice through the local media. ADEC is also responsible for declaring air episodes and issuing air quality advisories, as appropriate, during periods of poor air quality or inadequate dispersion conditions (Alaska Wildland Fire Coordinating Group 1998). The ADEC and the Municipality of Anchorage can declare a burn ban when fire danger is high. During a burn ban, prescribed burning is strictly prohibited.

Smoke and Obscurants
Fog oil is a battlefield obscurant that is used to produce a visual smoke screen to mask troops and troop locations. Fog oil is produced when petroleum distillate is heated and expelled from mobile smoke generators. Upon contact with the air, the expelled oil droplets condense to form a thick white smoke.

TITLE VI: STRATOSPHERIC OZONE PROTECTION

Regulations exist to control the air toxics that deplete the ozone layer. In addition to the control of these substances, the regulation imposes production and consumption limits and the eventual production phase-out of ozone depleting substances (ODS). These substances include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, carbon tetrachloride, and methyl chloroform (EPA 2002b). Production limits are imposed on manufacturers, importers, and exporters of these substances and thus do not directly affect Army activities. Current use of ODS at USARAK installations is controlled and managed through application of an ODS Control Plan. This plan is designed to implement the phase out of Class I and II ODS and to procure alternative refrigerants that do not deplete stratospheric ozone. The plan is also designed to foster good operating procedures at shop level. Good operating practices followed by the USARAK installations include: leak detection and timely repair of equipment, prohibitions on intentional release of ozone depleting substances, compliance with record retention requirements, and worker certification for servicing or disposing of refrigeration equipment. Detailed lists of ODS can be found on the EPA's ozone depletion website (EPA 2002b).

3.3 GEOLOGY

Appendix Table 3.3.a Geologic Terms Used in Section 3.4.

Alluvial	Pertaining to material or processes associated with transportation by concentrated running water.
Colluvium	Unconsolidated, unsorted earth material transported or deposited on side-slopes and/or at the base of slopes by gravity and by runoff.
Diamicton	A generic term for any non-lithified, unsorted, or poorly sorted sediment. Contains a wide range of particle sizes (e.g. till) and used when the makeup of the sediment is uncertain.
Drumlins	Glacial feature. A hill, mound, or ridge of compact till with a core of bedrock or drift. It usually has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction.
Eolian	Pertaining to material transported and deposited by the wind. Includes clastic materials such as dune sands, sand sheets, loess deposits, and clay.
Epicenter	A point on the surface of the earth which is directly above an earthquake's point of origin.
Esker	A long, narrow, and steep-sided ridge of irregularly stratified sand and gravel. Deposited from a stream flowing within or below a glacier. Left behind as high ground when the ice melted.
Estuarine	Formed by an estuary (a seaward end or the widened funnel-shaped tidal mouth of a river valley where fresh water comes into contact with seawater and where tidal effects are evident).
Floodplain	The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions.
Fluvial	Of or pertaining to rivers or streams. Produced by stream or river action.
Igneous	Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rocks.
Metamorphic	Rock altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement.
Moraines	Accumulation of unsorted, unstratified glacial drift deposited by glacier ice, in a variety of landforms.
Kettle lake	Glacial feature. A steep-sided, bowl-shaped depression commonly without surface drainage containing a lake or swamp. Formed by the melting of ice that had been wholly or partly buried in the drift.
Loess	Material transported and deposited by wind and consisting predominantly of silt-size particles. Dominantly from either glacial melt-waters or arid environments, such as deserts.
Outwash	Stratified, sorted sediments (sand and gravel) "washed out" from a glacier by melt-water streams and deposited in front of a glacier.
Permafrost	Ground, soil, or rock that remains at or below 0° C for at least two years.
Placer	Unconsolidated material containing particles of valuable minerals.
Sedimentary	A consolidated deposit of particles or organic remains accumulated at or near the surface under "normal" low temperature and pressure conditions.
Terrane	A collection of rocks that share a geologic history and have often traveled far from where they originated.

Appendix Table 3.3.b The Geologic Time Scale.

Phanerozoic Eon	544 million years ago to present
Cenozoic Era	65 million years ago to present
Quaternary Period	1.8 million years ago to present
Holocene Epoch	8,000 years ago to present
Pleistocene Epoch	1.8 million to 8,000 years ago
Tertiary Period	65 to 1.8 million years ago
Pliocene Epoch	5.3 to 1.8 million years ago
Miocene Epoch	23.8 to 5.3 million years ago
Oligocene Epoch	33.7 to 23.8 million years ago
Eocene Epoch	55.5 to 33.7 million years ago
Paleocene Epoch	65 to 55.5 million years ago
Mesozoic Era	248 to 65 million years ago
Cretaceous Period	145 to 65 million years ago
Jurassic Period	213 to 145 million years ago
Triassic Period	248 to 213 million years ago
Paleozoic Era	544 to 248 million years ago
Permian Period	286 to 248 million years ago
Carboniferous Period	360 to 286 million years ago
Pennsylvanian Period	325 to 286 million years ago
Mississippian Period	360 to 325 million years ago
Devonian Period	410 to 360 million years ago
Silurian Period	440 to 410 million years ago
Ordovician Period	505 to 440 million years ago
Cambrian Period	544 to 505 million years ago
Precambrian Time	4500 to 544 million years ago
Proterozoic Era	2500 to 544 million years ago
Vendian Period	544 to 650 million years ago
Archaean Era	3800 to 2500 million years ago
Hadean Time	4500 to 3800 million years ago

Source: U. S. Geological Survey website *http://geology.er.usgs.gov/paleo/geotime.shtml*

FORT WAINWRIGHT

Bedrock Geology

Fort Wainwright and the Tanana Flats are located within the large geological province called the Yukon-Tanana terrane. This terrane extends from western Alaska to western Canada and from the Denali Fault in the south to the Tintina Fault in the north. The Yukon-Tanana terrane is a poorly understood and complicated assemblage of mostly Paleozoic micaceous schists (formerly known as collectively as the Birch Creek schist, thought to be Precambrian in age), but also includes metasedimentary and metavolcanic rocks. These rocks have typically been folded, faulted, and

deformed in multiple tectonic events and settings. The older Paleozoic rocks have been intruded by granitic plutons of Mesozoic and Cenozoic age. Some isolated basins have accumulated considerable thicknesses of Tertiary and Quaternary sediments.

While small-scale regional maps have been compiled and more detailed studies done in a few locations, difficult access, limited exposure, lack of fossils, and complex structures hinder geologic studies in this area. However, recent magnetic and gravity maps and continued geochemical studies are leading to better understanding of the region's geologic history, structural relationships, and mineralization (USARAK 1999a; Newberry et al. 1996).

YTA is located on the Yukon-Tanana terrane mentioned above, underlain dominantly by meta-sedimentary rocks that originated as oceanic sediments deposited in a shallow continental margin environment (Foster et al. 1994; USARAK 1999a). The Paleozoic-aged metamorphic rocks were intruded during the late Cretaceous by the Eielson pluton, located in the west-central area of the training area. Northeast trending, high angle faults transect the area. Bedrock is highly weathered but largely obscured by thick accumulations of windblown fine sand and loess (Dusel-Bacon et al. 1998; Foster et al. 1979; Webber et al. 1978; Wilson et al. 1998; USARAK 1999a).

Surficial Geology, Geomorphology, and Land Forms

Interior Alaska has never been glaciated; however, the landscape has been strongly influenced, indirectly, by the glaciers advancing out of the Alaska Range during Pleistocene cold periods. During ice ages, glaciers advanced from the mountains and onto the foothills flanking the northern Alaska Range, and large fans and outwash plains carried abundant glacial sediments to the Tanana and Yukon rivers. Gravel and sand dominated the vast braided stream beds that filled many of the interior Alaska valleys. Wind removed the finer sediments from exposed gravel bars and deposited it on the surrounding landscape as a silt-rich sediment called loess.

Silt and clay-sized particles can travel hundreds of kilometers from a source area and blanket entire landscape. Silty micaceous loess, derived from outwash plains south of the Tanana River, was deposited over most of the area during the Pleistocene and Holocene. The hills around Fairbanks, including the Yukon Training Area are blanketed with up to 150 feet of loess that often contains organic tracers, paleosols, and volcanic ashes. Loess is thickest on the flanks of low hills where it has been deposited by the wind, but also secondarily re-deposited by slope processes removing loess from hilltops and washing it into valleys. In the lowest valley bottoms, where stream processes have been active, there may be little or no loess on the surface. Silty areas on north-facing slopes and in valley bottoms often contain significant amounts of ice. See Section, 3.4, Soils Resources, for more details.

The hilltops, often the oldest age surfaces, have thin layers of loess, weathered bedrock, and occasionally remnant towers of rock called tors. The youngest deposits occur along stream valleys in the form of well-stratified gravel, sand, and silt (BLM and U.S. Army 1994b). Gravel deposits along the Tanana River valley are up to 154 feet thick and are a significant source of groundwater.

The main post of Fort Wainwright is located in the Tanana valley, which is dominantly influenced by alluvial and eolian geomorphic processes. The area underlying the main base is comprised of well drained alluvial gravels and silty floodplain deposits. Abandoned channels and channel scars, and the present Chena River all influence the topography and drainage of the low lying areas. There is a thin mantle of loess over most older surfaces. Permafrost is discontinuous, with presence and thickness highly variable and potentially related to former meander scars and abandoned channels.

Major glacial-fed rivers originating in the Alaska Range flow through the Tanana Flats Training Area. The Wood River originates from many small glaciers and the Tanana River receives glacial runoff from the entire northern side of the Alaska Range. Accordingly, the dominant geomorphic units in TFTA are alluvial and related to numerous and variable stream systems and processes. Jorgensen et al. (1999) define a large number of floodplain-related units differentiated and modified in terms of age since abandonment, stream type (meander or braided), organic content and sediment type. Many of these floodplain deposits are comprised of a combination of gravels, silt, and organic materials. The geomorphology is dominated by deposits of the thick (2 to 4 m) silty and ice-rich abandoned floodplain cover over gravelly riverbed deposits with numerous organic deposits in collapse-scar bogs and fens (Jorgenson et al. 1999). Permafrost is discontinuous and highly variable. The presence or absence of permafrost is dependent on factors such as slope, aspect, fire history, vegetation, and disturbance. Many of the abandoned channels and meander scars contain bogs, fens, and swamps. Permafrost and a high water table keep large areas of TFTA wet for much of the year. Many areas are undergoing thermokarst or the melting of permafrost, and wetlands and fen areas are expanding (Section 3.4, Soils Resources). Detailed description of units and a map of the training lands can be found in the Ecological Land Survey for Fort Wainwright, Alaska (Jorgenson et al. 1999).

The upland hills of YTA are covered with loess. Thicker layers of re-transported loess present at lower elevations. These units reveal the dominance of eolian and hillslope processes at YTA. The source for windblown silt is the nearby glacially fed Tanana River. Higher elevations have thinner blankets of loess and occasionally exposed bedrock. Lower slopes are covered in thicker, often re-deposited layers of loess, organics, and paloesols (Jorgenson et al. 1999). Many north-facing slopes host spruce/sphagnum bogs that are indicative of cold or frozen soils. Contrasting south-facing slopes typically host aspen and birch trees on ice-free, less organic silty soils. Lower creek valleys are filled with alluvial gravels, with broader valleys containing silty, more organic, and sometimes frozen floodplain deposits (Jorgenson et al. 1999). Detailed descriptions of all geomorphic units, associated vegetation types, and maps of YTA can be found in the Ecological Land Survey for Fort Wainwright (Jorgenson et al. 1999).

DONNELLY TRAINING AREA

Bedrock Geology

Most northern portions of Fort Greely and Donnelly Training Area are covered by Quaternary deposits. However, a complex assemblage of Precambrian and Paleozoic-aged metamorphic rocks of the Yukon-Tanana terrane (discussed above) characterizes bedrock of the Northern Foothills area. These rocks were later intruded by Cretaceous and Tertiary-aged igneous rocks, resulting in a few exposed areas of granite and quartz diorite (Jorgenson et al. 1999).

The Fort Greely area is underlain by altered sedimentary and volcanic rocks of Paleozoic age, which were later intruded by granitic plutons. A large pluton estimated to be early Tertiary to mid Cretaceous is located in the southern area of the training lands, between Buchanan Creek and East Fork Little Delta River. The western half of the Delta West training area contains outcrops of Tertiary gravels. The oldest of these gravels date to the early Tertiary and contain coal and siltstones and sandstones. During uplift of the Alaska range, these older gravels were eroded and then covered with massive, coarse-grained, poorly-sorted and weakly consolidated gravels known as the Nenana gravels. These units are visible along the range and outcrop in the Healy valley to the west.

According to Anderson's (1970) map of the hydrologic reconnaissance of the Tanana Basin, the bedrock surrounding Black Rapids Training Area is likely to consist of igneous and metamorphic rocks that are well consolidated, dense, commonly fractured, and faulted. Bedrock outcrops along the Richardson Highway are used as rock-climbing training areas. Lower slopes are covered by moderate to thick deposits of weathered bedrock and colluvium with low ice content.

Surficial Geology, Geomorphology, and Land Forms

The landscape of DTA is comprised of a complex assemblage of glacial, fluvial, and eolian sediments and landforms. Surficial deposits and landforms are dominantly associated with present and past glacial activities, including braided streams, outwash fans and terraces, terminal moraines, kettle lakes, and loess deposits.

The Main Post, as well as the East Training Area and the northern half of the West Training Area, lie within the Tanana-Kuskokwim lowland. The entire lowland area is a structural basin that subsided as the Alaska Range rose to the south, then filled with materials eroded from those mountains. The area consists of alluvial fans that slope northward from the mountains and drop 20 to 50 feet in elevation per mile until they reach the floodplain along the Tanana River (USARAK 2002e).

Active glaciers are important natural features presently influencing the Donnelly Training Area. A number of glaciers terminate within and near the southern border of DTA. Trident Glacier, the largest of these, originates at 9,000 feet in the Alaska Range and terminates near 3,000 feet. This glacier feeds Delta Creek, which flows in braided channels to the Tanana River. Hayes and Gillam glaciers also terminate near the training area boundary. Most of the surface water present in the training area originates as glacial melt.

Glaciers have advanced several times in the past from the Alaska Range to the south. The most extensive and older advances are marked by rolling moraines dotted with numerous kettle lakes. These moraines consist of silty, poorly-sorted, gravel sometimes capped with thin layers of loess. Terminal moraines are often flanked by outwash gravels and terraces comprise of well-drained, sandy gravel (Jorgenson et al. 2001). Younger moraines express higher relief, more numerous kettles, and a thinner loess mantle. Large outwash trains and terraces associated with glacial moraines grade north toward the Delta and Tanana rivers.

The foothills, highlands, and plateaus flanking the Alaska Range are mantled with weathered bedrock and colluvium. Permafrost is present in most areas of DTA, but little research has been done on the distribution, thickness and condition of permafrost in the Donnelly area. Detailed discussion of geomorphic units, transects across the training lands, and a map can be found in the Ecological Land Survey of Fort Greely (Jorgenson et al. 2001).

This area is located on a large alluvial fan complex originating from glacial streams draining the Alaska Range. The physical character of the lower sediment was described as well stratified to lenticular bedded gravel, sand, and silt with a low ice content (Anderson 1970). Upper units are described as poorly stratified silt and silty sand with a moderate to high ice content. Surface drainage is assumed to be moderate to good, as well as the infiltration and permeability (Anderson 1970).

The sediments surrounding the Black Rapids Training Area are composed of a mixture of glacial, fluvial, and colluvial deposits. The training area is located near a dissected alluvial fan emanating from a steep side valley. A moraine left by the Black Rapids glacier is present nearby, on the other side of the Richardson Highway. This moraine marks a former advance of the Black Rapids

Glacier. The Black Rapids Glacier, directly across the valley from the training area, is a surging glacier. Surging glaciers will periodically and suddenly advance many feet per day, and at high rates of flow. These advances can result in ice margin positions advancing hundreds of meters or more. It is believed that surges result from the build up of water under the ice that induces the glacier to decouple from the bed and advance rapidly. Surges are often accompanied by large outburst floods when this dammed water is released. The last surge of the Black Rapids glacier occurred in 1936.

FORT RICHARDSON

Bedrock Geology

Bedrock deposits underlying Fort Richardson, characterized as old and young, consist of rock formed during different geologic periods. The Chugach Mountains are an obvious outcrop of old bedrock that includes rocks of both Chugach and Peninsula terrains (Silberling et al. 1994) and consists of metamorphosed sedimentary and igneous rocks (Hunter et al. 2000). The McHugh Complex represents most of the Chugach Mountain areas and the Valdez Group occurs near the south fork of Eagle River. Rocks of the Peninsula terrain outcrop in the upper reaches of the Anchorage Lowland. The Chugach and Peninsula terrains are separated by the Border Ranges Fault (MacKevett and Plafker 1974; Updike and Schmoll 1985) that is concealed beneath surficial deposits. It is suspected that this fault was active from the Cretaceous to within 300 years ago.

More recently formed tertiary sediments (the Kenai Group) such as sandstones, siltstones, and claystones that are representative of shallow marine environments, form a thick wedge that extends to the west from the Chugach Mountains. These strata underlie much of the upper Cook Inlet and are the major oil and gas producers. In the eastern reaches of the Anchorage Lowland, along the Chugach Mountains, rocks of the Kenai Group can be found to depths of 30 to 80 feet. Borings drilled east of the Glenn Highway near the small arms range indicate that 10 to 12 feet of fractured siltstone overlies the older metamorphic formation. Below the main cantonment area of Fort Richardson, bedrock can be found at depths ranging from 230 to 320 feet below the surface. The bedrock surface generally slopes to the west, and bedrock is as deep as 1000 feet in the western part of the Anchorage Lowland (Updike and Schmoll 1985). Isolated areas of shallow bedrock can be found on Fort Richardson.

Surficial Geology, Geomorphology, and Land Forms

The geology of Fort Richardson and adjacent lands has been extensively mapped by numerous researchers. The thick sequences of unconsolidated Quaternary deposits that underlie Fort Richardson have accumulated primarily as a result of glacial and marine sedimentation. These deposits thicken westward from the base of the Chugach Mountains. Below the Fort Richardson cantonment, glacial sediments range from 230 to 320 feet thick according to well logs (Cederstrom et al. 1964; Hunter et al. 1999). They are up to 1000 feet thick elsewhere in the Anchorage basin (Updike and Schmoll 1985).

The underlying geology of Fort Richardson is complex and highly variable due to deposition that occurred during the advance and retreat of glaciers with intermittent marine incursion (marine sedimentary processes). The following paragraphs provide descriptions of the various geologic units, but are not intended to reflect exact conditions underlying any given site on Fort Richardson.

The Mountain View fan is commonly on the order of 40 to 60 feet thick under most of the main cantonment area. The fan consists mostly of sands and gravels with a high concentration of

silt and clay. The formation is highly layered, and it is common to find lenses of clay and silt interbedded within the sand and gravel. Silt and clay lenses were likely deposited during floods and also could have resulted from deposition in small ponds and lakes.

The Elmendorf moraine lies beneath the Mountain View fan in the area of the main cantonment. The Elmendorf moraine is an end moraine and consists primarily of diamicton (poorly-sorted mixtures of silt, sand, and gravel) along with coarse gravel, fine well-sorted sand, dense silt, and moderately to well-compacted clay (Hunter et al. 2000). The lateral and ground moraine deposits tend to consist of diamicton (poorly or unsorted sediment) of variable thickness with interbedded lenses of sand, silt, and gravel. In areas where the Mountain View fan is absent, the moraine deposits represent the upper geologic unit. The glacier that deposited the Elmendorf moraine did not advance across the entirety of Fort Richardson and, as a result, coarse outwash deposits intermingled with deposits of unsorted material can be found along the front of the moraine. The older ground moraine deposits found in the southern part of the cantonment area are evidence that the glacier that formed the Elmendorf moraine did not advance across the entirety of Fort Richardson.

The next geologic unit underlying the cantonment area is the Bootlegger Cove Formation. The Bootlegger Cove Formation was formed during the advance and retreat of glacial ice, with an intermittent period of marine intrusion. Marine submergence occurred when glacial ice retreated forming a sedimentation basin that at various times contained either fresh or marine waters (Updike and Schmoll 1985). Schmoll and Yehle describe the Bootlegger Cove Formation as consisting of silty clay and clayey silt with minor interbedded silt, fine sand, fine to medium sand, thin beds of unsorted material, and scattered pebbles and cobbles. The thickness of the Bootlegger Cove Formation is quite variable, but has been found to be almost 300 feet thick in parts of the Anchorage Lowland (Cederstrom et al. 1964). Even though the Bootlegger Cove Formation is extensive, evidence exists to suggest that the formation does not extend much further northeast than the edge of the cantonment area. The formation is likely not found north and east of the cantonment area and is suspected to be only about 30 feet thick in the south-southwest areas of the post.

The lower geologic sequences (Dishno Pond moraines, Fort Richardson moraines, and Rabbit Creek moraines) all tend to be glacial diamictons (Cederstrom et al. 1964). Because of a lack of deep geologic borings and geophysical surveys, many of the descriptions of these sequences are speculative and descriptions vary (see Cederstrom et al. 1964; Trainer and Waller 1965; and Schmoll and Barnwell 1984). The Dishno Pond Sequence appears to underlie much of the Anchorage Lowland and the diamicton should be similar to the Fort Richardson diamicton, and be a few to tens of meters thick (Hunter et al. 2000). The Fort Richardson diamicton is thought to be highly stratified with sand and gravel horizons. This description is based on the proposed glacial history of the Anchorage basin. The Rabbit Creek moraine lies on top of the Kenai Formation (sedimentary bedrock). There is some evidence that layers of silt and clay were deposited between these moraines during periods of marine inundation.

The principal features transecting Fort Richardson are the Elmendorf moraine, the Mountain View alluvial fan, ground moraines, and Eagle River Flats tidal marsh. The Mountain View fan originates at the mouth of the Eagle River Valley. The fan slopes gently to the west-southwest and underlies most of the main cantonment area of Fort Richardson (Hunter et al. 1999). The fan is composed of outwash deposited by streams and floods that occurred when ice-dammed lakes in the Eagle River Valley drained. The main deposits of the Elmendorf moraine form a low lying ridge that tends to run east to west across the region immediately north of the main cantonment area of Fort Richardson. The Elmendorf moraine is an end moraine that was formed when the

Matanuska-Knik lobe of the Naptowne Glacier advanced from the northeast towards modern-day Anchorage.

The ground moraines were formed by a number of physical processes that operate underneath glaciers. The ground moraine found on the northern part of Fort Richardson was probably formed at the same time as the Elmendorf moraine. The southern ground moraine lies much deeper and was likely created by a glacial event that preceded formation of the northern ground moraine. The ground moraines tend to be extensive deposits of glacial till (unsorted and unlayered rock debris carried by a glacier) with hummocky surfaces and moderately gentle slopes. Ground moraine is typically associated with landforms called drumlins (elongated and rounded hills of glacial drift) that are common in the northern part of Fort Richardson. The streamlined hills located between the post housing area and the Glenn Highway are examples of the older ground moraines protruding through younger glacial deposits of various origin (Hunter et al. 2000).

Eagle River Flats is a low-lying tidal marsh located north-northwest of the main cantonment area on Fort Richardson that was created by various estuarine processes. Modern estuarine sediments are continually deposited during spring flood events and by tidal fluctuations of up to 30 feet or more. Older estuarine deposits are found extensively in Eagle River Flats and were likely deposited during the Holocene Epoch. Estuarine deposits are generally composed of well-bedded and sorted silt and fine sands.

At the current time, no glaciers exist on any part of Fort Richardson. However, several glaciers and rock glaciers exist in protected valleys of the Chugach Mountains above 4000 feet elevation. Many of these glaciers, such as the Eklutna Glacier, are located within 20 miles of Fort Richardson.

3.4 SOIL RESOURCES

Appendix Table 3.4.a Definitions of Soil Terms Used in Section 3.5, Soil Resources.

Alluvium	Unconsolidated material deposited by running water, including gravel, sand, silt, clay, and various mixtures of these.
Cryoturbation	A collective term used to describe all soil movements due to frost action, characterized by folded, broken and dislocated beds and lenses of unconsolidated deposits.
Glacial drift	A general term applied to all mineral material (clay, silt, sand, gravel, boulders) transported by a glacier and deposited directly by or from the ice, or by running water emanating from a glacier.
Horizon	A layer of soil, approximately parallel to the soil surface, differing in properties and characteristics from adjacent layers below or above it.
Loam	The textural-class name for soil having a moderate amount of sand, silt, and clay. Loam soils contain 7 to 27% clay, 28 to 50% silt, and 23 to 52% sand.
Loess	Material transported and deposited by wind and consisting predominantly of silt-size particles. Loess sources are dominantly from either glacial meltwaters or from non-glacial, arid environments, such as deserts.
Moraines	A general term for a landform composed mainly of till deposited by a glacier.
Muskegs	A bog, usually a sphagnum bog, frequently with grassy tussocks (hummocks), growing in wet, poorly drained boreal regions, with deep accumulations of organic material, often in areas of permafrost; a moss-covered muck or peat bog of boreal regions.
Organic matter (material)	Living, dead, partially or fully decomposed, biological and mineral mixture at the upper levels of soil.
Outwash	Stratified and sorted sediments removed or “washed out” from a glacier by melt-water streams and deposited in front of or beyond the end moraine or the margin of a glacier.
Parent material	The unconsolidated and more or less chemically weathered mineral or organic matter from which a soil is developed.
Peat	Unconsolidated soil material consisting largely of undecomposed or only slightly decomposed organic matter accumulated under conditions of excessive moisture.
Permafrost	Ground, soil, or rock that remains at or below 0° C for at least two years. It is defined on the basis of temperature and is not necessarily frozen.
Spodosols	Soils with a layer of organic matter and compounds of aluminum and usually iron. These soils are formed in acid, mainly coarse-textured materials in humid and mostly cool or temperate climates.
Subsidence	Settling of the ground.
Swale	A shallow, open depression in unconsolidated materials, which lacks a defined channel but can funnel overland or subsurface flow into a drainage way. Soils in swales tend to be more moist and thicker compared to surrounding soils.
Till	Dominantly unsorted and unstratified drift, generally unconsolidated deposited directly by a glacier.
Thermokarst	Topographic features produced in a permafrost region by local melting of ground ice and subsequent subsidence of the surface.

Appendix Table 3.4.b The Unified System of Classification[1]

MAJOR DIVISION			GROUP SYMBOLS	TYPICAL NAMES
Coarse-grained soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines. Silty gravels, gravel-sand-silt mixture
		Gravels with fines	GM	Clayey gravels, gravel-sand-clay mixtures
			GC	Well-graded sands and gravelly sands, little or no fines
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean sands	SW	Poorly graded gravels and gravel-sand mixtures, little or no fines
			SP	Silty sands, sand-silt mixtures
		Sands With fines	SM	Clayey sands, sand-clay mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-grained soils 50% or more passes No. 200 sieve	Silts and clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and clays Liquid limit Greater than 50%		MH	Inorganic silts, micaceous, or diatomaceous fine sand or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OC	Organic clays of medium to high plasticity
Highly organic soils			Pt	Peat, muck, and other highly organic soils

1 Note that this is a system to classify soil materials, not natural soil bodies. The two letter designations (SW, MH, etc.) help engineers predict the behavior of the soil material when used for construction purposes. The first letter is one of the following: G = gravel, S = sand, M = silts, C = clays, and O = organic-rich materials. The second letter indicates whether the sand or gravels are well graded (W) or poorly graded (P), and whether the silts, clays, and organic-rich materials have a high plasticity index (H) or a low plasticity index (L). Among the fine-grained materials, those closer to the top of the table are better suited for foundations and roadbeds.

3.5 SURFACE WATER

Appendix Table 3.5.a. Average Streamflow, all USARAK Properties.

Mean Monthly Discharge (cubic feet per second)									
Month	**DTA**	**YTA**		**TFTA/MP**			**FRA**		
	Tanana River	Salcha River	Chena River	Chena River	Tanana River	Wood River	Eagle River	Ship Creek	Cambell Creek
January	4,924	257	143	341	5,570	96.7	77.6	30.6	25.2
February	4,743	207	105	280	5,369	91.8	66.8	21.5	19
March	4,716	188	88.8	259	5,316	91.4	57.8	16.1	19
April	5,723	402	259	469	7,440	121	78.1	24.4	35.8
May	17,220	4,269	2,391	3,674	22,370	552	261	168	67
June	25,820	3,847	1,458	2,585	36,240	1,075	981	458	135
July	37,410	2,633	1,157	2,037	52,659	1,244	1734	304	125
August	35,850	3,021	1,205	2,442	48,530	1,276	1635	210	105
September	22,030	2,451	1,239	2,169	27,220	567	876	215	109
October	9,251	1,069	661	1,181	13,200	281	350	151	89.5
November	5,681	499	367	588	7,604	145	136	77.6	48.4
December	5,088	351	219	444	6,124	104	92.5	46.7	34.2
Avg. streamflow	14871	1600	774	1372	19804	470	529	144	68
Dates Recorded	’48-’57	’48-’00	’72-’80	’47-’00	’73-’00	’68-’78	’65-’81	’46-’99	’66-’99
Basin Area (mi^2)	13,500	2,170	1,445	1,995	undefined	855	192	90.5	69.7

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.b Water Quality, Wood River (USGS Number 15514500).

Water Quality Parameter	Feb-69	May-70	Jul-70	Sep-70	Apr-71
Water Temp (°C)	0.0	0.5	12.0	1.0	0.0
Discharge (cfs)[1]	121.0	318.0	1380.0	452.0	156.0
Color (Platinum-Cobalt Units)	5.0	10.0	10.0	0.0	5.0
Specific conductance (µS/CM) at 25°C	227.0	239.0	268.0	303.0	212.0
pH	7.6	7.5	8.0	8.2	7.7
Carbon Dioxide Dissolved (mg/L as CO_2)	5.3	4.9	–	1.3	3.7
$CACO_3$ (mg/L)	108.0	80.0	–	103.0	95.0
Bicarbonate HCO_3 (mg/L)	130.0	97.0	110.0	130.0	120.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.29	0.14	–	0.07	0.23
Total hardness (mg/L as $CACO_3$)	120.0	120.0	130.0	160.0	110.0
Calcium, dissolved (mg/L)	35.0	36.0	38.0	46.0	32.0

Appendix Table 3.5.b cont. Water Quality, Wood River (USGS Number 15514500).

