

# RECONNAISSANCE SURVEY FOR THREATENED, ENDANGERED AND SENSITIVE SPECIES AT CLEAR AIR FORCE STATION, ALASKA

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# **RECONNAISSANCE SURVEY FOR THREATENED, ENDANGERED AND SENSITIVE SPECIES AT CLEAR AIR FORCE STATION, ALASKA**

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## **ABSTRACT**

The Alaska Natural Heritage Program (AKNHP), University of Alaska Anchorage, surveyed Clear Air Force Station (AFS) in interior Alaska for the presence of vascular plants and vertebrates of conservation concern in the summers of 2005 and 2007. The survey was intended to identify locations, population attributes, and potential threats to rare plants and birds; information useful in minimizing the impacts of present and future activities on critical ecological resources of the Clear AFS. Additionally, we surveyed the area for non-native species that may affect natural resources at the site. We collected 151 unique vascular plant species; none of these plants are Federal or State-listed species. Four regionally rare species were collected that are listed by NatureServe and AKNHP. Large, established populations of invasive plant species were found that are likely having a negative impact on the biological resources of Clear AFS. We recognize two plant community types (gravel barrens and the Nenana river floodplain) as important natural areas. Both of these habitats are undergoing large-scale transformations due to the expansion of invasive species. We identified the presence of 53 species of birds present at Clear AFS; none of which are listed as Federal or State-listed threatened or endangered. However, five species observed during bird surveys are considered species of conservation or management concern by various state, federal, national and/or non-governmental organizations, including the Blackpoll Warbler, Gray-cheeked Thrush, Osprey, Rusty Blackbird and White-winged Crossbill. Both the Blackpoll Warbler and Gray-cheeked were previously reported by LaGory et al (1996) during an avian inventory at Clear AFS in 1995.

We make the following recommendations to promote the value of the station's biological resources: 1) manage non-native plant species (early detection and rapid response), 2) minimize ground disturbance in undeveloped areas of the station, 3) conduct pre- and post-disturbance surveys for valuable biological resources and indicator species, 4) conduct surveys of mammals and 5) repeat surveys at 5-year intervals to determine the effects of succession and changes to wetland habitats.

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## INTRODUCTION

The purpose of this project was to conduct a reconnaissance level survey to determine the presence and habitat requirements of plant and animal species of conservation concern at Clear Air Force Station (Clear AFS) that are either federally protected, state protected, sensitive, or species of concern. Phase I of this project, initiated in 2005, surveyed vascular plants at Clear AFS. Phase II, initiated in 2007, focused on assessing the presence and seasonal usage of vertebrate species at Clear AFS.

Comprehensive inventories are the foundation of any natural resource management program. Mitigating potential anthropogenic impacts is a great challenge and informed scientific inquiry can enable effective management decisions. We conducted the plant and animal surveys to build on information from past biodiversity inventories (LaGory et al. 1996) and to identify important and sensitive biological resources that could be impacted by activities and operations at Clear AFS. Here, we summarize the results of data collected during vascular plant and avian surveys, compare our results to those of earlier surveys, and make recommendations for managing species of conservation concern known to occur at Clear AFS.

No federal or state-listed plants are present near Clear AFS. Only one federal-listed vascular plant species is present in Alaska, the Aleutian shield fern (*Polystichum aleuticum*). This threatened species is only known from a few populations in the western Aleutians. The state of Alaska does not have any listed plant species.

The American Peregrine Falcon (*Falco peregrinus anatum*) was the only federally listed endangered animal species whose range included Clear AFS. However, this species was delisted in 1999 based on population recovery. At the time of this survey, no federal or state-listed animal species were known to occur at Clear AFS.

Before beginning the surveys, we summarized information on the known species of conservation concern found within Clear AFS and within a 50 mile radius for plants and a 100 mile radius for birds. We drafted a list of known and possible species of conservation concern, with known locations and habitat-type. Following the development of the target species list, we developed survey strategies to maximize the probability of encountering the species of conservation concern. The plant surveys covered all major habitats, substrates, and regions of the base. We identified locations, population attributes, and potential threats to the rare plants; information useful in minimizing the impacts of present and future activities on critical ecological resources of Clear AFS. Zoological surveys were conducted using techniques that ensured sampling of the entire area and also provided critical information on habitat relationships and population status. Survey efforts focused on documenting bird occurrence and habitat usage at the station, as no mammal species of concern were predicted to occur at the station.

Here we summarize past biodiversity surveys, the ecological context, our methods and results, and provide recommendations to resource managers based on these findings. Plant and animal surveys were conducted separately by different research teams, therefore, results and discussion of these two survey types are presented separately.

## PREVIOUS BIODIVERSITY SURVEYS

Argonne National Laboratory conducted a biodiversity survey at Clear AFS in 1995 to determine the presence of federally or state-listed species of conservation concern (see LaGory et al. 1996). They observed 157 vascular plants and 58 bird species following



extensive surveys during the spring, summer, and fall. They did not encounter any federal or state threatened and endangered species, or any candidate species. However, four plant species and two bird species were observed that were considered regionally rare by the Alaska Natural Heritage Program (AKNHP) at that time. The rare plant species were William's milkvetch (*Astragalus williamsii*), Setchell's willow (*Salix setchelliana*), sandbar willow (*Salix interior*), and William's campion (*Silene menziesii* ssp. *williamsii*) and the rare bird species were the Blackpoll Warbler (*Dendroica striata*) and Gray-cheeked Thrush (*Catharus minimus*). Additionally, LaGory et al. (1996) identified gravel barrens and the Nenana River floodplain habitats as exceptional natural areas on the station.

Numerous previous vascular plant collections are known from the vicinity of Clear AFS. Table 1 shows a list of the rare vascular plants that were known from Clear AFS or from a 50 mile radius of the station. These records were drawn from the AKNHP rare plant database. Additionally, we indicate the range of these species in the state and the habitat where they are most often encountered. In general, few rare species are expected to occur in Clear AFS, as most rare species in the area are found on habitats, such as high mountain slopes, that are not present at the station.

Northwind Inc. conducted a survey of invasive species at Clear AFS in 2004 in response to the station's need to control invasive species and reduce their negative ecological impact. They did not encounter any federally or state-listed prohibited invasive species; however, they did record 37 species of non-native plants. Seven of these species were classified as high priority for control on Clear AFS. These species were white sweetclover (*Melilotus alba*), bird vetch (*Vicia cracca*), butter-and-eggs (*Linaria vulgaris*), ox-eye daisy (*Leucanthemum vulgare*), quackgrass (*Elymus repens*), alsike clover (*Trifolium hybridum*), and narrow-leaved hawksbeard (*Crepis tectorum*). Infestations of four of these species were recognized as being quite extensive and likely impacting the natural resource value of the station.

Numerous avian species are known from the vicinity of Clear AFS. Table 2 shows a list of potentially rare bird species that were known from Clear AFS or from a 100 mile radius of the station. These records were drawn from the AKNHP Biotics database (generally species with G or S rank  $\geq 3$ , although several species with ranks of S4 were included if they were recognized by other organizations as being of concern) as well as from bird checklists for Denali National Park, the Dalton Highway, Fairbanks and Yukon Flats areas, and from a previous avian survey of Clear AFS (La Gory et al 1996). We indicate the range of these species in the state and the habitat where they are most often encountered. Within this list, we recognize species of concern as identified by the State of Alaska (threatened, endangered, or species of special concern), USWFS (threatened, endangered, candidate or birds of conservation concern), Bureau of Land Management (sensitive), and USDA Forest Service (sensitive). We also include species that are highlighted by non-governmental organizations such as Boreal Partners in Flight (priority species for conservation in central Alaska) and Audubon Alaska (Watchlist). The criteria for inclusion for each organizations list varied, but in general, species of conservation concern are those with threatened, declining or small populations.

Table 1. List of target rare vascular plant species known in Clear AFS or within 50 miles of Clear AFS, their probability of occurrence based and their associated habitat, and their global and state ranks (see Appendix 1 for an explanation of NatureServe conservation status ranks). *Salix interior* is known from Clear AFS and was reported by LaGory et al. (1996) as a rare species tracked by the Alaska Natural Heritage Program. This species is now known to be more widespread and is not currently tracked.

| Scientific Name                                       | Present in Clear AFS | Global Rank | State Rank  | Alaska Range and Habitat  |
|---|----------------------|-------------|-------------|---|
| <i>Aphragmus eschscholtzianus</i>                     | very unlikely        | G3          | S3          | Alaska Range/western Alaska - stony, moist mountain slopes                |
| <b><i>Astragalus williamsii</i></b>                   | <b>Present</b>       | <b>G4</b>   | <b>S3</b>   | <b>Interior Alaska – river bars, poplar-aspen woodlands</b>               |
| <i>Carex bebbii</i>                                   | Possible             | G5          | S1          | Interior Alaska - wet meadows   |
| <i>Carex lapponica</i>                                | Possible             | G4G5Q       | S2          | Interior Alaska - wet grassy meadows                                      |
| <i>Carex peckii</i>                                   | Possible             | G4G5        | S2S3        | Interior Alaska – dry slopes and woods                                    |
| <i>Ceratophyllum demersum</i>                         | Possible             | G5          | S2          | Interior Alaska – aquatic, still water                                    |
| <i>Chenopodium salinum</i>                            | very unlikely        | G5          | S1          | Interior Alaska – Manley Hot Springs                                      |
| <i>Cicuta bulbifera</i>                               | possible             | G5          | S1S2        | Interior Alaska – marshes and bogs  |
| <i>Corispermum ochotense</i> var. <i>alaskanum</i>    | possible             | G3G4T2?Q    | S2?         | Interior Alaska – sandy substrates  |
| <i>Douglasia alaskana</i>                             | very unlikely        | G2G3        | S2S3        | Alaska, Brooks Range, western Alaska – stony mountain slopes and outcrops |
| <i>Douglasia gormanii</i>                             | very unlikely        | G3          | S3          | Alaska Range – high elevation, stony mountains                            |
| <i>Draba ruaxes</i>                                   | very unlikely        | G3          | S3          | Alaska Range – high elevation, stony mountains                            |
| <i>Draba stenopetala</i>                              | very unlikely        | G3G4        | S3S4        | Primarily Alaska Range – rocks on high mountains                          |
| <i>Erysimum asperum</i> var. <i>angustatum</i>        | unlikely             | G5T2        | S1S2        | Interior Alaska – dry bluffs  |
| <i>Gentianopsis detonsa</i> ssp. <i>detonsa</i>       | possible             | G3G4T?      | S1          | Interior and Arctic Alaska, known from Nenana – meadows                   |
| <i>Juncus nodosus</i>                                 | unlikely             | G5          | S2          | Interior Alaska – swamps and hot springs                                  |
| <i>Minuartia biflora</i>                              | very unlikely        | G5          | S2          | Brooks and Alaska Ranges – dry places and snowbeds in the mountains       |
| <i>Oxytropis tananensis</i>                           | possible             | G2G3Q       | S2S3        | Interior Alaska – dry, sandy bluffs, and open aspen woodlands             |
| <i>Papaver alboroseum</i>                             | very unlikely        | G3G4        | S3          | Western Alaska mountains and Alaska Range – steep talus slopes            |
| <i>Potamogeton robbinsii</i>                          | possible             | G5          | S1          | Interior Alaska – aquatic, still water                                    |
| <i>Ranunculus kamchaticus</i>                         |                      | G4G5        | S2S3        |   |
| <b><i>Salix setchelliana</i></b>                      | <b>present</b>       | <b>G4</b>   | <b>S3</b>   | <b>Central Alaska – sandy river bars on glacial rivers</b>                |
| <b><i>Silene menziesii</i> ssp. <i>williamsii</i></b> | <b>present</b>       | <b>G4T4</b> | <b>S3S4</b> | <b>Interior Alaska – gravelly, open areas, roadsides</b>                  |
| <i>Stellaria alaskana</i>                             | very unlikely        | G3          | S3          | Alaska Range – stony slopes   |
| <i>Taraxacum carneocoloratum</i>                      | very unlikely        | G3Q         | S3          | Alaska Range – high mountain slopes                                       |
| <i>Thlaspi arcticum</i>                               | very unlikely        | G3          | S3          | Alaska Range and Brooks Range – open gravelly slopes                      |
| <i>Viola selkirkii</i>                                | unlikely             | G5?         | S3          | Southern Alaska – moist woods   |

Table 2. List of target rare terrestrial avian species known to occur in or within 100 miles of Clear AFS, their probability of occurrence based and their range in central Alaska, season of occurrence and associated habitat, their global and state ranks (see Appendix I for an explanation of AKNHP ranks), and other statuses afforded them by state, federal and non-governmental entities. Species highlighted in bold are known to occur at Clear AFS.

| Common name<br>(Scientific name)                                       | Probability of<br>Occurrence at<br>Clear AFS | Global<br>Rank | State<br>Rank | Other Status  | Range, Season of Occurrence<br>and Habitat   |
|--|--|----------------|---------------|---|--|
| Trumpeter Swan<br>( <i>Cygnus buccinator</i> )                         | Unlikley                                     | G4             | S4B,S3N       | BLM SENS <sup>1</sup> ;<br>USFS SENS <sup>2</sup>             | Central - uncommon breeder.<br>Forest wetlands, lakes,<br>marshes, rivers with dense<br>vegetation.  |
| Red-throated Loon<br>( <i>Gavia stellata</i> )                         | Possible                                     | G5             | S4B,<br>S4N   | USFWS BCC <sup>3</sup> ;<br>BLM SENS;<br>Audubon <sup>4</sup> | Central - uncommon breeder.<br>Nests on shores of small<br>oligotrophic lakes and islands.   |
| <b>Osprey</b><br>( <i>Pandion haliaetus</i> )                          | <b>Present</b>                               | <b>G6</b>      | <b>S3S4B</b>  | <b>USFS SENS</b>  | <b>Central - rare breeder. Boreal<br/>forest with shallow water<br/>lakes or rivers nearby; nests<br/>near water in trees or cliffs.</b>   |
| Gyr Falcon<br>( <i>Falco rusticolus</i> )                              | Very unlikely                                | G5             | S4            | Audubon;<br>BPIF PSOC <sup>5</sup>                            | Central - uncommon breeder.<br>Open country; nests on cliff<br>ledges.   |
| American Peregrine<br>Falcon<br>( <i>Falco peregrinus<br/>anatum</i> ) | Unlikley                                     | G4T2           | S3B           | USFWS DL <sup>6</sup> ;<br>SOA SSOC <sup>7</sup> ;<br>Audubon | Central - rare breeder. Open<br>country, especially shores and<br>marshes frequented by<br>waterfowl and shorebirds; nests<br>on cliff ledges.                                     |
| American Coot<br>( <i>Fulica americana</i> )                           | Very unlikely                                | G5             | S2B,<br>S2N   |   | Central - rare breeder. Lakes,<br>ponds, marshes, intertidal<br>ponds and sloughs.   |
| Solitary Sandpiper<br>( <i>Tringa solitaria</i> )                      | Possible                                     | G5             | S4B           | Audubon   | Central - uncommon breeder.<br>Muskegs, freshwater marshes,<br>lakes, ponds.   |
| <b>Whimbrel</b><br>( <i>Numenius phaeopus</i> )                        | <b>Present</b>                               | <b>G5</b>      | <b>S3S4B</b>  | <b>USFWS BCC,<br/>Audubon</b>                                 | <b>Central - common breeder.<br/>Tundra. - dwarf shrub tundra,<br/>dry dwarf-shrub ridges and<br/>steep slopes, and rolling,<br/>open, moist tundra among<br/>sedge hummocks .</b> |
| Hudsonian Godwit<br>( <i>Limosa haemastica</i> )                       | Very unlikely                                | G4             | S2S3B         | USFWS BCC,<br>Audubon   | Central - rare spring migrant.<br>Sedge-grass marshes, wet<br>tundra, taiga bogs.  |
| Surfbird<br>( <i>Aphriza virgata</i> )                                 | Very unlikely                                | G5             | S2N,<br>S3B   | USFWS BCC,<br>Audubon   | Central - uncommon breeder.<br>Alpine tundra along mountain<br>ridges.   |
| Sanderling<br>( <i>Calidris alba</i> )                                 | Very unlikely                                | G5             | S2B           |   | Central - rare spring and fall<br>migrant. Migration: sandy<br>beaches, tidal flats and rocky<br>beaches.  |
| Stilt Sandpiper<br>( <i>Calidris himantopus</i> )                      | Very unlikely                                | G5             | S3B           |   | Central - rare spring migrant.<br>Relatively open, dry tundra<br>north of treeline. Migration: tidal<br>flats, lakeshores, ponds,<br>sloughs.                                      |
| Buff-breasted<br>Sandpiper<br>( <i>Tryngites subruficollis</i> )       | Very unlikely                                | G4             | S2B           | USFWS BCC,<br>BLM SENS  | Central - rare spring migrant.<br>Migration: drier areas of tidal<br>flats, sandy beaches, grassy<br>fields and meadows.   |
| Snowy Owl<br>( <i>Bubo scandiacus</i> )                                | Unlikley                                     | G5             | S3S4          |   | Central - rare spring and fall<br>migrant. Migration: open and<br>wooded areas.  |
| Black-backed<br>Woodpecker<br>( <i>Picoides arcticus</i> )             | Possible                                     | G5             | S3            |   | Central - rare breeder. Burned-<br>over boreal and montane<br>coniferous forests.  |
| <b>Gray-cheeked Thrush</b><br>( <i>Catharus minimus</i> )              | <b>Present</b>                               | <b>G5</b>      | <b>S4S5B</b>  | <b>SOA SSOC,<br/>BLM SENS,<br/>BPIF PSOC</b>                  | <b>Central - common breeder.<br/>Mixed deciduous-coniferous<br/>woodlands, shrub thickets,<br/>coniferous forests.</b>   |

Table 2. (continued)

| (Common name<br>(Scientific name))                   | Probability of<br>Occurrence at<br>Clear AFS | Global<br>Rank | State<br>Rank | Other Status                                    | Range, Season of Occurrence<br>and Habitat   |
|--|--|----------------|---------------|---|--|
| Townsend's Warbler<br>( <i>Dendroica townsendi</i> ) | Possible                                     | G5             | S4B           | SOA SSOC,<br>BLM SENS,                          | Central - common breeder.<br>Coniferous forests, mixed<br>deciduous-coniferous<br>woodlands.                   |
| Blackpoll Warbler<br>( <i>Dendroica striata</i> )    | Present                                      | G5             | S4B           | SOA SSOC,<br>BLM SENS,<br>Audubon, BPIF<br>PSOC | Central - uncommon breeder.<br>Coniferous forests, mixed<br>deciduous-coniferous<br>woodlands, shrub thickets. |
| Rusty Blackbird<br>( <i>Euphagus carolinus</i> )     | Present                                      | G4             | S4B           | Audubon,<br>BPIF PSOC                           | Central - uncommon breeder.<br>Willow thickets near rivers in<br>coastal areas; swampy areas<br>inland.        |

<sup>1</sup>BLM SENS = Federal status included Bureau of Land Management Sensitive Species List (BLM 2006).

<sup>2</sup>USFS SENS = USDA U.S. Forest Service Sensitive Species List (USFS 1997)

<sup>3</sup>USFWS BCC = USFWS Birds of Conservation Concern (USFWS 2002).

<sup>4</sup>Audubon = Audubon Alaska Watchlist (Stenhouse and Senner 2005).

<sup>5</sup>BPIF PSOC = Boreal Partners in Flight Priority Species for Conservation (BPIF 1999).

<sup>6</sup>USFWS DL = USFWS Delisted (Federal Register 1999).

<sup>7</sup>SOA SSOC = State of Alaska Species of Special Concern (ADF&G 1998).

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## ECOLOGICAL CONTEXT

The following overview of general land use patterns, climate, physiography, hydrology, climate, flora and fauna at Clear AFS was summarized from existing documentation and is presented here to provide context to the surveys performed and to provide information that may be complimentary to the survey results.

### General Land Use Patterns

Clear AFS, located immediately south of the town of Anderson, covers a total of 11,500 acres and is approximately 125 km (78 miles) southwest of Fairbanks, Alaska (Fig. 1 and Fig. 2). Clear AFS is home to the 13th Space Warning Squadron. The squadron is assigned to the 21st Space Wing, Peterson Air Force Base, Colorado. Clear AFS is part of the Ballistic Missile Early Warning System. The primary mission of Clear AFS is to provide early warning of intercontinental ballistic missiles and sea-launched ballistic missiles to the Missile Warning Center at North American Aerospace Defense Command (NORAD). The secondary mission of Clear AFS is to provide space surveillance data on orbiting objects to the space control center also located in the Cheyenne Mountain Complex (see <http://www.globalsecurity.org/space/facility/clear.htm>).

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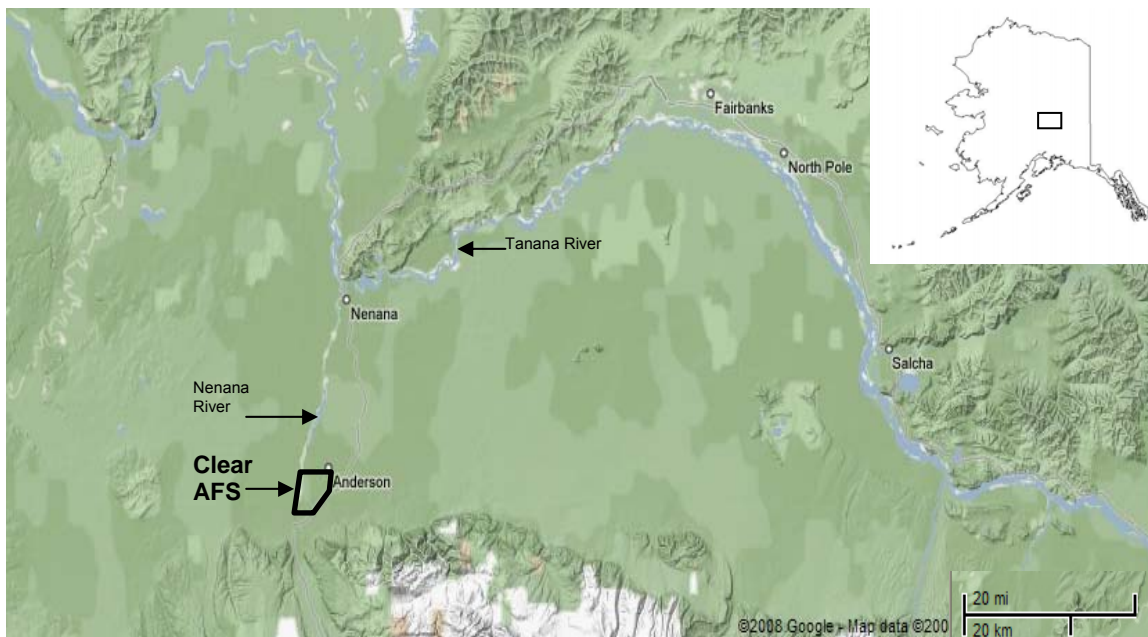


Figure 1. Clear AFS and vicinity. The inset map on the right indicates the general location of Clear AFS.

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Construction of the Clear AFS began in 1959 and the facility became operational by 1961. Construction and has continued since that time. Clear AFS's mechanical ballistic missile early warning system radar was deactivated in 2001 and replaced with a new phased-array radar, the SSPAR, which doubled the coverage of the 13th Space Warning Squadron's missile warning and space surveillance missions.

The installation is divided into three areas: composite, camp, and technical site. The composite area is where administration, recreation, and permanent living quarters are located. Civil engineering and security police offices are found in the camp area. The power plant, operations, and maintenance facilities that contain the radars and related equipment are found at the technical site area (see <http://www.globalsecurity.org/space/facility/clear.htm>).

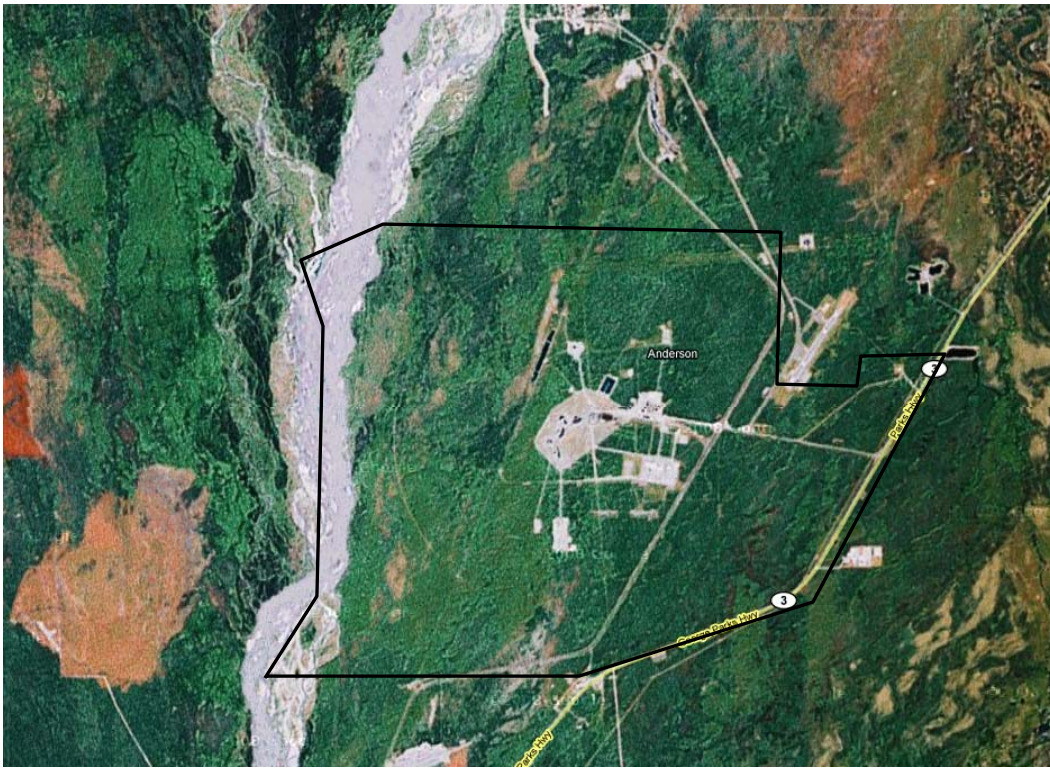


Figure 2. Aerial view of Clear AFS. Approximate station boundary is shown as the back line. The Nenana River is shown on the western boarder of the station and the Parks Highway forms the eastern border of the station. Developed areas show up as light gray, spruce forests as dark green, aspen forests as light green, gravel barrens as light brown, and gravel floodplains along the Nenana as white to light gray.

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### **Climate**

The climate of Clear AFS is subarctic continental, with an average growing season of 100 days; the average killing frost occurs on August 30 and the last on May 21. Summers are short and warm with frequent thunderstorms, lightning, and occasional rain. Winters are long and cold. Temperature extremes range from 32°C (90°F) in July to -52°C (-62°F) in January. Precipitation averages 28 to 33 cm (11 to 13 in) (Love 1991).

### **Physiography**

Clear AFS is located in the Tanana Valley immediately north of the foothills of the Alaska Range. The primary physiographic features are a broad glacial outwash plain and a narrow strip of river terraces and flood plains adjacent to the Nenana River on the western boarder of the installation. Elevation ranges from about 650 feet in the south and 550 feet in the north, with little topographic relief throughout the installation. Slopes in most places are nearly level to strongly sloping along river terraces and the terrain is generally modestly undulating and rolling.

### **Hydrology**

Clear AFS is relatively flat with a regional slope of only 4.7 meters/km that trends in a northerly direction. All drainage is to the north. The Nenana River is the main drainage through the area and forms the western boundary of the station. Several small creeks also drain the area and flow into the Nenana River about 16 km north of Clear AFS. The



Nenana River has a shallow braided channel unsuitable for river transportation (13 MWS 1989 in LaGore et al. 1996).

### Habitat

LaGory et al. (1996) identified 14 plant community types at Clear AFS (Table 3). Aspen and spruce forests were divided into nine communities based on the relative dominance of the species, canopy cover, and the substrate they are growing on. We have taken a coarser approach to the habitats and combine the aspen and white spruce forests into a single community, since a broad and continuous range of aspen, white spruce, and other tree species is present. We recognize five coarse plant community types: open gravel floodplains, gravel barrens, developed areas, mixed white-spruce and aspen forests, and black spruce forests.

Table 3. List of plant community types at Clear AFS recognized by LaGory et al. (1996).

|   |  |
|---|--|
| Gravel floodplains                            | Black spruce forest and woodland (burned, short stature)   |
| Gravel barrens                                | Black spruce forest (unburned, tall stature)               |
| Human disturbance                             | Black spruce – aspen forest (burned, short stature)        |
| Aspen woodland on gravel (short stature)      | Mosaic black spruce – aspen forest (burned, short stature) |
| Aspen – birch forest (burned, tall stature)   | Spruce woodland on gravel                                  |
| Aspen forest (burned, tall stature)           | Floodplain deciduous forest and shrubland                  |
| Aspen – black spruce (unburned, tall stature) | Floodplain white spruce forest                             |

### Gravel floodplains

The gravel floodplains are composed of sand and gravel bars along the braided Nenana River and are vegetated with a diverse assemblage of grasses, forbs, and short shrubs (Fig. 3). These gravel bars are highly dynamic and short-lived, as the Nenana is continually shifting channels. Older gravel bars along the banks of the Nenana have more mature willow, alder, and cottonwood closed to open shrublands communities. These shrublands transition into mixed deciduous forests of alder, cottonwood, birch, and aspen.



Figure 3. Gravel floodplain habitat along the Nenana River in the southwestern edge of Clear AFS.

### Gravel barrens

The gravel barren habitat occurs on older river terraces and channels, surrounded by spruce or aspen forests on well-drained coarse gravel with little or no soil development (Fig. 4). This is an unusual community in central Alaska that tended to have a significant component of plant species from warmer and drier microsites in central Alaska (e.g., south-facing bluffs, see LaGory 1996). Additionally, small willows, cottonwoods, and drought-stressed white spruce and aspen are interspersed in the gravel barrens.



Figure 4. Gravel barren habitat in Clear AFS.



### Developed areas

While the developed portion of the installation is relatively small, it does contain a unique assemblage of plant species. Areas where ground disturbance has occurred contain high densities of weedy native and non-native grasses and forbs. These areas are of particular concern regarding areas where non-native species may move off of disturbed substrates and into the natural habitats. Manmade wetlands are present around Lake Sansing and the cooling pond near the center of the installation (Fig. 5).

### Mixed white spruce and aspen forests

On moderately well-drained substrates, mixed white spruce and aspen forests occupy a large area of Clear AFS (Fig. 6). This composite community consists of naturally regenerated second growth forests, which developed following a stand-replacing wildfire around 1940. This boreal community has a broad range of understory plant species. Smaller areas of paper birch and alder forests are also present in this mixed forest community. A previous plant community delineation (LaGory et al. 1996) divided this mixed boreal forest into numerous communities.



Figure 6. Mixed white spruce and aspen forests in Clear AFS.

### Black spruce forests

Dense black spruce forests occupy a small portion of the installation. The black spruce forests have a thick peat layer; they have poorly drained soils, are generally underlain with permafrost, and have relatively low plant diversity (Fig. 7). Small patches of tamarack were observed in black spruce forests and peatlands. The forests are now in several successional stages. Small stands of white spruce and black spruce escaped the wildfires (LaGore 1996, Nelson 2005). Currently, Clear AFS is becoming increasingly dominated by spruce forests. Many stands are already occupied by only spruce, and as spruce continue to invade the deciduous stands, they will continue to become dominate over time, unless wildfire or other disturbances occur (Nelson 2005).



Figure 7. Closed black spruce forest in Clear AFS.

### Flora

The vascular plants known from Clear AFS tend to be widespread boreal forest species. These common boreal species include shrubs and small trees such as feltleaf willow, littletree willow, bog Labrador tea, prickly rose, and trailing red currant. Common low shrubs and forbs such as kinnikinnick, bog blueberry, black crowberry, twin flower,



bunchberry dogwood, northern bedstraw, woodland horsetail, and tall bluebells are known from Clear AFS (LaGory et al. 1996). The species from saturated peatlands are also widespread boreal species. These include silvery sedge, sweetgale, and tamarack. Boreal species from well-drained, as well as warmer summer habitats are also represented in Clear AFS. These include species such as Alaskan wheatgrass, Holboell's rockcress, staghorn cinquefoil, Siberian aster, purple reedgrass, rock harlequin, silverberry, streamside fleabane, Altai fescue, red fescue, alpine sweetvetch, field locoweed, gray pubescent plantain, and pasqueflower. For a list of vascular plants previously recorded in Clear AFS and the immediate area see Appendix II.