Water Quality Parameter	Feb-69	May-70	Jul-70	Sep-70	Apr-71
Magnesium (mg/L)	6.8	7.0	9.1	10.0	6.8
Sodium (mg/L)	2.5	1.6	1.5	2.3	2.3
Potassium (mg/L)	2.0	1.2	1.6	1.6	1.2
Chloride (mg/L)	0.0	0.0	4.5	0.0	0.0
Sulfate (mg/L)	13.0	40.0	35.0	52.0	14.0
Fluoride (mg/L)	0.2	0.2	0.2	0.0	0.3
Silica (mg/L2)	15.0	7.3	3.1	8.3	13.0
Dissolved solids (mg/L)	140.0	142.0	146.0	183.0	128.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	1.3	0.6	0.9	0.3	1.0
Iron (µg/L as Fe)	190.0	210.0	160.0	80.0	130.0

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.c Water Quality, Tanana River (USGS Number 15485500).

Water Quality Parameter	Jun-74	Jul-75	Apr-94
Water Temp °C	12.5	16	–
Discharge (cfs)[a]	21,100	60,900	–
Color (Platinum-Cobalt Units)		10	–
Specific conductance (µS/CM) at 25°C	210	194	–
pH	7.8	7.9	7.6
Carbon Dioxide Dissolved (mg/L as CO_2)	2.4	1.9	–
$CACO_3$ (mg/L)	76	75	–
Bicarbonate HCO_3 (mg/L)	93	92	–
Nitrogen, Nitrite + Nitrate dissolved (mg/L)	–	0.14	0.2
Total hardness (mg/L as $CACO_3$)	–	90	–
Calcium, dissolved (mg/L)	–	27	39
Magnesium (mg/L)	–	5.5	8.2
Sodium (mg/L)	–	3.6	3.6
Potassium (mg/L)	–	2.8	2.3
Chloride (mg/L)	–	2.5	1.1
Sulfate (mg/L)	–	27	33
Fluoride (mg/L)	–	0.1	0.1
Silica (mg/L2)	–	5.4	13
Dissolved solids (mg/L)	–	123	177
Iron (µg/L as Fe)	–	60	–

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.d Water Quality, Chena River at North Pole, AK (USGS Gage 15493500).

Water Quality Parameter	Sep-72	Dec-72	May-73	Jul-73	Mar-74
Water Temp (°C)	8.5	0.5	2.5	9.5	0.0
Discharge (cfs)[1]	1130.0	445.0	3290.0	1470.0	55.0
Color (Platinum-Cobalt Units)	5.0	–	100.0	20.0	10.0
Specific conductance (µS/CM) at 25°C	165.0	170.0	100.0	150.0	168.0
pH	7.8	7.2	7.2	7.0	6.6
Carbon Dioxide Dissolved (mg/L as CO_2)	3.5	13.0	6.4	5.1	12.0
$CACO_3$ (mg/L)	64.0	62.0	32.0	26.0	63.0
Bicarbonate HCO_3 (mg/L)	78.0	81.0	39.0	32.0	77.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.34	0.07	–	–	–
Nitrogen, Organic (mg/L N)	0.10	0.03	0.61	0.13	0.11
Total hardness (mg/L as $CACO_3$)	76.0	82.0	51.0	76.0	81.0
Calcium, dissolved (mg/L)	23.0	25.0	15.0	23.0	20.0
Magnesium (mg/L)	4.8	4.8	3.3	4.5	5.0
Sodium (mg/L)	1.7	1.8	1.2	1.7	2.2
Potassium (mg/L)	1.0	0.8	1.1	1.0	1.1
Chloride (mg/L)	1.0	0.8	1.2	0.8	1.3
Sulfate (mg/L)	18.0	20.0	14.0	18.0	21.0
Fluoride (mg/L)	0.2	0.1	0.2	0.2	0.3
Silica (mg/L)	6.5	7.6	4.6	6.5	8.2
Dissolved solids (mg/L)	96.0	98.0	61.0	94.0	101.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	1.5	0.3	–	–	–
Iron (µg/L as Fe)	220.0	–	400.0	210.0	190.0

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.e Water Quality, Salcha River (USGS Gage 15484000).

Water Quality Parameter	Feb-72	Oct-74	May-75
Water Temp (°C)	0.0	0.0	2.0
Discharge (cfs)[1]	–	1000.0	22100.0
Color (Platinum-Cobalt Units)	5.0	8.0	100.0
Specific conductance (µS/CM) at 25°C	152.0	150.0	36.0
pH	7.1	7.6	6.1
Carbon Dioxide Dissolved (mg/L as CO_2)	8.5	2.9	15.0
$CACO_3$ (mg/L)	55.0	58.0	10.0
Bicarbonate HCO_3 (mg/L)	67.0	71.0	12.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.45	–	–
Nitrogen, Organic Total (mg/L)	0.00	0.22	0.79
Total hardness (mg/L as $CACO_3$)	74.0	72.0	18.0

Appendix Table 3.5.e cont. Water Quality, Salcha River (USGS Gage 15484000).

Water Quality Parameter	Feb-72	Oct-74	May-75
Calcium, dissolved (mg/L)	20.0	19.0	5.6
Magnesium (mg/L)	5.8	6.0	1.0
Sodium (mg/L)	1.9	1.8	0.7
Potassium (mg/L)	0.8	0.9	1.4
Chloride (mg/L)	0.5	1.3	1.1
Sulfate (mg/L)	20.0	20.0	6.4
Fluoride (mg/L)	0.1	0.1	0.1
Silica (mg/L2)	7.7	7.7	2.6
Dissolved solids (mg/L)	92.0	93.0	26.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	2.0	–	–
Iron (µg/L as Fe)	160.0	220.0	460.0

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.f Water Quality, Delta River at Big Delta.

Water Quality Parameter	Feb-58	Aug-66	Oct-78	Jun-79
Water Temp (°C)	0.0	–	4.0	13.0
Color (Platinum-Cobalt Units)	0.0	0.0	–	–
Specific Conductance (µS/cm)	284.0	211.0	255.0	186.0
pH (standard units)	7.3	7.8	8.2	7.0
Total Hardness (mg/l $CaCO_3$)	130.0	89.0	120.0	81.0
Calcium, dissolved (mg/l Ca)	39.0	27.0	35.0	22.0
Magnesium, dissolved (mg/l Mg)	8.0	7.7	7.6	6.4
Potassium, dissolved (mg/l K)	4.0	2.4	3.7	2.0
Sodium, dissolved (mg/l Na)	2.9	1.4	3.0	2.4
Water, unfiltered field (mg/L $CaCO_3$)	103.0	79.0	90.0	62.0
Chloride, dissolved (mg/l Cl)	0.5	0.7	1.0	1.2
Fluoride, dissolved (mg/l F)	0.0	0.1	0.1	0.1
Silica, dissolved (mg/l as SiO_2)	7.6	4.3	5.6	4.3
Sulfate, dissolved (mg/l SO_4)	36.0	26.0	45.0	27.0
Solids, residue at 180° C	–	–	148.0	103.0
Solids, sum of constituents	161.0	117.0	156.0	103.0
Nitrogen, NO_2 + NO_3 dissolved (mg/l N)	–	–	0.28	0.11
Phosphorus, dissolved (mg/l P)	–	–	<.01	<.01
Iron, dissolved (µg/l Fe)	–	–	<10	40.0
Manganese, dissolved (µg/l Mn)	–	–	2.0	4.0

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.g Water Quality, Tanana River at Big Delta, AK (USGS Gage 15478000).

Water Quality Parameter	May-58	Aug-58	Oct-78	Jun-79
Water Temp (°C)	3.5	9.0	0.0	13.0
Discharge (cfs)[1]	–	–	–	–
Color (Platinum-Cobalt Units)	10.0	0.0	–	–
Specific conductance (µS/CM) at 25°C	232.0	264.0	277.0	218.0
pH	6.6	–	7.9	7.4
Carbon Dioxide Dissolved (mg/L as CO_2)	44.0	0.0	2.5	6.2
$CACO_3$ (mg/L)	90.0	93.0	103.0	80.0
Bicarbonate HCO_3 (mg/L)	110.0	110.0	120.0	98.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.2	0.1	–	–
Total hardness (mg/L as $CACO_3$)	110.0	130.0	130.0	97.0
Calcium, dissolved (mg/L)	33.0	28.0	37.0	28.0
Magnesium (mg/L)	7.1	15.0	8.1	6.5
Sodium (mg/L)	3.9	4.4	4.1	5.1
Potassium (mg/L)	2.3	1.9	2.3	1.7
Chloride (mg/L)	3.0	3.0	1.4	2.7
Sulfate (mg/L)	24.0	42.0	32.0	29.0
Fluoride (mg/L)	0.2	0.1	0.1	0.1
Silica (mg/L)	5.8	9.1	10.0	8.8
Dissolved solids (mg/L)	134.0	159.0	158.0	131.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	0.9	0.3	–	–
Iron (µg/L as Fe)	110.0	90.0	–	–

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.h Water Quality, Eagle River (USGS Gage 15277100).

Water Quality Parameter	Mar-67	Jun-67	Sep-67
Water Temp (°C)	0.0	6.5	4.5
Discharge (cfs)[1]	54.0	1650.0	4090.0
Color (Platinum-Cobalt Units)	5.0	5.0	10.0
Specific conductance (µS/CM) at 25°C	286.0	94.0	124.0
pH	7.5	7.6	7.2
Carbon Dioxide Dissolved (mg/L as CO_2)	5.8	1.6	6.0
$CACO_3$ (mg/L)	94.0	33.0	48.0
Bicarbonate HCO_3 (mg/L)	110.0	40.0	59.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.25	0.23	0.23
Total hardness (mg/L as $CACO_3$)	130.0	44.0	58.0
Calcium, dissolved (mg/L)	45.0	14.0	17.0
Magnesium (mg/L)	5.2	2.0	3.5

Appendix Table 3.5.h cont. Water Quality, Eagle River (USGS Gage 15277100).

Water Quality Parameter	Mar-67	Jun-67	Sep-67
Sodium (mg/L)	3.1	1.6	1.6
Potassium (mg/L)	0.8	0.4	1.4
Chloride (mg/L)	17.0	0.4	0.7
Sulfate (mg/L)	31.0	12.0	14.0
Fluoride (mg/L)	0.0	0.0	0.0
Silica (mg/L2)	7.2	3.2	7.3
Dissolved solids (mg/L)	167.0	54.0	76.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	1.1	1.0	1.0
Iron (µg/L as Fe)	320.0	2300.0	1700.0

Source: U.S. Geological Survey 2002-2003

Appendix Table 3.5.i Water Quality, Ship Creek (USGS Gage 15276000).

Water Quality Parameter	Nov-68	Apr-70	Jun-70	Aug-70
Water Temp (°C)	0.0	1.5	5.5	7.0
Discharge (cfs)[1]	19.0	11.0	444.0	216.0
Color (Platinum-Cobalt Units)	5.0	5.0	5.0	5.0
Specific conductance (µS/CM) at 25°C	152.0	161.0	95.0	116.0
pH	7.7	7.8	7.8	7.1
Carbon Dioxide Dissolved (mg/L as CO_2)	2.1	2.8	1.0	6.1
$CACO_3$ (mg/L)	55.0	58.0	31.0	39.0
Bicarbonate HCO_3 (mg/L)	67.0	70.0	38.0	48.0
Nitrogen, Nitrate, dissolved as N (mg/L)	0.07	0.18	0.07	0.14
Total hardness (mg/L as $CACO_3$)	66.0	70.0	42.0	52.0
Calcium, dissolved (mg/L)	20.0	22.0	14.0	17.0
Magnesium (mg/L)	3.8	3.9	2.0	2.4
Sodium (mg/L)	2.4	2.5	1.6	1.7
Potassium (mg/L)	0.6	0.3	0.4	0.2
Chloride (mg/L)	0.4	0.4	0.7	0.2
Sulfate (mg/L)	20.0	19.0	12.0	13.0
Fluoride (mg/L)	0.0	0.1	0.0	0.1
Silica (mg/L2)	8.6	7.0	4.7	3.1
Dissolved solids (mg/L)	89.0	90.0	55.0	62.0
Nitrogen, Nitrate, dissolved as NO_3 (mg/L)	0.3	0.8	0.3	0.6
Iron (µg/L as Fe)	0.0	–	60.0	0.0

Source: U.S. Geological Survey 2002-2003

3.6 GROUNDWATER

Appendix Table 3.6.a Groundwater Quality, Fort Wainwright Main Post

	Bldg. 1011	Bldg 4073	Well #3698	Well #4074
Date	**7/10/1974**	**7/10/1974**	**2/27/1975**	**2/27/1975**
pH	7.5	7.8	7.4	7.4
Specific Conductance (µmhos/cm)	396.0	278.0	291.0	300.0
Alkalinity (mg/l CaCO3)	200.0	134.0	124.0	122.0
Hardness (mg/l CaCO3)	209.0	141.0	135.0	133.0
Calcium, dissolved (mg/l)	63.6	39.7	38.0	39.0
Potassium (mg/l)	3.3	202.0	3.0	3.0
Silica (mg/l)	21.0	39.5	31.0	34.0
Total Dissolved Solids (mg/l)	257.0	211.0	191.0	192.0
Color (color units)	<5.0	<5.0	25.0	20.0
Fluoride, dissolved (mg/l)	0.16	0.21	1.11	0.13
Iron (mg/l Fe)	9.10	2.42	0.29	0.22
Magnesium (mg/l)	12.8	10.0	9.7	9.2
Chloride, dissolved (mg/l)	2.2	1.6	1.0	1.0
Sulfate, dissolved (mg/l)	15.3	14.3	17.6	16.8
Arsenic (mg/l)	<0.01	<0.01	<0.01	<0.01
Sodium, dissolved (mg/l Na)	5.3	5.2	3.9	4.1
Nitrate (mg/l N)	<0.04	<0.04	<0.04	<0.04

Source: University of Alaska Fairbanks 2003

Appendix Table 3.6.b Groundwater Quality, Donnelly Training Area

	Bldg. 606, Fort Greely	Bolio Range	Beales Range	Delta Junction School[1]
Date	**2/27/1975**	**2/27/1975**	**10/1/1974**	**6/18/1968**
pH	7.9	7.8	7.7	7.8
Specific Conductance (µmhos/cm)	263.0	292.0	780.0	231.0
Alkalinity (mg/l CaCO3)	89.0	98.0	109.0	
Hardness (mg/l CaCO3)	129.0	132.0	148.0	110.0
Calcium, dissolved (mg/l)	39.0	37.0	42.0	32.0

Appendix Table 3.6.b cont. Groundwater Quality, Donnelly Training Area

	Bldg. 606, Fort Greely	Bolio Range	Beales Range	Delta Junction School[1]
Date	**2/27/1975**	**2/27/1975**	**10/1/1974**	**6/18/1968**
Potassium (mg/l)	3.2	3.2	3.7	2.7
Silica (mg/l)	6.9	7.5	5.3	7.9
Total Dissolved Solids (mg/l)	182.0	172.0	191.0	138.0
Color (color units)	5.0	<5.0	<5.0	
Fluoride, dissolved (mg/l)	0.1	<0.1	<0.1	<0.1
Iron (mg/l Fe)	0.03	0.10	0.16	0.18
Magnesium (mg/l)	9.1	10.8	9.6	7.1
Chloride, dissolved (mg/l)	1.3	1.3	1.5	0.4
Sulfate, dissolved (mg/l)	41.0	38.0	38.0	36.0
Arsenic (mg/l)	0.01	<0.01	<0.01	
Sodium, dissolved (mg/l Na)	3.6	3.3	3.2	1.8
Nitrate (mg/l N)	0.2	0.2	0.1	0.1

[1]U.S. Geological Survey 1980

Source: USARAK 1979b

Appendix Table 3.6.c Groundwater Quality, Fort Richardson

Date	**11/20/1973**	**7/30/1999**	**10/8/1975**
Time	**9:45**	**13:00**	**9:30**
Depth Below Land Surface (Water Level) (Feet)	75	103	16
Depth of Well, Total (Feet)	183	152	
Oxygen, Dissolved (mg/L)		5.5	
pH, Water whole, Field (Standard Units)	7.9	7.9	
pH, Water whole, Lab (Standard Units)		7.6	
Specific Conductance (µS/cm)	162	210	276
Temperature (C)	3	4.5	7.5
Hardness, Total (as mg/l CaCO3)	73	110	140
Calcium, dissolved (mg/l)	23	35.8	42
Magnesium (mg/l)	3.8	6.08	8.3
Potassium (mg/l)	0.4	0.49	0.6
Sodium, Adsorption Ratio	0.1	0.1	0.1
Sodium, dissolved (mg/l Na)	2	2.4	2.4

Appendix Table 3.6.c cont. Groundwater Quality, Fort Richardson

Date	**11/20/1973**	**7/30/1999**	**10/8/1975**
Time	**9:45**	**13:00**	**9:30**
Alkalinity, Wat.dis TOT IT Field (mg/l CaCO3)		97	
ANC Water Unfiltered FET Field (mg/l CaCO3)	58		133
Chloride, dissolved (mg/l)	1	1.4	3.8
Fluoride, dissolved (mg/l)	<0.1	<0.1	0.1
Silica, dissolved (mg/l)	11	11.4	8.3
Sulfate, dissolved (mg/l)	18	18.8	14
Solids, Dissolved, residue (mg/l)	96	138	

Source: Pat Strelakos, personal communication 2002

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3.7 WETLANDS

3.7.a Hydrologic Role of Alaskan Wetlands

Permafrost exerts significant influences on the hydrology and infiltration rates of wetlands, thus many Alaskan wetlands are unique compared to warmer ecosystems. For example, in regions with discontinuous permafrost, the aspect of the slope determines whether wetlands will be present or not due to the presence or absence of permafrost.

Wetlands underlain by permafrost play an important role in the local hydrologic regime. Wetlands influence the general hydrologic response of a watershed by affecting the relationship between the amounts of precipitation and runoff. The duration between precipitation inputs and the greatest amount of storm discharge is known as *lag time.* The interval between precipitation and return to normal base flow conditions is known as *recession time.*

Runoff associated with spring snowmelt is the most important hydrologic event occurring in interior Alaska. During this period, wetlands have limited flood control and water retention capacities due to permafrost and peat. Thus peak flows are typically higher in wetlands underlain by permafrost. Nevertheless, wetlands with permafrost still slow the peak flows because water is detained by hummocks (elevated areas of moss or grass) or depressions, both of which result from freezing and thawing.

Lag times for arctic and subarctic wetlands tend to be shorter than wetlands in temperate climates because of the permafrost layer. Recession times in these wetlands are longer because the peat layer releases water slowly and because of low evapotranspiration rates.

In interior Alaska, wetlands only contribute small amounts of water to groundwater recharge because precipitation is balanced by evapotranspiration. The only appreciable groundwater recharge from wetlands would occur during snowmelt, but even this contribution is often offset due to poor infiltration through the permafrost layer.

The wetlands contribute a number of resource functions. They contribute to erosion control by decreasing wind and water velocities near the ground. The wetland vegetation also anchors soil particles in the root systems. Near floodplains, wetlands remove sediment from floodwaters, and the vegetation stabilizes riverbanks. Wetlands also insulate the permafrost from thawing. Removal of wetlands increases local erosive forces and creates *thermokarst* (large depressions in the land surface), which occurs when the permafrost thaws.

The water chemistry of wetlands is primarily the result of geologic setting, water balance, water quality, soil type, vegetation, and human activity (Fretwell et al. 1996). In areas where wetland water quality reflects the content of the water source (e.g., surface flow, precipitation, or groundwater) an accumulation of waterborne chemicals may result. Wetlands can filter or transform these chemicals and thus improve water quality.

3.7.b Federal Protection of Wetlands

Section 404 of the Clean Water Act was created in 1972 to control the discharge of dredged and fill materials into water. Section 404 permits are required for a variety of projects such as channel construction and maintenance, fills to create dry land for development, and water control projects such as dams and levees. The U.S. Army Corps of Engineers and the Environmental Protection Agency (EPA) oversee the permitting program under Section 404. The Army Corps of Engineers

administers the program under the oversight of the EPA. The EPA has the power to veto permits that could be harmful to surrounding resources.

The Army Corps of Engineers participates by balancing the benefits of activities against potential costs. Other federal agencies, state agencies, and the general public participate by providing data or commentary. In addition, cumulative effects of dredge or fill projects are considered in the permit application process. Thus, wetland mitigation plans are often required. During the permitting process, the Army Corps of Engineers considers four questions (Fretwell et al. 1996):

(1) Is the proposed discharge the least damaging practical alternative?

(2) Does the proposed discharge comply with other environmental standards or regulations?

(3) Will the proposed discharge significantly degrade wetlands?

(4) Have all appropriate and practical steps been taken to minimize potential harm to the wetlands?

Exemptions from the Section 404 permitting include farming activities; dam reconstruction or maintenance; operation of farm ponds or irrigation and drainage ditches; construction of temporary sediment basins; construction of roads for farming, forestry or mining; and activities under a state-approved nonpoint source management program (CWA 404(f)(1); 22 U.S.C.A 1344(f)(1)).

Unregulated methods of altering wetlands include wetland drainage, lowering of groundwater adjacent to wetlands, permanent flooding of existing wetlands, deposition of material that is not defined as dredged and fill, and wetland vegetation removal (Fretwell et al. 1996) (See Appendix Table 3.7a).

Wetlands are also protected under Executive Order 11990, Protection of Wetlands (signed by President Carter in 1977). This executive order ensures that federal agencies will protect and manage floodplains and wetlands. Protection of these resources is accomplished through the NEPA process, whereby planned actions and potential wetland conflicts are reviewed by agencies and the general public.

3.7.c USARAK Wetland Permit

Appendix Table 3.7.a Definition of Land Use Categories Used on the Environmental Limitations Overlays for USARAK during Summer Months.

Category	**Approved Activity** **SUMMER**	**Limited Activity (requires approval by Range Control on a case-by-case basis)**	**Prohibited Activity**
GREEN No limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Defensive fighting positions - Digging - Earth moving - Field kitchens - Laundry and bath facilities - Water purification - Portable latrines - Slit trenches - Vehicle decontamination training - Timber cutting (under 4” in diameter) - POL distribution	- Smoke generation - Fuel farms	None

Appendix Table 3.7.a cont. Definition of Land Use Categories Used on the Environmental Limitations Overlays for USARAK during Summer Months.

Category	**Approved Activity SUMMER**	**Limited Activity (requires approval by Range Control on a case-by-case basis)**	**Prohibited Activity**
YELLOW Minor limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4” in diameter)	- Digging - Earth moving	- Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution
RED Significant limitations or restrictions	- Foot maneuvers	-Tracked and wheeled maneuvers - Stream crossings with ADF&G permit	- Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4” in diameter) - Mechanical digging - Earth moving - Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution

Appendix Table 3.7.b. Definition of Land Use Categories Used on the Environmental Limitations Overlays for USARAK during Winter Months.

Category	**Approved Activity WINTER**	**Limited Activity (requires approval by Range Control on a case-by-case basis)**	**Prohibited Activity**
GREEN No limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Defensive fighting positions - Digging - Earth moving - Field kitchens - Laundry and bath facilities - Water purification - Portable latrines - Slit trenches - Vehicle decontamination training - Timber cutting (under 4” in diameter) - POL distribution	- Smoke generation - Fuel farms	None

Appendix Table 3.7.b. cont. Definition of Land Use Categories Used on the Environmental Limitations Overlays for USARAK during Winter Months.

Category	Approved Activity WINTER	Limited Activity (requires approval by Range Control on a case-by-case basis)	Prohibited Activity
YELLOW Minor limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4” in diameter)	- Digging - Earth moving - Snowplowing - Stream crossings with ADF&G permit	- Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution
RED Significant limitations or restrictions	- Foot maneuvers	- Tracked and wheeled maneuvers - Stream crossings with ADF&G permit	- Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4” in diameter) - Mechanical digging - Earth moving - Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution

Appendix Table 3.7.c Methods of Altering Wetlands.

Category	Description
Physical	
Filling	Adding material to raise the bottom level of wetlands or to replace the wetland with dry land.
Draining	Removing water from a wetland by ditching, tiling, or pumping.
Excavating	Dredging and removing soil and vegetation from a wetland.
Diverting water	Preventing the flow of water into a wetland by removing water upstream, lowering lake levels, or lowering groundwater tables.
Clearing	Removing vegetation by burning, digging, application of herbicide, scraping, mowing, or cutting.
Flooding	Raising water levels behind dams, pumping or channeling water into a wetland.
Diverting or withholding sediment	Trapping sediment by constructing dams, channels, or other types of projects, thereby inhibiting wetland regeneration in natural deposition areas such as deltas.

Appendix Table 3.7.c cont. Methods of Altering Wetlands.

Category	Description
Shading	Placing pile supported platforms or bridges over wetlands, causing vegetation to die because of lack of sunlight.
Conducting activities in adjacent areas	Disrupting the interactions between wetlands and adjacent land areas or incidentally affecting wetlands through activities at adjoining sites.
Chemical	
Changing nutrient levels	Increasing or decreasing nutrient levels within the local water or soil system, forcing wetland plant community changes.
Introducing toxins	Adding toxic compounds to a wetland either intentionally (e.g., herbicide treatment to reduce wetland vegetation) or unintentionally.
Biological	
Grazing	Consumption and compaction of vegetation by domestic or wild animals.
Disruption of natural processes	Reducing population of existing species, introducing exotic species, or otherwise disturbing resident organisms.

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3.8 VEGETATION

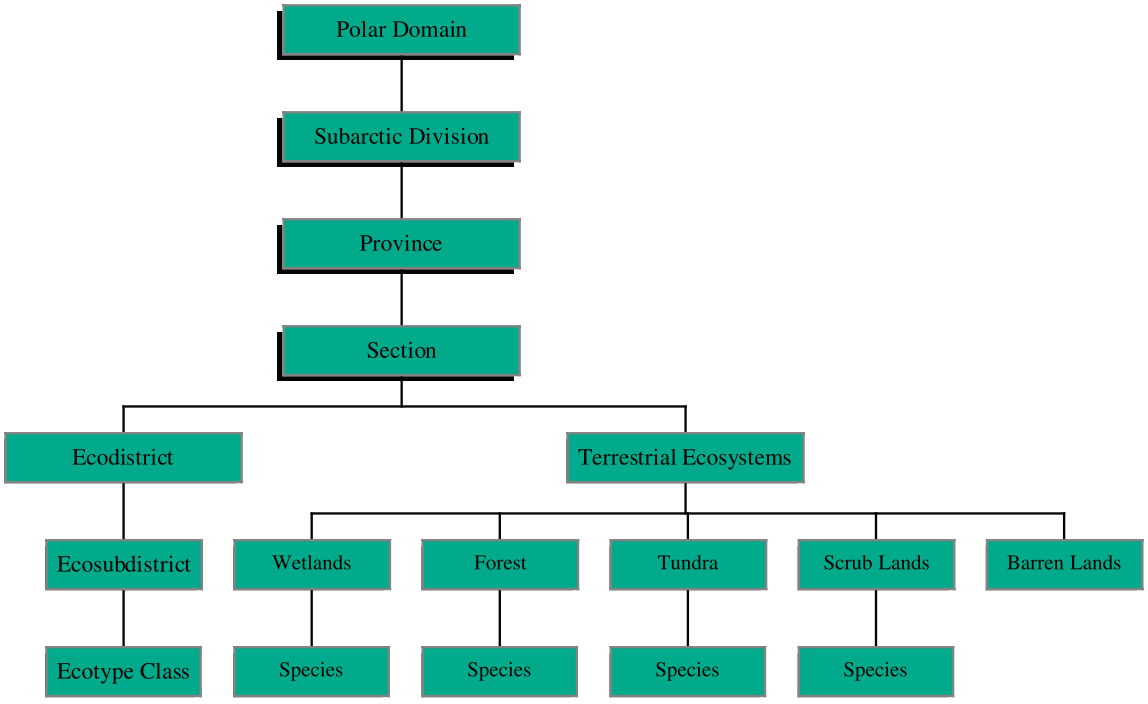
Ecological Classification System in Alaska

Appendix Table 3.8.a Description of Ecosystem Provinces and Sections that Encompass U.S. Army Alaska's Lands.

Ecosystem Province / Section	Description
Upper Yukon Taiga Meadow/ Upper Yukon Highlands - Fort Wainwright Main Post - Tanana Flats Training Area-Yukon Training Area	White spruce, paper birch, quaking aspen on lower and south-facing slopes. Black spruce dominates at higher elevations on north-facing slopes, and on lower hydric slopes. Sites above treeline are either barren or tundra, dominated by sedges and mosses on hydric sites and scrub birch and willow shrubs on arid sites.
Alaska Range Humid/ Taiga-Tundra-Meadow - Donnelly TA - Gerstle River - Black Rapids	White spruce dominates on lowlands, cottonwood on floodplains, and black spruce on poorly drained sites. Upland mixed forests of white spruce, paper birch, quaking aspen and balsam poplar. Alpine areas are barren or tundra, with prostrate plants. Riparian spruce/hardwood forests sometimes occur at low elevations.
Coastal Trough Humid Taiga/ Cook Inlet Lowlands - Fort Richardson	Lowland black spruce forests. Bottomland riparian spruce/poplar forests along with willow and alder shrubs. Moraines support white spruce forests, and cottonwood/tall bush communities are common on floodplains. Some wet tundra along coastline.

Source: Bailey 1995

Appendix Figure 3.8.a Conceptual Framework for Ecological Classification System in Alaska.