### **Fauna**

Wildlife species that inhabit Clear AFS are typical of interior Alaska and reflect the relative undisturbed and remote nature of the station and surroundings. Mammals known to occur on the station include the red fox (*Vulpes vulpes*), Grizzly bear and American black bear (*Ursus arctos* and *U. americanus*), moose (*Alces americanus*), snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), porcupine (*Erethizon dorsatum*), gray wolf (*Canis lupus*) and beaver (*Castor canadensis*) (13 MWS 1989, LaGore et al. 1996). A wide array of birds are known to occur at Clear AFS during the breeding season, including waterfowl, raptors, shorebirds, seabirds and numerous landbird species (LaGore et al. 1996). Hunting for bear, moose, and small game is permitted on some areas of Clear AFS.

## **VASCULAR PLANTS OF CONSERVATION CONCERN**

### **METHODS OF THE VASCULAR PLANT SURVEY**

#### **Plant Survey Methodology, Study Design, and Specimen Curation**

In order to attain the goal of determining the presence of the federally protected threatened and endangered species, state protected species, sensitive species and species of concern within Clear AFS, we used the reconnaissance method of floristic survey. This method was recommended as the best approach for plant inventories in all Alaska parks by the wide group of botanists at the Alaska Plant Inventory Working Group September 2000 meeting; the general methodology is also supported by Catling and Reznicek (2003). The reconnaissance method involves identifying survey areas within landscape units via spatial analysis using the following key criteria:

- regionally unique geological or geomorphologic features
- communities or habitats of biological concern
- likely habitats of expected species, as indicated by regional floras and known collections
- under-represented plant communities in existing inventories
- logistical feasibility (e.g., access, cost)
- potential of certain types of sites to maximize species and communities encountered (e.g., ecotones, high environmental gradient areas)

In addition to visiting all the different plant associations identified by LaGory et al. (1995), we distributed our sampling efforts roughly equally throughout Clear AFS in the course of two sampling trips. The first trip occurred in early July and focused on the western half of the AFS.

On the first sampling trip, two botanists walked in roughly parallel transects 10-20 meters apart from the southwest corner of Clear AFS along the Nenana River and east 2.5 km and then a return trip was made in a westerly direction, beginning 2 km north of the end of the first transect (Fig. 8). This process of walking parallel transects along the westerly margin of Clear AFS was repeated until that section has been completed. Additionally, we surveyed three widely dispersed 200 x 200 m areas in accessible portions of the eastern side of Clear AFS in early July to capture the early flowering taxa on the eastern side of the station.

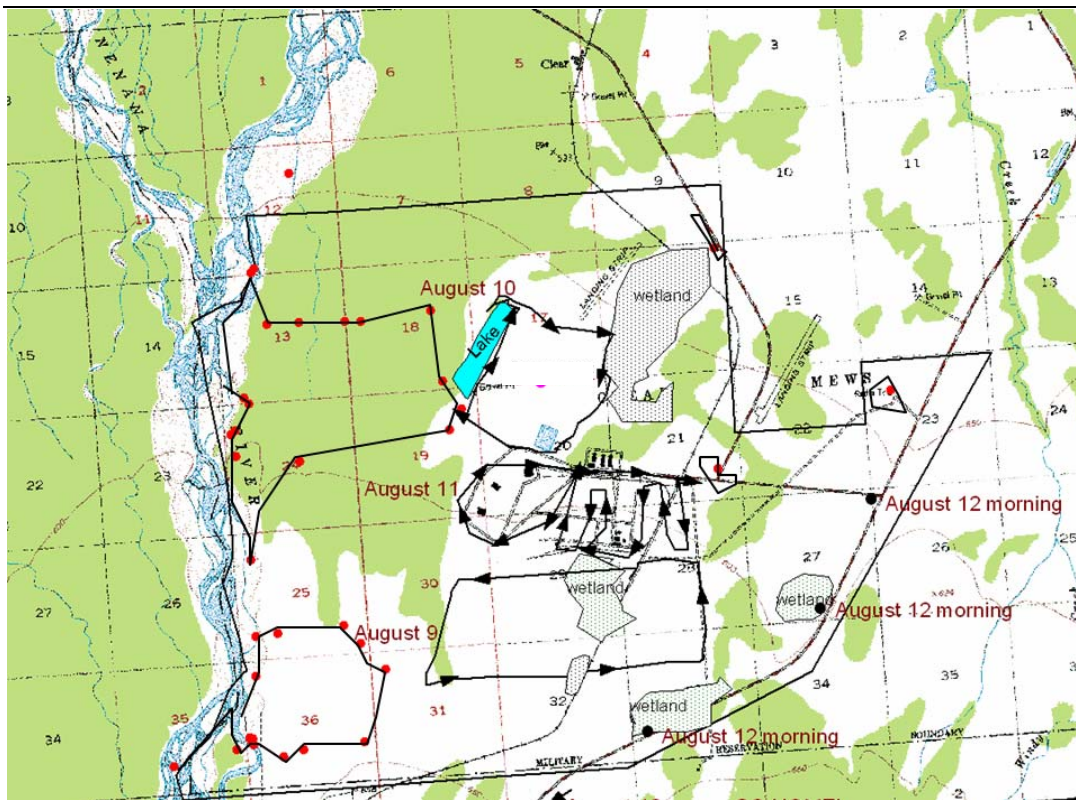


Figure 8. Clear Air Force Station showing vascular plant collection locations (red dots) and survey routes (black lines and arrows).

We made an attempt to inventory as many habitat types along the transects. While walking the transects, we noted the species and when encountering unfamiliar or interesting taxa, specimens were collected along with associated site and habitat data.

The second inventory occurred in mid-August and was designed to capture later-flowering groups such as aquatics and non-native, weedy species. The spatial location of collections focused on the eastern portion of Clear AFS and wetlands in the western portion that were identified as promising in the first sampling trip. Sampling effort was concentrated along roads, trails, railroads, and wetlands, but an effort was also made to walk loose transects in the western portion of Clear AFS (see Fig. 8).

### Field Methods

The field personnel consisted of two teams of two people. This included three AKNHP botanists: Matthew Carlson, Helen Cortes-Burns, and Irina Lapina. Transportation within Clear AFS was by road access, riverboat access along the Nenana River from Anderson, and by foot.

At each region we conducted a complete floristic inventory using the following methods:

- Each region was mapped on an aerial photo or USGS topographic map and a georeferenced point was recorded using GPS. The routes surveyed were also mapped. Representative photos were taken of each region including the plant communities, unusual landforms, and notable plants.
- A description of each region was recorded and significant landforms and plant associations described.

- As new plant communities were encountered, the following data were recorded: vegetation type, slope, aspect, elevation, topographic position, moisture, soil types, parent material, cover classes of growth forms and bare ground, and dominant species by growth form.
- Additional data were gathered specific to the location, habitat, etc. in which plants were collected (these collection localities are referred to as "collection sites"). The nature of data collected is discussed in the following section.
- Voucher specimens were collected and curated as discussed below.

Collections were made only if the population was large enough to support removal of individuals following the collecting protocols of Murray and Parker (1990) and Parker and Murray (1992).

### **Vouchers and Curation**

The following data were recorded with each vouchered specimen: date, unique collection number, latitude and longitude (NAD27, decimal degrees, taken from a handheld GPS unit); slope, aspect, elevation, topographic position, associated landforms, associated species, vegetation class, substrate, soil moisture, soil type, drainage, parent material, cover class and frequency class, notes on characters not preserved well, associated photo number, phenology, and ecological observations. Each voucher specimen is referenced to a specific geographic locality, generally less than 1,000 m<sup>2</sup>, having a uniform habitat. Collections at each site ranged from single specimens to over thirty taxa.

The size of the population and area surveyed was included for species of concern. Population is defined here as a group of individuals of the same species (or subspecies) that occupy the same locality separated from other such groups by more than 1 km. This follows from the definition that NatureServe uses to define "element occurrences."

The first set of collection sheets are archived at the Herbarium of the University of Alaska Museum (ALA) and additional sheets are archived at the University of Alaska Anchorage Herbarium (UAAH).

Specimens were given conditional names in the field by AKNHP botanists. The plants were later sorted, examined and identified by AKNHP botanists, including Robert Lipkin, and the collections then sent to ALA where notable finds and difficult taxa were reviewed by Carolyn Parker (University of Alaska Museum).

We selected collection sites to represent the range in variability of ecoregional subsections landcover types, wetlands, plant associations, and vascular plant species diversity within Clear AFS. Collection sites were explored by covering the region by foot and by carefully examining all the plant species to identify those that were new or noteworthy. Greater time and effort was expended in high diversity and high environmental gradient areas.

These methods have been successful in floristic surveys by AKNHP on other military lands in Alaska (Tande et al. 1995, Lipkin and Tande 2001) and in National Parks in Alaska (see Carlson et al. 2003, Carlson et al. 2004).

## **PLANT SURVEY RESULTS AND DISCUSSION**

A total of 212 specimens were collected, encompassing 151 distinct taxa (see Appendix III). The majority of taxa collected represent new vouchered records for Clear AFS. The

species observed and collected were generally common boreal species of interior Alaska. For example, *Calamagrostis canadensis*, *Geocaulon lividum*, *Viburnum edule*, *Cornus canadensis*, and *Rubus arcticus* were ubiquitous in the forested understory. The common wetland sedges, *Carex aquatilis* and *C. canescens* were observed and collected in a number of areas with standing water or saturated peatlands. In gravel barrens and gravel bars, we did observe a number of species that are uncommon and generally restricted to relatively warm and dry microsites in interior Alaska. *Cnidium cniidiifolium*, *Elaeagnus commutata*, and *Pulsatilla patens* are three species that were found in the southwest corner of Clear AFS in an Aspen-tall willow barren. These species generally inhabit dry open slopes, terraces, and open woods in interior Alaska and Yukon; *Pulsatilla patens* extends south in the Rocky Mountains (NatureServe 2008, Welsh 1974).

### Rare species

No federal or state listed taxa were observed, but four regionally rare species were collected that are listed by NatureServe and the Alaska Natural Heritage Program. All of the rare species were associated with gravelly or sandy habitats; three were collected along the Nenana River on early successional habitats. One rare species was found on gravel roadsides and adjacent gravel barrens. The rare species were *Astragalus polaris* (G4-S3S4), *Astragalus williamsii* (G4-S3), *Salix setchelliana* (G4-S3), and *Silene menziesii* ssp. *williamsii* (G4T4-S3S4). Two other species are included that have been considered to be regionally rare. Figure 9 shows the locations of the rare plants collected in Clear AFS.

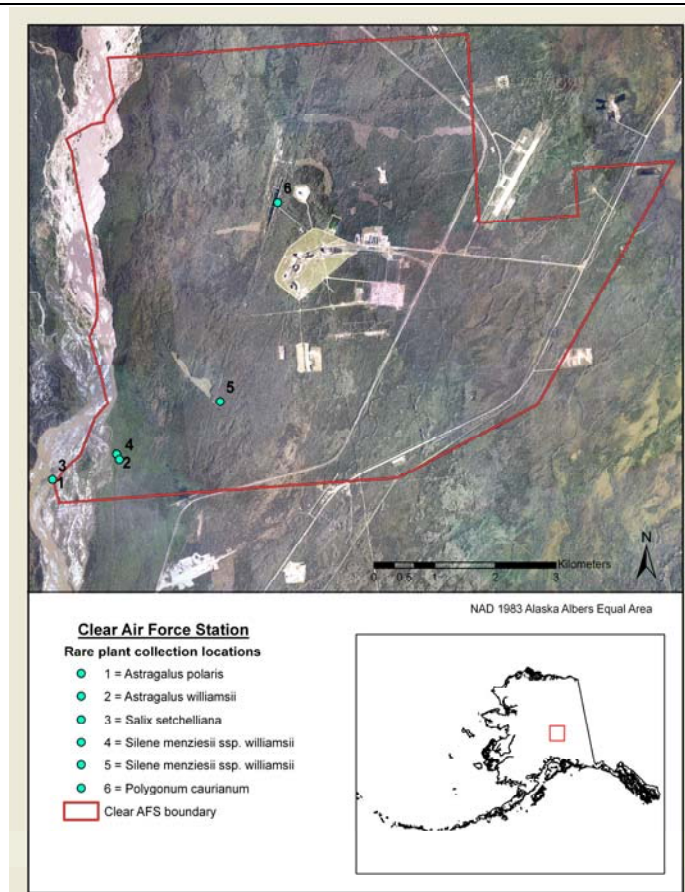


Figure 9. Rare plant locations at Clear AFS.



## Rare Plant Species of Conservation Concern

### Polar Milkvetch

A small population of *Astragalus polaris* (Fabaceae) was found in the southwest corner of Clear AFS (64.2607069° N, 149.28141662° W) on an established river bar, primarily of open sand and gravel (Fig. 10). Less than 50 individuals were scattered over approximately 100 m<sup>2</sup>. It has not been collected from the survey area before. This collection was made approximately 78 km north of a previous collection site at the Denali Park Road and approximately 97 km west of a collection site at Dry Creek, east of Healy (Hultén 1968, University of Alaska Museum 2008).



Figure 10. Riverbar habitat and location of *Astragalus polaris*.

This species, which is distributed from northwestern Alaska to the mountains of south-central Alaska, is considered secure globally, but cause for long-term concern. Within Alaska, is uncommon and cause for long-term concern (AKNHP 2008, NatureServe 2008). This taxon is tightly linked to open sand and gravel habitats inland and to salt marshes along the northwestern coast (Hultén 1968). Judging from other locations we have seen this species, we expect that it is adapted to modest levels of natural disturbance and it may be quite uncommon along the Nenana that is subject to intensive flooding and ice-scour. Any modifications of habitat that encourage shading and development of competing species are likely to cause declines in *Astragalus polaris*.



Figure 11. *Astragalus williamsii* growing in gravel barren habitat. Plants are present in the foreground and background.

*Astragalus polaris* is small decumbent legume with fairly elongated inflorescences, lilac-purple petals, and strongly inflated and papery fruits (Hultén 1968). This species is restricted to the western to central mountainous and arctic regions of Alaska. A number of collections are known from the Alaska Range, just to the south. It is likely that seeds have been carried down from the mountains and have established in habitats that are suboptimal.

### William's Milkvetch

We located a single population of *Astragalus williamsii* (Fabaceae) in the southwest portion of Clear AFS (64.26379° N, 149.2590° W) in an open and gravel barren of cobbles, coarse gravel, and moss, surrounded by young *Populus balsamifera* (Fig. 11). The population was of approximately 25-50 individuals in a roughly 100 m<sup>2</sup> area. Half of the *A. williamsii* plants at this population were growing in a thick stand of the invasive *Melilotus alba* and a small population of the introduced *Elymus sibiricus*. A population of this species was noted by LaGory et al. (1996) in a similar habitat and location.

*Astragalus williamsii* is an erect legume with elongated racemes of white to yellowish flowers and small erect pods. It is endemic to the eastern interior of Alaska and adjacent Yukon on gravelly streambanks, river bars, poplar and aspen woods. It is considered globally secure, but cause for long-term concern and is uncommon to rare in Alaska. In Clear AFS the gravel barrens appear to be its preferred habitat and it is troubling that these habitats are also being invaded by the much taller and aggressive, *Melilotus alba*.

*Melilotus alba* had numerous bee-pollinators visiting it, but no bees were seen visiting the *A. williamsii* plants. The invasive plant may be drawing native pollinators away from the rare species or clogging *A. williamsii* stigmas with heterospecific pollen.