Forest Management Goals, Objectives and Responsibilities

The goals for USARAK's forestry program are to manage vegetation and forests to support ecosystem management objectives, to upgrade military range projects, and to provide recreational opportunities. The objectives to meet the forestry program's goals are to:

- Maintain a current inventory of forest and vegetative resources
- Conduct forestry planning
- Implement forest management practices through timber stand improvement, timber management, timber sales, and timber salvage cuts
- Control forest pests
- Provide firewood for the local military and civilian population
- Conduct commercial timber sales only as a tool to meet the above goals

Details for management of timber resources are found in the Integrated Natural Resources Management Plans for each post (USARAK 2002efg). 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. The Bureau of Land Management retains responsibility for the sale of forest products on most lands used by USARAK. Most forests on withdrawal lands fall under the Bureau of Land Management's restricted category for management. Any manipulation of lands where the Bureau of Land Management 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 Bureau of Land Management 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.

Flora of Fort Wainwright

Collected vascular plants arranged by family from Fort Wainwright Military Installation, Alaska, 1995 and two plants found on Fort Greely not in the list. (*)

Adiantaceae
Cryptogramma stelleri

Adoxaceae
Adoxa moschatellina

Alismataceae
Alisma triviale
Sagittaria cuneata

Apiaceae
*Bupleurum americanum**
Cicuta bulbifera
Cicuta virosa
Cnidium cnidiifolium
Podustera macounii
Sium suave

Apocynaceae
Apocynum androsaemifolium

Araceae
Calla palustris

Aspleniaceae
Athyrium filix-femina
Cystopteris fragilis
Dryopteris fragrans

Gymnocarpium dryopteris
Gymnocarpium robertianum
Woodsia ilvensis

Asteraceae
Achellea borealis
Achillea millefolium
Achillea sibirica
Antennaria friesiana
Antennaria pulcherrima
Antennaria rosea
Anthemis cotula
Arnica alpina ssp. *attenuata*
Arnica angustifolia
Arnica griscomii ssp. *frigida*
Artemisia alaskana
Artemisisa arctica
Artemisia frigida
Artemisia furcata
Artemisia laciniata
Artemisiatilesii ssp. *elatior*
Aster junciformis
Aster sibiricus
Bidens cernua
Chrysanthemum leucanthemum
Cirsium arvense
Conyza canadensis
Crepis elegans
Crepis tectorum
Erigeron acris
Erigeron caespitosus
Erigeron compositus
Erigeron elatus
Erigeron glabellus
Erigeron lonchophyllus
Gaillardia pulchella
Gnaphalium uliginosum
Matricaria matricarioides
Petasites frigidus
Petasites nivalis
Petasites sagittatus
Rubeckia hirta
Saussurea angustifolia
Senecio atropurpureus
Senecio atropurpureus
Senecio llugens
Senecio pauciflorus
Senecio tundricola
Senecio vulgaris
Solidago canedensis
Solidago decumbens
Solidago multiradiata
Sonchus arvensis
Sonchus asper
Taraxacum ceratophorum
Taraxacum officinale
Tripleurospermum inodorum

Balsaminaceae
Impatiens noli-tangere

Betulaceae
Alnus tenuifolia
Alnus viridis ssp.*crispa*
Betula glandulosa
Betula hybrids
Betula nana
Betula papyrifera

Boraginaceae
Lappula myosotis
Mertensia paniculata
Plagiobothrys cognatus

Brassicaceae
Arabis divaricarpa
Arabis hirsuta
Aragis holboellii
Arabis lyrata
Barbarea orthoceras
Brassica rapa
Capsella bursa-pastoris
Cardamine pratensis ssp. *angustifolia*
Descurainia sophia
Descurainia sophioides
Draba fladnizensis
Draba glabella
Draba nemorosa
Erysimum cheiranthoides ssp. *cheiranthoides*
Erysimum inconspicuum
Halimolobus mollis
Hesperis matronalis
Lepisium densiflorum
Hesperis matronalis
Parrya nudicaulis
Rorippa barbareaefolia
Rorippa curvisiliqua
Rorippa palustris ssp. *hispida*
Rorippa pulustris ssp. *palustris*
Thlaspi arvense

Callitrichaceae
Callitriche verna

Campanulaceae
Campanula lasiocarpa
Campanula uniflora

Caprifoliaceae
Linnaea borealis
Viburnum edule

Caryophyllaceae
Dianthus barbatus
Gastrolychnis affinis
Gastrolychnis ostenfeldii
Minuartia arctica
Minuartia yukonensis
Moehringia lateriflora
Silene williamsii
Spergularia rubra
Stellaria borealis ssp. *borealis*
Stellaria calycantha
Stellaria crassifolia
Stellaria laeta
Stellaria longifolia
Stellaria longipes
Stellaria media
Wilhelmsia physodes

Ceratophyllaceae
Ceratophyllum demersum

Chenopodiaceae
Chenopodium album
Chenopodium capitatum
Chenopodium hybridum

Cornaceae
Cornus canadensis
Cornus canadensis_x_suecica
Swida stolonifera

Cupressaceae
Juniperus communis

Cyperaceae
Carex aenea
Carex aquatilis
Carex atherodes
Carex bigelowii
Carex bonanzensis
Carex brunnescens
Carex canescens
Carex capillaris
Carex capitata
Carex chordorrhiza
Carex concinna
Carex crawfordii
Carex diandra
Carex disperma
Carex duriuscula
Carex eleusinoides
Carex filifolia
Carex garberi ssp. *bifaria*
Carex krausei
Carex lasiocarpa
Carex leptalea
Carex limosa.
Carex magellanica ssp. *irrigua*
Carex maritima
Carex media
Carex microchaeta ssp. *microchaeta*
Carex microchaeta ssp. *nesophila*
Carex obtusata
Carex oederi
Carex peckii
Carex phyllomanica
Carex podocarpa
Carex rossii
Carex rostrata
Carex rotundata
Carex rupestris
Carex saxatilis
Carex supina ssp. *spaniocarpa*
Carex tenuiflora
Carex utriculata
Carex vaginata
Eleocharis acicularis
Eleocharis palustris
Eriophorum angustifolium ssp. *scabriusculum*
Eriophorum gracile
Eriophorum russeolum
Eriophorum scheuchzeri
Eriophorum vaginatum
Kobresia simpliciuscula
Scirpus validus
Scirpus validus
Trichophorum alpinum

Diapensiaceae
Diapensia lapponica ssp. *obovata*

Droseraceae
Drosera anglica
Drosera rotundifolia

Elaeagnaceae
*Elaeagnus commutata**
Shepherdia canadensis

Empetraceae
Empetrum hermaphroditum

Equisetaceae
Equisetum arvense
Equisetum fluviatile
Equisetum hiemale
Equisetum palustre
Equisetum pratense
Equisetum scirpoides
Equisetum silvaticum
Equisetum variegatum

Ericaceae
Andromeda polifolia
Arctostaphylos uva-ursi
Arctous alpina
Arctous rubra
Cassiope tetragona ssp. *tetragona*
Chamaedaphne calyculata
Ledum groenlandicum
Ledum palustre ssp. *decumbens*
Loiseleuria procumbens
Oxycoccus microcarpus
Vaccinium uliginosum ssp. *alpinum*
Vaccinium vitis-idaea

Fabaceae
Astragalus adsurgens ssp. *viciifolius*
Astragalus alpinus
Astragalus bodinii
Caragana arborescens
Hedysarum alpinum ssp. *americanum*
Hedysarum mackenzii
Lupinus arcticus
Medicago falcata
Medicago sativa
Melilotus albus
Melilotus officinalis
Oxytropis deflexa var. *foliolosa*
Oxytropis deflexa var. *sericea*
Oxytropis tanenensis
Oxytropis varians
Trifolium hybridum
Trifolium pratense
Trifolium repens
Vicia angustifolia
Vicia cracca

Fumariaceae
Corydalis aurea
Corydalis sempervirens

Gentianaceae
Gentiana glauca
Gentianella amarella
Gentianella propinqua
Gentianopsis detonsa ssp. *yukonensis*
Lomatogonium rotatum
Menyanthes trifoliata

Geraniaceae
Eroduim cicutarium
Geranium bicknellii

Grossulariaceae
Ribes hudsonianum
Ribes lacustre
Ribes triste

Haloragaceae
Hippuris bulgaris
Myriophyllum sibiricum
Myriophyllum verticillatum

Hydrophyllaceae
Nemophila menziesii

Iridaceae
Iris setosa

Juncaceae
Juncus alpinus
Juncus arcticus ssp. *alaskanus*
Juncus arcticus ssp. *ater*
Juncus bufonius
Juncus castaneus ssp. *castaneus*
Juncus castaneus ssp. *leucochlamys*
Juncus filiformis
Juncus stygius
Juncus triglumis ssp. *albescens*
Luzula confusa
Luzula kjellmaniana
Luzula multiflora
Luzula parviflora
Luzula rufescens

Juncaginaceae
Triglochin maritimum
Triglochin palustris

Lamiaceae
Dracocephalum parviflorum
Galeopsis bifida
Lycopus uniflorus
Scutellaria galericulata
Stachys palustris ssp. *pilosa*

Lemnaceae
Lemna minor
Lemna trisulca

Lentibulariaceae
Pinguicula villosa
Utricularia intermedia
Utricularia minor
Utricularia vulgaris

Liliaceae
Tofieldia coccinea
Zygadenus elegans

Linaceae
Linum lewisii

Lycopodiaceae
Huperzia selago
Lycopodium alpinum
Lycopodium annotinum ssp. *annotinum*
Lycopodium annotinum ssp. *pungens*
Lycopodium complanatum
Lycopodium obscurum

Myricaceae
Myrica gale

Nymphaceae
Nuphar polysepalum
Nymphaea tetragona

Onagraceae
Circaea alpina
Epilobium angustifolium
Epilobium ciliatum
Epilobium ciliatum ssp. *adenocaulon*
Epilobium hornemannii ssp. *hornemannii*
Epilobium latifolium
Epilobium palustre

Ophioglossaceae
Botrychium lunaria

Orchidaceae
Calypso bulbosa
Corallorrhiza trifida
Cypripedium guttatum ssp. *guttatum*
Cypripedium passerinum
Goodyera repens
Hammarbya paludosa
Listera borealis
Platanthera hyperborea
Platanthera obtysata
Spiranthes romanzoffiana

Orobanchaceae
Boschniakia rossica

Papaveraceae
Exchscholzia californica

Pinaceae
Larix laricina
Picea glauca
Picea mariana

Plantaginaceae
Plantago major var. *major*

Poaceae
Agrostis scabra
Alopecurus aequalis
Alopecurus alpinus
Alopecurus pratensis
Arctagrostis latifolia var. *arundinacea*
Arctophila fulva
Avena fatua
Becknannia erucaeformis
Bromopsis inermis
Bromopsis pumpelliana ssp. *pumpelliana*
Calamagrostis canadensis
Calamagrostis inexpansa
Calamagrostis lapponica
Calamagrostis neglecta
Calamagrostis purpurascens
Deschampsia cespitosa
Elymus alaskanus ssp. *borealis*
Elymus macrourus
Elymus subsecundus
Elymus trachycaulus
Elymus trachycaulus ssp. *trachycaulus*
Elym Elymus trachycaulus ssp. *violaceus*

Elytrigia repens
Elytrigia spicata
Festuca altaica
Festuca brachyphylla
Festuca lenensis
Festuca saximontana
Glyceria borealis
Glyceria maxima
Glyceria pulchella
Hierochloe alpina
Hierochloe odorata
Hordeum brachyantherum
Hordeum jubatum
Leymus innovatus
Lolium multiflorum
Phleum pratense
Poa alpina
Poa annua
Poa arctica
Poa glauca
Poa palustris
Poa pratensis
Puccinellia borealis
Puccinellia interior
Trisetum spicatum

Polemoniaceae
Collomia linearis
Polemonium acutiflorum

Polygonaceae
Bistorta plumosa
Bistorta vivipara
Polygonum alaskanum
Polygonum amphibium
Polygonum aviculare
Polygonum convolvulus
Polygonum lapathifolium
Polygonum pennsylvanicum ssp. *oneillii*
Rumex arcticus
Rumex fenestratus
Rumex mexicanus
Rumex sibiricus

Polypodiaceae
Polypodium vulgare ssp. *columbianum*

Potamogetonaceae
Potamogeton alpinus
Potamogeton epihydrus
Potamogeton filiformis
Potamogeton friesii
Potamogeton gramineus
Potamogeton pectinatus
Potamogeton praelongus
Potamogeton pusillus var. *tenuissimus*
Potamogeton richardsonii
Potamogeton vaginatus
Potamogeton zosteriformis

Primulaceae
Androsace septentrionalis
Dodecatheon pulchellum ssp. *Pauciflorum*
Lysimachia thyrsiflora
Primula incana
Trientalis europaea. ssp. *arctica*

Pyrolaceae
Moneses uniflora
Orthilia secunda
Orthilia secunda ssp. *obtusata*
Pyrola asarifolia
Pyrola chlorantha
Pyrola grandiflora

Ranunculaceae
Aconitum delphinifolium
Actaea rubra
Anemone narcissiflora var. *monantha*
Anemone parviflora
Anemone richardsonii
Aquilegia brevistyla
Caltha natans
Caltha palustris
Consolida ambiqua
Delphinium glaucum
Pulsatilla patens
Ranunculus gmelinii
Ranunculus hyperboreus
Ranunculus lapponicus
Ranunculus macounii
Ranunculus pennsylvanicus
Ranunculus reptans
Ranunculus sceleratus ssp. *multifidus*
Ranunculus trichophyllus
Rhalictrum sparsiflorum

Rosaceae
Amelanchier alnifolia
Comarum palustre
Dryas drummondii
Dryas octopetala var. *octopetala*

Fragaria virginiana
Geum perincisum
Pentaphylloides floribunda
Potentila arguta
Potentilla egedii
Potentilla hookeriana
Potentilla multifida
Potentilla norvegica
Potentilla pennsylvanica
Potentilla uniflora
Potentilla virgulata
Rosa acicularis
Rosa woodsii
Rubus arcticus ssp. *arcticus*
Rubus chamaemorus
Rubus idaeus
Sanguisorba officinalis
Sorbus scopulina
Spiraea stevenii

Rubiaceae
Galium boreale
Galium brandegei
Galium trifidum ssp. *trifidum*
Galium triflorum

Salicaceae
Populus balsamifera ssp. *balsamifera*
Populus tremuloides
Salix alaxensis var. *longistylis*
Salix arbusculoides
Salix arctica
Salix bebbiana
Salix brachycarpa
Salix brachycarpa ssp. *niphoclada*
Salix fuscescens
Salix glauca
Salix glauca var. *acutifolia*
Salix hastata
Salix interior
Salix lucida ssp. *lasiandra*
Salix myrtillifolia
Salix novae-angliae
Salix phlebophylla
Salix planifolia
Salix planifolia ssp. *pulchra*
Salix pseudomonticola
Salix scouleriana

Santalaceae
Geocaulon lividum

Saxifragaceae
Chrysosplenium tetrandrum
Parnassia palustris
Saxifraga cernua
Saxifraga nelsoniana
Saxifraga reflexa
Saxifraga tricuspidata

Scrophulariaceae
Castilleja caudata
Castilleja elegans
Euphrasia disjuncta
Linaria vulgaris
Pedicularis capitata
Pedicularis labradorica
Pedicularis lanata
Pedicularis langsdorffii
Pedicularis macrodonta
Rhinanthus minor
Synthyris borealis
Veronica scutellata

Selaginellaceae
Selaginella sibirica

Sparganiaceae
Sparganium angustifolium
Sparganium hyperboreum
Sparganium minimum

Typhaceae
Typha latifolia

Urticaceae
Urtica dioica ssp. *gracilis*

Valerianaceae
Valeriana capitata

Violaceae
Viola biflora
Viola epipsila
Viola renifolia
Viola tricolor

SOURCE: Racine, et al. 1997

Appendix Table 3.8.b Description of the Ecosubdistricts of the Tanana Floodplains Ecodistrict (including portions of Fort Wainwright Main Post, and the Tanana Flats and Yukon Training Areas).

Ecosubdistrict (Location[1])	Geomorphologic Characteristics	Dominant Plant Communities
Eielson-Tanana Floodplain (TFTA,MP)	Active and inactive floodplain.	Partially vegetated river bars, riverine willow and alder tall scrub. Sites also have productive stands of balsam poplar and white spruce forests.
Rosie Creek Floodplain (TFTA)	Intertwined river channels, numerous islands and braided river bars.	Partially vegetated river barrens, riverine willow and alder tall shrub. Area also has productive stands of balsam poplar and white spruce forests.
Chena Floodplain (MP)	Active and inactive floodplain.	Partially vegetated river barrens, riverine willow and alder tall shrub. Sites also have productive stands of balsam poplar and white spruce forests.
Chena Slough Floodplain (TFTA)	Active and inactive floodplain with numerous meander point bars.	Partially vegetated river barrens, riverine willow and alder tall shrub. Sites also have productive stands of balsam poplar and white spruce forests.
Salchaket Slough Floodplain (TFTA)	Active and inactive floodplain with numerous meander point bars.	Partially vegetated river barrens, riverine willow, wet sedge meadows, and alder tall shrub. Stands of balsam poplar and white spruce forests are present.
Fairbanks Lowlands (MP)	Inactive floodplain with permafrost; occasional organic bogs.	Black spruce, tamarack, and birch forests and shrub birch-ericaceous shrubs.
Eielson Lowland (TFTA)	Inactive floodplain area with sporadic permafrost.	Black spruce, tamarack, and birch forests and shrub birch-ericaceous shrubs. Willow-sedge fens occur in abandoned channels.
Salchaket Slough Lowlands (TFTA)	Inactive floodplain with permafrost; occasional organic bogs.	Black spruce, tamarack, and birch forests and shrub birch-ericaceous shrubs
Bear Creek Lowlands (TFTA)	Inactive floodplain area with sporadic permafrost.	Black spruce, tamarack, and birch forests and shrub birch-ericaceous shrubs. Willow-sedge fens occur in abandoned channels.

[1]TFTA = Tanana Flats Training Area; MP = Main Post, Fort Wainwright.

Source: Jorgensen et al. 1999

Appendix Table 3.8.c. Description of the Ecosubdistricts of Tanana-Wood River Flats Ecodistrict at Tanana Flats Training Area.

Ecosubdistrict (Location[1])	Geomorphologic Characteristics	Dominant Plant Communities
Clear Creek Lowlands (TFTA)	Inactive floodplain with permafrost; occasional organic bogs.	Black spruce, tamarack, and birch forests and wet willow-sedge fens, and shrub birch-ericaceous shrubs.
Willow Creek Lowlands (TFTA)	Abandoned river channels with discontinuous permafrost.	Birch forests, shrub swamps, floating fens, and collapse scar bogs, with patches of black spruce forests and shrub birch-ericaceous low shrubs.
Crooked Creek Lowlands (TFTA)	Abandoned river channels with discontinuous permafrost.	Black spruce, birch forests, shrub swamps, and sedge-moss bogs dominate.
Dry Creek Lowlands (TFTA)	Abandoned river channels with nearly continuous permafrost.	Black spruce and birch forests, low and tall shrub, shrub swamps, and sedge-moss bogs.
Wood River Lowlands (TFTA)	Small streams that form a dense network, with discontinuous permafrost.	Black spruce and birch forests, shrub-tussock meadows, shrub swamps, and sedge-moss bogs.
Little Delta River Lowlands (TFTA)	Abandoned floodplain with permafrost.	Black spruce forests and shrub-tussock meadows, and some birch forest along uplands.
Tanana-Blair Lake Uplands (TFTA)	Hills and buttes with permafrost present on northern and lower slopes.	White spruce-birch-aspen forests on upper slopes, black spruce and birch forests on lower slopes. Elymus-shrub association found on dry, south slopes.
Wood River Uplands (TFTA)	Well-drained abandoned river channels; permafrost is absent.	White spruce-birch-aspen forests or herbaceous and shrubby vegetation in burned areas.

[1]TFTA = Tanana Flats Training Area

Source: Joregensen et al. 1999

Appendix Table 3.8.d Description of the Ecosubdistricts of the Steese-White Mountains Ecodistrict at Fort Wainwright Main Post and Yukon Training Area.

Ecosubdistrict (Location[1])	Geomorphologic Characteristics	Dominant Plant Communities
Chena Salcha Highlands (YTA)	Mountainous area of weathered bedrock; permafrost on northern slopes.	White spruce-birch-aspen forests on south slopes, black spruce forests on north slopes; riverine willows in drainages, and alpine tundra on exposed ridges.
French-Moose Creek Lowlands (YTA)	Rounded hills/mountains; low marshy land with collapse-scar and flat bogs. Permafrost near continuous.	Black spruce and birch forests, shrub-tussock meadows, sedge-moss bogs, and aquatic vegetation in shallow thaw ponds.

Appendix Table 3.8.d cont. Description of the Ecosubdistricts of the Steese-White Mountains Ecodistrict at Fort Wainwright Main Post and Yukon Training Area.

Ecosubdistrict (Location[1])	Geomorphologic Characteristics	Dominant Plant Communities
Chena Floodplain (YTA)	Lower Chena River with active and inactive floodplains. No permafrost.	Partially vegetated river barrens – riverine willow and alder tall shrub, and wet sedge meadows. Productive stands of balsam poplar and white spruce forests.
South Fork Chena Lowlands (YTA)	Valley bottoms with active and inactive floodplains; permafrost prevalent.	Black spruce, and birch forests, low shrubland, and tussock tundra. White spruce and balsam poplar forests found along floodplains.
Little Chena Uplands (MP)	Drained uplands with a loess cap overlying bedrock.	White spruce/birch-aspen forests on south slopes. Black spruce on north slopes; riverine willows in small drainages.

[1]YTA = Yukon Training Area; MP = Main Post, Fort Wainwright.

Source: Jorgensen et al. 1999

Appendix Table 3.8.e Description of the Ecosubdistricts at Donnelly Training Area.

Ecodistrict/ Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Hayes Mountains Ecodistrict		
Molybdenum Ridge Mountains	Mountainous area	Dry barrens, moist low scrub and wet low scrub, interspersed with ridges of alpine dry dwarf scrub.
Gakona Mountains		
Hayes Glacier	Mountainous area	Large patches of alpine rocky dry barrens with some small pockets of alpine rocky moist low scrub.
Middle Tanana Floodplain		
Arctic Creek Uplands	Upland areas	Upland moist mixed forest, and upland moist broadleaf forest. Some areas of upland moist needleleaf forest.
Jarvis Creek Floodplain	Floodplain area	Riverine gravelly dry broadleaf forest and riverine gravelly dry needleleaf forest. Some areas of riverine gravelly barrens.
Delta River Floodplain	Floodplain area	Riverine gravelly barrens. Some areas of riverine gravelly dry broadleaf forest, riverine gravelly dry needleleaf forest, and occasional pockets of riverine dry dwarf scrub.
Delta Creek Floodplain	Floodplain area	Riverine gravelly dry broadleaf forest and riverine gravelly dry needleleaf forest. Some areas of lowland wet needleaf forest and riverine gravelly barrens.
Little Delta River Floodplain	Floodplain area	Riverine gravelly dry broadleaf forest. Small pockets of riverine gravelly dry needleleaf forest and lowland wet needleleaf forest. Small areas of riverine gravelly barrens.

Source: Jorgensen et al. 2001

Appendix Table 3.8.f Characteristics of the Ecosubdistricts from the Delta Lowlands Ecodistrict at Donnelly Training Area.

Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Little Delta River Highlands	Upland areas	Upland moist low and tall scrub and lowland wet scrub. Occasional areas of alpine wet low scrub and alpine rocky moist low scrub. Some pockets of alpine wet tussock meadow.
Jarvis Creek Glaciated Lowlands	Lowland areas	Upland moist needleleaf forest and upland mixed forest. Some pockets of lowland tussock scrub bog and upland moist low and tall scrub-disturbed. Wet needleleaf forest surrounds some ponds.
Jarvis Creek Lowlands	Lowland areas	Lowland gravelly needleleaf forest and lowland gravelly broadleaf forest. Small concentrations of upland moist broadleaf forest and lowland wet mixed forest.
Granite Creek Lowlands	Lowland areas	Lowland low scrub-disturbed. Small sites of lowland. Gravelly dry broadleaf forest and lowland tussock scrub bog.
Delta River Glaciated Lowlands	Lowland areas	Large patches of lowland tussock scrub bog, upland moist needleleaf forest and upland broadleaf forest. Some sites contain lowland wet needleleaf forest.
Delta River Lowlands	Lowland areas	Large patches of lowland tussock scrub bog. Some patches of lowland wet broadleaf forest and lowland wet low scrub.
Delta Creek Glaciated Lowlands	Lowland areas	Large areas of lowland tussock scrub bog. Occasional pockets of lowland low scrub/disturbed ecosites.
Upper Delta Creek Lowlands	Lowland areas	Large areas of lowland tussock scrub bog. Occasional pockets of lowland wet low scrub and riverine moist needleleaf forest along abandoned channels.
Lower Delta Creek Lowlands	Lowland areas	Lowland wet needleleaf forest, lowland wet low scrub and lowland tussock scrub bog. Riverine moist needleleaf forest occurs in abandoned channels.
Upper Little Delta River Lowlands	Lowland areas	Lowland tussock scrub bog. Some small patches of lowland wet low scrub.
Lower Little Delta River Lowlands	Lowland areas	Lowland scrub tussock scrub bog, lowland wet low scrub. Small patches of lowland wet mixed forest.

Source: Jorgensen et al. 2001

Appendix Table 3.8.g Characteristics of the Ecosubdistricts from the Delta Highlands Ecodistrict at Donnelly Training Area.

Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Hayes Highland Plateaus	Upland areas	Alpine wet tussock meadow and alpine rocky moist low scrub; occasional patches of alpine wet low scrub.
Donnelly Highland Plateau	Plateau areas	Upland moist low and tall scrub, lowland tussock scrub bog, lowland wet low scrub. Also areas of alpine wet tussock meadow and alpine rocky moist low scrub.

Appendix Table 3.8.g cont. Characteristics of the Ecosubdistricts from the Delta Highlands Ecodistrict at Donnelly Training Area.

Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Dinosaur Ridge Highlands	Upland areas	Upland moist low and tall scrub, alpine rocky moist low scrub, and upland moist low and tall–disturbed. Alpine wet tussock meadow, alpine wet low scrub occur along ridges. Occasional pockets of lowland wet needleleaf forest, upland moist broadleaf forest, upland moist mixed forest.
Jarvis Creek Glaciated Highlands	Upland areas	Upland moist low and tall scrub. Occasional pockets of lowland wet low scrub.
Delta River Glaciated Highlands	Upland areas; braided river channels	Vegetation types include a mix of lowland tussock scrub bog, lowland wet low scrub, and occasional upland moist low and tall scrub. River channels support riverine moist needleleaf forests.
Little Delta River Glaciated Highlands	Upland areas	Dominant vegetation includes upland moist low and tall scrub and lowland wet low scrub. Occasional pockets of lowland tussock scrub bog.
Little Delta River Highlands	Upland areas	Upland moist low and tall scrub, lowland wet scrub. Occasional areas of alpine wet low scrub and alpine rocky moist low scrub. Some pockets of alpine wet tussock meadow.

Source: Jorgensen et al. 2001

Appendix Table 3.8.h Description of the Ecosubdistricts at Fort Richardson.

Ecodistrict/ Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Cook Inlet Basin		
Upper Cook Inlet Coast	Tidal flat that is frequently inundated with tides and sediment, or inactive tidal flats with thin, brackish soils.	Meadows with halophytic grasses and forbs. Marshes with halophytic sedges. Meadows with sweetgale-graminoid/shrub associations.
Mat-Su Lowlands		
Knik Glaciated Lowlands	Lobes of glacial deposits including moraines, drumlins, eskers, and ridge deposits.	White spruce and birch forests on upper slopes. Black spruce, shrub birch, shrub bogs, and sedge/ moss bogs on lower slopes.
Anchorage Glaciated Lowlands	Flat to rolling terrain resulting from glacial, alluvial, and fluvial deposits.	White spruce and birch forests on upper slopes. Black spruce, extensive bogs on lower slopes.
Northern Chugach Floodplains	Floodplains on gentle to moderate slopes; includes variety of deposit formations.	Early successional herbs on gravel bars. Alder-willow scrub on active overbank deposits. Black cottonwood and white spruce on inactive overbank deposits.

Appendix Table 3.8.h cont. Description of the Ecosubdistricts at Fort Richardson.

Ecodistrict/ Ecosubdistrict	Geomorphologic Characteristics	Dominant Plant Communities
Northern Chugach Mountains		
Eklutna Mountains	Rugged, non-glaciated mountains.	Dryas, crowberry, or cassiope tundra above treeline. Spruce-birch forest or alder scrub below treeline.
Eklutna Mountain Hillsides	Glacially affected hillsides and U-shaped valleys.	Spruce-birch forests and alder scrub.
Northern Chugach Floodplains	Floodplains on gentle to moderate slopes; includes variety of deposit formations.	Early successional herbs on gravel bars. Alder-willow scrub on active overbank deposits. Black cottonwood and white spruce on inactive overbank deposits.

Appendix Table 3.8.i Aerial Extent of Ecotypes within Tanana Flats and Yukon Training Areas.