### Setchell's Willow

At the same location as the *Astragalus polaris* (64.2607069°N, 149.28141662° W), we collected *Salix setchelliana* (Salicaceae) from a small population of 50 to 100 plants. It was difficult to determine how many distinct individuals were present, since most were connected with underground stems. The plants were growing in open moist sand that appeared to have been disturbed by shifting river channels within the last few years. This species was also noted along the Nenana River by LaGory et al. (1996). We expected to see this small willow in other river bars with silty-sandy moist substrates along the river but did not.

*Salix setchelliana* is endemic to Alaska, Yukon Territory, and British Columbia and is listed as a long-term concern on the global level and a rare to uncommon species within Alaska. This willow is completely restricted to the barren sandbars of glacier rivers of the Alaska Range and adjacent mountain ranges in Alaska. It is known from gravel bars of the rivers of the north slope of the Alaska Range as far west as the Tonzona River and south to the Matanuska River in the Cook Inlet region. Isolated collections occur on terraces of the Alsek River near Yakutat in the North Tongass National Forest (Carlson et al. 2004) and Denali National Park. This species also occurs in southwestern Yukon Territory, Canada, on silt and gravel outwash of the Donjek and Alsek Rivers and beaches of Lake Kluane (Argus 2004, Viereck and Little 2000). There are likely over 100 locations globally. It tends to form extensive populations on gravel or sand bars along many miles of glacial rivers. The remoteness of the sites could be a cause of under-collecting. There are no known threats (NatureServe 2008), with the exception of competition from invasive species and alterations of early successional river bar habitats due to establishment of novel species. Catkins and leaves start to develop in mid-June and seeds start to disperse by mid-July. It spread mostly vegetatively by root shoots (Collet 2002, Collet 2004).



Figure 12. *Salix setchelliana* growing in a typical open cobbly and sandy habitat.

*Salix setchelliana* is a distinctive short willow with thick, fleshy leaves, and bright red capsules (Fig. 12). It is highly rhizomatous and can form extensive patches on moist sandy substrates.

### William's Campion

Approximately 30 *Silene menziesii* ssp. *williamsii* (Caryophyllaceae) individuals were found in the southwestern portion of Clear AFS along the Nenana River in an Aspen-tall willow shrub habitat (64.26301° N, 149.25818° W) and 50 individuals were observed along a road embankment in a closed aspen forest (64.27039° N, 149.22264° W). This taxon was known from Clear AFS from prior surveys (LaGory et al. 1996).

*Silene menziesii* ssp. *williamsii* is a small plant with broadly lanceolate opposite leaves, a light green calyx and viscid



Figure 13. *Silene menziesii* ssp. *williamsii* growing in a typical open cobbly roadside habitat.

foliage (see Hultén 1968, Fig. 13). This taxon is closely related to the more widespread subspecies *Silene menziesii* ssp. *meinziesii*, but the rare subspecies is distinguished by having narrower leaves, larger and bisexual flowers.

This uncommon to rare subspecies is endemic to Alaska and Yukon Territory. It inhabits open woods, grassy slopes, roadsides, airstrips, and rock outcrops in central and eastern Alaska and western Yukon (Welsh 1974). *Silene menziesii* ssp. *williamsii* appears to require moderately open and well-drained habitats. This taxon appears to be relatively short-lived and capable of colonizing open, disturbed ground. Moderate ground-disturbing activities appear to be unlikely to negatively affect populations of this plant on Clear AFS. Non-native plants, which also tend to occupy similar habitats on Clear AFS, are cause for concern for this species and others. It is likely that *Silene menziesii* ssp. *williamsii* would suffer from competition from non-native plants in these open and roadside habitats.

#### **Alaska Knotweed**

*Polygonum caurianum* is ranked as globally vulnerable (G3) and is critically imperiled in Yukon (S1); it is believed to be relatively common in Alaska, however, and is not ranked by the Alaska Natural Heritage Program (NatureServe 2008). This species was collected along the west margin of Lake Sansing at 64.29906° N, 149.19821° W in saturated soil of organics and large cobbles.

This species inhabits gravel bars along rivers, beaches, dunes, waste places and roadsides in much of Alaska south of the Brooks Range, and in southern Yukon (Hultén 1968, Welsh 1974). It has also been recorded in Northwest and Yukon Territories, Nunavut, and Ontario (NatureServe 2008). This species is likely under-collected and is more common than generally considered. Also, it is often associated with ephemeral habitats, and therefore believed to be resilient to disturbance.

#### **Plant Species Previously Considered Rare**

*Salix interior* (synonym = *Salix exigua* Nutt., sandbar willow) was a species that was believed to more restricted in Alaska at the time LaGory et al. (1996) conducted their inventory. This willow is quite common to early successional floodplains and was collected at two locations and observed throughout the Nenana River bars.

#### **Non-Native Plant Species of Conservation Concern**

In total, 18 non-native species were collected on Clear AFS. The majority of these are ruderal species that are not particularly damaging to ecosystem function or community structure. Non-native plants were primarily restricted to areas of human activity (road fill, parking lots, trails, etc.). Few non-native plant species were encountered in closed forested regions.

#### **White Sweetclover**

Along the Nenana River a large and nearly continuous population of *Melilotus alba* is present (white sweetclover, Fabaceae). This species formed open to dense stands of many thousands of individuals throughout the western boarder of Clear AFS on early to mid-successional river bars and gravel barrens (Fig. 14). This species is easily identified by its erect growth-form, small trifoliate leaves, and white flowers. It is regarded as one of the most invasive plants (invasiveness ranking of 80 out of 100) in Alaska with a potential to alter successional patterns along Alaska's floodplains (Carlson et al. 2008). This species appears to inhibit the survivorship and growth of willows (Spellman 2008), affect soil chemistry and biochemical cycling (Rzeczycki unpublished data) and may have complex effects on forage quality of willows for moose (Sowerwine unpublished



data). Three of the rare plant species were seen growing either in populations of *M. alba* or adjacent to them. Since these rare species are almost entirely linked with open, low-competition environments, we believe *M. alba* may be causing negative impacts on the rare taxa. *Melilotus alba* was also observed along the Parks Highway and access roads in Clear AFS.

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Figure 14. White sweetclover (*Melilotus alba*) infestation along the Nenana River.

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*Melilotus alba* appears to represent the greatest threat to native habitats and species. Management of this species may be possible on the eastern side of Clear AFS, but will be particularly challenging along the Nenana River, where large populations exist upstream all the way to Healy and are surely sending down large numbers of seeds yearly (see Conn et al. 2008).

#### **Yellow Sweetclover**

A small population of *Melilotus officinalis* (yellow sweetclover) was collected in the southwest corner of Clear AFS along the Nenana River, surrounded by *M. alba*. *Melilotus officinalis* has not spread as rapidly and aggressively as *M. alba*, but we recommend eliminating this species since it appears to be at an early stage of invasion.

#### **Siberian Wildrye**

One species that was previously not encountered in Clear AFS, but appears to be expanding in sandy substrates in southcentral and interior Alaska is *Elymus sibiricus*. This is a tall, rhizomatous grass with distinctive flexuous spikes. We observed two small populations along the Nenana River in a gravel barren at 64.20259° N, 149.26244° W and an open gravel bar at 64.31585312° N, 149.251601° W. We recommend eliminating these populations and conducting surveys each summer to identify any new populations and control the populations.

### **Other Non-Native Plant Species**

The majority of other invasive plant species encountered was associated with roadsides, such as the Parks Highway and gate to Denali Bureau Landfill, and included species that are regarded as weakly to moderately invasive. Table 4 summarizes the non-native plants found on Clear AFS, their invasiveness ranks, and locations.

Table 4. Non-native species populations encountered at Clear AFS, their locations, habitats, and invasiveness ranking (see Carlson et al. 2008 for more information about the ranking system and these species.)

| Species  | Invasiveness                                     |  | Latitude  | Longitude  | Habitat   |
|--|--|--|-----------|------------|---|
|  | Rank   |  |           |            |   |
| <i>Bromus inermis</i> ssp. <i>inermis</i> Leyss.                         | 62   |  | 64.260707 | 149.281417 | Nenana River gravel bar, associated with <i>Populus balsamifera</i> , <i>Salix</i> spp.   |
| <i>Chenopodium album</i> L.  | 35   |  | 64.27039  | 149.22264  | Road embankment in a closed aspen forest  |
| <i>Crepis tectorum</i> L.  | 52   |  | 64.2715   | 149.11504  | Imported gravels, associated with <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i> , <i>Chamerion angustifolium</i>   |
| <i>Elymus repens</i> (L.) Gould  | 59   |  | 64.26245  | 149.22951  | Road grade in a closed aspen forest   |
| <i>Elymus sibiricus</i> L.   | Not Ranked                                       |  | 64.20259  | 149.26244  | Gravel barren   |
| <i>Elymus sibiricus</i> L.   | Not Ranked                                       |  | 64.315853 | 149.251601 | Open river bar  |
| <i>Erysimum cheiranthoides</i> L.  | Generally considered native                      |  | 64.29858  | 149.198547 | Road along east shore of Lake Sansing   |
| <i>Gnaphalium uliginosum</i> L.  | Not Ranked                                       |  | 64.309179 | 149.22267  | Black forest in thick moss-humus  |
| <i>Hordeum jubatum</i> L.  | 63 – likely with native and introduced genotypes |  | 64.29906  | 149.19821  | Clearcuts, saturated soils, associated with <i>Populus tremuloides</i> , <i>P. balsamifera</i> , <i>Shepherdia canadensis</i> , <i>Salix</i> spp., <i>Epilobium ciliatum</i> , <i>Poa palustris</i> |
| <i>Lepidium densiflorum</i> Schrad.                                      | 25   |  | 64.29688  | 149.20181  | Access road embankments in aspen, tall willows  |
| <i>Lolium perenne</i> ssp. <i>multiflorum</i> (Lam.) Husnot              | 41   |  | 64.2715   | 149.11504  | Imported gravels, associated with <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i> , <i>Chamerion angustifolium</i>   |
| <i>Matricaria discoidea</i> DC.  | 34   |  | 64.27039  | 149.22264  | Road embankment in a closed aspen forest  |
| <i>Melilotus alba</i> Medikus  | 80   |  | 64.27039  | 149.22264  | Road embankment in a closed aspen forest  |
| <i>Melilotus officinalis</i> (L.) Lam.                                   | 65   |  | 64.260707 | 149.281417 | Open river bar  |
| <i>Phleum pratense</i> L.  | 56   |  | 64.2715   | 149.11504  | Imported gravels, associated with <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i> , <i>Chamerion angustifolium</i>   |
| <i>Plantago major</i> L.   | 44   |  | 64.27039  | 149.22264  | Road embankment   |
| <i>Plantago major</i> L.   | 44   |  | 64.27351  | 149.22868  | Road embankment   |
| <i>Poa pratensis</i> L.  | 57 – Native and introduced genotypes             |  | 64.26301  | 149.25818  | Aspen-Willow tall shrub adjacent to the Nenana River  |
| <i>Poa pratensis</i> L.  | 57 – Native and introduced genotypes             |  | 64.27351  | 149.22868  | Road embankment   |
| <i>Poa pratensis</i> L.  | 57 – Native and introduced genotypes             |  | 64.29362  | 149.16867  | Open field adjacent to the dormitories  |
| <i>Taraxacum officinale</i> ssp. <i>officinale</i> G.H. Weber ex Wiggers | 62   |  | 64.26346  | 149.25839  | Alder thicket along the Nenana River  |
| <i>Trifolium hybridum</i> L.   | 57   |  | 64.27039  | 149.22264  | Road embankment in a closed aspen forest  |

## CONCLUSION AND RECOMMENDATIONS FOR PLANT SPECIES

Clear Air Station does not appear to harbor critically imperiled vascular plant taxa, but it does have a number of regional endemics that warrant attention. Losses of populations of these regional endemics on Clear AFS does not immediately threaten the species, but it would likely cause loss of genetic variability and place greater conservation importance on remaining populations. Additionally, the ecology of these species is not well known and losses of populations could result in cascading losses of other dependent

populations (e.g., specialist pollinators or herbivores). We recommend casual demographic monitoring (population trends) and ecological studies to understand the rare species' ecological interaction with other species and the abiotic environment.

With the exception of *Silene menziesii* ssp. *williamsii*, which grows in road edges and gravels exposed by human activity, the other rare taxa are confined to early and mid-successional river bars or gravel barrens along the Nenana. This is clearly the more unique and critical habitat type for vascular plants on Clear AFS, relative to aspen woodlands or black spruce forests. This river bar habitat is also being severely threatened by a large invasion of white sweetclover (*Melilotus alba*). This species is undoubtedly altering the hydrology, nutrient cycling, and successional processes along the Nenana, as well as competing with the native plants (including the rare species) for resources. While control of this species will be difficult, the potential ecological impacts are extremely large and warrant such efforts. Additionally, we recommend studies to understand what those impacts are.

Overall, we suggest that population control of non-native species through early detection and rapid response will have a great positive effect on rare plant species and other biological resources on Clear AFS. Secondly, rare plant populations could be negatively impacted by ground disturbing activities. Ground disturbing activities are also likely to facilitate the establishment of more non-native plants. We recommend limiting ground disturbance of the biologically sensitive areas, particularly the gravel barren habitats. Additionally, if a disturbance of natural substrates is anticipated, we recommend conducting more intensive surveys for rare species in those areas and conducting pre- and post-disturbance monitoring of those populations.

## AVIAN SPECIES OF CONSERVATION CONCERN

### METHODS OF THE AVIAN SURVEYS

#### Avian Survey Methodology and Study Design

In order to attain the goal of determining the presence of federally protected threatened and endangered animal species, state protected species, sensitive species and species of concern within Clear AFS, we conducted avian surveys during the period of spring migration, breeding and fall migration to assess species composition, distribution and seasonal usage of the station in a variety of habitats. Information generated from this study will serve to inform resource managers at Clear AFS about the presence of sensitive avian species and identify their seasonal use of the station and the habitats that support them.

To accomplish this objective we implemented two types of surveys:

1. Road based surveys that utilized a repeatable, scientifically valid design suited to survey birds in road accessible areas to gauge seasonal changes in bird use of the station.
2. Off-road surveys that utilized a repeatable, scientifically valid design to census birds in a variety of habitats during the June breeding season.

During both surveys, we collected data on vegetation cover type and physical attributes at each sample point in order to describe avian habitat associations for any species of concern.

Although numerous mammalian species are known to occur in or adjacent to Clear AFS, none of these were identified as species of concern by various state or federal entities. Therefore, our survey for rare, threatened and endangered animal species present at Clear AFS exclusively targeted avian species. However, we did note any observations or sign (e.g. tracks or scat) of mammals encountered incidentally during or in transit to bird surveys.

#### Sampling Design

We utilized two different sampling strategies to assess the species composition and distribution of birds present at Clear AFS. The first sampling strategy involved road-based point count surveys conducted at bi-weekly intervals from late-May to late-August to assess seasonal changes in bird use of the station. The second sampling strategy involved more extensive point count censuses at random locations during the June breeding season (approximately June 11 – June 30). The latter strategy was used to identify species of potential concern that breed on Clear AFS and provide information on the types of habitats that they utilize. Each sampling type is described separately below.

*Road-based Point Count Surveys – Seasonal Usage:* We attempted to repeat the road-based point count surveys conducted by LaGory et al. (1996) to assess seasonal changes in bird use on Clear AFS. This driving route consisted of 32 stops (points), with 0.2 miles between each stop, for a total distance of 15 miles (Fig. 15). This route was selected for repeat sampling based on its inclusion of multiple habitat types and relative ease of access for sampling. At each sampling point (stop), the observer counted the number of individual birds of each species seen or heard and their behavior during a 5-minute sampling period. Sampling methods were consistent with the North American Breeding Bird Survey (BBS; Sauer et al. 1997), a national road-based survey sponsored by the US Geological Survey (USGS), designed to provide a continent-wide perspective



of changes in avian populations. We censused this route at approximately two week intervals from May 25 to August 22, 2007.

We conducted a reconnaissance of the route on May 19 and 20, 2007, to assess the repeatability of the road-based route described by LaGory et al. (1996) and to build familiarity with the station and its habitats. We were unable to access a one mile-long section of the original route due to construction of the SARRS radar station (circa 2001). With the elimination of this mile-long section, our road based survey was reduced to 32 points compared of the original 35 points surveyed by LaGory et al. (1996). We conducted a training session along the route on May 25, 2007 to ensure that all observers were consistent with data collection techniques.

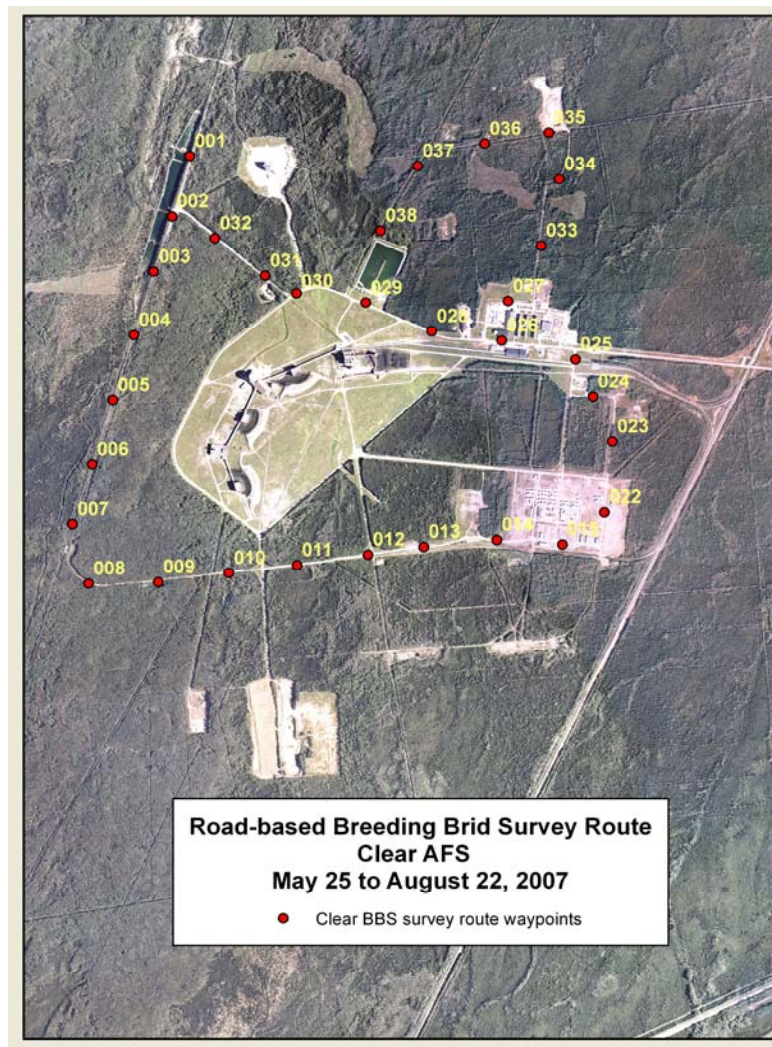


Figure 15. Map of the road-based breeding bird survey route conducted bi-weekly at Clear AFS, from May 25 to August 22, 2007. Survey points are numbered consecutively from 1 to 15 and 22 to 38. There are no survey points numbered 16 to 21.

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*Off-road Point Count Surveys – Breeding Season:* To assess the composition of bird species present at Clear AFS and identify habitats important during the breeding season we conducted off-road point count surveys in a variety of habitats. Surveys were timed to coincide with the period of peak courtship activity of birds, allowing us to maximize

detection rates. According to the earlier work of LaGory et al. (1996), this period was approximately June 11 to June 30.

We used a stratified random sampling design to select sample plots to reduce bias in abundance estimates and to provide a more spatially balanced sample. Strata were defined by the most currently available vegetation map for Clear AFS, developed by Kautz in 2005. For our stratification, we collapsed the 12 major vegetation cover types described by Kautz (2005) to five categories, based on the dominant vegetation type (Table 5).

Table 5. Summary of the dominant vegetation cover types used to stratify off-road avian surveys at Clear AFS.

| <b>Dominant Cover Type</b> | <b>Total acres</b> | <b>% Total cover</b> | <b># survey plots within cover type</b> |
|----------------------------|--------------------|----------------------|---|
| Black Spruce               | 4046               | 51                   | 3                                       |
| Quaking Aspen              | 2801               | 35                   | 2                                       |
| Alder Willow               | 535                | 7                    | .5                                      |
| Balsam Poplar              | 516                | 6                    | 1                                       |
| White Spruce               | 58                 | 1                    | .5                                      |
|                            | <b>7956</b>        | <b>100</b>           | <b>7</b>                                |

Within the sample frame, we allocated sample plots proportionally to the area covered by each dominant vegetation type, except that we allocated a single plot to those strata that would otherwise have been too small to receive one (e.g., alder willow and white spruce; Table 5). Because surveys were set to commence within 30 minutes after sunrise (approximately 3:00 a.m.), we selected sampling blocks with a starting point within 1 km of established primary or secondary roads or trails, within appropriate strata, to allow for sufficient time and safe travel to sampling starting points prior to sunrise. A total of seven sampling plots were selected using a random numbers generator. The alder willow and white spruce plots were adjacent to each area and were therefore combined to form a single plot.

Protocols for point count surveys were consistent with the Alaska Landbird Monitoring Survey (ALMS) sponsored by Boreal Partners in Flight and managed by the USGS Alaska Science Center (Handel and Cady 2004). Each of the seven selected random points was the starting point for a 4 X 4 array/sampling block (Fig. 16). Within a given sampling block, points were spaced 250 m apart. The entire 4 X 4 (16 survey point) grid was sampled in one morning or two consecutive mornings if we were unable to complete the grid in one day.

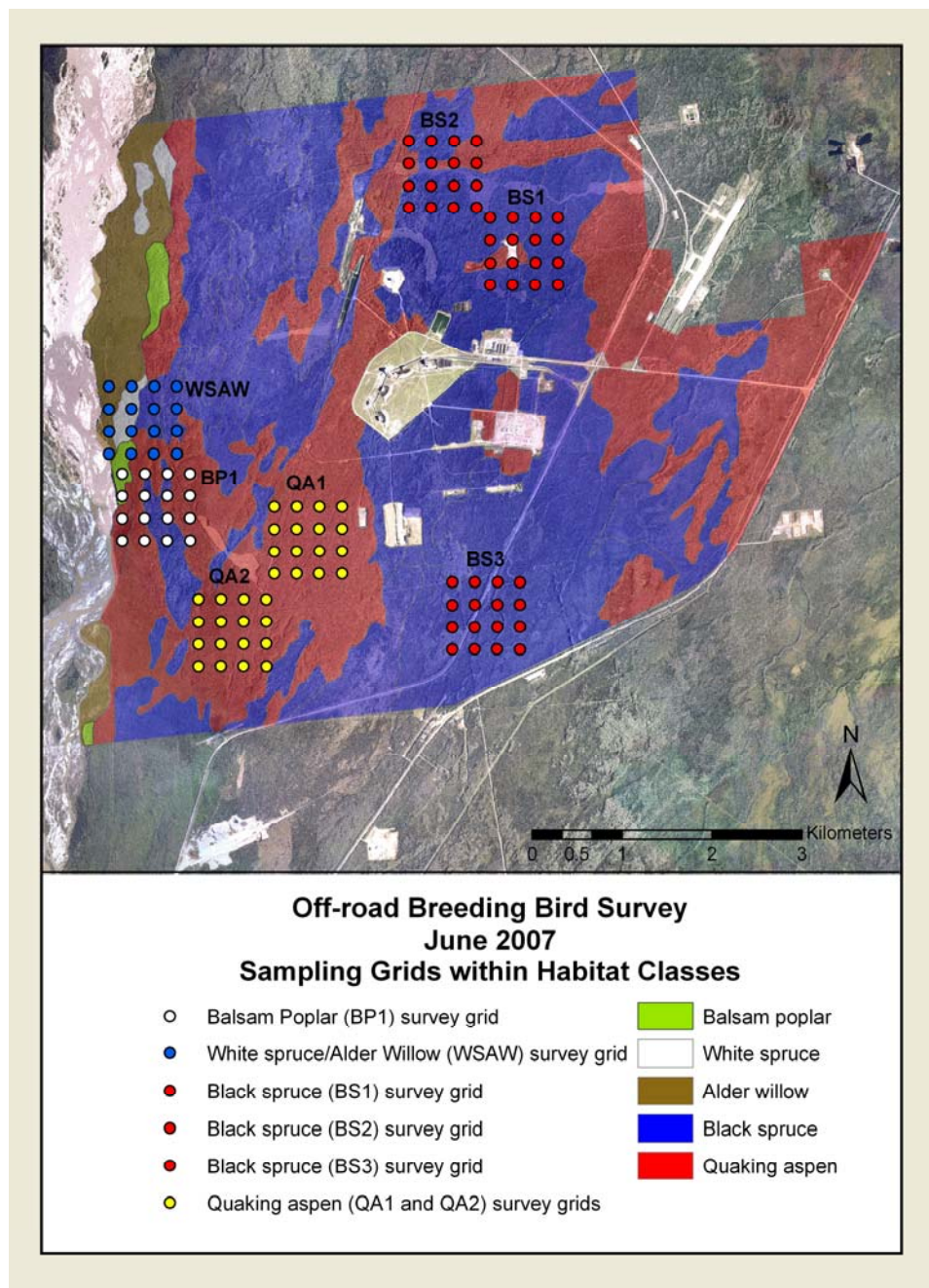


Figure 16. Distribution of off-road breeding bird survey sampling plots (grids) by habitat class, Clear AFS.

### Field Methods

The field personnel consisted of one team of three people for the off-road point counts; this team was reduced to two people for the road-based surveys. These included three AKNHP zoologists: Tracey Gotthardt, Tamara Fields and Anna Jansen. Road-based survey locations were accessed by vehicle along primary and secondary roads. Off-road breeding bird survey locations were accessed by vehicle along primary and secondary roads whenever possible, and trails and off-trail locations were accessed by mountain bike or on foot.



Road-based point count surveys were conducted throughout the breeding season and were also designed to capture spring and fall migration. Surveys were conducted on a bi-weekly basis from May 25 to August 22, 2007. Off-road breeding bird surveys were designed to detect peak courtship, and were conducted for 10 consecutive days from 13 June to 23 June 2007.

*Point sampling:* At each survey point we counted the number of individual birds of each species seen or heard within a 150 m radius during a 5-minute sampling period. The observer also estimated the horizontal distance to individual birds. Distance estimations were categorical and denoted by 10-m bands out to 100 m from the survey point and in 25-m bands from 101-150 m from the survey point. We used a double-observer approach with dependent observers (Nichols et al. 2000). This technique required observers to alternate between “primary” and “secondary” roles. The primary observer communicated birds seen or heard to the secondary observer. The secondary observer recorded birds detected by the primary observer as well as any additional birds (s)he detected.

In addition to data collected during point-count censuses, a daily log of birds and mammals observed at any location on the station was maintained. Several species were recorded in this daily log that were not recorded along census routes.

*Habitat sampling:* For assessing both vegetation cover type within 150-m radius of each sample point and habitat associations for birds detected during counts, we followed ALMS sampling protocols which use the Alaska Vegetation Classification (Viereck et al. 1992). This five-level hierarchical system describes vegetation by structure (vertical and horizontal), moisture content of the substrate, and floristics. At each point, we classified vegetation to level III (see Appendix IV). To determine the vegetative cover about a point we used a range finder to define the 150-m radius and then visually examined the percent cover of the different vegetation types within the circle. We also took pictures of representative vegetation at each point.

### **Training**

All observers participated in bird identification and distance estimation training at the Alaska Bird Observatory, Fairbanks, Alaska, prior to going into the field. Both aural and visual bird identification skills were utilized during surveys. We conducted a preliminary survey of the station in May to familiarize all observers with the birds and the various habitat types.

### **Data Management**

All bird survey data and habitat data were entered into an Excel spreadsheet and later transferred into an Access database. Original forms, field maps, and photographs are stored at the AKNHP office in Anchorage. We used ArcGIS 9.0 to establish a GIS project for the study area and to summarize and present spatial data. All GPS data were downloaded and integrated with the bird data in the ArcGIS database.

### **Analyses**

Information on species occurrence was extracted from both road-based and off-road surveys to generate a comprehensive list of species for Clear AFS. This information was also used to determine the status (i.e. breeding or migrant) of species within the study area. These data were mapped at the plot level to derive patterns of distribution of species across the study area. In addition to the bird data, observations of mammals were taken from plot summary forms and summarized.

## AVIAN SURVEY RESULTS AND DISCUSSION

### Species List

We combined the results of the off-road (breeding bird), road-based (seasonal usage) surveys, and incidental sightings collected during surveys between survey points to create a comprehensive avian species list for Clear AFS. During the 2007 field season, we detected a total of 53 species of birds present at the station. Among these were 36 species of landbirds (grouse, woodpeckers, flycatchers, swallows, chickadees, kinglets, thrushes, pipits, waxwings, warblers, sparrows, and blackbirds), 5 species of raptors, 2 species of shorebirds, 4 waterfowl species, 3 loons and grebes, and 5 seabirds (including gulls) (Table 6).

Table 6. Birds of Clear AFS. “B” indicates a species detected during off-road (breeding) surveys, “S” indicates a species detected during road-based (seasonal usage) surveys and “I” indicates a species that was observed incidentally while in transit between survey points during either off-road or road-based surveys. Species reported by previous observers (LaGory et al 1996) are denoted by an “X”.

| Common Name            | Scientific Name                 | G Rank | S Rank   | Detection Status | Previous Detections |
|------------------------|---------------------------------|--------|----------|------------------|---------------------|
| Alder Flycatcher       | <i>Empidonax alnorum</i>        | G5     | S5B      | B,S,I            | X                   |
| American Pipit         | <i>Anthus rubescens</i>         | G5     | S5B      | I                |                     |
| American Robin         | <i>Turdus migratorius</i>       | G5     | S5B      | B,S              | X                   |
| American Tree Sparrow  | <i>Spizella arborea</i>         | G5     | S3N,S5B  | S                | X                   |
| American Wigeon        | <i>Anas americana</i>           | G5     | S4N,S5B  | S                | X                   |
| Arctic Tern            | <i>Sterna paradisaea</i>        | G5     | S4S5B    | I                | X                   |
| Bald Eagle             | <i>Haliaeetus leucocephalus</i> | G5     | S5       | S                |                     |
| Black-capped Chickadee | <i>Poecile atricapilla</i>      | G5     | S5       | B,S              | X                   |
| Blackpoll Warbler      | <i>Dendroica striata</i>        | G5     | S4B      | B,S              | X                   |
| Boreal Chickadee       | <i>Poecile hudsonica</i>        | G5     | S5       | B,S              | X                   |
| Canada Goose           | <i>Branta canadensis</i>        | G5     | S5B      | S                | X                   |
| Cliff Swallow          | <i>Petrochelidon pyrrhonota</i> | G5     | S5B      | S                | X                   |
| Common Raven           | <i>Corvus corax</i>             | G5     | S5       | B,S              | X                   |
| Common Redpoll         | <i>Carduelis flammea</i>        | G5     | S5       | B,S              | X                   |
| Dark-eyed Junco        | <i>Junco hyemalis</i>           | G5     | S5B      | B,S              | X                   |
| Fox Sparrow            | <i>Passerella iliaca</i>        | G5     | S5B, S3N | S                | X                   |
| Glaucous Gull          | <i>Larus hyperboreus</i>        | G5     | S5B, S4N | S                |                     |
| Glaucous-winged Gull   | <i>Larus glaucescens</i>        | G5     | S5B, S5N | S                |                     |
| Gray Jay               | <i>Perisoreus canadensis</i>    | G5     | S5       | B,S              | X                   |
| Gray-cheeked Thrush    | <i>Catharus minimus</i>         | G5     | S4S5B    | B,S              | X                   |
| Hammond's Flycatcher   | <i>Empidonax hammondi</i>       | G5     | S4S5B    | S                | X                   |
| Hermit Thrush          | <i>Catharus guttatus</i>        | G5     | S5B      | B,S              | X                   |
| Herring Gull           | <i>Larus argentatus</i>         | G5     | S5B, S5N | S                | X                   |
| Horned Grebe           | <i>Podiceps auritus</i>         | G5     | S5       | S                |                     |
| Lapland Longspur       | <i>Calcarius lapponicus</i>     | G5     | S5B      | I                |                     |
| Lesser Yellowlegs      | <i>Tringa flavipes</i>          | G5     | S5B      | S                | X                   |
| Lincoln's Sparrow      | <i>Melospiza lincolni</i>       | G5     | S5B      | S                | X                   |
| Mallard                | <i>Anas platyrhynchos</i>       | G5     | S5B, S5N | S                |                     |
| Merlin                 | <i>Falco columbarius</i>        | G5     | S4B, S3N | B                |                     |
| Mew Gull               | <i>Larus canus</i>              | G5     | S5B      | B,S              | X                   |
| Northern Flicker       | <i>Colaptes auratus</i>         | G5     | S5B      | I                | X                   |
| Northern Goshawk       | <i>Accipiter gentilis</i>       | G5     | S4       | B,S              |                     |