Vegetation class	Tanana Flats TA		Yukon TA		Total	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Barren (<5% vegetated)	375	0.1	322	0.3	697	0.2
Water (<5% vegetated)	2805	1.1	118	0.1	2805	0.8
Partially Vegetated (>5,<30% cover)	473	0.2	212	0.2	685	0.2
Closed White Spruce Forest	3321	1.3			3321	0.9
Closed Black Spruce Forest	19,978	7.6	777	0.7	20,756	5.6
Closed Black Spruce–White Spruce Forest	6374	2.4			6374	1.7
Open White Spruce Forest	289	0.1			289	0.1
Open Black Spruce Forest	34,364	13.0	25,794	24.7	60,158	16.3
Open Black Spruce–Tamarack Forest	10,827	4.1			10,827	2.9
Open Black Spruce–White Spruce Forest	363	0.1	3794	3.6	4157	1.1
Open Black Spruce (South-facing)			1586	1.5	1586	0.4
Mixed Conifer Woodland	8069	3.1	939	0.9	9008	2.4
Closed Balsam Poplar Forest	2561	1.0	13	0.0	2574	0.7
Closed Paper Birch Forest	1690	0.6	3112	3	4802	1.3
Closed Quaking Aspen Forest	126	0.0			126	0.0
Closed Paper Birch–Quaking Aspen Forest	630	0.2	11,382	10.9	12,012	3.3
Open Paper Birch Forest	448	0.2	1346	1.3	1793	0.5
Open Paper Birch–Quaking Aspen Forest	336	0.1	4119	3.9	4454	1.2
Broadleaf–Scrub Woodland	1953	0.7	2058	2.0	4011	1.1
Closed Spruce–Paper Birch Forest	11,741	4.4	12,230	11.7	23,971	6.5
Closed Spruce–Paper Birch–Quaking Aspen Forest	2113	0.8	10,652	10.2	12,765	3.5
Closed Balsam Poplar–White Spruce Forest	1643	0.6	47	0.0	1690	0.5
Open Spruce–Paper Birch Forest	2708	1.0	9304	8.9	12,012	3.3
Open Quaking Aspen–Spruce Forest	466	0.2			466	0.1

Appendix Table 3.8.i cont. Aerial Extent of Ecotypes within Tanana Flats and Yukon Training Areas.

Vegetation class	Tanana Flats TA		Yukon TA		Total	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Closed Tall Alder–Willow Shrub	5342	2	2529	2.4	7871	2.1
Open Tall Shrub Swamp	4873	1.8			4873	1.3
Closed Low Shrub Birch–Ericaceous Shrub	22,406	8.5	659	0.6	23,065	6.3
Closed Low Scrub	12,208	4.6	864	0.8	13,072	3.5
Open Low Mixed Shrub–Sedge Tussock Bog	7610	2.9	1890	1.8	9500	2.6
Open Low Scrub (post burn, disturbance)	397	0.2	831	0.8	1228	0.3
Open Low Willow–Graminoid Shrub Bog	5219	2.0			5219	1.4
Dryas–Lichen Dwarf Shrub Tundra			45	0.0	45	0.0
Midgrass–Shrub	91	0.0			91	0.0
Bluejoint Meadow	21	0.0	34	0.0	55	0.0
Subarctic Lowland Sedge–Herb Bog Meadow	891	0.3	106	0.1	997	0.3
Subarctic Lowland Sedge Wet Meadow	1040	0.4	15	0.0	1056	0.3
Subarctic Lowland Sedge–Moss Bog Meadow	224	0.1	19	0.0	243	0.1
Subarctic Lowland Herb Bog Meadow	2640	1.0			2640	0.7
Lowland Eolian Complex			2303	2.2	2303	0.6
Riverine Complex	953	0.4	2461	2.4	3414	0.9
Slope Drainage Complex	9586	3.6	4942	4.7	14,528	3.9
Paludification Complex, (wet forb–sedge fen)	7708	2.9			7708	2.1
Thermokarst Complex, open birch–shrub birch–fen	29,330	11.1			29,330	8.0
Thermokarst Complex, open birch–shrub swamp–fen	765	0.3			765	0.2
Thermokarst Complex, black spruce–scar bog	21,576	8.2			21,576	5.9
Thermokarst Complex, closed paper birch–scar bog	2946	1.1			2946	0.8
Thermokarst Complex, mixed spruce–paper birch–bog	6412	2.4			6412	1.7
Thermokarst Complex, open birch–shrub–bog	8075	3.1			8075	2.2
Total	**263,964**	**100**	**104,503**	**100.0**	**368,467**	**100**

Flora of Donnelly Training Area

Adiantaceae [including Cryptogrammaceae]
Cryptogramma stelleri (Gmel.) Prantl

Adoxaceae
Adoxa moschatellina L.

Apiaceae [=Umbelliferae]
Angelica lucida L.
Bupleurum triradiatum Adams ssp. *arcticum* (Regel) Hulten
Cnidium cnidiifolium (Turcz.) Schischk.
Podistera macounii (Coult. & Rose) Mathias & Constance [=*Ligusticum mutellinioides* (Crantz) Willar ssp. *alpinum* (Ledeb.) Thell.]

Aspleniaceae [including Athyriaceae, Aspidiaceae]
Cystopteris fragilis (L.) Bernh.
Cystopteris fragilis (L.) Bernh. ssp. *dickieana* (Sim) Hyl.

Cystopteris montana (Lam.) Bernh. ex Desv.
Dryopteris fragrans (L.) Schott
Gymnocarpium dryopteris (L.) Newman
Woodsia glabella R. Br. ex Richards.
Woodsia ilvensis (L.) R. Br.

Asteraceae [=Compositae]
Achillea borealis Bong.
Achillea millefolium L.sensu Hulten
Achillea sibirica Ledeb.
Antennaria friesiana (Trautv.) Ekman
Antennaria monocephala DC ssp. *monocephala*
Antennaria monocephala DC ssp. *philonipha* (A. Porsild) Hulten
Arnica angustifolia M. Vahl [=*Arnica alpina* (L.) Olin ssp. *angustifolia* (M. Vahl) Maguire]
Arnica griscomii Fern. ssp. *frigida* (C.A. Mey.ex Iljin) S.J. Wolf [=*Arnica frigida* C.A. Mey.ex Iljin]
Arnica lessingii (Torr. & Gray) *Greene*
Artemisia alaskana Rydb.
Artemisia arctica Less.
Artemisia borealis Pallas
Artemisia frigida Willd.
Artemisia globularia Cham. ex Bess.
Artemisia laciniata Willd.
Artemisia tilesii Ledeb. ssp. *elatior* (Torr. & Gray) Hulten
Aster sibiricus L.
Crepis elegans Hook.
Crepis nana Richards.
Erigeron acris L.
Erigeron caespitosus Nutt.
Erigeron elatus E. Greene
Erigeron eriocephalus J.Vahl
Erigeron glabellus Nutt. ssp. *pubescens* (Hook.) Cronq.
Erigeron humilis Graham
Erigeron lonchophyllus Hook.
Erigeron purpuratus Greene
Gnaphalium uliginosum L.
Matricaria matricarioides (Less.) Porter
Petasites frigidus (L.) Fries
Petasites sagittatus (Banks ex Pursh) Gray
Saussurea angustifolia (Willd.) DC. (including one specimen that fits *Saussurea viscida* Hulten var. *yukonensis* (Pors.) *sensu* Hulten)
Senecio atropurpureus (Ledeb.) Fedtsch.
Senecio congestus (R. Br.) DC.
Senecio kjellmannii [=*Senecio atropurpureus* (Ledeb.) Fedtsch. ssp. *tomentosus* (Kjellm.) Hulten]
Senecio lugens Richards.
Senecio ogotorukensis Packer [=*Senecio conterminus* Greenm.]
Senecio pauciflorus Pursh
Senecio pauperculus Michx.
Senecio resedifolius Less.
Senecio tundricola Tolm.[=*Senecio fuscatus* (Jord. & Fourr.) Hayek]
Senecio yukonensis Porsild
Solidago decumbens Greene var. *oreophila* (Rydb.) Fern.
Solidago multiradiata Ait.
Taraxacum kamtschaticum Dahlst.
Taraxacum lacerum E.Greene

Betulaceae
Alnus sinuata (Regel) Rydb.[=*Alnus crispa* (Ait.) Pursh ssp. *sinuata* (Regel) Hulten]
Alnus tenuifolia Nutt.[=*Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung]
Alnus viridis Vill. ssp. *crispa* (Ait.) A. Love & D. Love [=*Alnus crispa (Ait.) Pursh* ssp. *crispa*]
Betula glandulosa Michx.
Betula hybrid
Betula nana L.
Betula neoalaskana Sarg.[=*Betula papyrifera* Marsh. ssp. *humilis* (Regel) Hulten]
Betula papyrifera Marsh.

Boraginaceae
Eritrichium splendens Kearney
Mertensia paniculata (Ait.) G. Don
Myosotis alpestris F.W. Schmidt ssp. *asiatica* Vestergr.

Brassicaceae [=Cruciferae]
Arabis hirsuta (L.) Scop. ssp. *pycnocarpa* (M. Hopk.) Hulten
Arabis lyrata L. ssp. *kamchatica* (Fisch.) Hulten
Barbarea orthoceras Ledeb.
Cardamine bellidifolia L.
Cardamine purpurea Cham. & Schlecht.
Cardamine umbellata E.Greene
Descurainia richardsonii (Sweet) O. Schulz

Descurainia sophioides (Fisch. ex Hook.) O.E. Schulz
Draba alpina L. complex
Draba cana Rydb. [=*Draba lanceolata* Royle]
Draba glabella Pursh var. *glabella* Pursh [=*Draba hirta* L.]
Draba incerta Payson
Draba lonchocarpa Rydb. var. *lonchocarpa*
Draba longipes Raup
Draba nivalis Lilj.
Draba stenopetala Trautv.
Erysimum cheiranthoides L.
Eutrema edwardsii R. Br.
Lepidium densiflorum Schrad.
Lesquerella arctica (Wormsk. ex Hornem.) S. Wats.
Parrya nudicaulis (L.) Boiss.
Rorippa barbareifolia (DC.) Kitigawa [=*Rorippa hispida* (Desv.) Britt. var. *barbareaefolia* (DC.) Hulten]
Rorippa palustris (L.) Besser ssp. *glabra* (O. Schulz) Stuckey [=*Rorippa islandica* (Oeder) Borb. ssp. *fernaldiana* (Butt. & Abbe) Hulten]
Subularia aquatica L.
Torularia humilis (C. Meyer) O. Schulz [=*Braya humilis* (C. A. Mey.) B.L. Robins.]

Callitrichaceae
Callitriche hermaphroditica L.
Callitriche verna L. emend. Kutz.

Campanulaceae
Campanula lasiocarpa Cham ssp. *lasiocarpa*
Campanula uniflora L.

Caprifoliaceae
Linnaea borealis L. ssp. *americanus* (J. Forbes) Hulten
Linnaea borealis L. ssp. *borealis* L.
Viburnum edule (Michx.) Raf.

Caryophyllaceae
Arenaria capillaris Poir.
Cerastium beeringianum Cham. & Schlecht.
Cerastium beeringianum Cham. & Schlecht. var. *beeringianum*
Cerastium fontanum Baumg.
Gastrolychnis affinis (J. Vahl) Tolm. & Koznanch.[=*Melandrium affine* J. Vahl]
Gastrolychnis apetala (L.) Tolm. & Kozhanch.[=*Melandrium apetalum* (L.) Fenzl ssp. *arcticum* (E. Fries) Hulten]
Gastrolychnis ostenfeldii (A. Pors.) D. Murray [=*Melandrium taimyrense* Tolm.]
Minuartia arctica (Stev. ex Ser.) Graebn.
Minuartia dawsonensis (Britt.) House
Minuartia macrocarpa (Pursh) Ostenf.
Minuartia obtusiloba (Rydb.) House
Minuartia rossii (R. Br.) Graebn.
Minuartia rubella (Wahlenb.) Hiern
Moehringia lateriflora (L.) Fenzl
Sagina nivalis (Lindbl.) Fries [=*Sagina intermedia* Fenzl]
Silene acaulis (L.) Jacq.
Silene repens Patrin ex Pers.
Silene williamsii Britt. [=*Silene menziesii* Hook. ssp. *williamsii* (Britt.) Hulten]
Stellaria alaskana Hulten
Stellaria borealis Bigelow
Stellaria calycantha (Ledeb.) Bong.
Stellaria crassifolia Ehrh.
Stellaria edwardsii R. Br.
Stellaria laeta Richardson
Stellaria longifolia Muhl. ex Willd.
Stellaria longipes Goldie
Wilhelmsia physodes (Fisch.) McNeill

Chenopodiaceae
Chenopodium album L.
Chenopodium capitatum (L.) Aschers.

Cornaceae
Cornus canadensis L.

Crassulaceae
Rhodiola integrifolia Raf. [=Sedum rosea (L.) Scop. ssp. *integrifolium (Raf.) Hulten]*

Cupressaceae
Juniperus communis L. ssp. *nana* (Willd.) Syme

Cyperaceae
Carex aenea Fern.
Carex aquatilis Wahlenb.
Carex aquatilis Wahlenb. ssp. *aquatilis*
Carex arcta Boott
Carex atherodes Spreng.

Carex atratiformis Britt. ssp. *raymondii* (Calder) Pors.[=*Carex raymondii* Calder]
Carex aurea Nutt.
Carex bicolor Bellardi ex All.
Carex bigelowii Torr. ex Schwein.
Carex canescens L.
Carex capillaris L.
Carex capitata L.
Carex concinna R. Br.
Carex crawfordii Fern.
Carex cf.*deweyana* Schwein.
Carex diandra Schrank
Carex disperma Dew.
Carex eburnea Boott
Carex filifolia Nutt.
Carex garberi Fern. ssp. *bifaria* (Fern.) Hulten
Carex gynocrates Wormsk. ex Drej.[=*Carex dioica* L. ssp. *gynocrates* (Wormsk.) Hulten]
Carex kelloggii W. Boott
Carex krausei Boeckl.
Carex lachenalii Schkuhr.
Carex limosa L.
Carex livida (Wahlenb.) Willd.
Carex lugens Holm
Carex macloviana d 'Urv. [=*Carex macloviana* d 'Urv. ssp. *pachystachya (*Cham.) Hulten]
Carex magellanica Lam. ssp. *irrigua* (Wahlenb.) Hulten
Carex media R. Br.
Carex membranacea Hook.
Carex microchaeta Holm
Carex microchaeta Holm ssp. *microchaeta*
Carex microchaeta Holm ssp. *nesophila* (Holm) D. Murray
Carex microglochin Wahlenb.
Carex oederi Retz. ssp. *viridula* (Michx.) Hulten
Carex petricosa Dewey
Carex podocarpa R. Br.
Carex rostrata Stokes
Carex rotundata Wahlenb.
Carex cf.*rotundata* Wahlenb.
Carex rupestris All.
Carex saxatilis L. ssp. *laxa* (Trautv.) Kalela
Carex *scirpoidea* Michx.
Carex supina Willd.ex Wahlenb. var. *spaniocarpa* (Steud.) Boivin
Carex sychnocephala Carey
Carex tenuiflora Wahlenb.
Carex utriculata Boott [=*Carex rhynchophysa* C.A. Meyer]
Carex vaginata Tausch
Carex williamsii Britt.
Eleocharis acicularis (L.) Roem. & Schult
Eleocharis palustris (L.) Roem. & Schult.
Eriophorum angustifolium Honck ssp. *subarcticum* (Vassiljev) Hulten
Eriophorum brachyantherum Trautv. & C.A. Mey.
Eriophorum gracile W.D.J. Koch
Eriophorum russeolum Fries
Eriophorum scheuchzeri Hoppe
Eriophorum scheuchzeri Hoppe var. *tenuifolium* Ohwi
Eriophorum vaginatum L.
Kobresia myosuroides (Vill.) Fiori
Scirpus validus M. Vahl
Trichophorum caespitosum (L.) Hartman

Diapensiaceae
Diapensia lapponica L. ssp. *obovata* (F. Schm.) Hulten

Droseraceae
Drosera rotundifolia L.

Elaeagnaceae
Elaeagnus commutata Bernh. ex Rydb.
Shepherdia canadensis (L.) Nutt.

Empetraceae
Empetrum hermaphroditum Lange ex Hagerup [=*Empetrum nigrum* L. ssp. *hermaphroditum* (Lange ex Hagerup) Bocher]

Equisetaceae
Equisetum arvense L.
Equisetum fluviatile L.ampl Ehrh.
Equisetum palustre L.
Equisetum pratense Ehrh.
Equisetum scirpoides Michx.
Equisetum silvaticum L.
Equisetum variegatum Schleich. ex F. Weber & D.M.H. Mohr

Ericaceae
Andromeda polifolia L.

*Arctostaphylos uva-ursi (*L.) Spreng. var *uva-ursi*
Arctous alpina (L.) Niedenzu [=*Arctostaphylos alpina* (L.) Spreng.]
Arctous rubra [=*Arctostaphylos rubra* (Rehd. & Wilson) Fern.]
Cassiope tetragona (L.) D. Don ssp. *tetragona*
Chamaedaphne calyculata (L.) Moench
Ledum groenlandicum Oeder [=*Ledum palustre* L. ssp. *groenlandicum* (Oeder) Hulten]
Ledum palustre L. ssp. *decumbens* (Ait.) Hulten
Loiseleuria procumbens (L.) Desv.
Oxycoccus microcarpus Turcz.
Rhododendron lapponicum (L.) Wahlenb.
Vaccinium uliginosum L.
Vaccinium vitis-idaea L. ssp. *minus* (Lodd.) Hulten

Fabaceae [=Leguminosae]
Astragalus adsurgens Pallas ssp. *viciifolius* (Hulten) Welsh
Astragalus alpinus L.
Astragalus americanus (Hook.) M.E. Jones
Astragalus bodinii Sheldon
Astragalus eucosmus Robins ssp. *eucosmus*
Astragalus umbellatus Bunge
Astragalus williamsii Rydb.
Hedysarum alpinum L.
Hedysarum hedysaroides (L.) Schinz & Thell.
Hedysarum mackenzii Richards.
Lupinus arcticus S. Wats.
Oxytropis bryophila (E. Greene) Yurtsev [=*Oxytropis nigrescens* (Pallas) Fisch. ex DC ssp. *bryophila*]
Oxytropis deflexa (Pallas) DC. var. *foliolosa* (Hook.) Barneby
Oxytropis deflexa (Pallas) DC. var. *sericea* Torr. & Gray
Oxytropis maydelliana Trautv.
Oxytropis varians (Rydb.) Schumann [=*Oxytropis campestris* (L.) DC ssp. *gracilis* (Nels.) Hulten]
Oxytropis viscida Nutt.
Trifolium hybridum L.

Fumariaceae
Corydalis sempervirens (L.) Pers.

Gentianaceae
Gentiana algida Pall.
Gentiana glauca Pallas
Gentiana prostrata Haenke
Gentianella propinqua (Richards.) J. Gillett ssp. *propinqua* (Richards.) J.Gillett [= *Gentiana propinqua* Richards ssp. *propinqua*]
Gentianopsis detonsa (Rottb.) Ma ssp. *yukonensis* (J. Gillett) J. Gillett [=*Gentiana barbata* Froel.]
Lomatogonium rotatum (L.) Fries ex Fern.

Grossulariaceae [=Saxifragaceae, in part]
Ribes hudsonianum Richards.
Ribes triste Pallas

Haloragaceae
Hippuris vulgaris L.
Myriophyllum sibiricum Kom. [=*Myriophyllum spicatum* L.]

Iridaceae
Iris setosa Pallas ex Link var. *interior* E.Anders.
Sisyrinchium montanum Greene

Isoetaceae
Isoetes echinospora Durieu [=*Isoetes muricata* Dur. var *braunii* auct.]

Juncaceae
Juncus alpinus Vill.
Juncus arcticus Willd. ssp. *alaskanus* Hulten
Juncus arcticus Willd. ssp. *ater* (Rydb.) Hulten
Juncus biglumis L.
Juncus bufonius L.
Juncus castaneus Sm ssp. *castaneus*
Juncus castaneus Sm ssp. *leucochlamys* (Zing. ex Krecz.) Hulten
Juncus filiformis L.
Juncus triglumis L. ssp. *albescens* (Lange) Hulten
Luzula arcuata (Wahlenb.) Sw ssp. *arcuata* (Wahlenb.) Sw.
Luzula confusa Lindeberg
Luzula multiflora (Retz.) Lej. ssp. *multiflora* var. *frigida* (Buch.) Sam.

Luzula parviflora (Ehrh.) Desv.
Luzula rufescens Fisch. ex E. Mey.
Luzula spicata (L.) DC.
Luzula tundricola Gorodk.

Juncaginaceae
Triglochin palustre L.

Lamiaceae
Dracocephalum parviflorum Nutt.

Lentibulariaceae
Pinguicula villosa L.
Pinguicula vulgaris L.
Utricularia intermedia Hayne
Utricularia minor L.
Utricularia vulgaris L. ssp. *macrorhiza* (Le Conte) R.T. Clausen

Liliaceae
Allium schoenoprasum L.
*Lloydia serotina (*L.*) Reichenb.*
Tofieldia coccinea Richards.
Tofieldia pusilla (Michx.) Pers.
Zigadenus elegans Pursh

Linaceae
Linum lewisii Pursh [=*Linum perenne* L. ssp. *lewisii* (Pursh) Hulten]

Lycopodiaceae
Diphasiastrum alpinum (L.) Holub [=*Lycopodium alpinum* L.]
Diphasiastrum complanatum (L.) Holub [=Lycopodium complanatum L.]
Huperzia selago (L.) Bernh.ex Mart. & Schrank [=*Lycopodium selago* L. ssp. *appressum* (Desv.) Hulten, *Huperzia haleakalensis* (Breck.) Holub in FNA (1993)]
Lycopodium annotinum L. ssp. *annotinum*
Lycopodium annotinum L. ssp. *pungens* (LA Pyl.) *Hult*
Lycopodium clavatum L. var. *monostachyon* Grev. & Hook.

Myricaceae
Myrica gale L.

Nymphaceae
Nuphar polysepalum Engelm.

Onagraceae
Epilobium angustifolium L.
Epilobium ciliatum Raf ssp. *adenocaulon* (Haussk.) Hoch & Raven [=*Epilobium adenocaulon* Haussk.]
Epilobium hornemannii Rchb ssp. *hornemannii*
Epilobium latifolium L.
Epilobium palustre L.

Ophioglossaceae
Botrychium lunaria (L.) Sw.

Orchidaceae
Calypso bulbosa (L.) Oakes
Corallorrhiza trifida Chatelain
Cypripedium guttatum Sw.
Cypripedium passerinum Richards.
Goodyera repens (L.) R. Br. ex Ait.f.
Platanthera hyperborea (L.) Lindl.
Platanthera obtusata (Banks ex Pursh) Lindl.
Spiranthes romanzoffiana Cham.

Orobanchaceae
Boschniakia rossica (Cham. & Schlecht.) Fedtsch.

Papaveraceae
Papaver macounii Greene
Papaver radicatum Rottb ssp. *radicatum* [=*Papaver lapponicum* (Tolm.) Nordh ssp. *occidentale* (Lundstr.) Knaben]

Pinaceae
Larix laricina (Du Roi) K.Koch
Picea glauca (Moench) Voss
Picea mariana (P. Mill.) B.S.P.

Plantaginaceae
Plantago canescens M.F. Adams
Plantago major L.

Poaceae [=Graminae]
Agrostis scabra Willd.
Alopecurus aequalis Sobol.
Arctagrostis latifolia (R. Br.) Griseb. ssp. *arundinacea* (Trin.) Tzvelev
Arctagrostis latifolia (R. Br.) Griseb. ssp. *latifolia* (R. Br.) Griseb.
Arctophila fulva (Trin.) Rupr.ex Anderss.
Avena sativa L.

Beckmannia erucaeformis (L.) Host ssp. *baicalensis* (Kuzn.) Hulten
Bromopsis inermis (Leyss.) Holub [=*Bromus inermis* Leyss.]
Bromopsis pumpelliana (Scribn.) Holub ssp. *pumpellianus* [=*Bromus pumpellianus* Scribn. var. *pumpellianus*]
Calamagrostis canadensis (Michx.) Beauv.
Calamagrostis canadensis (Michx.) Beauv. ssp. *canadensis*
Calamagrostis inexpansa Gray
Calamagrostis purpurascens R. Br.
Deschampsia cespitosa (L.) Beauv.
Elymus alaskanus (Scribn. & Merr.) A. Love ssp. *hyperarcticus* (Polunin) A. Love & D. Love [=*Agropyron boreale* (Turcz.) Drobov ssp. *hyparcticum* (Polunin) Melderis]
Elymus cf.*macrourus* (Turcz.) Tzvelev [=*Agropyron macrourum* (Turcz.) Drobov]
Elymus trachycaulus (Link) Gould ex Shinners cf. ssp. *subsecundu* s (Link) Gould [= *Agropyron subsecundum* (Link) Hitchc.]
Elymus trachycaulus (Link) Gould ex Shinners ssp. *trachycaulus* [=*Agropyron pauciflorum* (Schwein.) Hitchc.]
Elymus trachycaulus (Link) Gould ex Shinners ssp. *violaceus* (Hornem.) A. & D. Love [= *Agropyron violaceum* (Hornem.) Lange]
*Elytrigia repens (*L.*)* Beauv. var. *repens* [=*Agropyron repens* (L.) Beauv.]
Festuca altaica Trin.
Festuca brachyphylla J.A. Schultes ex J.A. & J.H. Schultes
Festuca brevissima Yurtsev [=*Festuca ovina* L. ssp. *alaskensis* Holmen]
Festuca rubra L.sens lat.
Festuca rubra L. ssp. *richardsonii* (R. Br.) Hulten [=*Festuca rubra* L., in part]
Festuca saximontana Rydb.
*Festuca vivipara (*L.*)* Smith [="*Festuca vivipara"*]
Glyceria borealis (Nash) Batchelder
Glyceria maxima (Hartm.) Holmb. ssp. *grandis* (S. Wats.) Hulten
Glyceria pulchella (Nash) K.Schum.
Hierochloe alpina (Sw.) Roem. & Schult.
Hierochloe odorata (L.) Beauv.
Hordeum jubatum L.
Leymus innovatus (Beal) Pilger [=*Elymus innovatus* Beal]
Phleum pratense L.
Poa cf.*alpigena* (Fries) Lindman
Poa alpina L.
Poa annua L.
Poa arctica R. Br. sens lat.
Poa glauca M. Vahl
Poa lanata Scribn. & Merr.
Poa paucispicula Scribn. & Merr.
Poa pratensis L.
Poa pseudoabbreviata Rosh.
Poa secunda J. Presl [=includes *Poa nevadensis* Vasey, *Poa ampla* Merrill, *Poa stenantha*, in part, *Poa scabrella* (Thurb.) Benth. and *Poa canbyi* (Scribn.) Howell]
Trisetum spicatum (L.) Richter

Polemoniaceae
Phlox hoodii Richards.
Phlox sibirica L. ssp. *richardsonii* (Hook.) Hulten
Polemonium acutiflorum Willd. ex Roemer & J.A. Schultes
Polemonium pulcherrimum Hook.

Polygonaceae
Bistorta plumosa (Small) E. Greene [=*Polygonum bistorta* L. ssp. *plumosum* (Small) Hulten]
Bistorta vivipara (L.) Gray [=*Polygonum viviparum* L.]
Oxyria digyna (L.) Hill
Polygonum alaskanum (Small) W. Wight
Polygonum amphibium L.
Polygonum aviculare L.
Polygonum pennsylvanicum L. ssp. *oneillii* (Brenckle) Hulten
Rumex arcticus Trautv.
Rumex longifolius DC.
Rumex maritimus L. ssp. *fueginus* (L. Phillips) *Hulten*
Rumex maritimus L. ssp. *maritimus*

Portulacaceae
Claytonia sarmentosa C.A. Mey.
Claytonia tuberosa Pallas ex J.A. Schultes

Potamogetonaceae
Potamogeton alpinus Balbis

Potamogeton filiformis Pers.
Potamogeton foliosus Raf.
Potamogeton gramineus L.
Potamogeton obtusifolius Mertens & Koch
Potamogeton praelongus Wulfen
Potamogeton pusillus L. [=*Potamogeton berchtoldii* Fieb.]
Potamogeton richardsonii (Benn.) Rydb. [=*Potamogeton perfoliatus* L. ssp. *richardsonii* (Bennett) Hulten]
Potamogeton zosteriformis Fern.[=*Potamogeton zosterifolius* Schum. ssp. *zosteriformis* (Fern.) Hulten]

Primulaceae
Androsace chamaejasme Wulfen ssp. *lehmanniana* (Spreng.) Hulten
Androsace septentrionalis L.
Dodecatheon frigidum Cham. & Schlecht.
Dodecatheon pulchellum (Raf.) Merr. ssp. *pauciflorum* (E. Greene) Hulten
Primula cf.*egaliksensis* Wormsk. ex Hornem.
Primula eximia Greene [=*Primula tschuktschorum* Kjellm. var. *arctica* (Koidz.) Fern.]
Trientalis europaea L. ssp. *arctica* (Fisch. ex Hook.) Hulten

Pyrolaceae
Moneses uniflora (L.) Gray
Orthilia secunda (L.) House [=*Pyrola secunda* L.]
Pyrola asarifolia Michx.
Pyrola chlorantha Sw.
Pyrola grandiflora Radius
Pyrola minor L.

Ranunculaceae
Aconitum delphinifolium DC ssp. *delphinifolium*
Actaea rubra (Ait.) Willd.
Anemone drummondii S. Wats.
Anemone narcissiflora L. ssp. *interior* Hulten
Anemone parviflora Michx.
Anemone richardsonii Hook.
Aquilegia brevistyla Hook.
Delphinium glaucum S. Wats.
Pulsatilla patens (L.) P. Mill. ssp. *multifida* (Pritz.) Zamels
Ranunculus gmelini DC. ssp. *gmelini*
Ranunculus hyperboreus Rottb.
Ranunculus lapponicus L.
Ranunculus nivalis L.
Ranunculus reptans L.
Ranunculus sceleratus L. ssp. *multifidus* (Nutt.) Hulten
Ranunculus trichophyllus Chaix
Thalictrum alpinum L.
Thalictrum sparsiflorum Turcz. ex Fisch. & C.A. Mey.

Rosaceae
Acomastylis rossii (R. Br.) E. Greene [=*Geum rossii* (R. Br.) Ser.]
Comarum palustre L. [=*Potentilla palustris* (L.) Scop.]
Dryas alaskensis A. Porsild [=*Dryas octopetala* L. ssp. *alaskensis* (Porsild) Hulten]
Dryas drummondii Richards. ex Hook.
Dryas integrifolia Vahl
Dryas octopetala L.
Dryas octopetala L. ssp. *octopetala* var. *octopetala*
Fragaria virginiana Duchesne ssp. *glauca* (S. Wats.) Staudt
Geum perincisum Rydb. [=*Geum macrophyllum* Willd. var. *perincisum* (Rydb.) Raup]
Pentaphylloides floribunda (Pursh) A. Love [=*Potentilla fruticosa* L.]
Potentilla anserina L.
Potentilla biflora Willd. ex Schlecht.
Potentilla hookeriana Lehm.
Potentilla multifida L.
Potentilla norvegica L. ssp. *monspeliensis* (L.) Ashers. & Graebn.
Potentilla pennsylvanica L.
Potentilla uniflora Ledeb.
Potentilla virgulata A. Nels.
Rosa acicularis Lindl.
Rubus arcticus L.ssp. *arcticus* L.
Rubus chamaemorus L.
Rubus idaeus L.
Sanguisorba officinalis L.
Sanguisorba stipulata Raf.
Spiraea stevenii (Schneid.) Rydb. [=*Spiraea beauverdiana* Schneid.]