Table 6. (continued)

| Common Name                                  | Scientific Name               | G Rank | S Rank              | Detection Status | Previous Detections |
|--|-------------------------------|--------|---------------------|------------------|---------------------|
| Northern Shoveler                            | <i>Anas clypeata</i>          | G5     | S5B                 | S                | X                   |
| Orange-crowned Warbler                       | <i>Vermivora celata</i>       | G5     | S5B                 | B,S              | X                   |
| Osprey                                       | <i>Pandion haliaetus</i>      | G5     | S2B                 | B,I              |                     |
| Pacific Loon                                 | <i>Gavia pacifica</i>         | G5     | S5B,S4S5N<br>S4S5B, | S                |                     |
| Red-necked Grebe                             | <i>Podiceps grisegena</i>     | G5     | S4N                 | S                |                     |
| Ruby-crowned Kinglet                         | <i>Regulus calendula</i>      | G5     | S5B                 | B,S              | X                   |
| Ruffed Grouse                                | <i>Bonasa umbellus</i>        | G5     | S4                  | I                | X                   |
| Rusty Blackbird                              | <i>Euphagus carolinus</i>     | G4     | S3S4B               | I                | X                   |
| Sandhill Crane                               | <i>Grus canadensis</i>        | G5     | S5B                 | I                | X                   |
|  | <i>Passerculus</i>            |        |                     |                  |                     |
| Savannah Sparrow                             | <i>sandwichensis</i>          | G5     | S5B                 | S                | X                   |
| Sharp-shinned Hawk                           | <i>Accipiter striatus</i>     | G5     | S4B,S3N             | I                | X                   |
| Spotted Sandpiper                            | <i>Actitis macularius</i>     | G5     | S5B                 | S                | X                   |
| Swainson's Thrush                            | <i>Catharus ustulatus</i>     | G5     | S5B                 | B,S              | X                   |
| Tree Swallow                                 | <i>Tachycineta bicolor</i>    | G5     | S5B                 | B,S              | X                   |
| Varied Thrush                                | <i>Ixoreus naevius</i>        | G5     | S5B                 | S                | X                   |
| White-crowned Sparrow                        | <i>Zonotrichia leucophrys</i> | G5     | S5B                 | S                | X                   |
| White-winged Crossbill                       | <i>Loxia leucoptera</i>       | G5     | S5                  | B                | X                   |
| Wilson's Snipe                               | <i>Gallinago delicata</i>     | G5     | S5B                 | B,S              |                     |
| Wilson's Warbler                             | <i>Wilsonia pusilla</i>       | G5     | S5B                 | B,S              | X                   |
| Yellow Warbler                               | <i>Dendroica petechia</i>     | G5     | S5B                 | B,S              | X                   |
| Yellow-rumped Warbler                        | <i>Dendroica coronata</i>     | G5     | S5B                 | B,S              | X                   |
| <b>Total species detected during surveys</b> |                               |        |                     | <b>53</b>        |                     |

We detected 12 species not previously reported by LaGory et al. (1996) as occurring at Clear AFS. These included: Pacific Loon, Red-necked Grebe, Horned Grebe, Mallard, Bald Eagle, Northern Goshawk, Merlin, Osprey, Wilson's Snipe, Glaucous and Glaucous-winged Gull, and American Pipit. Conversely, we did not detect 17 of the species reported during surveys conducted 11 years earlier by LaGory et al (1996), including 5 species of landbirds, 4 species of shorebirds, 4 waterfowl species, 3 species of raptors and one grouse species (see Appendix V for full list).

### Avian Species of Concern

We did not detect any State or Federally listed threatened or endangered bird species during our study. However, five species observed during the 2007 bird surveys are considered species of conservation or management concern by various state, federal, national and/or non-governmental organizations (Table 7). These include the Blackpoll Warbler, Gray-cheeked Thrush, Osprey, Rusty Blackbird and White-winged Crossbill. The Blackpoll Warbler and Gray-cheeked Thrush, both State of Alaska Species of Special Concern, were also reported by LaGory et al (1996) during a previous avian inventory at Clear AFS.

Table 7. Avian species of conservation concern recorded in Clear AFS.

| Common Name <sup>1</sup> | G Rank | S Rank | Federal <sup>2</sup> | State <sup>3</sup> | Other State <sup>4</sup> | Other National <sup>5</sup> |
|--------------------------|--------|--------|----------------------|--------------------|--------------------------|-----------------------------|
| Blackpoll Warbler        | G5     | S4B    | BLM SENS             | SSOC               | Audubon, BPIF PSOC       |                             |
| Gray-cheeked Thrush      | G5     | S4S5B  | BLM SENS             | SSOC               | BPIF PSOC                |                             |
| Osprey                   | G5     | S2B    | USFS SENS            |                    |                          |                             |
| Rusty Blackbird          | G4     | S3S4B  |                      |                    | Audubon, BPIF PSOC       | NALCP                       |
| White-winged Crossbill   | G5     | S5     |                      |                    | BPIF PSOC                |                             |

<sup>1</sup>See Table 6 for scientific names.

<sup>2</sup>BLM SENS = Federal status included Bureau of Land Management Sensitive Species List (BLM 2006) and USFS SENS = USDA U.S. Forest Service Sensitive Species List (USFS 1997).

<sup>3</sup>SSOC = State of Alaska Species of Special Concern (ADF&G 1998).

<sup>4</sup>Audubon = Audubon Alaska Watchlist (Stenhouse and Senner 2005), BPIF PSOC = Boreal Partners in Flight Priority Species for Conservation (BPIF 1999).

<sup>5</sup>NALCP = North American Landbird Conservation Plan (Rich et al. 2004).

### Blackpoll Warbler

Blackpoll Warblers were heard during surveys on four different occasions (Table 8; Figs.17, 24) on four different days (June 16, 18, July 11 and August 8). These dates coincided with the breeding and fall migratory periods of this species. Although no direct evidence (e.g., nests or fledged young) was gathered that indicated the species breeds on Clear AFS, its presence throughout the breeding period and the presence of singing adult males suggests it may breed on the station. All sites where Blackpoll Warbler were heard were forested and included black spruce-dominated, quaking aspen-dominated, and mixed forest types with a moderate to heavy shrub layer and light herbaceous cover (Table 8; Fig. 19).



Figure 17. Blackpoll Warbler (*Dendroica striata*). Photo credit © Jeff Nadler

### Gray-cheeked Thrush

The Gray-cheeked Thrush was seen or heard on Clear AFS on eight different occasions (Table 8; Figs.18, 24) on four days (June 16, 17 and August 14, 22). Similar to the Blackpoll Warbler, no direct evidence of breeding was observed, but detections of Gray-Cheeked Thrush during the breeding season may indicate it breeds on the station. Five of the sites where Gray-cheek Thrush were heard singing were at adjacent point locations in the central part of the base; a Blackpoll Warbler was also detected at one of these locations (Fig. 24). Similar to the Blackpoll Warbler, all sites where Gray-cheeked Thrush were heard were forested and included black spruce-dominated, quaking aspen-dominated, paper-birch dominated and mixed forest types with a moderate shrub layer and light herbaceous cover (Fig. 19).



Figure 18. Forest-nesting passerine species, Gray-cheeked Thrush (*Catharus minimus*). Photo credit © Kevin T. Karlson.



Figure 19. Example of quaking aspen/black spruce mixed forest habitat similar to where Blackpoll Warbler and Gray-cheeked Thrush were detected.

### Osprey

A total of five Osprey were observed during summer 2007 (Table 8, Fig. 20). A single Osprey was observed flying overhead during road-based surveys (August 8; Fig. 23). Osprey were also recorded incidentally on two other occasions on two different days (June 18 and August 21). A single bird was sighted on June 18, while the August 21 sighting was of three birds. All sightings were birds flying overhead. It is unclear whether or not Osprey breed at Clear AFS, but two of the three sightings coincided with the fall migratory period of this species.



Figure 20. Osprey (*Pandion haliaetus*).  
Photo credit © Jeff Nadler.



### **Rusty Blackbird**

Five Rusty Blackbirds were observed on the periphery of Lake Sansing on August 23 for approximately 30 minutes (Table 8, Fig. 21). They were absent from this location the following day. It is likely they were in transit during the fall migratory period.

### **White-winged Crossbill**

White-winged Crossbills were heard on two occasions during two different days (June 19 and 20) (Table 8; Fig. 24). Similar to the Blackpoll Warbler and Gray-cheeked Thrush, the presence of singing male White-winged Crossbills during the breeding season may indicate the species breeds on the station, although it appears that the number of individuals breeding on site was low or this species was not easily detected during surveys. All sites where White-winged Crossbills were heard were black-spruce dominated forest with a light to moderate shrub layer, light to moderate herbaceous cover and a high number of both coniferous and deciduous snags (Table 8; Figs. 22 and 23).



Figure 21. Rusty Blackbird (*Euphagus carolinus*). Photo credit © Jeff Nadler.



Figure 22. Example of Black spruce dominated forest with numerous coniferous snags.



Figure 23. White-winged Crossbill (*Loxia leucoptera*). Photo credit: Wikipedia.

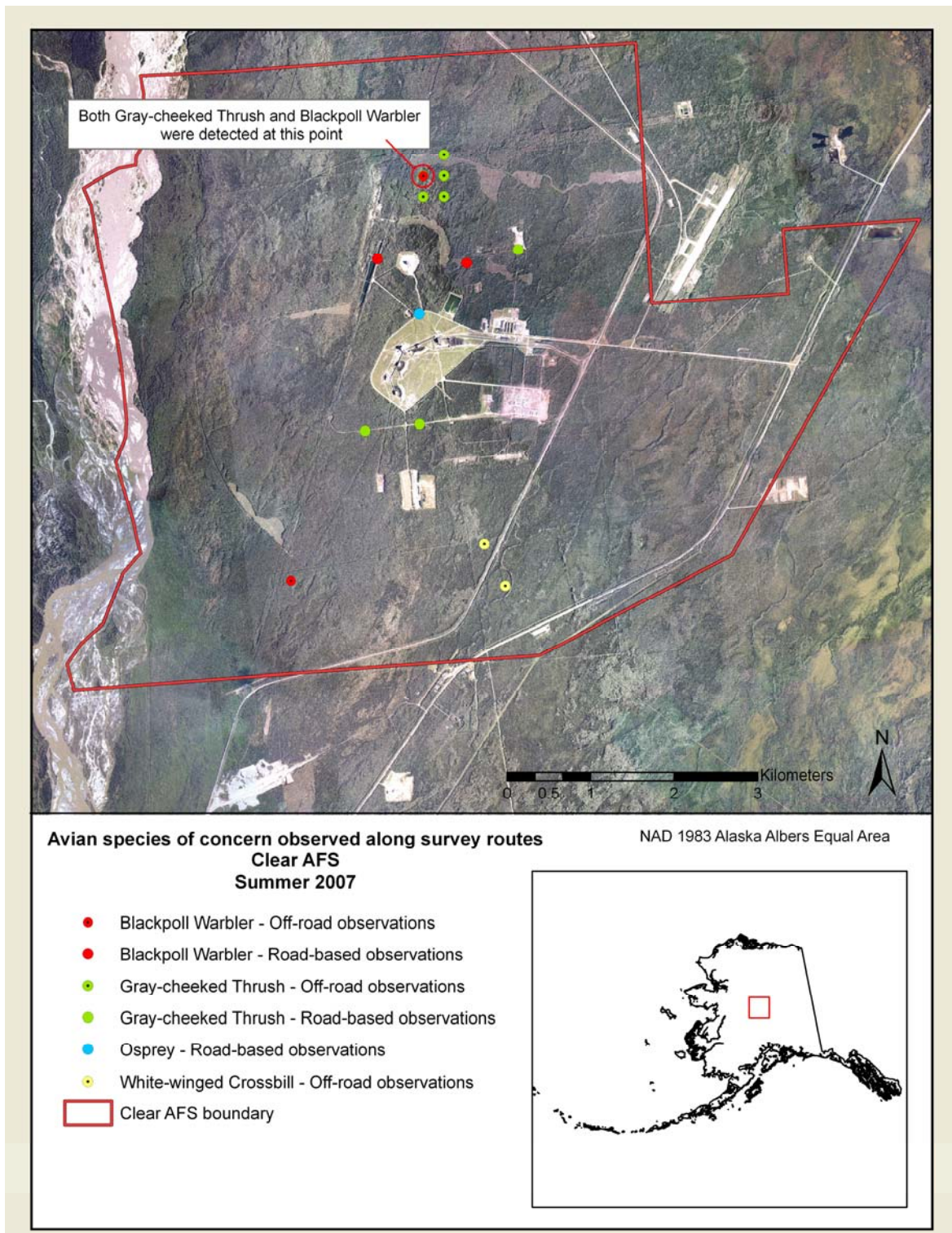


Figure 24. Locations where Blackpoll Warbler, Gray-cheeked Thrush, Osprey and White-winged Crossbill were observed during avian surveys, Clear AFS, May to August 2007.

Table 8. Records of observations for avian species of concern: Blackpoll Warbler, Gray-cheeked Thrush, Osprey, Rusty Blackbird and White-winged Crossbill, Clear AFS, June to August 2007.

| Date                          | Survey Type | Route | Stop | # Birds Observed | Latitude/Longitude | Dominant Tree Species  | Tree Canopy Cover (%) | Tree Height (m) | Shrub Canopy Cover (%) |
|-------------------------------|-------------|-------|------|------------------|--------------------|--|-----------------------|-----------------|------------------------|
| <b>Blackpoll Warbler</b>      |             |       |      |                  |                    |  |                       |                 |                        |
| 6/16                          | Off-road    | BS2   | 8    | 1                | 64.3093 -149.1844  | Black spruce, quaking aspen  | 70                    | 3-21            | 6-25                   |
| 6/18                          | Off-road    | QA2   | 12   | 1                | 64.2632 -149.2353  | Quaking aspen, paper birch   | 64                    | 9-21            | 26-50                  |
| 7/11                          | Road-based  | --    | 37   | 1                | 64.2997 -149.1752  | Black spruce, paper birch (85%),<br>Quaking aspen, spruce spp. (15%)     | 38                    | 59              | 51-75                  |
| 8/8                           | Road-based  | --    | 1    | 1                | 64.3008 -149.1971  | Quaking aspen  | 24                    | 9-21            | 51-75                  |
| <b>Gray-cheeked Thrush</b>    |             |       |      |                  |                    |  |                       |                 |                        |
| 6/16                          | Off-road    | BS2   | 1    | 1                | 63.3072 -149.1847  | Quaking aspen, black spruce  | 60                    | 5-21            | 26-50                  |
| 6/16                          | Off-road    | BS2   | 2    | 1                | 64.3070 -149.1796  | Black spruce, quaking aspen  | 42                    | 5-21            | 26-50                  |
| 6/16                          | Off-road    | BS2   | 8    | 1                | 64.3093 -149.1844  | Black spruce, quaking aspen  | 70                    | 3-21            | 6-25                   |
| 6/16                          | Off-road    | BS2   | 10   | 1                | 64.3114 -149.1789  | Quaking aspen, black spruce (55%),<br>Quaking aspen (45%)                | 54                    | 5-21            | 26-50                  |
| 6/17                          | Off-road    | BS2   | 7    | 1                | 64.3092 -149.1793  | Black spruce, quaking aspen  | 55                    | 5-21            | 26-50                  |
| 8/14                          | Road-based  | --    | 9    | 1                | 64.2826 -149.2032  | Quaking aspen, white spruce  | 47                    | 5-21            | 26-50                  |
| 8/22                          | Road-based  | --    | 11   | 1                | 64.2829 -149.1897  | Paper birch, white spruce  | 68                    | 5-21            | 26-50                  |
| 8/22                          | Road-based  | --    | 35   | 2                | 64.3007 -149.1623  | Black spruce, quaking aspen  | 55                    | 5-21            | 51-75                  |
| <b>Osprey</b>                 |             |       |      |                  |                    |  |                       |                 |                        |
| 6/18                          | Incidental  | --    | --   | 1                | -----              | -----  | --                    | --              | --                     |
| 8/8                           | Road-based  | --    | 30   | 1                | 64.2946 -149.1878  | Black spruce, quaking aspen (50%),<br>Quaking aspen, balsam poplar (50%) | 37                    | 5-21            | 26-50                  |
| 8/21                          | Incidental  | --    | --   | 3                | -----              | -----  | --                    | --              | --                     |
| <b>Rusty Blackbird</b>        |             |       |      |                  |                    |  |                       |                 |                        |
| 8/23                          | Incidental  | --    | --   | 5                | -----              | -----  | --                    | --              | --                     |
| <b>White-winged Crossbill</b> |             |       |      |                  |                    |  |                       |                 |                        |
| 6/19                          | Off-road    | BS3   | 15   | 1                | 64.2696 -149.1759  | Black spruce   | 25                    | 5-9             | 26-50                  |
| 6/20                          | Off-road    | BS3   | 8    | 1                | 64.2653 -149.1818  | Black spruce, paper birch  | 40                    | 5-21            | 26-50                  |



## Breeding Bird Surveys

### Frequency of Occurrence on Off-road Point Counts

Frequency of occurrence summaries are based on detections made at the seven plots where we conducted 103 point count surveys during the June breeding season. Our sampling goal was for a total of 112 possible sampling points within seven sampling plots. We eliminated five sampling points during surveys due to their proximity to bear baiting stations; an additional four points were dropped when a carcass was discovered along a transect section (5 of these were in balsam poplar habitat, 4 were in white spruce/alder willow habitat).