Rubiaceae
Galium boreale L.
Galium brandegei A. Gray
Galium trifidum L. ssp. *trifidum*

Salicaceae
Populus balsamifera L. ssp. *balsamifera*
Populus tremuloides Michx.
Salix alaxensis (Anderss.) Coville var. *alaxensis* (Anderss.) Coville
Salix alaxensis (Anderss.) Coville var. *longistylis* (Rydb.) Schneid.
Salix arbusculoides Anderss.
Salix arctica Pall.
Salix barclayi Anderss.
Salix bebbiana Sarg. [=*Salix depressa* L. ssp. *rostrata* (Anderss.) Hiitonen]
Salix brachycarpa Nutt. ssp. *niphoclada* (Rydb.) Argus
Salix fuscescens Anderss.
Salix glauca L.
Salix glauca L. var. *acutifolia* (Andersson) C. Schneider
Salix lanata L. ssp. *richardsonii* (Hook.) A. Skvortsov
Salix myrtillifolia Anderss.
Salix novae-angliae Anderss. [=*Salix myrtillifolia* Anderss., in part]
Salix planifolia Pursh ssp. *pulchra* (Cham.) Argus
Salix polaris Wahlenb. ssp. *pseudopolaris* (Flod.) Hulten
Salix reticulata L.
Salix rotundifolia Trautv. ssp. *dodgeana* (Rydb.) Argus [=*Salix dodgeana* Rydb.]
Salix setchelliana Ball

Santalaceae
Geocaulon lividum (Richards.) Fern.

Saxifragaceae
Boykinia richardsonii (Hook.) Rothrock
Chrysosplenium tetrandrum (Lund) Th. Fries
Chrysosplenium wrightii Franch. & Savigny
Parnassia kotzebuei Cham.ex Spreng.
Parnassia palustris L. ssp. *neogaea* (Fern.) Hulten
Saxifraga cf.*adscendens* L. ssp. *oregonensis (*Raf.) Bacig.
Saxifraga bronchialis L.
Saxifraga calycina Sternb.[=*Saxifraga davurica* Willd. ssp. *grandipetala* (Engler & Irmsch) Hulten]
Saxifraga cernua L.
Saxifraga eschscholtzii Sternb.
Saxifraga flagellaris Willd. ex Sternb.
Saxifraga hieraciifolia Waldst. & Kit
Saxifraga hirculus L.
Saxifraga nelsoniana D. Don [=*Saxifraga punctata* L.]
Saxifraga oppositifolia L.
Saxifraga reflexa Hook.
Saxifraga rivularis L.
Saxifraga serpyllifolia Pursh
Saxifraga spicata D. Don
Saxifraga tricuspidata Rottb.

Scrophulariaceae
Castilleja caudata (Pennell) Rebr.
Castilleja yukonis Pennell
Euphrasia disjuncta Fern. & Wieg.
Lagotis glauca Gaertn.
Pedicularis capitata M.F. Adams
Pedicularis labradorica Wirsing
Pedicularis lanata Cham. & Schlecht. [=*Pedicularis kanei* Durand]
Pedicularis langsdorfii Fisch. ex Stev.
Pedicularis sudetica Willd.
Pedicularis verticillata L.
Rhinanthus minor L. ssp. *borealis* (Sterneck) Love
Synthyris borealis Pennell
Veronica peregrina L. ssp. *xalapensis* (Kunth) Pennell
Veronica wormskjoldii Roemer & J.A. Schultes

Selaginellaceae
Selaginella sibirica (Milde) Hieron.

Sparganiaceae
Sparganium angustifolium Michx.
Sparganium hyperboreum Laestad. ex Beurling
Sparganium minimum (Hartman F.) Fries

Valerianaceae
Valeriana capitata Pallas ex Link

Violaceae
Viola biflora L.
Viola epipsila Ledeb.
Viola selkirkii Pursh ex Goldie

Appendix Table 3.8.j Aerial Extent of Ecotypes Found on Donnelly Training Area.

Ecotype	Area	
	Ha	%
Alpine Rocky Dry Barrens	3,378	1.3
Alpine Rocky Dry Dwarf Scrub	2,659	1.0
Alpine Rocky Moist Low Scrub	10,570	4.1
Alpine Wet Tussock Meadow	6,698	2.6
Alpine Wet Low Scrub	8,139	3.1
Upland Rocky Dry Meadow	38	<0.1
Upland Rocky Dry Low Scrub	782	0.3
Upland Rocky Dry Broadleaf Forest	815	0.3
Upland Moist Low & Tall Scrub	13,233	5.1
Upland Moist Low & Tall Scrub-disturbed	10,455	4.0
Upland Moist Broadleaf Forest	5,462	2.1
Upland Moist Mixed Forest	4,938	1.9
Upland Moist Needleleaf Forest	12,401	4.8
Upland Wet Needleleaf Forest	509	0.2
Lowland Gravelly Dry Broadleaf Forest	947	0.4
Lowland Gravelly Moist Low Scrub	6,339	2.4
Lowland Gravelly Needleleaf Forest	5,896	2.3
Lowland Moist Tall Scrub	865	0.3
Lowland Low Scrub -disturbed	9,467	3.6
Lowland Wet Low Scrub	36,136	13.9
Lowland Tussock Scrub Bog	55,133	21.2
Lowland Wet Broadleaf Forest	985	0.4
Lowland Wet Mixed Forest	2,021	0.8
Lowland Wet Needleleaf Forest	29,967	11.5
Lacustrine Moist Meadow	6	<0.1
Ponds and Lakes	3,044	1.2
Riverine Gravelly Barrens	4,876	1.9
Riverine Gravelly Dry Dwarf Scrub	1,899	0.7
Riverine Gravelly Dry Broadleaf Forest	4,044	1.6
Riverine Gravelly Needleleaf Forest	4,119	1.6
Riverine Moist Low & Tall Scrub	1,263	0.5

Appendix Table 3.8.j cont. Aerial Extents of Ecotypes Found on Donnelly Training Area.

Ecotype	Area	
	Ha	**%**
Riverine Moist Broadleaf Forest	135	0.1
Riverine Moist Mixed Forest	688	0.3
Riverine Moist Needleleaf Forest	2,548	1.0
Upper Perennial River	8,106	3.1
Human Disturbed Barrens	1,115	0.4
Human Disturbed Scrub	556	0.2
TOTAL	**260,234**	**100**

Flora of Fort Richardson

Adiantaceae
Cryptogramma acrostichoides var. *acrostichoides*

Adoxaceae
Adoxa moschatellina

Amaranthaceae
Amaranthus retroflexus

Apiaceae
Angelica genuflexa
Angelica lucida
Cicuta douglasii
Circuta virosa
Conioselinum pacificum
Heracleum lanatum
Ligusticum scoticum ssp. *hultenii*
Osmorhiza depauperata

Araliaceae
Oplopanax horridus

Aspleniaceae
Athyrium filix-femina
Cystopteris fragilis
Cystopteris montana
Dryopteris dilatata
Dryopteris fragrans
Gymnocarpium dryopteris
Matteuccia struthiopteris

Asteraceae
Achillea millefolium
Achillea ptarmica
Achillea sibirica
Antennaria alpina
Antennaria friesiana
Antennaria friesiana ssp. *alaskana*
Antennaria monocephala
Antennaria rosea
Antennaria rosea ssp. *pulvinata*
Anthemis cotula
Anthemis tinctoria
Arnica grjscomii ssp. *frigida*
Arnica latifolia
Arnica lessingii
Arnica ovata
Artemisia arctica
Artemisia tilesii
Aster junciformis
Aster sibiricus
Chrysanthemum arcticum
Chrysanthemum leucanthemum
Crepis elegans
Crepis nana
Crepis tectorum
Erigeron acris
Erigeron humilis
Erigeron peregrinus
Erigeron purpuratus
Helianthus anuus
Hieracium triste
Matricaria matircarioides
Petasites frigidus
Petasites sagittatus
Senecio lugens
Senecio pauciflorus
Senecio vulgaris
Senecio triangularis
Solidago lepida
Solidago multiradiata

Taraxacum alaskanum
Taraxacum carneocoloratum
Taraxacum officinale
Tripleurospermum inodoratum

Balsaminaceae
Impatiens noli-tangere

Betulaceae
Alnus sinuata ssp. *sinuata*
Alnus tenuifolia ssp. *tenuifolia*
Alnus viridis ssp. *crispa*
Betula glandulosa
Betula hybrids
Betula kenaica
Betula papyrifera

Boraginaceae
Mertensia paniculata
Myosotis alpestris

Brassicaceae
Aphragmus eschscholtzianus
Arabis hirsuta ssp. *eschscholtziana*
Arabis holboellii
Arabis lyrata ssp. *kamchatica*
Barbarea orthoceras
Brassica rapa
Capsella bursa-pastoris
Capsella rubella
Cardamine bellidifolia
Cardamine pratensis ssp. *angustifolia*
Cardamine umbellata
Descurainia sophiodes
Draba alpina
Draba aurea
Draba borealis
Draba cana
Draba fladzinensis
Draba glabella
Draba lactea
Draba lonchocarpa
Draba longipes
Draba nivalis
Draba ruxaes
Draba stenoloba
Draba stenopetala
Erucastrum gallicum
Erysimum cherianthoides
Erysimum cherianthoides ssp. *altum*
Eutrema edwardsii
Lepidium densiflorum
Rorippa barbareaefolia
Rorippa palustris ssp. *hispida*
Rorippa palustris ssp. *palustris*
Rorippa sylvestris
Thlaspi arcticum

Callitrichaceae
Callitriche verna

Campanulaceae
Campanula lasiocarpa
Campanula rotundifolia
Campanula uniflora

Caprifoliaceae
Linnaea borealis
Sambucus racemosa
Viburnum edule

Caryophyllaceae
Cerastium arvense
Cerastium beeringianum var. *beeringianum*
Cerastium fontanum
Gastrolychnis apetala
Melandrium noctiflorum
Minuartia biflora
Minuartia macrocarpa
Minuartia rubella
Moehringia lateriflora
Sagina nivalis
Sagina saginoides
Silene acaulis
Spergula arvensis
Spergularia canadensis
Stellaria borealis
Stellaria borealis ssp. *sitchana*
Stellaria calyacantha
Stellaria crassifolia
Stellaria humifusa
Stellaria laeta
Stellaria longifolia
Stellaria media
Stellaria monantha
Stellaria umbellata

Chenopodiaceae
Atriplex gmelini
Chenopodium album
Salicornia europaea

Cornaceae
Cornus canadensis
Cornus suecica
Swida stolonifera

Crassulaceae
Rhodiola intergrifolia ssp. *integrifolia*

Cuppressaceae
Juniperus communis

Cyperaceae
Carex aquatilis ssp. *aquatilis*
Carex atrosquama
Carex bigelowii
Carex buxbaumii
Carex canescens
Carex chordorrhiza
Carex circinnata
Carex deweyana
Carex diandra
Carex dioica ssp. *gynocrates*
Carex garberi ssp. *bifaria*
Carex gmelinii
Carex kelloggii
Carex lachenalii
Carex lasiocarpa
Carex leptalea
Carex limosa
Carex livida
Carex loliaceae
Carex lyngbyaei
Carex mackenziei
Carex macloviana
Carex macrochaeta
Carex magellanica
Carex media
Carex membranacea
Carex mertensii
Carex microchaeta
Carex microchaeta ssp. *nesophila*
Carex micropoda ssp. *micropoda*
Carex nigricans
Carex obtusata
Carex oederi
Carex pauciflora
Carex pluriflora
Carex podocarpa
Carex praticola
Carex ramenskii
Carex rariflora
Carex rostrata
Carex rotunda
Carex saxatilis
Carex scirpoidea
Carex spectabilis
Carex tenuifolia
Carex utriculata
Carex vaginata
Eleocharis kamtschatica
Eleocharis palustris
Eleocharis quinquefolia
Eriophorum angustifolium ssp. *subarcticum*
Eriophorum gracile
Eriophorum russeolum
Eriophorum russeolum var. *albidum*
Eriophorum scheuchzeri
Eriophorum viridi-carinatum
Scirpus paludosus
Scirpus validus
Trichophorum alpinum
Trichophorum caespitosum

Diapensaceae
Diapensia lapponica

Droseraceae
Drocera anglica
Drocera rotundifolia

Eleagnaceae
Shepherdia canadensis

Empetraceae
Empetrum hermaphroditum ssp. *hermaphroditum*

Equisetaceae
Equisetum arvense
Equisetum fluviatile
Equisetum palustre
Equisetum pratense
Equisetum scirpoides
Equisetum silvaticum
Equisetum variegatum

Ericaceae
Andromeda polifolia
Arctostaphylos uva-ursi
Arctous alpina
Arctous rubra
Cassiope lycopodioides
Cassiope stelleriana

Cassiope tetragona
Chamaedaphne calyculata
Ledum groenlandicum
Ledum palustre
Loiseleuria procumbens
Menziesia ferruginea
Oxycoccus microcarpus
Pyllodoce aleutica
Vaccinium caespitosum
Vaccinium ovalifolium
Vaccinium uliginosum
Vaccinium vitis-idaea

Fabaceae
Astragalus alpinus
Astragalus alpinus ssp. *alpinus*
Astragalus polaris
Astragalus umbellatus
Hedysarum alpinum
Lathyrus palustris ssp. *pilosus*
Lupinus nootkatensis
Lupinus polyphyllus
Medicago falcata
Medicago sativa
Melilotus albus
Melilotus officinalis
Oxytropis byrophila
Oxytropis huddelsonii
Oxytropis maydelliana
Oxytropis varians
Trifolium hybridum
Trifolium pratense
Trifolium repens
Vicia cracca

Fumariaceae
Corydalis pauciflora
Corydalis sempervirens

Gentianaceae
Gentiana glauca
Gentianella amarella ssp. *acuta*
Gentianella propinqua var. *propinqua*
Menyanthes trifoliata
Swertia perennis

Gerianiaceae
Geranium erianthum
Geranium pusillum

Grossulariaceae
Ribes hudsonianum
Ribes laxiflorum
Ribes triste

Haloragaceae
Hippuris montana
Hippuris tetraphylla
Hippuris vulgaris
Myriophyllum exalbescens
Myriophyllum verticillatum

Hydrophyllaceae
Romanzoffia sitchensis

Iridaceae
Iris setosa

Isoetaceae
Isoestes echinospora

Juncaceae
Juncus alpinus
Juncus biglumis
Juncus castaneus
Juncus castaneus ssp. *castaneus*
Juncus castaneus ssp. *leucochlamys*
Juncus drummondii
Juncus ensifolius
Juncus mertensianus
Juncus stygius ssp. *americanus*
Juncus triglumis
Luzula arcuata
Luzula arcuata ssp. *unalaschensis*
Luzula confusa
Luzula multiflora var. *frigida*
Luzula parviflora
Luzula spicata
Luzula wahlenbergii

Juncaginaceae
Triglochin maritimum
Triglochin palustris

Lamiaceae
Galeopsis bifida
Mentha arvensis
Scutellaria galericulata

Lemnaceae
Lemna minor

Lentibulanaceae
Pinguicula villosa
Utricularia intermedia
Utricularia minor
Utricularia vulgaris

Liliaceae
Allium schoenoprasum
Fritillaria camschatcensis
Lloydia serotina
Smilacina stellata
Streptopus ameplexifolius
Tofieldia coccinea
Tofieldia glutinosa
Tofieldia pusilla
Veratrum viride
Zygadenus elegans

Lycopodiaceae
Huperzia selago
Huperzia selago ssp. *chinense*
Lycopodium alpinum
Lycopodium annotinum
Lycopodium clavatum ssp. *monostachyon*
Lycopodium complanatum
Lycopodium sabinaefolium var. *sitchense*

Myricaceae
Myrica gale

Najadaceae
Najas flexilis

Nymphaceae
Nuphar polysepalum

Onagraceae
Circaea alpina
Epilobium anagallidifolium
Epilobium angustifolium
Epilobium ciliatum ssp. *glandulosum*
Epilobium hornemannii ssp. *hornemannii*
Epilobium latifolium
Epilobium palustre

Ophiglossaceae
Botrichium boreale
Botrichium lanceolatum
Botrichium lunaria

Orchidaceae
Coeloglossum viride ssp. *brachteatum*
Corallorrhiza trifida
Goodyera repens var. *ophioides*
Hammarbya paludosa
Listera cordata
Malaxis monophylla var. *brachypoda*
Platanthera hyperborea var. *hyperborea*
Platanthera hyperborea var. *viridiflora*
Platanthera obtusata
Spiranthes romanzoffiana

Orobanchaceae
Boschniakia rossica

Papaveraceae
Papaver alboroseum
Papaver nudicaule
Papaver radicatum

Pinaceae
Picea glauca
Picea mariana
Tsuga mertensiana

Plantaginaceae
Plantago major var. *major*
Plantago maritima ssp. *juncoides*

Plumbaginaceae
Armeria maritima ssp. *arctica*

Poaceae
Agrostis scabra
Alopecuris aequalis
Alopecuris alpinus
Arctagrostis latifolia
Arctagrostis latifolia var. *arundinaceae*
Arctagrostis latifolia var. *latifolia*
Arctagrostis poaeoides
Avena fatua
Beckmannia erucaeformis ssp. *baicalensis*
Bromopsis intermis
Bromus tectorum
Calamagrostis canadensis
Calamagrostis deschampsioides
Calamagrostis inexpansa
Calamagrostis lapponica
Calamagrostis nutkaensis
Dactylis glomerata
Deschampsia caespitosa ssp. *caespitosa*
Elymus alaskanus ssp. *alaskanus*
Elymus glaucus
Elymus sibiricus

Elymus trachycaulis ssp. *andinus*
Elymus trachycaulis ssp. *novae-angilae*
Elytriga repens
Festuca altaica
Festuca brevissima
Festuca rubra
Festuca vivipara
Glyceria borealis
Glyceria striata
Hierchole alpina
Hierchole odorata
Hordeum brachyantherum
Hordeum jubatum
Leymus mollis ssp. *mollis*
Lolium multiflorum
Phalaris arundinaceae
Phleum commutatum var. *americanum*
Phleum pratense
Poa alpigena
Poa alpina
Poa annua
Poa arctica
Poa eminens
Poa glauca
Poa palustris
Poa paucisicula
Poa pratensis
Poa psuedoabbreviata
Puccinellia grandis
Puccinella nutkanensis
Puccinella phryganodes
Shizachne purpurascens
Trisetum spicatum
Trisetum spicatum ssp. *alaskanum*
Trisetum spicatum ssp. *molle*
Triticum aestivum
Vahlodea atropurpurea ssp. *paramushirensis*

Polemoriaceae
Polemonium acutiflorum
Polemonium pulcherrimum

Polygonaceae
Bistorta vivipara
Oxyria digyna
Polygonum amphibium
Polygonum aviculare
Polygonum convolvulus
Polygonum fowleri
Polygonum lapathifolium
Polygonum pennsylvanicum ssp. *oneillii*
Rumex acetosella
Rumex arcticus
Rumex crispus
Rumex fenestratus
Rumex transitorius

Portulaceae
Claytonia sarmentosa

Potamogetonaceae
Potamogeton alpinus
Potamogeton epihydrus
Potamogeton filiformis
Potamogeton gramineus
Potamogeton natans
Potamogeton pectinatus
Potamogeton richardsonii ssp. *richardsonii*
Potamogeton praelongus
Potamogeton vaginatus
Potamogeton zosterifolius
Ruppia spiralis
Zannichellia palustris

Primulaceae
Dodecatheon pulcehllum
Douglasia alaskana
Glaux maritima
Lysimachia thyrisflora
Primula cuneifolia ssp. *saxifragifolia*
Trientalis europaea

Pyrolaceae
Moneses uniflora
Orthilia secunda
Pyrola asarifolia
Pyrola asarifolia var. *purpurea*
Pyrola chlorantha
Pyrola minor

Ranunculaceae
Aconitum delphinifolium
Acontium delphinifolium ssp. *paradoxicum*
Actaea rubra
Anemone multifida var. *saxicola*
Anemone narcissiflora var. *monantha*
Anemone narcissiflora ssp. *villosissima*
Anemone parviflora
Anemone richardsonii
Aquilegia formosa
Caltha palustris ssp. *asarifolia*

Delphinium glaucum
Ranunculus arborvitus
Ranunculus cymbalaria
Ranunculus eschscholtzii
Ranunculus gmelini ssp. *gmelini*
Ranunculus hyperboreus
Ranunculus lapponicus
Ranunculus macounii
Ranunculus nivalis
Ranunculus occidentalis
Ranunculus pygmaeus
Ranunculus scleratus
Ranunculus trichophyllus
Ranunculus trichophyllus var. *trichophyllus*
Thalictrum alpinum
Thalictrum sparsiflorum

Rosaceae
Actomastylis rossii
Amelanchier alnifolia
Comarum palustre
Dryas alaskensis ssp. *alaskensis*
Dryas drummondii
Dryas intergrifolia
Dryas octopetala
Fragaria chiloensis
Geum macrophyllum ssp. *macropyhllum*
Geum perincisum ssp. *perincisum*
Luetkea pectinata
Pentaphylloides floribunda
Potentilla anserina
Potentilla diversifolia
Potentilla egedii ssp. *grandis*
Potentilla hyparctica
Potentilla multifida
Potentilla norvegica
Potentilla uniflora
Rosa acicularis
Rosa nutkana
Rubus arcticus
Rubus chamaemorus
Rubus idaeus
Rubus pedatus
Rubus stellatus ssp. *stellatus*
Sanguisorba stipulata
Sibbaldia procumbens
Sorbus scopulina
Spiraea beauverdiana

Rubiaceae
Galium boreale
Galium trifidum ssp. *trifidum*
Galium triflorum

Salicaceae
Populus balsamifera
Populus balsamifera ssp. *balsamifera*
Populus balsamifera ssp. *trichocarpa*
Populus tremuloides
Salix alaxensis
Salix arctica
Salix barclayi
Salix bebbiana ssp. *rostrata*
Salix brachycarpa ssp. *niphoclada*
Salix fuscescens
Salix glauca
Salix lucida ssp. *lasiandra*
Salix ovalifolia
Salix planifolia ssp. *pulchra*
Salix reticulata
Salix rotundifolia
Salix scouleriana
Salix sitchensis

Santalaceae
Geocaulon lividum

Saxifragaceae
Chrysosplenium tetrandrum
Heuchera glabra
Leptarrhena pyrolifolia
Mitella pentandra
Parnassia kotzebuei
Parnassia palustris
Parnassia palustris ssp. *neogaea*
Saxifraga adscendens
Saxifraga bronchialis
Saxifraga caespitosa
Saxifraga calycina
Saxifraga cernua
Saxifraga eschscholtzii
Saxifraga flagellaris
Saxifraga foliolosa
Saxifraga lyallii ssp. *hultenii*
Saxifraga hirculis
Saxifraga nelsoniana ssp. *pacifica*
Saxifraga nivalis
Saxifraga oppositifolia
Saxifraga rivularis

Saxifraga serpyllifolia
Saxifraga tricuspidata

Scheuchzeriaceae
Scheuchzeria palustris

Selaginellaceae
Selaginella selaginoides

Sparganiaceae
Sparganium angustifolium
Sparganium hyperboreum
Sparganium minimum

Thelypteridaceae
Thelypteris phegopteris

Typhaceae
Typha latifolia

Appendix Table 3.8.k Aerial Extents of Ecotypes Found within Fort Richardson.

Ecotype	Area (Ha)	%
Alpine Rocky Dry Barrens	1,086	4.3
Alpine Rocky Dry Dwarf Scrub	2,002	8.8
Alpine Rocky Moist Dwarf Scrub	1,370	5.5
Alpine Rocky Moist Low Scrub	37	0.1
Alpine Lake	37	0.1
Subalpine Rocky Moist Meadow	77	0.3
Subalpine Rocky Moist Low Scrub	638	2.5
Subalpine Rocky Moist Tall Scrub	1,128	4.5
Subalpine Rocky Moist Broadleaf Forest	220	0.9
Subalpine Rocky Moist Needleleaf Forest	71	0.3
Upland Rocky Dry Barrens	16	0.1
Upland Rocky Dry Broadleaf Forest	80	0.3
Upland Rocky Dry Mixed Forest	41	0.2
Upland Rocky Moist Tall Scrub	127	0.5
Upland Rocky Moist Broadleaf Forest	3,872	15.4
Upland Rocky Mixed Forest	5,569	22.2
Upland Rocky Moist Needleleaf Forest	287	1.1
Lowland Loamy Moist Meadow	28	0.1
Lowland Gravelly Moist Tall Scrub	30	0.1
Lowland Gravelly Moist Broadleaf Forest	458	1.8
Lowland Gravelly Moist Mixed Forest	1,800	7.2
Lowland Gravelly Moist Needleleaf Forest	764	30
Lowland Bog Meadow	77	0.3
Lowland Scrub Bog	406	106
Lowland Needleleaf Forest Bog	125	0.5
Lowland Lake and Aquatic Forb	95	0.4
Riverine Gravelly Moist Barrens	12	<0.1

Appendix Table 3.8.k cont. Aerial Extents of Ecotypes Found within Fort Richardson.