We detected 589 birds of 23 species during off-road point count surveys (Table 9). Overall, we detected 5.71 ( $\pm 0.09$  SE) individuals of 1.67 ( $\pm 0.04$  SE) species per point. The five most commonly detected species were all passerines and included: Swainson's Thrush, Dark-eyed Junco, Yellow-rumped Warbler, Common Raven and Orange-crowned Warbler, respectively. Swainson's Thrush had the greatest average occurrence (1.76 birds/point) followed by Dark-eyed Junco (0.95 birds/point) and Yellow-rumped Warbler (0.93 birds/point).

Table 9. Occurrence of birds on off-road point counts during the inventory of breeding birds at Clear AFS, 2007.

| Common Name <sup>1</sup>           | Total Detected | Average Occurrence <sup>2</sup> | # Points on Which Detected | Percent Detection <sup>3</sup> |
|------------------------------------|----------------|---------------------------------|----------------------------|--------------------------------|
| Alder Flycatcher                   | 5              | 0.0485                          | 4                          | 3.88%                          |
| American Robin                     | 1              | 0.0097                          | 1                          | 0.97%                          |
| Boreal Chickadee                   | 2              | 0.0194                          | 4                          | 3.88%                          |
| Black-capped Chickadee             | 4              | 0.0388                          | 1                          | 0.97%                          |
| Blackpoll Warbler                  | 2              | 0.0194                          | 2                          | 1.94%                          |
| Common Raven                       | 65             | 0.6311                          | 36                         | 34.95%                         |
| Common Redpoll                     | 28             | 0.2718                          | 22                         | 21.36%                         |
| Dark-eyed Junco                    | 98             | 0.9515                          | 61                         | 59.22%                         |
| Gray-cheeked Thrush                | 5              | 0.0485                          | 5                          | 4.85%                          |
| Gray Jay                           | 11             | 0.1068                          | 10                         | 9.71%                          |
| Hermit Thrush                      | 27             | 0.2621                          | 19                         | 18.45%                         |
| Mew Gull                           | 10             | 0.0971                          | 4                          | 3.88%                          |
| Merlin                             | 1              | 0.0097                          | 1                          | 0.97%                          |
| Northern Goshawk                   | 1              | 0.0097                          | 1                          | 0.97%                          |
| Orange-crowned Warbler             | 40             | 0.3883                          | 32                         | 31.07%                         |
| Ruby-crowned Kinglet               | 4              | 0.0388                          | 2                          | 1.94%                          |
| Swainson's Thrush                  | 181            | 1.7573                          | 77                         | 74.76%                         |
| Wilson's Snipe                     | 2              | 0.0194                          | 2                          | 1.94%                          |
| Wilson's Warbler                   | 2              | 0.0194                          | 2                          | 1.94%                          |
| White-winged Crossbill             | 2              | 0.0194                          | 2                          | 1.94%                          |
| Woodpecker spp.                    | 1              | 0.0097                          | 1                          | 0.97%                          |
| Yellow Warbler                     | 1              | 0.0097                          | 1                          | 0.97%                          |
| Yellow-rumped Warbler              | 96             | 0.9320                          | 61                         | 59.22%                         |
| <b>Total Number of Individuals</b> | <b>589</b>     | <b>5.7184</b> ( $\pm 0.09$ SE)  |                            |                                |
| <b>Total Number of Species</b>     | <b>23</b>      | <b>1.67</b> ( $\pm 0.04$ SE)    |                            |                                |

<sup>1</sup>See Table 6 for scientific names.

<sup>2</sup>Average Occurrence = number of individuals detected/number of points surveyed.

<sup>3</sup>Percent Detection = number of points on which detected/number of points surveyed.

The species with the highest average occurrence also tended to have the highest percent detection values at plots where we conducted point count surveys. Swainson's Thrush, Dark-eyed Junco and Yellow-rumped Warbler had the three highest observed detection values (74.76%, 59.22% and 59.22%, respectively). Overall, detection rates of birds on point counts were relatively low, likely reflecting the low breeding densities of birds in the boreal forest.

### Species Distribution - Off-road Point Counts

Summaries of species distribution across sample sites are based on all observations collected during visits to the seven survey plots that spanned the time period June 13 to June 23 (Table 10). The distribution of species across Clear AFS was similar to their frequency of occurrence (see Table 8) in that commonly detected species were typically widely distributed and infrequently detected species had restricted distributions. For instance, the five species with the highest number of detections during point count surveys (Table 9) were the only five species to be detected at all seven plots (Table 10). Blackpoll Warbler, on the other hand, was rarely detected during point count surveys ( $n = 2$ ). Other species that were infrequently detected during surveys and were not widely distributed included American Robin, Gray-cheeked Thrush, Merlin, Northern Goshawk, White-winged Crossbill and Yellow Warbler.

Table 10. Species occurrence within sampling plots during off-road breeding bird surveys at Clear AFS, 2007. See Figure 15 for plot locations.

| Common Name                    | Plot identification number |          |           |           |          |          |           | # of Detections |
|--------------------------------|----------------------------|----------|-----------|-----------|----------|----------|-----------|-----------------|
|                                | BP1                        | BS1      | BS2       | BS3       | QA1      | QA2      | WSAW1     |                 |
| Alder Flycatcher               | X                          |          | X         |           |          |          | X         | 3               |
| American Robin                 |                            |          | X         |           |          |          |           | 1               |
| Boreal Chickadee               | X                          |          |           | X         | X        |          |           | 3               |
| Black-capped Chickadee         |                            |          |           | X         |          |          | X         | 2               |
| Blackpoll Warbler              |                            |          | X         |           |          | X        |           | 1               |
| Common Raven                   | X                          | X        | X         | X         | X        | X        | X         | 7               |
| Common Redpoll                 | X                          | X        | X         | X         | X        | X        | X         | 7               |
| Dark-eyed Junco                | X                          | X        | X         | X         | X        | X        | X         | 7               |
| Gray-cheeked Thrush            |                            |          | X         |           |          |          |           | 1               |
| Gray Jay                       | X                          |          | X         | X         | X        | X        | X         | 6               |
| Hermit Thrush                  | X                          | X        |           | X         |          |          |           | 3               |
| Mew Gull                       | X                          | X        | X         |           |          |          | X         | 4               |
| Merlin                         |                            |          | X         |           |          |          |           | 1               |
| Northern Goshawk               |                            |          | X         |           |          |          |           | 1               |
| Orange-crowned Warbler         |                            | X        | X         | X         | X        | X        | X         | 6               |
| Ruby-crowned Kinglet           |                            |          |           |           |          |          | X         | 1               |
| Swainson's Thrush              | X                          | X        | X         | X         | X        | X        | X         | 7               |
| Wilson's Snipe                 |                            | X        |           | X         |          |          |           | 2               |
| Wilson's Warbler               | X                          |          |           |           |          | X        |           | 2               |
| White-winged Crossbill         |                            |          |           | X         |          |          |           | 1               |
| Woodpecker spp.                |                            |          |           |           |          |          | X         | 1               |
| Yellow Warbler                 |                            |          | X         |           |          |          |           | 1               |
| Yellow-rumped Warbler          | X                          | X        | X         | X         | X        | X        | X         | 7               |
| <b>Total Number of Species</b> | <b>11</b>                  | <b>9</b> | <b>15</b> | <b>12</b> | <b>8</b> | <b>9</b> | <b>12</b> |                 |

### Seasonal Use of Clear AFS on Road-based Surveys

Road-based point count surveys were conducted on a bi-weekly basis along a 32 point route from May 25 to August 22 to provide information on seasonal changes in bird use at Clear AFS. Over the three month period, we detected a total of 49 species (Table 11). With the exception of the Merlin, White-winged Crossbill and an unidentified woodpecker, 20 of the 23 species detected during off-road surveys were also recorded during the road-based surveys (see Table 9).

Based on observations of nests or nesting behavior, eight bird species were observed breeding at Clear AFS. These include the Cliff Swallow, Common Raven, Dark-eyed Junco, Gray Jay, Mew Gull, Swainson's Thrush, Tree Swallow and Yellow-rumped Warbler. Eighteen species were probable breeders, based on their presence during the June breeding season and observations of males singing at this time. Two species of concern, the Blackpoll Warbler and Gray-cheeked Thrush were categorized as probable breeders. Twenty bird species used Clear AFS during migration based on observations of birds in passage or only observed infrequently during spring or fall surveys. One species of concern, the Osprey, was categorized as a potential migrant. We were unable to determine the status of three species, the Horned Grebe, Mallard and Spotted Sandpiper (Table 11).

Table 11. Seasonal use of bird species observed at Clear AFS, May to August 2007, based on road-based survey results. Species of concern are highlighted in bold. Common name followed by an asterisk (\*) indicates species was also detected during off-road breeding bird surveys conducted during June 2007, and is included here for comparison. Seasonal use was denoted by B = if breeding status was based on observations of nests or nesting behavior, b = probable breeder based on observations of males singing during the breeding season, or m = probable migrant based on observations of birds in passage or only observed infrequently during spring or fall surveys. A double asterisk (\*\*) under the category "Previously Observed" indicates the species was reported by LaGory et al. (1996) during previous surveys at Clear AFS.

| Common Name                 | Number Observed by Month |      |          |          |          | Seasonal Use | Previously observed |
|-----------------------------|--------------------------|------|----------|----------|----------|--------------|---------------------|
|                             | May                      | June | July     | August   | Total    |              |                     |
| Alder Flycatcher*           |                          | 1    |          |          | 1        | b            | **                  |
| American Robin*             | 23                       | 10   |          | 3        | 36       | b            | **                  |
| American Tree Sparrow       | 1                        |      |          |          | 1        | m            | **                  |
| American Wigeon             |                          |      |          | 15       | 15       | M            | **                  |
| Arctic Tern                 |                          |      |          | 1        | 1        | m            | **                  |
| Bald Eagle                  |                          |      |          | 1        | 1        | m            |                     |
| Black-capped Chickadee*     |                          |      |          | 12       | 12       | b            | **                  |
| <b>Blackpoll Warbler*</b>   |                          |      | <b>1</b> | <b>1</b> | <b>2</b> | <b>b</b>     |                     |
| Boreal Chickadee*           | 2                        | 2    |          | 3        | 7        | b            | **                  |
| Canada Goose                | 3                        | 23   |          | 204      | 230      | b            | **                  |
| Cliff Swallow               | 75                       | 20   | 1        | 8        | 104      | B            | **                  |
| Common Raven*               | 111                      | 252  | 372      | 270      | 1005     | B            | **                  |
| Common Redpoll*             | 23                       | 9    | 7        | 4        | 43       | b            |                     |
| Dark-eyed Junco*            | 43                       | 66   | 7        | 110      | 226      | B            | **                  |
| Fox Sparrow                 | 1                        |      |          |          | 1        | m            | **                  |
| <b>Gray-cheeked Thrush*</b> |                          |      |          | <b>4</b> | <b>4</b> | <b>b</b>     | **                  |
| Glaucous Gull               |                          |      |          | 8        | 8        | m            |                     |
| Gray Jay*                   | 15                       | 5    | 2        | 25       | 47       | B            | **                  |
| Gull spp.                   |                          |      |          | 5        | 5        | m            |                     |

Table 11. (continued)

| Common Name                 | Number Observed by Month |            |            |            |             | Seasonal Use | Previously observed |
|-----------------------------|--------------------------|------------|------------|------------|-------------|--------------|---------------------|
|                             | May                      | June       | July       | August     | Total       |              |                     |
| Glaucous-winged Gull        |                          |            |            | 4          | 4           | m            |                     |
| Hammond's Flycatcher        |                          |            |            | 3          | 3           | m            | **                  |
| Herring Gull                | 10                       | 7          | 13         | 5          | 35          | b            | **                  |
| Hermit Thrush*              | 20                       | 10         |            |            | 30          | b            | **                  |
| Horned Grebe                | 1                        | 1          |            | 1          | 3           | m or b       |                     |
| Jaeger spp.                 |                          |            |            | 1          | 1           | m            |                     |
| Lincoln's Sparrow           |                          |            |            | 1          | 1           | m            | **                  |
| Mallard                     |                          | 10         |            |            | 10          | m or b       | **                  |
| Mew Gull*                   | 89                       | 184        | 184        | 14         | 471         | B            | **                  |
| Northern Flicker            |                          |            |            | 1          | 1           | m            | **                  |
| Northern Goshawk*           |                          |            | 1          | 2          | 3           | b            |                     |
| Northern Shoveler           |                          |            |            | 2          | 2           | m            | **                  |
| Orange-crowned Warbler*     | 3                        | 17         |            | 6          | 26          | b            | **                  |
| <b>Osprey</b>               |                          |            |            | 1          | 1           | <b>m</b>     |                     |
| Pacific Loon                |                          | 1          |            |            | 1           | m            |                     |
| Pie-billed Grebe            |                          | 2          |            |            | 2           | m            |                     |
| Ruby-crowned Kinglet*       | 3                        | 2          |            | 5          | 10          | b            | **                  |
| Red-necked Grebe            |                          | 2          |            | 1          | 3           | m            |                     |
| Sandhill Crane              | 1                        |            |            | 28         | 29          | m            | **                  |
| Savannah Sparrow            | 3                        | 6          |            | 9          | 18          | b            | **                  |
| Spotted Sandpiper           |                          | 3          |            |            | 3           | M or b       | **                  |
| Swallow spp.                |                          | 4          |            | 6          | 10          | b            |                     |
| Swainson's Thrush*          | 29                       | 64         | 2          | 14         | 109         | B            | **                  |
| Tree swallow                | 19                       | 112        |            | 15         | 146         | B            | **                  |
| Varied Thrush               | 2                        |            |            |            | 2           | m            | **                  |
| White-crowned Sparrow       | 3                        |            |            |            | 3           | m            | **                  |
| Wilson's Snipe*             |                          | 2          | 1          |            | 3           | b            |                     |
| Wilson's Warbler*           |                          | 2          |            |            | 2           | b            | **                  |
| Yellow Warbler*             | 1                        | 3          |            | 148        | 152         | b            | **                  |
| Yellow-rumped Warbler*      | 69                       | 78         |            | 38         | 185         | B            | **                  |
| <b>Total Count by Month</b> | <b>550</b>               | <b>898</b> | <b>591</b> | <b>979</b> | <b>3018</b> |              |                     |

### Species Distribution – Road-based Surveys

Similar to results from the off-road breeding bird surveys, species that were most commonly detected during road-based surveys also had the widest distributions. Seven species were detected at 24 or more of the 32 survey points (75% of points) including: Dark-eyed Junco, Yellow-rumped Warbler, Yellow Warbler, Common Raven, Mew Gull, Swainson's Thrush and Common Redpoll, respectively.