Ecotype	Area (Ha)	%
Riverine Loamy Wet Tall Scrub	35	0.1
Riverine Gravelly Moist Tall Scrub	56	0.2
Riverine Gravelly Moist Broadleaf Forest	113	0.4
Riverine Gravelly Moist Mixed Forest	204	0.8
Riverine Gravelly Moist Needleleaf Forest	44	0.2
Rivers and Streams	68	0.3
Coastal Loamy Wet Barrens	279	1.1
Coastal Loamy Wet Meadow, brackish	365	1.5
Coastal Sandy Moist Meadow	6	<0.1
Coastal Loamy Wet Low Scrub	62	0.2
Coastal Lake and Marsh	170	0.7
Nearshore Water	11	<0.1
Human Modified Barrens	653	2.6
Human Modified Meadow	270	1.1
Human Modified Scrub	1,331	5.3
Human Modified Forest	454	1.8
Human Modified Waterbodies	3	<0.1
Human Modified Complex	515	2.1
TOTAL	**25,089**	**100**

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3.9 WILDLIFE AND FISHERIES

Appendix Table 3.9.a Terrestrial Mammals, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]				
		TFTA	YTA	DTA	FRA	Habitat
LARGE MAMMALS						
Black bear	*Ursus americanus*	X	X	X	X	Forest
Grizzly bear	*Ursus arctos*	X	X	X	X	Alpine, subalpine
Moose	*Alces alces*	X	X	X	X	Scrub, forest
Caribou	*Rangifer tarandus*	X	X	X		Tundra, open forest
Bison	*Bison bison*			X		Grassland, river bars
Dall sheep	*Ovis dalli*		X	X	X	Alpine, tundra
FURBEARERS						
Coyote	*Canis latrans*	X	X	X	X	Ubiquitous
Red fox	*Vulpes vulpes*	X	X	X	X	Ubiquitous
Wolf	*Canis lupus*	X	X	X	X	Alpine, forest, muskeg
Lynx	*Lynx canadensis*	X	X	X	X	Forest, muskeg
Beaver	*Castor canadensis*	X	X	X	X	Streams, lakes
River otter	*Lutra canadensis*	X	X	X	X	Near water
Pine marten	*Martes americana*	X	X	X	X	Spruce forest
Mink	*Mustela vison*	X	X	X	X	Near water
Short-tailed weasel	*Mustela erminea*	X	X	X	X	Forest, scrub
Least weasel	*Mustela nivalis*	X	X	X	X	Scrub
Wolverine	*Gulo gulo*	X	X	X	X	Subalpine, forest
Muskrat	*Ondatra zibethicus*	X	X	X	X	Near water, wetlands
Hoary marmot	*Marmota caligata*	X	X	X	X	Alpine
Woodchuck	*Marmota monax*	X	X	X		Dry forest, rocky slope
Northern flying squirrel	*Glaucomys sabrinus*	X	X	X	X	Conifer, mixed forest
Arctic ground squirrel	*Spermophilus parryii*	X	X	X	X	Alpine
Red squirrel	*Tamiasciurus hudsonicus*	X	X	X	X	Spruce forest
SMALL GAME AND UNCLASSIFIED SPECIES						
Snowshoe hare	*Lepus americanus*	X	X	X	X	Forest, scrub
Collared pika	*Ochonta collaris*			X	X	Alpine, tundra
Little brown bat	*Myotis lucifugus*	X	X	X	X	Wooded areas
North. bog lemming	*Synaptomys borealis*	X	X	X	X	Wet tundra, muskeg
Brown lemming	*Lemmus trimucronatus*	X	X	X	X	Alpine
Deer mouse	*Peromyscus maniculatus*	?	?	?		Forest, grassland
Meadow jumping mouse	*Zapus hudsonicus*	X	X	X	X	Grassland
Pygmy shrew	*Sorex hoyi*	X	X	X	X	Forest, grassland
Dusky shrew	*Sorex monticulus*	X	X	X	X	Muskeg, forest
Masked shrew	*Sorex cinereus*	X	X	X	X	Subalpine

Appendix Table 3.9.a cont. Terrestrial Mammals, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]				
		TFTA	YTA	DTA	FRA	Habitat
Tundra shrew	*Sorex tundrensis*	X	X	X	X	Spruce/tamarack
Water Shrew	*Sorex palustris*				X	Near water
Porcupine	*Erethiszon dorsatum*	X	X	X	X	Coniferous forest
Long-tailed vole	*Microtus longicaudus*			X		Wet meadow
Alaska (singing) vole	*Microtus miurus*	X	X	X	X	Slopes
Meadow vole	*Microtus pennsylvanicus*	X	X	X	X	Grassland
Yellow-cheeked vole	*Microtus xanthognathus*	X	X	X		Spruce forest
Tundra vole	*Microtus oeconomus*	X	X	X	X	Alpine
Northern redback vole	*Clethrionomys rutilus*	X	X	X	X	Alpine, forest
House mouse	*Mus musculus*	X		X	X	Buildings

[1]TFTA = Tanana Flats Training Area, YTA = Yukon Training Area, DTA = Donnelly Training Area, FRA = Fort Richardson

Sources: Anderson et al 2001; USARAK 1999a; USARAK 2002e,f,g

Appendix Table 3.9.b Bird Species, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]			
		TFTA	YTA	DTA	FRA
LOONS AND GREBES					
Common loon	*Gavia immer*	X	X	X	X
Arctic loon	*Gavia arctica*	X	X	X	
Pacific loon	*Gavia pacifica*	X	X	X	X
Red-necked grebe	*Podiceps grisegena*	X	X	X	X
Horned grebe	*Podiceps auritus*	X	X	X	X
CRANES					
Sandhill crane	*Grus canadensis*	X	X	X	X
WATERFOWL					
Tundra swan	*Cygnus columbianus*	X	X	X	X
Trumpeter swan	*Cygnus buccinator*	X	X	X	X
Greater white-fronted goose	*Anser albifrons*	X	X	X	X
Snow goose	*Chen caerulescens*	X	X	X	X
Canada goose	*Branta canadensis*	X	X	X	X
Mallard	*Anas platyrhynchos*	X	X	X	X
Gadwall	*Anas strepera*	X	X	X	X
Green-winged teal	*Anas crecca*	X	X	X	X
American wigeon	*Anas americana*	X	X	X	X
Eurasian wigeon	*Anas penelope*	X	X		X
Northern pintail	*Anas acuta*	X	X	X	X
Northern shoveler	*Anas clypeata*	X	X	X	X

Appendix Table 3.9.b cont. Bird Species, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]			
		TFTA	YTA	DTA	FRA
Blue-winged teal	*Anas discors*	X	X	X	
Canvasback	*Aythya valisineria*	X	X	X	X
Redhead	*Aythya american*	X	X	X	X
Ring-necked duck	*Aythya collaris*	X	X	X	X
Harlequin duck	*Histrionicus histrionicus*	X	X	X	X
Greater scaup	*Aythya marila*	X	X	X	X
Lesser scaup	*Aythya affinis*	X	X	X	X
White-winged scoter	*Melanitta fusca*	X	X	X	
Surf scoter	*Melanitta perspicillata*	X	X	X	
Long-tailed duck (Oldsquaw)	*Clangula hyenemalis*	X	X	X	
Common scoter	*Melanitta deglandi*			X	
Barrow's goldeneye	*Bucephala islandica*	X	X	X	X
Common goldeneye	*Bucephala clangula*	X	X	X	X
Bufflehead	*Bucephala albeola*	X	X	X	
RAILS					
American coot	*Fulica americana*	X	X	X	
SHOREBIRDS					
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	X
Blackbellied plover	*Pluvialis squatarola*	X	X	X	
American (lesser) golden plover	*Pluvialis dominica*	X	X	X	
Killdeer	*Charadrius vociferus*	X	X	X	
Hudsonian godwit	*Limosa haemastica*				
Whimbrel	*Numenius phaeopus*	X	X	X	
Wilson's phalarope	*Phalaropus tricolor*				X
Red-necked phalarope	*Phalaropus lobatus*				X
Greater yellowlegs	*Tringa melanoleuca*	X	X		X
Lesser yellowlegs	*Tringa flavipes*	X	X	X	X
Solitary sandpiper	*Tringa solitaria*	X	X	X	X
Spotted sandpiper	*Actitis macularia*	X	X	X	X
Common snipe	*Gallinago gallinago*	X	X	X	X
Surfbird	*Aphriza virgata*	X	X	X	X
Northern phalarope	*Phalaropus lobatus*			X	
Upland (plover) sandpiper	*Bartramia longicauda*	X	X	X	
White-rumped sandpiper	*Calidris fusicollis*				
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	
Dunlin	*Calidris alpine*	X	X	X	
Short-billed Dowitcher	*Limnodromus griseus*				X
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	
Western sandpiper	*Calidris mauri*	X	X	X	

Appendix Table 3.9.b cont. Bird Species, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]			
		TFTA	YTA	DTA	FRA
Least sandpiper	*Calidris minutilla*	X	X	X	
Baird's sandpiper	*Calidris bairdii*	X	X	X	
Pectoral sandpiper	*Calidris melanotos*	X	X	X	
JAEGERS, GULLS, AND TERNS					
Bonaparte's gull	*Larus philadelphia*	X	X		X
Mew gull	*Larus canus*	X	X	X	X
Herring gull	*Larus argentatus*	X	X	X	X
Glaucous winged gull	*Larus glaucescens*				X
Arctic tern	*Sterna paradisaea*	X	X	X	X
Caspian tern	*Sterna caspia*				X
VULTURES, HAWKS AND FALCONS					
Golden eagle	*Aquila chrysaetus*	X	X	X	X
Bald eagle	*Haliaeetus leucocephalus*	X	X	X	X
Northern harrier	*Circus cyaneus*	X	X	X	X
Sharp-shinned hawk	*Accipiter striatus*	X	X	X	X
Northern goshawk	*Accipiter gentiles*	X	X	X	X
Swainson's hawk	*Buteo swainsoni*	X	X		
Red-tailed (Harlan's) hawk	*Buteo jamaicensis*	X	X	X	X
Rough-legged hawk	*Buteo lagopus*	X	X	X	
Osprey	*Pandion haliaetus*	X	X	X	X
American kestrel	*Falco sparverius*	X	X	X	
Merlin	*Falco columbarius*	X	X	X	X
Peregrine falcon	*Falco peregrinus*	X	X	X	X
Gyrfalcon	*Falco rusticolus*	X	X	X	
GALLINACEOUS BIRDS					
Spruce grouse	*Dendragopus canadensis*	X	X	X	X
Ruffed grouse	*Bonasa umbellus*	X	X	X	
Sharp-tailed grouse	*Tympanuchus phasianellus*	X	X	X	
Rock ptarmigan	*Lagopus mutus*	X	X	X	X
Willow ptarmigan	*Lagopus lagopus*	X	X	X	X
White-tailed ptarmigan	*Lagopus leucurus*			X	X
PIGEONS AND DOVES					
Rock dove (pigeon)	*Columba livia*	X	X	X	X
Mourning dove	*Zenaida macroura*				
OWLS					
Short-eared owl	*Asio flammeus*	X	X	X	
Great horned owl	*Bubo virginianus*	X	X	X	X
Great gray owl	*Strix nebulosa*	X	X	X	X
Snowy owl	*Nyctea scandiaca*	X	X	X	
Northern hawk owl	*Surnia ulula*	X	X	X	X

Appendix Table 3.9.b cont. Bird Species, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]			
		TFTA	YTA	DTA	FRA
Boreal owl	*Aegolius funereus*	X	X	X	X
GOATSUCKERS					
Common nighthawk	*Chordeiles minor*				
HUMMINGBIRDS					
Rufous hummingbird	*Selasphorus rufus*	X	X		
KINGFISHERS					
Belted kingfisher	*Ceryle alcyon*	X	X	X	X
WOODPECKERS					
Northern flicker	*Colaptes auratus*	X	X	X	X
Downy woodpecker	*Picoides pubescens*	X	X	X	X
Hairy woodpecker	*Picoides villosus*	X	X	X	X
Three-toed woodpecker	*Picoides tridactylus*	X	X		X
Black-backed woodpecker	*Picoides arcticus*	X	X	X	X
PERCHING BIRDS					
Olive-sided flycatcher	*Contopus borealis*	X	X	X	X
Western wood-pewee	*Contopus sordidulus*	X	X	X	X
Hammond's flycatcher	*Empidonax hammondii*	X	X		
Say's phoebe	*Sayornis saya*	X	X		X
Alder flycatcher	*Empidonax alnorum*	X	X		X
Horned lark	*Eremophila alpestris*	X	X	X	X
Tree swallow	*Tachycineta bicolor*	X	X	X	X
Violet-green swallow	*Tachycineta thalassina*	X	X	X	X
Bank swallow	*Riparia riparia*	X	X	X	X
Cliff swallow	*Hirundo pyrrhonota*	X	X	X	X
Barn swallow	*Hirundo rustica*	X	X		
Gray jay	*Perisoreus canadensis*	X	X	X	X
Black-billed magpie	*Pica pica*	X	X	X	X
Common raven	*Corvus corax*	X	X	X	X
Steller's jay	*Cyanocitta stelleri*				X
Clark's nutcracker	*Nucifraga columbiana*				
Black-capped chickadee	*Parus atricapillus*	X	X	X	
Gray-headed chickadee	*Parus cinctus*	X	X		
Boreal chickadee	*Parus hudsonicus*	X	X	X	X
Red-breasted nuthatch	*Sitta canadensis*				X
Brown creeper	*Certhia americana*	X		X	X
Golden-crowned kinglet	*Regulus satrapa*				X
Ruby-crowned kinglet	*Regulus calendula*	X		X	X
Townsend's solitaire	*Myadestes townsendi*	X		X	X
Swainson's thrush	*Catharus ustulatus*	X		X	X
Gray-cheeked thrush	*Catharus minima*	X			X

Appendix Table 3.9.b cont. Bird Species, by Common and Scientific Name, at USARAK Posts.

Common Name	Scientific Name	Army Installation/Post[1]			
		TFTA	YTA	DTA	FRA
Hermit thrush	*Catharus guttata*	X		X	X
Varied thrush	*Ixoreus naevius*	X		X	
American robin	*Turdus migratorius*	X	X	X	X
Northern wheateater	*Oenanthe oenanthe*	X		X	X
Northern shrike	*Lanius excubitor*	X		X	X
American dipper	*Cinclus mexicanus*	X		X	X
American (water) pipit	*Anthus rubescens*	X		X	X
Winter wren	*Troglodytes troglodytes*				X
Bohemian waxwing	*Bombycilla garrulus*	X	X	X	X
European starling	*Sturnus vulgaris*				X
Orange-crowned warbler	*Vermivora celata*	X	X	X	X
Arctic warbler	*Phylloscopus borealis*	X	X	X	X
Yellow-rumped warbler	*Dendroica coronata*	X	X	X	X
Townsend's warbler	*Dendroica townsendi*	X	X	X	X
Blackpoll warbler	*Dendroica striata*	X	X	X	X
Yellow warbler	*Dendroica petechia*	X	X	X	X
Wilson's warbler	*Wilsonia pusilla*	X	X	X	X
Northern waterthrush	*Seiurus noveboracensis*	X	X		X
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	X
Dark-eyed junco	*Junco hyemalis*	X	X	X	X
White-crowned sparrow	*Zonotrichia leucophrys*	X	X	X	X
Golden-crowned sparrow	*Zonotrichia atricapilla*				X
Chipping sparrow	*Spizella passerina*	X	X	X	
American tree sparrow	*Spizella arborea*	X	X	X	X
Fox sparrow	*Passerella iliaca*	X	X	X	X
Lincoln's sparrow	*Melospiza lincolnii*	X	X	X	X
Song sparrow	*Melospiza melodia*	X	X		X
Lapland longspur	*Calcarius lapponicus*	X	X	X	
Snow bunting	*Plectrophenax nivalis*	X	X	X	
Red-winged blackbird	*Agelaius phoeniceus*				X
Rosy finch	*Leucosticte arctoa*				
Rusty blackbird	*Euphagus carolinus*	X	X	X	X
Pine siskin	*Carduelis pinus*	X	X	X	X
Red crossbill	*Loxia curvirostra*				X
White-winged crossbill	*Loxia leucoptera*	X	X	X	X
Pine grosbeak	*Pinicola enucleator*	X	X	X	
Common redpoll	*Carduelis flammea*	X	X	X	X
Hoary redpoll	*Carduelis hornemanni*	X	X	X	

[1]TFTA = Tanana Flats Training Area, YTA = Yukon Training Area, DTA = Donnelly Training Area, FRA = Fort Richardson

Sources: Anderson et al. 2001; USARAK 1999a; USARAK 2002e,f,g

Table 3.9.c Black Bear Baiting Harvest Summary at Tanana Flats and Yukon Training Areas.

Year	# of Registered Hunters	Spring Harvest		Total
		Tanana Flats TA	Yukon TA	
1991	66	N/A	1	1
1992	113	N/A	N/A	3
1993	116	N/A	N/A	3
1994	76	N/A	N/A	4
1995	99	6	4	10
1996	65	4	7	11
1997	86	7	10	17
1998	69	11	2	13
1999	86	20	4	18

N/A = Data not available

Sources: Reidsma 1998, 1999 (Natural Resources Report: FW 98-1 (DEC) FWA ERD)

Table 3.9.d Grizzly Bear Harvest Summary at Tanana Flats and Yukon Training Areas.

Year	Harvest		Total
	Tanana Flats TA	Yukon TA	
1989	None reported	1	1
1990	N/A	N/A	N/A
1991	N/A	1	1
1992	2	1	1
1993	N/A	N/A	N/A
1994	N/A	N/A	N/A
1995	N/A	3	3
1996	N/A	1	1
1997	N/A	N/A	N/A
1998	N/A	2	2
1999	N/A	1	1
2000	None reported	1	1

N/A = Data not available

Source: Steve Reidsma, personal communication 2003

Table 3.9.e Furbearer Harvest at Tanana Flats Training Area.

Year	Muskrat	Beaver	River Otter	Mink	Pine Marten	Weasel	Wolverine	Lynx	Fox	Coyote	Wolf
75/76	0	0	2	6	61	2	3	33	73	0	18
76/77	30	6	7	0	64	12	9	20	32	1	2
77/78	27	10	2	28	0	18	5	10	20	0	0
78/79	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
79/80	0	5	1	14	38	2	0	23	39	1	0
80/81	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
81/82	7	2	0	22	25	3	0	9	85	0	0
82/83	0	6	3	44	88	0	2	35	178	2	1
83/84	5	52	2	40	39	0	3	26	141	0	3
84-86*	0	9	4	47	87	2	4	13	127	1	0
86/87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
87/88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
88/89	N/A	N/A	N/A	3	8	11	1	1	1	N/A	N/A
89/90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
90/91	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
91/92	N/A	21	1	12	88	7	1	46	41	1	1
92/93	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11	8	1	2
93/94	0	4	1	16	20	33	0	4	42	2	5
94/95	0	3	1	3	55	0	2	13	16	1	2
95/96	1	4	0	27	5	11	0	3	26	13	0
96/97	0	3	5	55	108	6	0	15	50	5	12
97/98	0	6	0	65	64	8	2	58	48	4	5
98/99	0	1	3	98	33	21	0	119	47	2	22
99/00	0	1	2	19	113	7	2	249	79	2	22
00/01	0	26	3	20	29	4	2	331	105	13	21

* 1984-86 data was combined.

N/A = Data not available

Source: Steve Reidsma, personal communication 2003

Table 3.9.f Furbearer Harvest at Yukon Training Area.

Year	Muskrat	Beaver	River Otter	Mink	Pine Marten	Weasel	Wolverine	Lynx	Fox	Coyote	Wolf
75/76	4	5	0	1	37	25	0	21	8	0	0
76/77	9	45	0	13	130	41	4	13	30	1	2
77/78	0	20	0	23	106	20	0	5	17	1	1

Table 3.9.f cont. Furbearer Harvest at Yukon Training Area.

Year	Muskrat	Beaver	River Otter	Mink	Pine Marten	Weasel	Wolverine	Lynx	Fox	Coyote	Wolf
78/79	0	12	0	7	151	56	1	5	34	0	3
79/80	0	0	0	13	161	41	0	4	30	0	7
80/81	N/A	N/A	N/A	1	38	9	2	6	21	N/A	N/A
81/82	0	4	0	12	62	8	1	20	35	1	0
82/83	0	0	0	2	44	10	1	16	31	0	1
83/84	0	5	6	2	59	20	1	32	31	0	1
84/86	3	7	0	1	131	22	1	40	76	2	2
86/87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
87/88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
88/89	N/A	N/A	N/A	1	50	6	N/A	5	15	2	2
89/90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
90/91	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
91/92	N/T	N/T	N/T	0	130	N/T	1	17	47	3	1
92/93	1	0	N/T		46	N/T	0	18	18	3	0
93/94	0	0	0	0	123	3	3	16	22	0	2
94/95	N/T	0	0	8	98	0	2	9	21	8	3
95/96	0	3	N/T	22	78	15	2	3	40	7	4
96/97	3	4	0	34	141	56	0	17	50	1	13
97/98	5	4	0	8	45	4	2	31	43	0	3
98/99	0	2	0	32	68	36	0	33	57	6	2
99/00	5	8	0	4	68	13	2	37	52	6	3
00/01	6	4	1	10	68	6	1	22	51	2	4

N/A = Data not available
N/T = Not trapped

Source: Steve Reidsma, personal communication 2003

Table 3.9.g Game Bird and Waterfowl Harvest at Yukon Training Area.

Year	Game Species			
	Grouse	Ptarmigan	Duck	Goose
1990-91	1,270	156	176	0
1991-92	511	214	98	0
1992-93	889	100	79	0
1993-94	1,828	169	79	3
1994-95	3,360	261	112	0
1995-96	2,233	256	150	2
1996-97	2,239	301	76	0

Sources: USARAK 1999; Steve Reidsma, personal communication 2003

Table 3.9.h Fish Stocking for Lakes on Fort Wainwright.

Lake Name	Stocking Plan				Year[1]							
	Finger[2]	Sub[3]	Catch[4]	Brood[5]	1998	1999	2000	2001	2002	2003	2004	2005
Manchu Lake												
Rainbow Trout	X				0	8,600	0	0	0	0	0	0
Rainbow Trout			X		0	0	500	0	500	0	500	0
Arctic Char	X				0	8,600	0	0	0	0	0	0
Arctic Char		X			0	0	0	3,200	0	3,200	0	3,200
River Road Pond												
Grayling			X		300	300	300	300	300	300	300	300
Weigh Station 1 & 2												
Rainbow Trout				X			25	25	25	25	25	25
Rainbow Trout			X				500	500	0	500	0	500
Grayling			X				200	200	200	200	200	200
Chinook Salmon			X				500	500	500	500	500	500
Arcitic Char			X				0	0	500	0	500	0
Monterey Lake												
Rainbow Trout				X			25	25	25	25	25	25
Rainbow Trout			X				1,000	1,000	1,000	1,000	1,000	1,000
Chinook Salmon			X				500	500	500	500	500	500

[1] Years 2002 and beyond are planned stocking rates
[2] Fingerling
[3] Sub-adult
[4] Catchable adult (size exceeds legal minimum)
[5] Brood fish of at least 1-3 years and large size

Source: Alaska Department of Fish and Game 2002b

Table 3.9.i Moose harvest summary (1997-99) at Donnelly Training Area and Gerstle River.

Year	Game Management Sub Unit				
	20 D			20A	
	33 Mile Loop	Delta Junction Management	Gerstle River	West of Delta River	Unknown
1997	25	2	1	9	0
1998	28	8	4	4	4
1999	13	5	6	9	1

Source: Reidsma 1997, 1998, 1999

Table 3.9.j Fish Stocking for Lakes on Donnelly Training Area.

Lake Name	Stocking Plan			Years[1]							
	Finger[2]	Sub[3]	Catch[4]	1998	1999	2000	2001	2002	2003	2004	2005
Bolio											
Rainbow Trout			X	1,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500

Table 3.9.j cont. Fish Stocking for Lakes on Donnelly Training Area.

Lake Name	Stocking Plan			Years[1]							
	Finger[2]	Sub[3]	Catch[4]	1998	1999	2000	2001	2002	2003	2004	2005
Bullwinkle											
Rainbow Trout	X			0	800	0	800	0	0	800	0
Chet											
Rainbow Trout	X			0	1600	0	1600	0	0	1600	0
Rainbow Trout[5]								25	25	25	25
Arctic Char		X						250	0	250	0
Lake Trout		X		250	0	300	250	0	0	250	0
Doc											
Rainbow Trout	X			0	500	0	500	0	0	500	0
Ghost											
Rainbow Trout	X			0	1,000	0	1,000	1,000	0	1,000	0
Grayling	X			0	0	0	0	0	0	0	0
Coho Salmon	X			3,000	0	0	0	0	0	0	0
Arctic Char		X		0	0	0	100	300	0	300	0
Lake Trout		X		300	0	300	0	0	0	0	0
J											
Grayling			X	0	750	0	750	0	750	0	750
Coho Salmon	X			3,000	0	3,000	0	3,000	0	3,000	0
Arctic Char	X	X		0	0	0	100	150	0	150	0
Koole											
Rainbow Trout	X			16,000	16,000	0	20,000	20,000	0	20,000	0
Luke											
Grayling			X	0	400	0	400	0	400	0	400
Mark											
Rainbow Trout	X			0	0	0	3600	3600	0	3600	0
Arctic Char		X		0	0	0	100	100	0	100	0
Coho Salmon	X			3,600	3,600	3,600	0	3,600	3,600	0	3,600
Nickle											
Rainbow Trout	X			0	1,000	0	1,000	1,000	0	1,000	0
Arctic Char				0	0	0	100	100	0	100	0
Grayling			X	0	250	0	250	0	250	0	250
Lake Trout		X		200	0	200	0	0	0	0	0
No Mercy											
Rainbow Trout	X			0	600	0	600	600	0	600	0
North Twin											
Rainbow Trout	X			2,000	2,000	2,000	2,000	2,000	0	2,000	0
Lake Trout		X		600	0	600	0	0	0	0	0

Table 3.9.j cont. Fish Stocking for Lakes on Donnelly Training Area.

Lake Name	Stocking Plan			Years[1]							
	Finger[2]	Sub[3]	Catch[4]	1998	1999	2000	2001	2002	2003	2004	2005
Rockhound											
Rainbow Trout	X			0	600	0	600	600	0	600	0
Sheefish											
Rainbow Trout	X			0	4,000	0	0	0	0	0	0
Arctic Char		X		0	800	0	700	700	0	700	0
Chinook Salmon		X		0	0	400	0	0	0	0	0
Grayling			X	0	400	0	400	0	400	0	400
South Twin											
Rainbow Trout	X			4,000	4,000	0	0	0	0	0	0
Rainbow Trout			X	0	0	0	500	0	500	0	500
Rainbow Trout				0	0	0	25	0	25	0	25
Weazel											
Rainbow Trout	X			1,600	0	1,600	0	1,600	0	1,600	0

[1] Years 2002 and beyond are planned stocking rates
[2] Fingerling. Target size = 2 g rainbow trout; 4 g Coho salmon
[3] Subcatchable. Target size = 40 g Arctic char.
[4] Catchable adult. Target size = 100 g rainbow trout, Chinook salmon, grayling
[5] Brood fish of at least 1-3 years and large size. Target size = 1500 g rainbow trout.
Source: Steve Reidsma, personal communication 2002

Table 3.9.k Fish stocking for waters on Fort Richardson.

Lake Name	Stocking Plan		Years[1]				
	Smolt[2]	Catch[3]	2002	2003	2004	2005	2006
Clunie Lake							
Rainbow Trout		X	4,500	2,500	4,,500	2,500	2,500
Arctic Char		X	4,500	4,500	4,500	4,500	4,500
Chinook Salmon		X	8,000	3,000	3,000	3,000	3,000
Gwen Lake							
Rainbow Trout		X	4,000	5,000	4,000	5,000	4,000
Otter Lake							
Rainbow Trout		X	5,500	6,500	5,500	6,500	5,500
Walden Lake							
Rainbow Trout		X	3,400	3,000	0	1,000	1,000
Ship Creek							
Chinook Salmon	X		315,000	315,000	315,000	315,000	315,000
Coho Salmon	X		225,000	240,000	240,000	240,000	240,000

[1] Years 2002 and beyond are planned stocking rates
[2] Smolt. Target Size = 12 g Chinook salmon; 20 g Coho salmon
[3] Catchable adult. Target size: 100 g rainbow trout, 100 g arctic char, 100 g Chinook salmon
Source: Alaska Department of Fish and Game 2002b

3.10 THREATENED OR ENDANGERED SPECIES AND SPECIES OF CONCERN

Appendix Table 3.10.a Federally Listed Threatened, Endangered, and Delisted Species in the State of Alaska[1].

Status	Listing
Animals (10)	
Endangered	Albatross, short-tailed (*Phoebastria (=Diomedea) albatrus*)
Endangered	Curlew, Eskimo (*Numenius borealis*)
Threatened	Eider, spectacled (*Somateria fischeri*)
Threatened	Eider, Steller's (AK breeding pop.) (*Polysticta stelleri*)
Delisted	Falcon, American peregrine (*Falco peregrinus anatum)*
Delisted	Falcon, Arctic peregrine *(Falco peregrinus tundrius)*
Endangered	Sea turtle, leatherback (*Dermocelys coriacea*)
Endangered	Sea-lion, Steller (western pop.) (*Eumetopias jubatus*)
Threatened	Sea-lion, Steller (eastern pop.) (*Eumetopias jubatus*)
Endangered	Whale, bowhead (*Balaena mysticetus*)
Endangered	Whale, finback (*Balaenoptera physalus*)
Endangered	Whale, humpback (*Megaptera novaeangliae*)
Plants (1)	
Endangered	Fern, Aleutian shield (*Polystichum aleuticum*)

[1]There are currently no federally listed proposed or candidate species in Alaska.

Source: U.S Fish and Wildlife Service 2003.

Appendix Table 3.10.b State of Alaska Listing of Sensitive and Species of Concern with Potential to be Found on USARAK Lands.

Common Name	Scientific Name	Potential to be Found on USARAK Lands
Species of Concern[1]		
Aleutian Canada goose	*Branta canadensis leucopareia*	No
American peregrine falcon	*Falco pereginus anatum*	Occasional FWA, DTA, FRA
Arctic peregrine falcon	*Falco peregrinus tundrius*	No
Northern goshawk (southeast population)	*Accipter gentilis laingi*	Occasional FRA
Spectacled eider	*Somateria fischeri*	No
Steller's eider	*Polysticta stelleri*	No
Olive-sided flycatcher	*Contopus cooperi*	FWA, DTA, FRA
Gray-cheeked thrush	*Catharus minimus*	FWA, DTA, FRA
Townsend's warbler	*Dendroica townsendii*	FWA, DTA, FRA

Appendix Table 3.10.b cont. State of Alaska Listing of Sensitive and Species of Concern with Potential to be Found on USARAK Lands.

Common Name	Scientific Name	Potential to be Found on USARAK Lands
Blackpoll warbler	*Dendroica striata*	FWA, DTA, FRA
Brown bear (Kenai Peninsula population)	*Ursus arctos horribilis*	Possible FRA
Stellar sea lion[2]	*Eumetopias jubatus*	No
Harbor seal	*Phoca vitulina*	Occasional FRA
Beluga whale (Cook Inlet population)	*Delphinapterus leucas*	Occasional FRA
Bowhead whale	*Balaena mysticetus*	No
Sensitive Species[3]		
Trumpeter swan	*Cygnus buccinator*	FWA, DTA, FRA
American osprey	*Pandion haliaetus carolinensis*	FWA, DTA, 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]Stellar sea lion rarely seen in Cook Inlet.

[3]The state designations of threatened and endangered species overlap many federal designations. These two species, found on USARAK lands, have been listed by the U.S. Forest Service as sensitive species since there is concern about their viability (USARAK 1999a; Alaska Natural Heritage Program 1994).

Appendix Table 3.10.c Fort Wainwright's Rare Vascular Plants listed by Alaska Natural Heritage Program.[1]

Taxon	Global Ranking	State Ranking
Alisma triviale	G5	S2
Artemisia laciniata	G5	S2
Carex crawfordii	G5	S2S3
Ceratophyllum demersum	G5	S1S2
Cicuta bulbifera	G5	S1S2
Cryptogramma stelleri	G5	S2S3
Dodecatheon pulchellum ssp. *pauciflorum*	G5T5Q	S2
Lycopus uniflorus	G5	S3
Oxytropis tananensis	G3	S3
Rorippa curvisiliqua	G5	S1
Rosa woodsii	G5	S1S2
Syntheris borealis	G3G4	S3S4

Appendix Table 3.10.c cont. Fort Wainwright's Rare Vascular Plants listed by Alaska Natural Heritage Program.

[1]Alaska Natural Heritage Program Rare Species Global Rankings

- G3 Either very rare and local throughout its range or found locally in a restricted range (typically 21-100 occurrences)
- G4 Apparently secure globally
- G5 Demonstrably secure globally
- G#G# Global rank of species uncertain; best described as a range between the two ranks
- G#T# Global rank of species & variety or subspecies
- G#Q Taxonomically questionable

Alaska Natural Heritage Program Rare Species State Rankings

- S1 Critically imperiled in state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state (typically 5 or fewer occurrences, or very few remaining individuals or acres)
- S2 Imperiled in state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (typically 6 to 20 occurrences, or few remaining individuals or acres)
- S3 Rare or uncommon in the state (typically 21-100 occurrences)
- S4 Apparently secure in state, with many occurrences
- S#S# State rank of species uncertain; best described as a range between the two ranks

Source: Racine et. al 1997

Appendix Table 3.10.d Donnelly Training Area's Rare Vascular Plants listed by Alaska Natural Heritage Program.[1]

Taxon	**Global Ranking**	**State Ranking**
Artemisia laciniata	G5	S2
Carex atratiformis ssp. *raymondii*	G5T5	S2
Carex crawfordii	G5	S2S3
Carex deweyana	G5	S1SE
Carex eburnean	G5	S2S3
Carex sychnocephala	G4	S1
Cryptogramma stelleri	G5	S2S3
Cystopteris montana	G5	S3
Dodecatheon pulchellum ssp. *pauciflorum*	G5T5Q	S2
Draba incerta	G5	S2S3
Draba stenopetala	G3	S3
Festuca brevissima	G3	S3
Glyceria pulchella	G5	S2S3
Phlox hoodii	G5	S1S2
Phlox sibirica ssp. *richardsonii*	G4T2T3Q	S2
Potamogeton obtusifolius	G5	S1
Salix setchelliana	G3G4	S3
Saxifraga adscendens ssp. *oregonensis*	G5T4T5	S2S3
Sisyrinchium montanum	G5	S1

Appendix Table 3.10.d cont. Donnelly Training Area's Rare Vascular Plants listed by Alaska Natural Heritage Program.[1]

Taxon	Global Ranking	State Ranking
Stellaria alaskana	G3	S3
Viola selkirkii	G5?	S3

[1]Alaska Natural Heritage Program Rare Species Global Rankings

- G3 Either very rare and local throughout its range or found locally in a restricted range (typically 21-100 occurrences)
- G4 Apparently secure globally
- G5 Demonstrably secure globally
- G#Q Taxonomically questionable
- G#G# Global rank of species uncertain; best described as a range between the two ranks
- G#T# Global rank of species & variety or subspecies
- ? Inexact
- N Nonbreeding status

Alaska Natural Heritage Program Rare Species State Rankings

- S1 Critically imperiled in state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state (typically 5 or fewer occurrences, or very few remaining individuals or acres)
- S2 Imperiled in state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (typically 6 to 20 occurrences, or few remaining individuals or acres)
- S3 Rare or uncommon in the state (typically 21-100 occurrences)
- S4 Apparently secure in state, with many occurrences
- S#S# State rank of species uncertain; best described as a range between the two ranks

Source: Racine et al. 2000

Appendix Table 3.10.e Rare Vascular Plants at Fort Richardson listed by Alaska Natural Heritage Program.[1]

Taxon	Global Ranking	State Ranking
Anemone multifidia var. *saxicola*	G4G5Q	S2S3
Aphragmus eschscholtzianus	G3	S2S3
Atripex gmillini	G5	SR
Carex deweyana	G5	SE?S1
Douglasia alaskana	G2G3	S2S3
Draba ruaxea	G2G3	S2
Draba stenopetala	G3	S2
Eleocharis kamtschatica	G4	S2
Eleocharis quinquefolia	G5	S1
Eriophorum viridi-carinatum	G5	S2
Glyceria striata	G5T5Q	S2
Hammarbya paludosa	G5	S2
Malaxis monophylla	G5T5	S3S4
Myriophyllum verticillatum	G5	S3
Najas flexilis	G5	S1S2

Appendix Table 3.10.e cont. Rare Vascular Plants at Fort Richardson listed by Alaska Natural Heritage Program.[1]

Taxon	Global Ranking	State Ranking
Oxytropis huddelsonii	G3	S2S3
Papaver alboroseum	G3	S3
Salicornia europaea	G5N	S2
Saxifraga adscendens spp. *oregonensis*	G5T4T5	S2S3
Saxifraga eschscholtzii	G4	S3S4
Smilacina stellata	G5	S2
Stellaria umbellate	G4	S1S2
Taraxacum carneocoloratum	G2Q	S2
Thlaspi arcticum	G3	S3
Viola selkirkii	G5?	S3
Zannichellia palustris	G5	S2S3

[1]Alaska Natural Heritage Program Rare Species Global Rankings

- G3 Either very rare and local throughout its range or found locally in a restricted range (typically 21-100 occurrences)
- G4 Apparently secure globally
- G5 Demonstrably secure globally
- G#Q Taxonomically questionable
- G#G# Global rank of species uncertain; best described as a range between the two ranks
- G#T# Global rank of species & variety or subspecies
- ? Inexact
- N Nonbreeding status

Alaska Natural Heritage Program Rare Species State Rankings

- S1 Critically imperiled in state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state (typically 5 or fewer occurrences, or very few remaining individuals or acres)
- S2 Imperiled in state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (typically 6 to 20 occurrences, or few remaining individuals or acres)
- S3 Rare or uncommon in the state (typically 21-100 occurrences)
- S4 Apparently secure in state, with many occurrences
- S#S# State rank of species uncertain; best described as a range between the two ranks

Source: Lichvar et. al. 1997

Appendix Table 3.10.f Ranking of Ecosystem Management Priority Species at Fort Wainwright.

Species	Rarity	Population Trend	Habitat Specialist	Spatial Distribution	Disturbance Sensitivity	Habitat Importance	Potential Military Impacts	Other Impacts	Game Status	Recovery Potential	Sums
Wolverine	5	3	2	5	5	5	4	2	5	5	41
Brown Bear	4	3	2	5	4	5	4	3	4	4	38
Black Bear	3	3	2	4	4	5	4	3	4	4	36
Gray wolf	3	3	2	5	4	5	4	2	5	3	36
Great Gray Owl	5	3	4	5	2	4	4	3	1	4	35
Little Brown Bat	4	3	4	2	5	3	4	4	1	5	35
Lynx	4	3	2	3	3	4	4	4	5	3	35
Marten	4	3	3	3	2	5	4	4	4	3	35
Meadow Jumping Mouse	4	3	5	5	4	1	4	4	1	4	35
Olive-sided Flycatcher	4	4	2	4	3	5	4	4	1	4	35
Apocynum androsaemifolium	3	3	4	4	3	4	4	4	1	4	34
Boreal Owl	4	3	2	4	3	5	4	4	1	4	34
Chinook Salmon	2	4	4	3	3	4	2	4	5	3	34
Common Loon	4	4	4	4	5	4	2	2	1	4	34
Northern Goshawk	4	3	2	4	4	5	4	4	1	3	34
Dodecatheon pulchellum pauciflorum	3	3	3	4	4	4	4	4	1	3	33
Festuca lenensis	4	3	4	4	4	5	2	2	1	4	33
Minuartia yukonensis	5	3	5	4	3	5	2	1	1	4	33
Sandhill Crane	4	2	2	2	4	4	4	4	4	3	33
Chum Salmon	2	4	3	2	3	4	2	4	3	3	30
Arctic Grayling	2	3	4	1	2	4	2	4	5	1	28
Moose	3	3	2	3	2	1	4	2	5	3	28
Ruffed Grouse	2	3	3	1	2	1	4	4	5	1	26

1 = low priority or concern; 5 = high priority or concern

Source: USARAK Ecosystem Management Team 2002

Appendix Table 3.10.g Ranking of Ecosystem Management Priority Species at Donnelly Training Area.

Species	Rarity	Population Trend	Habitat Specialist	Spatial Distribution	Disturbance Sensitivity	Importance of Habitat	Potential Military Impacts	Potential Land Management Impacts	Game Status	Recovery Potential	Sums
Wolverine	5	3	2	5	5	5	4	2	5	5	41
Brown Bear	4	3	2	5	4	5	4	3	4	4	38
Black Bear	3	3	2	4	4	5	4	3	4	4	36
Gray Wolf	3	3	2	5	4	5	4	2	5	3	36
Great Gray Owl	5	3	4	5	2	4	4	3	1	4	35
Olive-sided Flycatcher	4	4	2	4	3	5	4	4	1	4	35
Caribou	4	3	3	4	2	5	4	2	5	3	35
Little Brown Bat	4	3	4	2	5	3	4	4	1	5	35
Lynx	4	3	2	3	3	4	4	4	5	3	35
Marten	4	3	3	3	2	5	4	4	4	3	35
Meadow Jumping Mouse	4	3	5	5	4	1	4	4	1	4	35
Boreal Owl	4	3	2	4	3	5	4	4	1	4	34
Northern Goshawk	4	3	2	4	4	5	4	4	1	3	34
Carex sychnocephala	5	3	5	4	4	4	2	2	1	4	34
Sandhill Crane	4	2	2	2	4	4	4	4	4	3	33
Dall's Sheep	3	3	3	3	4	5	3	1	5	3	33
Dodecatheon pulchellum ssp. pauciflorum	3	3	3	4	4	4	4	4	1	3	33
Townsend's Warbler	3	4	3	3	2	5	4	4	1	3	32
White-winged Crossbill	4	3	3	3	2	5	4	4	1	3	32
Bison	4	3	3	3	3	2	4	2	5	3	32
Northern Water Shrew	4	3	4	4	3	3	3	3	1	4	32
Glyceria pulchella	3	3	5	4	4	5	2	1	1	4	32
Golden Eagle	4	4	3	3	3	5	2	2	1	4	31
Willow Ptarmigan	3	3	3	3	2	5	3	2	5	2	31
Cryptogramma stelleri	3	3	4	4	3	4	3	2	1	4	31
Draba incerta	3	3	4	4	4	5	2	1	1	4	31
Gyrfalcon	5	3	2	4	4	4	2	2	1	3	30
Merlin	4	3	2	3	3	5	4	2	1	3	30
Northern Shrike	4	3	2	4	2	5	3	3	1	3	30
Osprey	4	3	3	4	4	4	2	2	1	3	30
Smith's Longspur	4	3	4	4	3	5	2	1	1	3	30
Whimbrel	3	4	3	2	4	5	3	2	1	3	30
Collared Pika	3	3	4	4	2	5	2	3	1	3	30

Appendix Table 3.10.g cont. Ranking of Ecosystem Management Priority Species at Donnelly Training Area.

Species	Rarity	Population Trend	Habitat Specialist	Spatial Distribution	Disturbance Sensitivity	Importance of Habitat	Potential Military Impacts	Potential Land Management Impacts	Game Status	Recovery Potential	Sums
Artemisia laciniata	3	3	3	4	3	4	3	2	1	4	30
Blackpoll Warbler	4	4	3	3	3	3	3	3	1	2	29
Hammond's Flycatcher	3	3	3	2	2	5	4	4	1	2	29
Trumpeter Swan	4	2	4	4	3	4	2	2	1	3	29
Northern Bog Lemming	3	3	4	4	2	4	2	3	1	3	29
Carex eburnean	3	3	4	4	2	4	2	2	1	4	29
Bald Eagle	4	2	3	4	3	4	2	2	1	3	28
Moose	3	3	2	3	2	1	4	2	5	3	28

1 = low priority or concern; 5 = high priority or concern

Source: USARAK Ecosystem Management Team 2002

Appendix Table 3.10.h Ecosystem Management Priority Species at Fort Richardson.

Species	Rarity	Population Trend	Habitat Specialization	Spatial Distribution	Disturbance Sensitivity	Importance of Habitat	Potential Military Impacts	Potential Land Management Impacts	Game Status	Recovery Potential	Sums
Wolverine	5	4	2	5	5	5	4	2	5	5	42
Beluga Whale	5	5	4	4	4	5	3	3	3	5	41
Brown Bear	4	3	2	5	4	5	4	3	4	4	38
Viola selkirkii	5	3	2	4	5	4	4	4	1	4	36
Black Bear	3	3	2	4	4	5	4	3	4	4	36
Marten	4	3	3	3	2	5	4	4	4	3	35
Lynx	3	3	3	3	3	4	4	4	5	3	35
Gray Wolf	3	3	2	4	4	5	4	2	5	3	35
Dall's Sheep	3	3	4	4	4	5	3	1	5	3	35
Olive-sided Flycatcher	4	4	2	4	3	5	4	4	1	4	35
Great Gray Owl	5	3	4	5	2	4	4	3	1	4	35
Common Loon	4	4	5	4	5	4	2	2	1	4	35
Taraxacum carneocoloratum	5	3	4	4	5	4	2	2	1	4	34
Saxifraga adscendens ssp. oregonensis	5	3	4	4	5	4	2	2	1	4	34
Meadow Jumping Mouse	4	3	4	4	4	3	4	4	1	3	34
Little Brown Bat	3	3	4	2	5	3	4	4	1	5	34
Alaska Tiny Shrew	5	3	3	5	2	5	2	3	1	5	34

Appendix Table 3.10.h Ecosystem Management Priority Species at Fort Richardson.

Species	Rarity	Population Trend	Habitat Specialization	Spatial Distribution	Disturbance Sensitivity	Importance of Habitat	Potential Military Impacts	Potential Land Management Impacts	Game Status	Recovery Potential	Sums
Sandhill Crane	4	2	3	2	4	4	4	4	4	3	34
Pacific Loon	3	3	4	2	4	5	4	4	1	4	34
Boreal Owl	4	3	2	4	3	5	4	4	1	4	34

1 = low priority or concern; 5 = high priority or concern

Source: USARAK Ecosystem Management Team 2002

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3.11 FIRE MANAGEMENT

Appendix Table 3.11.a Fires ≥ 100 Acres on Tanana Flats Training Area.

Date	Alaska Fire Service #	Fire Name	Acres	Cause [1]	Management Option
09/05/1957	200	Eielson	360	Unknown	N/A
06/10/1958	29	Quartz Lake	120	Lightning	N/A
05/27/1963	19	Eielson N20	160	Human	N/A
07/10/1966	Z85	Salcha Military	20,000	Human	N/A
07/23/1968	Z82	Redmond Creek	2,000	Lightning	N/A
04/29/1969	9364	35 Mile Richardson	280	Human	N/A
06/21/1969	9476	Ninety Eight	56,640	Lightning	N/A
06/10/1969	9431	Bluff Ridge	4,590	Human	N/A
06/10/1976	8559	EIL NE 20	5,200	Human	N/A
07/20/1976	8648	Military 3	100	Human	N/A
06/19/1981	69	111069	600	Human	N/A
06/19/1981	8630	Blair NE 6	1,900	Human	N/A
05/15/1984	A012	412018	120	Human	N/A
06/30/1986	A138	Caribou	3,800	Lightning	Moderate
06/15/1986	A076	Rapid Creek	4,630	Lightning	Full
06/16/1986	A083	FBK E 35	200	Human	Unplanned
06/27/1990	A128	Not given	880	Human	Unplanned
07/17/1990	Not Assigned [2]	Not given	1,820	Lightning	Moderate
06/18/1991	B306	Not given	1,000	Human	Unplanned
06/20/1991	B323	Not given	100	Human	Unplanned
08/05/1992	A454	Not given	200	Human	Unplanned
07/16/1993	B580	Butte Creek	840	Lightning	Limited
06/27/1997	B407	Midway	400	Recurrent	Full
07/02/1997	B462	Butte Creek	4,222	Lightning	Moderate
06/05/1997	B262	Brigadier	940	Human	Full
06/04/1998	A334	Crooked	857	Lightning	Limited
04/28/1999	B028	Small Arms Range	409	Human	Limited
07/05/1999	B413	McCoy Creek	5,100	Lightning	Limited
06/13/2000	A232	Beaver Creek	3,379	Lightning	Limited
06/20/2001	B247	Survey Line	112,112	Unknown	Limited
06/23/2001	B247	Tractor Trail	3,257	Unknown	Limited

N/A = Not Applicable

[1] Other, Military, Recreation, Incendiary, and Blasting categories were changed to Human.
[2] State Fire # 11163.

Source: Tammy DeFries, personal communication 2002

Appendix Table 3.11.b Fires ≥ 100 Acres on Fort Wainwright Yukon Training Area.

Date	Alaska Fire Service #	Fire Name	Acres	Cause[1]	Management Option
9/06/1957	202	Colorado Roadhouse	1,800	Human	N/A
9/05/1957	200	Eielson	360	Human	N/A
6/01/1958	32	Chena Dome	50,000	Lightning	N/A
6/18/1959	50	Eielson	7,080	Lightning	N/A
5/27/1963	19	Eielson N20	160	Human	N/A
6/10/1976	8559	EIL NE 20	5,200	Human	N/A
6/16/1986	A083	FBK E 35	200	Human	Unplanned
6/23/1987	B078	Eielson	10,960	Lightning	Unplanned
6/27/1990	A128	Not given	880	Human	Unplanned
6/18/1991	B306	Not given	1,000	Human	Unplanned
6/20/1991	B323	Not given	100	Human	Unplanned
6/28/1991	B508	Not given	220	Human	Unplanned
8/05/1992	A454	Not given	200	Human	Unplanned
6/05/1999	B176	Engineer Hill	273.6	Human	Full
6/24/2000	A280	Beaver Creek	1,159	Lightning	Limited
6/13/2000	A232	Beaver Creek	3,379	Lightning	Limited
05/18/01	B087	South Fork 2	369	Human	Limited
07/19/01	B341	South Fork 3	150	Human	Limited

N/A = Not Applicable

[1] Other, Military, Recreation, Incendiary, and Blasting categories were changed to Human.

Source: Tammy DeFries, personal communication 2002

Appendix Table 3.11.c Fires ≥ 100 Acres on Donnelly Training Area.

Date	Alaska Fire Service #	Fire Name	Acres	Cause [1]	Management Option
06/14/1956	45	Walsh	8,000	Human	N/A
07/08/1963	72	Delta Creek 2	130	Lightning	N/A
06/23/1971	8656	Iowa C	17,500	Lightning	N/A
07/27/1971	8856	Strafi	227	Human	N/A
06/16/1981	57	111057	1,200	Lightning	N/A
05/09/1983	8480	313001, Big W 17	35,450	Human	N/A
04/27/1984	A003	41.... , FBK SE 66	100	Human	N/A
06/17/1986	A085	632026	200	Human	Full
05/20/1990	A009	Not given	100	Lightning	Unplanned
06/28/1990	A132	Not given	7,000	Human	Unplanned
06/28/1990	A133	Not given	16,640	Human	Unplanned

Appendix Table 3.11.c cont. Fires ≥ 100 Acres on Donnelly Training Area.

Date	Alaska Fire Service #	Fire Name	Acres	Cause [1]	Management Option
05/06/1992	A034	Not given	1,410	Human	Unplanned
05/06/1992	A035	Not given	960	Human	Unplanned
05/10/1996	A145	Hillbilly Lake	14,200	Human	Limited
05/29/1996	A321	100 Mile Creek	66,560	Human	Limited
06/07/1996	A416	Observation Post 27	2,000	Human	Moderate
06/13/1997	B320	Oklahoma	2,500	Lightning	Limited
05/21/1998	A188	Carla Lake	53,720	Lightning	Full
04/23/1998	A043	Simpsonville	357	Human	Limited
09/23/1999	B222	Donnelly Flats	18,720	Human	Full
05/09/2001	B049	Winter Ridge	110	Human	Limited
09/24/2001	B374	Deluth	2,110	Human	Limited
09/27/2001	B376	Hillbilly	1,475	Human	Limited

N/A = Not Applicable

[1] Other, Military, Recreation, Incendiary, and Blasting categories were changed to Human.

Source: Tammy DeFries, personal communication 2002

Appendix Table 3.11.d Fires > 1 Acre on Fort Richardson.

Date	Alaska Fire Service #	Fire Name	Acres	Cause [1]	Management Option
06/06/1956	31	Eagle River #2	2	Human	N/A
07/08/1958	67	Beach Lake	25	Human	N/A
04/19/1969	9078	Mile 15	2	Human	N/A
06/05/1970	9191	Fire Lake	5	Human	N/A
06/20/1989	B038	Not assigned	5	Human	Full
08/13/1993	Not assigned	Fort Rich Br	5.3	Human	Full
05/13/1999	B075	Bravo	5	Human	Full
05/12/2000	A079	Small Arms	1	Human	Full

N/A = Not Applicable

[1] Other, Military, Recreation, Incendiary, and Blasting categories were changed to Human.

Source: Tammy DeFries, personal communication 2002

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3.12 CULTURAL RESOURCES

Interior Alaska 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 environment during the Wisconsin Ice Age set the stage for this long habitation period. At that time the region was a treeless steppe-tundra environment, supporting migrating herds of grazing animals, such as bison, horse, and mammoth that these early peoples successfully preyed upon (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. It is generally limited to lithic (stone) artifacts such as projectile points, cutting tools, scrapers, waste flakes from the manufacturing of these tools, and hearths. Archeologists generally divide Interior Alaska's prehistory into three broad archeological 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

The Paleoarctic Tradition represents the earliest human group known to inhabit Alaska. They camped on terraces, buttes, and bluffs using high ground to locate and track their prey that included large mammals such as mammoth and bison. The treeless environment and nomadic nature of these peoples had a direct impact on the kind of tools they fashioned. Stone, bone, antler, and ivory provided the most abundant material for manufacturing weapons and cutting tools. Artifacts associated with this culture include small stone microblades and microblade cores. No sites that can be assigned to this time period have been found on the Main Post.

Northern Archaic Tradition

The Northern Archaic Tradition appeared about 6,000 years ago as an adaptation to the forest environment of Interior Alaska and may have persisted until about 1,000 years ago. The appearance of side notched projectile points, a diagnostic tool type for the tradition, indicates that the development of the Northern Archaic culture was related to the expansion of the boreal forest. Artifact assemblages associated with this culture generally contain some, but not all of a variety of tools ranging from bifacial knives and microblades to end scrapers and side notched points. No sites that can be assigned to this period have been found on the Main Post.

Athabascan Tradition

Athabascans are generally divided linguistically and geographically into subgroups that inhabit or have inhabited Interior Alaska and Canada. Linguistic evidence suggests that the Athabascan culture may have appeared in the Tanana Valley as early as 2,500 years ago. Through ethnography, oral history and a broad array of cultural items, much has been learned about Athabascan culture and history in the region (Clark 1981).

In the Tanana Valley there are four such groupings; the Upper Tanana, Tanacross, Tanana and Koyukon. These are further divided according to geographic location. The Salcha, Chena, Wood River, Goodpaster, and Healy Lake bands are identified according to certain cultural

characteristics and geographic areas they have traditionally inhabited. Bands of the Tanana subgroups are historically associated with the geographic area that embodies Fort Wainwright Main Post. The Chena band had inhabited the region since protohistoric times and probably from prehistoric times (Andrews 1975).

Athabascan settlement patterns depended greatly on the availability of subsistence resources. Interior bands lived a nomadic lifestyle, depending to a greater extent on terrestrial animals for sustenance. They often traversed vast areas to support themselves and spent much of the winter engaged in subsistence activities (Reckord 1983). It was often necessary for bands to divide into smaller groups to find game. Salmon runs on the Tanana River were smaller, shorter, and less varied and did not form a major subsistence resource. Fish supplemented their diet during the lean winter months when finding game animals was most difficult (Andrews 1975).

Interior Alaska 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), The Gold Rush (1880s-1928), Development of Transportation and Communication Networks (1890s-1910s), and Military Activities (1890s-Present).

Early Contact, 1810s-1880s

Russian fur traders entered Interior Alaska from the south in the 1810s, establishing a post at Taral on the Copper River, and from the west in the 1830s, establishing a post at Nulato on the Yukon River (Hanable 1982). British traders from the east established Fort Yukon where the Porcupine River joins the Yukon River in 1847. Trade goods from Nulato may have made it to Tanana Athabascans through Native middlemen and then to groups further up the Tanana. Goods from the Copper River post may have been traded to Upper Tanana Athabascans by the Ahtna and then to groups further down the Tanana.

Contact between Tanana Athabascans and white traders increased after the 1860s. The Salcha traded with Russian and British traders at Nuklukayet (modern day Tanana) during the 1860s. With the U.S. purchase of Alaska in 1867, control of trading stations and the fur trade passed to Americans. Through the 1880s American traders established several posts on the Yukon and Tanana Rivers, including locations at Nuklukayet, Belle Isle (modern day Eagle), and Fort Yukon (Dixon et al. 1980).

As they became increasingly dependent on traders, Natives began to live a more sedentary lifestyle. Guns allowed them to obtain game with greater efficiency. Clothing, staples, tools, and other necessities could be obtained through trade. They began to abandon their traditional seasonal hunting rounds for more permanent settlements.

Several village sites associated with the early contact period have been reported near Fort Wainwright Main Post; two just northwest of the Fort’s boundary and one near Fairbanks (Reynolds 1986).

The Gold Rush, 1880s-1928

In 1886 gold was discovered at Franklin Creek and Chicken Creek on the Fortymile River, bringing several hundred white settlers into the Tanana region. In 1894 gold was discovered on Birch Creek and Circle City was established, bringing another influx of settlers to the region northeast of present day Fairbanks. Prospectors used a trail established by the Salcha band to gain

access to the Tanana Valley from Circle City (Andrews 1975). It is likely that the first settlers established themselves in the Tanana Valley at this time.

A trading post was established at Chena at the confluence of the Chena and Tanana Rivers in 1900. In 1902, E.T. Barnette established a trading post at the future town site of Fairbanks. That same year, Felix Pedro, a prospector from Circle City, discovered gold on Pedro Creek, north of Fairbanks. In 1903, John E. Bonnifield struck gold southwest of Fairbanks. Barnette spread word of Pedro's discovery and a stampede ensued. Within six years the population of Fairbanks swelled to over 15,000 (Naske and Rowinski 1981).

Most mining activities occurred on creeks to the north of Fairbanks. These activities centered around two types of gold deposits: placer and lode. Easily accessible placer gold deposits were exhausted by 1910. Capital intensive technologies such as dredging were needed to extract remaining placer deposits. The first dredge was established near Fairbanks in 1911. Large scale dredging did not begin until completion of the Alaska Railroad in 1923 made it possible to transport necessary equipment cost effectively (City of Fairbanks and FNSB Historic Preservation Commission 1995). No sites associated with early mining have been found on Main Post (Neely 2001).

Development of Transportation and Communication Networks, 1890s-1910s

Riverboat was the primary means of getting people and supplies into the Interior during the early years. Riverboats traveled up the Yukon River from St. Michael on the Bering Sea, to the Tanana River and down the Yukon River from the White Pass & Yukon railhead at Whitehorse, to the Tanana River. Boats traveled to Fairbanks from June 1 through mid October (Matheson and Haldeman 1981).

The U.S. Army developed the Valdez-Fairbanks Trail as an overland trail. It began as a military trail built in 1899 by Captain William Abercrombie from Valdez to Eagle. With the establishment of Fairbanks in 1904 a branch of the trail was extended north from Gulkana to Fairbanks. In succeeding years the trail was upgraded to a wagon road and in 1913 the first automobiles used the road. Roadhouses along the route catered to the pioneers. The original Valdez/Fairbanks Trail crossed the Main Post and followed what is now Gaffney Road (Neely 2002).

Appendix Table 3.12.a Archaeological Surveys of Fort Wainwright Main Post.

Year	Researcher	Survey Location	Results
1979	Dixon et. al	South slope of Birch Hill	Sites found
1982	Steele	Range Control Headquarters Building	No archaeological sites found
1983	Steele	Borrow Areas	No archaeological sites found
1983	Reynolds	Borrow Areas	No archaeological sites found
2001	Sackett	Biathlon Range, Birch Hill	No archaeological sites found

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.b Archaeological Inventory of Fort Wainwright Main Post.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
FAI-00040	Site	Unknown	Not Evaluated
FAI-00041	Site	Unknown	Not Evaluated
FAI-00042	Site	Unknown	Not Evaluated
FAI-00043	Site	Denali	Not Eligible
FAI-00199	Site	Unknown	Not Evaluated
FAI-00200	Site	Unknown	Not Evaluated

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.c Ladd Field National Historic Landmark Inventory.

AHRS #	Bldg #	Name
FAI-00448	1021	Nurses Quarters
FAI-00449	1024	Radio Station
FAI-00451	1043	North Post Chapel
FAI-00452	1045	Murphy Hall
FAI-00502	1046	Garage
FAI-00453	1047	7 Apartments-Officers
FAI-00446	1048	Commander's Quarters
FAI-00454	1049	12 Apartments – NCO
FAI-00455	1050	Post Office
FAI-00456	1051	14 Apartments – NCO
FAI-00463	1533	Butler Building
FAI-00464	1534	Butler Building
FAI-00465	1537	Butler Building
FAI-00533	1538	Butler Building
FAI-00510	1539	Butler Building
FAI-00466	1540	Butler Building
FAI-00467	1555	Hospital/Barracks
FAI-00468	1556	Jitney Garage
FAI-00469	1557	Hangar No. 1
FAI-00470	1558	Airfield Operations
FAI-00471	1560	Service Club
FAI-00472	1562	Quartermasters
FAI-00478	2085	Hangar No. 6
FAI-00482	3005	Hangar No. 3
FAI-00483	3006	Butler Building
FAI-00485	3008	Hangar No. 2
FAI-00486	3009	Butler Building

Appendix Table 3.12.c cont. Ladd Field National Historic Landmark Inventory.

AHRS #	Bldg #	Name
FAI-00487	3018	Butler Building
FAI-00488	3019	Butler Building
FAI-00489	3020	Butler Building
FAI-00490	3021	Butler Building
FAI-00491	3022	Butler Building
FAI-00492	3028	Butler Building
FAI-00465	3203	Type 49 Ammo Igloo
	N/A	North Apron/Taxiway
	N/A	North Runway
	N/A	South Runway
	N/A	South Apron/Taxiway

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.d Ladd Field Air Force Base National Historic District.

AHRS #	Bldg #	Description
FAI-01248	1001	Barracks
FAI-01249	1004	Barracks
FAI-00448	1021	Personnel Services
FAI-00449	1024	OPS Management Training
FAI-01251	1040	BOQ 5
FAI-01252	1041	BOQ 4
FAI-01253	1042	BOQ 3
FAI-00451	1043	Protestant Chapel
FAI-00452	1045	VIP Housing
FAI-00453	1047	Officers Quarters
FAI-00446	1048	Commanders Quarters
FAI-00454	1049	NCO Quarters
FAI-00455	1050	Postal Warehouse
FAI-00456	1051	NCO Quarters
FAI-01254	1053	Electric Shop
FAI-01255	1054	Motor Pool #2
FAI-00457	1059	Motor Pool Gate Check
FAI-01257	1060	Air Defence Command Center
FAI-00533	1538	Special Investigation Transportation
FAI-00503	1541	Airways & Air Comm. Services
FAI-00467	1555	Headquarters
FAI-00468	1556	Reciprocal Engine Shop

Appendix Table 3.12.d cont. Ladd Field Air Force Base National Historic District.

AHRS #	Bldg #	Description
FAI-00469	1557	Hangar No. 1
FAI-00471	1560	Bowling Alley No. 2
FAI-00472	1562	Air Force Service Stores Dept. No. 4
FAI-01258	1565	Refueling Maintenance Shop
FAI-012	1579	BOM Warehouse Dept. No. 1
FAI-00	1595	Machine Shop
FAI-00504	2077	Hangars No. 7 & 8
FAI-01259	2079	Flight Communications Section
FAI-00478	2085	Hangar No. 6
FAI-01260	2104	Falcon Missile Section
FAI-00505	2106	Hangars No. 4 & 5
FAI-01261	2107	Flight Synthetic Trainer
FAI-01230	2201	Ordnance Storage
FAI-01231	2202	Ordnance Storage
FAI-01232	2203	Ordnance Storage
FAI-01233	2204	Ordnance Storage
FAI-01234	2205	Ordnance Storage
FAI-01235	2206	Ordnance Storage
FAI-01236	2207	Ordnance Storage
FAI-00482	3005	Hangar No. 3
FAI-00483	3006	Maintenance Transportation
FAI-00485	3008	Hangar No. 2
FAI-00486	3009	Wood Shop
FAI-00487	3018	Warehouse No. 4
FAI-00488	3019	Air Force Service Stores Dept. No. 2
FAI-00489	3020	Air Force Service Stores Dept. No. 3
FAI-00490	3021	Warehouse No. 7
FAI-00491	3022	Warehouse No. 8
FAI-01279	3595	Power and Heating Plant
FAI-01263	3700	Golden North Service Club, U.S. Army
FAI-01264	3701	BX Branch No. 3 (Main Store)
FAI-01265	3706	Barracks
FAI-01266	3707	HQ SQ Section
FAI-01267	3708	Barracks
FAI-01268	3711	Barracks
FAI-01269	3712	HQ SQ Section

Appendix Table 3.12.d cont. Ladd Field Air Force Base National Historic District.

AHRS #	Bldg #	Description
FAI-01270	3713	Barracks
FAI-01271	3716	Barracks
FAI-01272	3717	Dining Hall No. 3
FAI-01273	3718	Barracks
FAI-01274	3719	Barracks
FAI-01275	3720	Barracks
FAI-01276	3721	Barracks
FAI-01277	3722	Clothing Store
FAI-01278	3723	Barracks
FAI-01244	N/A	North Runway
FAI-01245	N/A	South Runway
FAI-01246	N/A	North Taxiway
N/A	N/A	South Taxiway/Apron

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.e Archaeological Surveys on Tanana Flat Training Area.

Year	Researcher	Survey Location	Results
1973	Frizzera	Blair Lakes	Located 3 sites
1979	Dixon et. al	Blair Lakes, Clear Creek Butte, and Wood River Butte	

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.f Archaeological Inventory of Tanana Flats Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
FAI-00044	Site	Denali	Eligible
FAI-00045	Site	Denali/N. Archaic/Athabascan	Eligible
FAI-00048	Site	Unknown	Eligible
FAI-00049	Site	Unknown	Eligible
FAI-00171	Site	Denali/Northern Archaic	Eligible
FAI-00177	Site	Northern Archaic	Eligible
FAI-00182	Site	Denali	Eligible
FAI-00194	Site	Denali	Eligible
FAI-00195	Site	Denali/Northern Archaic	Eligible
FAI-00196	Site	Northern Archaic	Eligible
FAI-00197	Site	Denali/Northern Archaic	Eligible
FAI-00198	Site	Northern Archaic	Eligible
FAI-00057	Site	Euro-American	Not Eligible
FAI-00058	Site	Euro-American	Not Eligible

Appendix Table 3.12.f cont. Archaeological Inventory of Tanana Flats Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
FAI-00059	Site	Unknown	Not Eligible
FAI-00060	Site	Unknown	Not Eligible
FAI-00172	Site	Unknown	Not Eligible
FAI-00173	Site	Denali	Not Eligible
FAI-00174	Site	Unknown	Not Eligible
FAI-00175	Site	Unknown	Not Eligible
FAI-00176	Site	Unknown	Not Eligible
FAI-00178	Site	Unknown	Not Eligible
FAI-00179	Site	Unknown	Not Eligible
FAI-00180	Site	Unknown	Not Eligible
FAI-00181	Site	Unknown	Not Eligible
FAI-00183	Site	Denali	Not Eligible
FAI-00184	Site	Unknown	Not Eligible
FAI-00185	Site	Northern Archaic	Not Eligible
FAI-00186	Site	Unknown	Not Eligible
FAI-00187	Site	Unknown	Not Eligible
FAI-00188	Site	Unknown	Not Eligible
FAI-00189	Site	Unknown	Not Eligible
FAI-00190	Site	Unknown	Not Eligible
FAI-00191	Site	Unknown	Not Eligible
FAI-00192	Site	Unknown	Not Eligible
FAI-00193	Site	Denali	Not Eligible
FAI-00047	Site	Denali	Not Evaluated
FAI-00050	Site	Unknown	Not Evaluated
FAI-00054	Site	Unknown	Not Evaluated
FAI-00055	Site	Unknown	Not Evaluated
FAI-00087	Site	Unknown	Not Evaluated
FAI-00088	Site	Unknown	Not Evaluated
FAI-00170	Site	Unknown	Not Evaluated

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.g Archaeological Surveys of Yukon Training Area.

Year	Researcher	Survey Location	Results
1978	Homes		Located 10 sites
1999	Higgs		

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.h Archaeological Inventory of Yukon Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
XBD-00093	Site	Unknown	Not Eligible
XBD-00094	Site	Unknown	Not Eligible
XBD-00095	Site	Unknown	Not Eligible
XBD-00103	Site	Unknown	Not Eligible
XBD-00104	Site	Unknown	Not Eligible
XBD-00105	Site	Unknown	Not Eligible
XBD-00111	Site	Unknown	Not Evaluated
XBD-00162	Site	Unknown	Not Evaluated

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.i Archaeological Surveys of Donnelly Training Area.

Year	Researcher	Survey Location	Results
1967	Frederick West	Donnelly and Delta moraine topography, SE corner Donnelly Training Area.	Found 20 sites
1977	Rabich and Reger	Fort Greely cantonment entrance	Found one site; artifacts included retouched flakes, endscrapers, burin spalls, wedge-shaped cores, and micro-core debitage.
1978	Bacon	XM-1 Tank Range adjacent to Meadows Road.	No archaeological resources found.
1978	Holmes	Systematic archaeological survey encompassing large areas of Ft Greely.	Identified 60 archaeological sites; majority of these sites (52) were surface finds with remaining 8 found through sub-surface testing.
1979	Bacon and Holmes	Reconnaissance survey of Fort Greely Cantonment.	Located two sites, and conducted test excavations at 4 others.
1980	Bacon	Development sites (11) in the Cantonment area	No archaeological sites found.
1980	Steele	Surveyed proposed Bison Trail, Squad Assault Range, Bolio Lake powerline extension, and the M-16 Record Fire Range.	Three sites were located.
1982	Steele	Material source on west slope of Donnelly Dome	No archaeological sites found
1983	Steele	Texas Range powerline extension.	Shovel testing revealed one site.
1993	Staley	SR6 Molybdenum Ridge and Donnelly Dome	No archaeological sites found.
1999	Northern Land Use Research, Inc.	Arctic Creek uplands, Dinosaur Ridge highlands, Upper Delta Creek lowlands, Little Delta River Glaciated highlands, Delta River lowlands, Jarvis Creek lowlands, Delta River floodplain, Creek Glaciated lowlands, Jarvis Creek Glaciated highlands	Located 16 sites.
2001	Neely and Price		No archaeological sites found.

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.j Archaeological Inventory of Donnelly Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
XBD-00033	Site	Unknown	Eligible
XBD-00106	Site	Unknown	Eligible
XBD-00110	Site	Unknown	Eligible
XMH-00004	Site	Denali	Eligible
XMH-00005	Site	Denali	Eligible
XMH-00006	Site	Denali	Eligible
XMH-00007	Site	Denali	Eligible
XMH-00008	Site	Denali	Eligible
XMH-00009	Site	Denali	Eligible
XMH-00010	Site	Denali	Eligible
XMH-00011	Site	Denali	Eligible
XMH-00019	Site	Denali	Eligible
XMH-00020	Site	Denali	Eligible
XMH-00294	Site	Denali	Eligible
XMH-00295	Site	Denali	Eligible
XMH-00297	Site	Unknown	Eligible
XMH-00379	Site	Unknown	Eligible
XMH-00388	District	Denali	Eligible
XMH-00016	Site	Unknown	Not Eligible
XMH-00018	Site	Unknown	Not Eligible
XMH-00023	Site	Unknown	Not Eligible
XMH-00232	Site	Unknown	Not Eligible
XMH-00233	Site	Unknown	Not Eligible
XMH-00234	Site	Unknown	Not Eligible
XMH-00235	Site	Unknown	Not Eligible
XMH-00236	Site	Unknown	Not Eligible
XMH-00237	Site	Unknown	Not Eligible
XMH-00238	Site	Unknown	Not Eligible
XMH-00268	Site	Unknown	Not Eligible
XMH-00269	Site	Unknown	Not Eligible
XMH-00270	Site	Unknown	Not Eligible
XMH-00273	Site	Unknown	Not Eligible
XMH-00274	Site	Unknown	Not Eligible
XMH-00276	Site	Unknown	Not Eligible
XMH-00282	Site	Unknown	Not Eligible
XMH-00283	Site	Unknown	Not Eligible

Appendix Table 3.12.j cont. Archaeological Inventory of Donnelly Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
XMH-00285	Site	Unknown	Not Eligible
XMH-00286	Site	Unknown	Not Eligible
XMH-00287	Site	Unknown	Not Eligible
XMH-00288	Site	Unknown	Not Eligible
XMH-00291	Site	Unknown	Not Eligible
XMH-00296	Site	Unknown	Not Eligible
XMH-00298	Site	Unknown	Not Eligible
XMH-00301	Site	Unknown	Not Eligible
XMH-00302	Site	Unknown	Not Eligible
XMH-00309	Site	Unknown	Not Eligible
XMH-00314	Site	Unknown	Not Eligible
XMH-00318	Site	Unknown	Not Eligible
XMH-00325	Site	Unknown	Not Eligible
XBD-00107	Site	Unknown	Not Evaluated
XBD-00108	Site	Unknown	Not Evaluated
XBD-00109	Site	Unknown	Not Evaluated
XBD-00187	Site	Unknown	Not Evaluated
XBD-00189	Site	Unknown	Not Evaluated
XMH-00001	Site	Denali	Not Evaluated
XMH-00012	Site	Unknown	Not Evaluated
XMH-00017	Site	Unknown	Not Evaluated
XMH-00021	Site	Unknown	Not Evaluated
XMH-00022	Site	Unknown	Not Evaluated
XMH-00253	Site	Unknown	Not Evaluated
XMH-00265	Site	Unknown	Not Evaluated
XMH-00266	Site	Unknown	Not Evaluated
XMH-00267	Site	Unknown	Not Evaluated
XMH-00271	Site	Unknown	Not Evaluated
XMH-00272	Site	Unknown	Not Evaluated
XMH-00275	Site	Unknown	Not Evaluated
XMH-00277	Site	Unknown	Not Evaluated
XMH-00278	Site	Unknown	Not Evaluated
XMH-00279	Site	Unknown	Not Evaluated
XMH-00284	Site	Unknown	Not Evaluated
XMH-00290	Site	Unknown	Not Evaluated
XMH-00292	Site	Unknown	Not Evaluated
XMH-00293	Site	Unknown	Not Evaluated

Appendix Table 3.12.j cont. Archaeological Inventory of Donnelly Training Area.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
XMH-00299	Site	Unknown	Not Evaluated
XMH-00300	Site	Unknown	Not Evaluated
XMH-00303	Site	Unknown	Not Evaluated
XMH-00304	Site	Unknown	Not Evaluated
XMH-00305	Site	Unknown	Not Evaluated
XMH-00306	Site	Unknown	Not Evaluated
XMH-00307	Site	Unknown	Not Evaluated
XMH-00308	Site	Unknown	Not Evaluated
XMH-00310	Site	Unknown	Not Evaluated
XMH-00311	Site	Unknown	Not Evaluated
XMH-00313	Site	Unknown	Not Evaluated
XMH-00315	Site	Unknown	Not Evaluated
XMH-00316	Site	Unknown	Not Evaluated
XMH-00322	Site	Unknown	Not Evaluated
XMH-00323	Site	Unknown	Not Evaluated
XMH-00324	Site	Unknown	Not Evaluated
XMH-00391	Site	Unknown	Not Evaluated
XMH-00575	Site	Unknown	Not Evaluated
XMH-00829	Site	Unknown	Not Evaluated
XMH-00830	Site	Unknown	Not Evaluated
XMH-00831	Site	Unknown	Not Evaluated
XMH-00832	Site	Unknown	Not Evaluated
XMH-00833	Site	Unknown	Not Evaluated
XMH-00834	Site	Unknown	Not Evaluated
XMH-00835	Site	Unknown	Not Evaluated
XMH-00836	Site	Unknown	Not Evaluated
XMH-00837	Site	Unknown	Not Evaluated
XMH-00838	Site	Unknown	Not Evaluated
XMH-00839	Site	Unknown	Not Evaluated
XMH-00840	Site	Unknown	Not Evaluated
XMH-00841	Site	Unknown	Not Evaluated
XMH-00842	Site	Unknown	Not Evaluated

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.k Archaeological Inventory of Fort Richardson.

AHRS #	Resource Type	Cultural Affiliation	National Register Status
ANC-00263	Cabin Site	Unknown	Not Eligible
ANC-00264	Cabin Site	Unknown	Not Eligible
ANC-00265	Structure	Unknown	Not Eligible
ANC-00668	Historic Site	Unknown	Not Eligible
ANC-00822	Prehistoric Site	Unknown	Not Eligible
ANC-01175	Prehistoric Site	Unknown	Not Eligible

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.l Nike Site Summit Inventory, National Register of Historic Places.

AHRS #	Name
ANC-792	Battery Control Building
ANC-793	Target Tracking Radar Shelter
ANC-794	Missile Tracking Radar Shelter
ANC-795	Target Ranging Radar Shelter
ANC-796	Electrical Substation C
ANC-797	Vehicle Garage Foundation
ANC-798	High Power Acquisition Radar
None	Helicopter Pad
None	Bore Mast
ANC-800	High Explosive Magazine
ANC-801	Guided Missile Magazine
ANC-802	Sentry Station
ANC-803	Sentry Station
ANC-804	Guided Missile Maintenance Facility
ANC-805	Vehicle Maintenance Shop
ANC-806	Sentry Station
ANC-807	Launching Control Building
ANC-808	Electrical Substation B
ANC-809	Dog Kennel
ANC-810	Missile Launch and Storage
ANC-811	Electrical Substation
ANC-812	Electrical Substation
ANC-813	Fuse and Detonator Magazine
ANC-814	Missile Launch and Storage #2
ANC-815	Missile Warhead Magazine

Source: USARAK Cultural Resources 2003

Appendix Table 3.12.m Fort Richardson Historic District

Bldg No.	AHRS No.	Name
1	ANC-01088	Post Headquarters
2	ANC-01243	Theater
3	ANC-01244	Chapel
5	ANC-01245	Commissary
54	ANC-01246	Officers Quarters
58	ANC-01247	Officers Quarters
602	ANC-01248	Barracks
604	ANC-01249	Clinic
606	ANC-01250	BN HQ
618	ANC-01251	BN HQ Bldg
620	ANC-01252	Barracks
622	ANC-01253	Barracks
624	ANC-01254	Barracks
626	ANC-01255	Barracks
628	ANC-01256	Barracks
630	ANC-01257	Barracks
632	ANC-01258	Barracks
640	ANC-01259	Barracks
652	ANC-01260	Tel Exch Bldg
654	ANC-01261	Fire Station
655	ANC-01262	Open Dining
656	ANC-01263	PM Admin Bldg
658	ANC-01264	ACES Facility
662	ANC-01265	Barracks
664	ANC-01266	Barracks
668	ANC-01267	Barracks
670	ANC-01268	Barracks
672	ANC-01269	BN HQ
700	ANC-01270	FE Facility
701	ANC-01271	Imflam Mat Storage
704	ANC-01273	Vehicle Storage
724	ANC-01274	GEN PUP Warehouse
726	ANC-01275	Fixed Laundry
730	ANC-01276	Eng Adm Bldg
740	ANC-01277	FE Maint SHP
750	ANC-01278	VEH MNT SHOP

Appendix Table 3.12.m cont. Fort Richardson Historic District

Bldg No.	AHRS No.	Name
755	ANC-01279	Skill Center
756	ANC-01280	VEH MNT SHP
772	ANC-01281	Standby GEN
778	ANC-01282	VEH MNT SHP
794	ANC-01284	VEH MNT SH
796	ANC-01285	VEH MNT SH
798	ANC-01286	VEH MNT SHP
800	ANC-01287	GEN PURP Warehouse
802	ANC-01288	GEN PURP Warehouse
804	ANC-01289	GEN PURP Warehouse
806	ANC-01290	GEN PURP Warehouse
809	ANC-01291	COLD STOR Warehouse
974	ANC-01292	MTOE SUP MNT SHP
975	ANC-01293	VEH MNT SHP
976	ANC-01294	QM Repair Shop
977	ANC-01295	ADMIN GENPURP
984	ANC-01296	GEN PURP Warehouse
986	ANC-01297	Sampling FAC

Source: USARAK Cultural Resources 2003

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3.13 SOCIOECONOMICS

Appendix Table 3.13.a Native Village Corporations subject to the Alaska Native Claims Settlement Act (ANCSA).

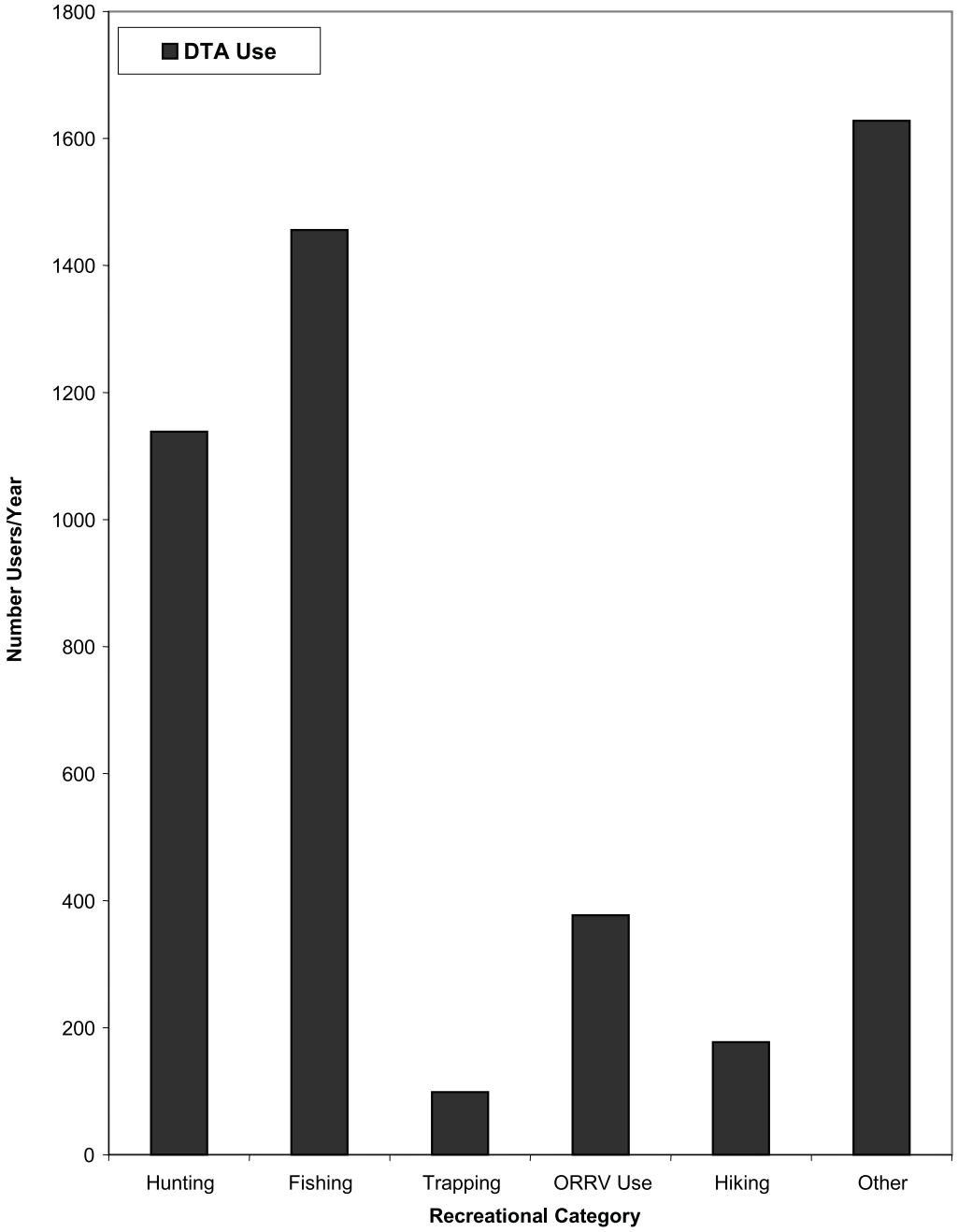
Region	Village Corporation	Village Names
Doyon Ltd.	K'oyitl'ots'ina, Ltd.	Merged corporation between Alatna, Allakaket, Hughes, and Huslia
	Ingalik, Inc.	Anvik
	Beaver Kwit'chin Corp.	Beaver
	Evansville, Inc.	Bettles Field
	Tihteet'aii, Inc.	Birch Creek
	Chalkyitsik Native Corp.	Chalkyitsik
	Danzhit Hanlaii Corp.	Circle
	Dot Lake Native Corp.	Dot Lake
	Hungwitchin Corp.	Eagle
	Evansville, Inc.	Evansville
	Gwitchyaa Zhee Corp.	Fort Yukon
	Hee-Yea Lindge Corp.	Grayling
	Mendas Chaag Native Corp.	Healy Lake
	Deloycheet, Inc.	Holy Cross
	Gana-a'yoo, Ltd.	Merged corporation between Galena, Kaltag, Koyukuk, and Nulato
	Bean Ridge Corp.	Manley Hot Springs
	MTNT, Ltd.	Merged coporation between McGrath, Nikolai, Takotna, and Telida
	Seth-De-Ya-Ah Corp.	Minto
	Toghotthele Corp.	Nenana
	Northway Natives, Inc.	Northway
	Baan-O-Yeel-Kon Corp.	Rampart
	Dineega Corp.	Ruby
	Zho-Tse, Inc.	Shageluk
	Dinyee Corp.	Stevens Village
	Tanacross, Inc.	Tanacross
	Tozitna, Ltd.	Tanana

Appendix Table 3.13.a cont. Native Village Corporations subject to the Alaska Native Claims Settlement Act (ANCSA).

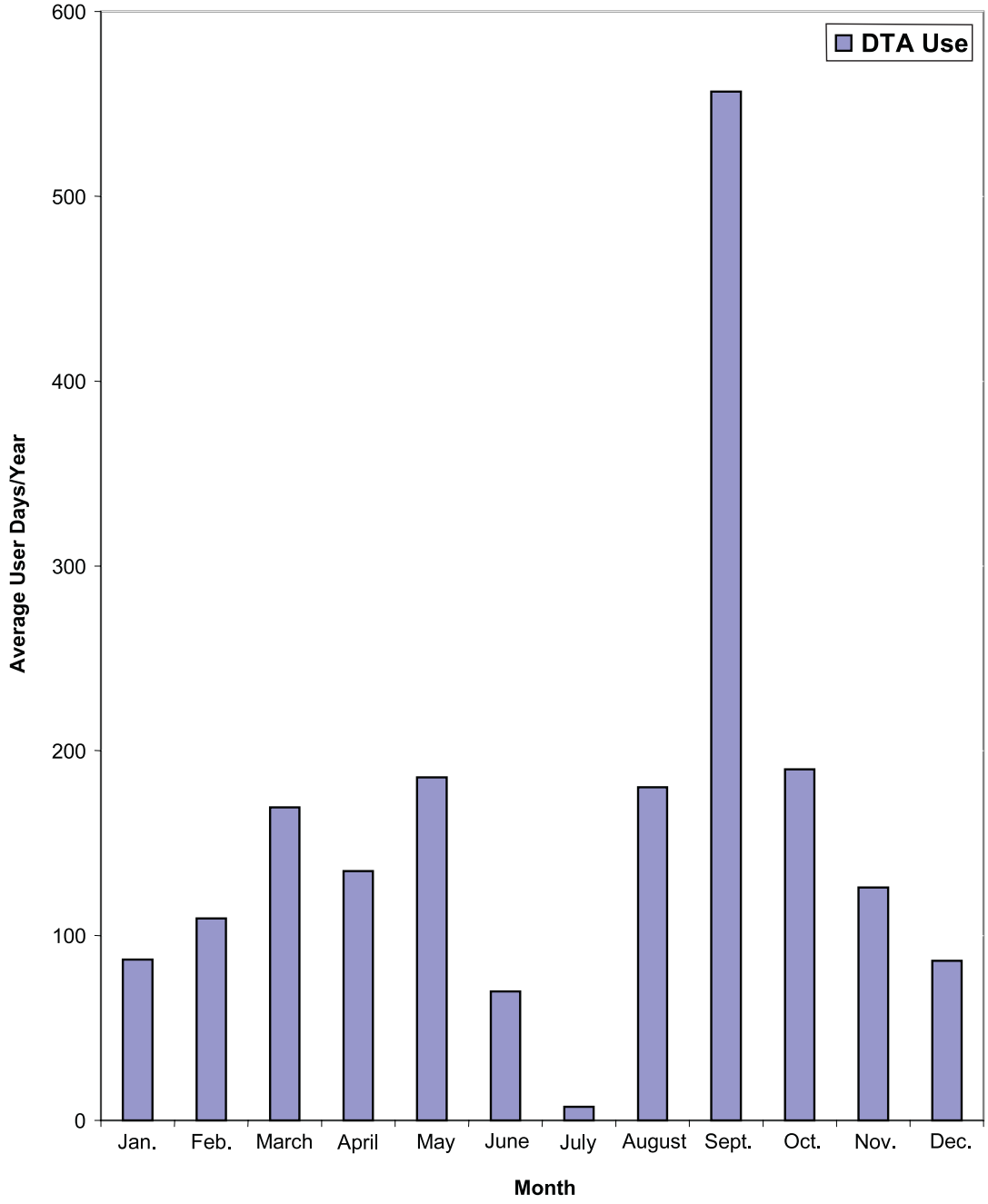
Region	Village Corporation	Village Names
Cook Inlet Region, Inc. (CIRI)	Chickaloon-Moose Creek Native Association, Inc.	Chickaloon
	Eklutna, Inc.	Eklutna
	Knikatnu Inc.	Knik
	Ninilchik Native Assoc.	Ninilchik
	Salamatof Native Assoc., Inc.	Salamatof
	Seldovia Native Assoc., Inc.	Seldovia
	Tyonek Native Corp.	Tyonek
Chugach	Chenega Corp.	Chenega Bay
	Eyak Corp.	Eyak
	English Bay Corp.	Nanwalek
	Port Graham Corp.	Port Graham
	Tatitlek Corp.	Tatitlek
Ahtna	Chitina Native Corp.	Chitina
	Cantwell, Chistochina, Copper Center, Gakona, Gulkana, Mentasta Lake, and Tazlina have all merged with Ahtna)	

3.14 PUBLIC ACCESS AND RECREATION

Appendix Figure 3.14.a Recreational Use, Donnelly Training Area



Appendix Figure 3.14.b Hunting Use by Month, Donnelly Training Area



3.16 NOISE

Small Arms Range Noise

A Swedish study of annoyance caused by noise from shooting ranges (Sorensen and Magnusson 1979) showed the annoyance for this type of noise is low up to a certain threshold, after which it increases relatively quickly. For the A-weighted fast-time integrated maximum level (L_{Amaxf}), this threshold is approximately 63 dBA. At levels below this threshold, less than 2% of the population exposed to the noise consider themselves to be highly annoyed. At the threshold level, the percent highly annoyed increases to 10%, and continues to increase as the noise level increases (Appendix Table 3.16.a).

Appendix Table 3.16.a Percentage Of Population Highly Annoyed From Small Arms Range Noise.

dBA	Percent Highly Annoyed
<63	2
63	10
65	13
70	21
75	29
80	38

The LAmaxf for the M-16 rifle and the .50-cal machine gun at several azimuths and distances are shown in Appendix Tables 3.16.b and 3.16.c. The zero degree azimuth is the direction of fire while the 180° azimuth is directly behind the weapon.

Appendix Table 3.16.b Predicted L_{Amaxf} for M-16 (5.56mm) Rifle.

Distance (meters)	Predicted Level, dBA				
	Azimuth				
	0°	45°	90°	135°	180°
50	95-107	93-105	88-100	81-93	78-90
100	86-100	84-98	79-93	72-86	69-83
200	77-93	75-91	70-86	63-79	60-76
500	65-83	63-81	58-76	51-69	48-66
1,000	56-76	54-74	49-69	42-62	39-59
2,000	47-69	45-67	40-62	33-55	30-52

Appendix Table 3.16.c Predicted L_{Amaxf} for M2 (.50-Cal) Machine Gun.

Distance (meters)	Predicted Level, dBA				
	Azimuth				
	0°	45°	90°	135°	180°
50	104-116	102-114	97-109	92-104	90-102
100	95-109	93-107	88-102	83-97	81-95
200	86-102	84-100	79-95	74-90	72-88
500	74-92	72-90	67-85	62-80	60-78
1,000	65-85	63-83	58-78	53-73	51-71
2,000	56-78	54-76	49-71	44-66	42-64

The range of levels shown in the tables is caused by changes in the sound propagation conditions between the source and receiver. The primary cause of the range in levels is the wind direction. The lower numbers approximate the levels expected when the receiver is upwind of the source, and the higher numbers when the receiver is downwind. The levels listed in the tables do not include any reduction in the noise caused by natural or man-made terrain between the source and receiver, such as hills and berms. The tables are useful in conveying two pieces of information. Firstly, the direction of fire will have a large difference on the noise level. Secondly, the impact of small arms noise is relatively localized. Under most weather conditions, once you are 1,000 meters from the range, levels should not be high enough to annoy people.