We summarized detection data at the 32 stops along the road-based survey route by survey date to identify patterns in seasonal use by birds at different parts of the station (Table 12). Survey points 14-15 and 22-30 had the highest number of birds detected at them. These sites were all located in consecutive order and ran from the "camp" area of the station in the vicinity of the Civil Engineering and Security Police offices, then continue north along 4<sup>th</sup> Street to the intersection with A Street, then west along A Street

as far as the large grassy field located between the power plant and the cooling pond (refer to Fig. 15 for survey point locations).

Survey point 29, which was located between the power plant and the cooling pond, appeared to be an important area for numerous birds from May through August. This location had the overall greatest number of detections ( $n = 329$ ) as well as the highest number of individual species detected ( $n = 19$ ). It appeared to be an especially important area for large flocks of Mew Gulls (70 were counted here May 25 and a flock of 51 was detected here on July 11).

Table 12. Number of detections by survey point along road-based avian survey route, conducted from May 25 to August 22, 2007, Clear, AFS. Rows highlighted in light gray indicate survey points with the highest number of detections.

| Survey Point | Date       |            |            |            |            |            |            | Total # detections | Total # of species |
|--------------|------------|------------|------------|------------|------------|------------|------------|--------------------|--------------------|
|              | 25-May     | 12-Jun     | 24-Jun     | 11-Jul     | 8-Aug      | 14-Aug     | 22-Aug     |                    |                    |
| 1            | 14         | 6          | 6          | 0          | 1          |            | 4          | 31                 | 10                 |
| 2            | 9          | 3          | 3          | 1          | 2          | 3          | 2          | 23                 | 9                  |
| 3            | 15         | 8          | 11         | 3          | 3          | 8          | 9          | 57                 | 12                 |
| 4            | 11         | 8          | 3          | 4          | 1          | 7          | 11         | 45                 | 10                 |
| 5            | 14         | 8          | 6          | 1          | 7          | 10         | 13         | 59                 | 12                 |
| 6            | 13         | 20         | 7          | 0          | 12         | 5          | 16         | 73                 | 14                 |
| 7            | 9          | 10         | 5          |            | 7          | 9          |            | 40                 | 10                 |
| 8            | 11         | 6          | 3          | 0          | 7          | 4          | 39         | 70                 | 13                 |
| 9            | 12         | 3          | 2          | 1          | 9          | 4          | 10         | 41                 | 10                 |
| 10           | 16         | 6          | 5          | 0          | 8          | 3          | 17         | 55                 | 11                 |
| 11           | 11         | 7          | 14         | 0          | 10         | 3          | 15         | 60                 | 11                 |
| 12           | 13         | 9          | 9          | 1          | 15         | 5          | 22         | 74                 | 8                  |
| 13           | 17         | 15         | 8          | 14         | 13         | 3          | 11         | 81                 | 12                 |
| 14           | 0          | 11         | 7          | 80         | 26         | 7          | 10         | 141                | 12                 |
| 15           | 21         | 30         | 43         | 72         | 24         | 11         | 8          | 209                | 13                 |
| 22           | 24         | 30         | 20         | 98         | 25         | 3          | 75         | 275                | 12                 |
| 23           | 10         | 15         | 10         | 38         | 15         | 6          | 12         | 106                | 9                  |
| 24           | 17         | 45         | 12         | 12         | 16         | 0          | 15         | 117                | 13                 |
| 25           | 13         | 20         | 17         | 17         | 15         | 0          | 14         | 96                 | 14                 |
| 26           | 69         | 42         | 22         | 30         | 20         | 0          | 14         | 197                | 11                 |
| 27           | 16         | 26         | 18         | 17         | 10         | 5          | 40         | 132                | 14                 |
| 28           | 0          | 24         | 25         | 40         | 70         | 0          | 34         | 193                | 9                  |
| 29           | 124        | 45         | 52         | 71         | 19         | 9          | 9          | 329                | 19                 |
| 30           | 0          | 14         | 46         | 48         | 12         | 0          | 17         | 137                | 11                 |
| 31           | 14         | 10         | 22         | 11         | 5          | 0          | 2          | 64                 | 9                  |
| 32           | 15         | 9          | 14         | 3          | 5          | 0          | 3          | 49                 | 10                 |
| 33           | 19         | 5          | 6          | 10         | 19         | 6          | 4          | 69                 | 15                 |
| 34           | 7          | 7          | 6          | 6          | 13         | 1          | 11         | 51                 | 12                 |
| 35           | 0          | 2          | 9          | 2          | 3          | 0          | 6          | 22                 | 9                  |
| 36           | 9          | 4          | 6          | 3          | 12         | 0          | 3          | 37                 | 10                 |
| 37           | 9          | 4          | 5          | 5          | 3          | 0          | 3          | 29                 | 9                  |
| 38           | 18         | 7          | 14         | 5          | 9          | 0          | 3          | 56                 | 14                 |
| <b>Total</b> | <b>550</b> | <b>459</b> | <b>436</b> | <b>592</b> | <b>416</b> | <b>112</b> | <b>452</b> | <b>3018</b>        |                    |

### **Other Species**

During bird surveys a number of mammal species or their sign were observed incidentally. These included brown bear, black bear, red fox, porcupine, red squirrel, beaver and moose. Snowshoe hare appeared to be at a peak or near peak in their ten-year cycle, as they were commonly seen in high numbers throughout the survey area. We did not detect or observe sign of mink or gray wolf, as reported by LaGory et al. (1996). The North American Lynx was also not observed.

### **CONCLUSION AND RECOMMENDATIONS FOR ANIMAL SPECIES**

Clear AFS does not appear to harbor critically imperiled vertebrate taxa, although two bird species on the State of Alaska's Species of Concern List were detected on the station. Blackpoll Warbler and Gray-cheeked Thrush were observed at Clear AFS between June and August, and probably breed on the station. LaGory et al. (1996) also detected these two Species of Concern during surveys conducted 11 years earlier. Similar to our results, LaGory et al. (1996) reported low detection rates for both species, indicating that Blackpoll Warbler and Gray-cheeked Thrush do not occur in high densities on the station and their relative abundance and seasonal use of Clear AFS has not changed over time. Two of the four locations where we detected Blackpoll Warbler were within .5 km from locations where they were detected by LaGory et al. (1996).

Both Blackpoll Warbler and Gray-cheeked Thrush were found in relatively undisturbed forest habitats. The majority of detections for both species were in the central portion of Clear AFS, north of the composite area. To aid in the conservation of these two species, we recommend minimization of disturbance to these areas and habitat types. The relatively large amount of forested habitat present on Clear AFS should reduce the impacts of occasional or limited disturbance.

While the Osprey, Rusty Blackbird and White-winged Crossbill are not formally designated as Species of Concern by federal or state entities, their inclusion in conservation concern lists of other agency or non-governmental organizations should warrant some consideration. Of these three species, only the White-winged Crossbill was recognized as potentially breeding at Clear AFS. This species was found in habitats most similar to Blackpoll Warbler. Therefore, any efforts expended to conserve habitats important to the Blackpoll Warbler would likely include habitats utilized by White-winged Crossbills.

The Rusty Blackbird has experienced a 90% population decline over the past four to five decades throughout its range (Greenberg and Droege 1999). Although the decline in Alaska does not appear to be as precipitous as it is in other portions of the species U.S. range, BBS data indicate a statewide population decline of -5.2%/year from 1980 to 2004 (Sauer et al. 2005). Concerns for this species in Alaska include acidification of boreal wetlands and the impacts of acidification on food resources (Greenberg and Droege 1999). There are no immediate concerns for the species at Clear AFS at this time, as this species appears to use the station only during fall migration. However, we include the Rusty Blackbird in discussion to raise awareness about its conservation status and to insure that future avian studies at Clear AFS make concerted efforts to target this species and associated wetland habitat types.

Numerous bird species utilized the developed areas of the base for breeding, nesting and rearing chicks. One key area of importance to numerous species was the large field located between the cooling pond and power plant and extends around the old radar site. Passerines, gulls and geese were noted in this area and it was an especially



important breeding area for Mew Gulls. We observed grass cutting activities in this area in early July, at a time when many chicks may still have been in the nest or too young to fly. We recommend that grass cutting activities be curtailed in this area during the June breeding and July nesting period.

Overall, we make the following recommendations to promote the value of the station's vertebrate resources: 1) limit ground disturbance of biologically sensitive areas, particularly the extensive field area surrounding the old radar site; 2) minimize disturbance to undeveloped portions of the station to the extent practicable, particularly black spruce and quaking aspen dominated forested habitats preferred by Blackpoll Warbler and Gray-cheeked Thrush; 3) conduct a survey of mammals; and 4) conduct an avian survey of wetland habitats; and 5) repeat surveys at 5-year intervals to determine the effects of succession on species distribution.

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# Appendix I. NatureServe/Heritage Program conservation status rank definitions.

| Rank                   | Definition  |
|------------------------|---|
| <b>Global Rankings</b> |   |
| <b>G1</b>              | Critically imperiled globally – at very high risk of extinction due to extreme rarity, very steep declines, or other factors.                                 |
| <b>G2</b>              | Imperiled globally – at high risk of extinction due to very restricted ranges, very few populations, steep declines, or other factors.                        |
| <b>G3</b>              | Vulnerable globally- at moderate risk of extinction due to restricted range, relatively few populations, recent and widespread declines, or other factors     |
| <b>G4</b>              | Apparently secure globally – uncommon but rare; some cause for long-term concern due to declines or other factors.  |
| <b>G5</b>              | Secure globally – Common, widespread, and abundant.   |
| <b>G#G#</b>            | Range rank – range of ranks due to uncertainty.   |
| <b>GU</b>              | Unrankable due to lack of information.  |
| <b>GH</b>              | Historical occurrence   |
| <b>GNR</b>             | Unranked  |
| <b>GNA</b>             | Not applicable  |
| <b>State Rankings</b>  |   |
| <b>S1</b>              | Critically imperiled in the state – at very high risk of extinction due to extreme rarity, very steep declines, or other factors.                             |
| <b>S2</b>              | Imperiled in the state – at high risk of extinction due to very restricted ranges, very few populations, steep declines, or other factors.                    |
| <b>S3</b>              | Vulnerable in the state- at moderate risk of extinction due to restricted range, relatively few populations, recent and widespread declines, or other factors |
| <b>S4</b>              | Apparently secure in the state – uncommon but rare; some cause for long-term concern due to declines or other factors.  |
| <b>S5</b>              | Secure in the state – Common, widespread, and abundant.   |
| <b>S#S#</b>            | Range rank – range of ranks due to uncertainty.   |
| <b>SU</b>              | Unrankable due to lack of information.  |
| <b>SH</b>              | Historical occurrence   |
| <b>SNR</b>             | Unranked  |
| <b>SNA</b>             | Not applicable  |
| <b>Qualifiers</b>      |   |
| <b>B</b>               | Breeding status   |
| <b>M</b>               | Migratory status  |
| <b>N</b>               | Non-breeding status   |
| <b>?</b>               | Inexact   |
| <b>Q</b>               | Questionable taxonomically  |
| <b>T</b>               | Intraspecific taxon – subspecies or population  |



**Appendix II.** List of vascular plants previously known from Clear AFS and those within 20 km of Clear AFS (records bounded by 64.2° N, 149.5° W in the northwest and 64.2° N, 149.0° W in the southeast).

| Reference           | Scientific name                   | Specific locality                             | Date       | Lat   | Long    | Conservati |
|---------------------|-----------------------------------|---|------------|-------|---------|------------|
| LaGory et al. 1996  | <i>Achillea borealis</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Achillea sibirica</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Actaea rubra</i>               | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Agropyron boreale</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Agropyron trachycaulus</i>     | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Agrostis scabra</i>            | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Alnus tenuifolia</i>           | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Alnus viridis ssp. sinuata</i> | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Alopecurus aequalis</i>        | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Androsace serpentrionalis</i>  | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Anemone richardsonii</i>       | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arabis hirsuta</i>             | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arabis holboellii</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arabis lyrata</i>              | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arctagrostis latifolia</i>     | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arctostaphylos rubra</i>       | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arctostaphylos uva-ursi</i>    | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arnica alpina</i>              | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Arnica frigida</i>             | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Artemisia tilesii</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Aster sibiricus</i>            | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Astragalus alpinus</i>         | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Astragalus williamsii</i>      | Clear AFS                                     | 1995       |       |         | G4 S2S3    |
| UAM Herbarium 86572 | <i>Astragalus bodinii</i>         | 1/2 mile 284 Parks Hwy., 20 miles S of Nenana | 1965/06/11 | 64.29 | -149.08 |            |
| LaGory et al. 1996  | <i>Barbarea orthoceras</i>        | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Beckmannia erucaeformis</i>    | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Betula glandulosa</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Betula papyrifera</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Bromus inermis</i>             | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Calamagrostis canadensis</i>   | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Calamagrostis purpurascens</i> | Clear AFS                                     | 1995       |       |         |            |
| UAM Herbarium 86677 | <i>Cardamine pratensis</i>        | HWY., 48 KM SW OF NENANA                      | 1965/05/29 | 64.21 | -149.28 |            |
| LaGory et al. 1996  | <i>Carex canescens</i>            | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Carex concinna</i>             | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Carex media</i>                | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Carex praticola</i>            | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Castilleja caudata</i>         | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Castilleja elegans</i>         | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Chenopodium album</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Cnidium cniidifolium</i>       | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Comarum palustre</i>           | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Corallorrhiza trifida</i>      | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Cornus canadensis</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Corydalis sempervirens</i>     | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Crepis elegans</i>             | Clear AFS                                     | 1995       |       |         |            |
| UAM Herbarium 86579 | <i>Cypripedium guttatum</i>       | NENANA HWY., 40 KM SW OF NENANA               | 1965/06/20 | 64.25 | -149.2  |            |
| LaGory et al. 1996  | <i>Descurania sophia</i>          | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Dryas drummondii</i>           | Clear AFS                                     | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Elaeagnus commutata</i>        | Clear AFS                                     | 1995       |       |         |            |

## Appendix II. (continued)

| Reference           | Scientific name                  | Specific locality                         | Date       | Lat   | Long    | Conservati |
|---------------------|----------------------------------|---|------------|-------|---------|------------|
| LaGory et al. 1996  | <i>Elymus innovatus</i>          | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Empetrum nigrum</i>           | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Epilobium angustifolium</i>   | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Epilobium latifolium</i>      | Clear AFS                                 | 1995       |       |         |            |
| UAM Herbarium 86587 | <i>Epilobium palustre</i>        | OF TOWN                                   | 1965/08/31 | 64.22 | -149.23 |            |
| LaGory et al. 1996  | <i>Equisetum arvense</i>         | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Equisetum scirpoides</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Equisetum sylvaticum</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Erigeron acris</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Erigeron glabellus</i>        | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Erigeron lonchophyllus</i>    | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Festuca altaica</i>           | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Festuca brachyphylla</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Festuca rubra</i>             | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Galium boreale</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Gentiana propinqua</i>        | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Geocaulon lividum</i>         | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Geum macrophyllum</i>         | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Goodyera repens</i>           | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Hedysarum alpinum</i>         | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Hedysarum mackenzii</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Hierochloa odorata</i>        | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Hordeum jubatum</i>           | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Juncus arcticus</i>           | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Juncus bufonis</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lamium amplexicaule</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Larix laricina</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Ledum palustre</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lepidium densiflorum</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Linnaea borealis</i>          | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lupinus arcticus</i>          | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lycopodium annotinum</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lycopodium clavatum</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Lycopodium complanatum</i>    | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Matricaria matricarioides</i> | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Melilotus alba</i>            | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Melilotus officinalis</i>     | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Mertensia paniculata</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Moehringia lateriflora</i>    | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Moneses uniflora</i>          | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Myrica gale</i>               | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Oxytropis campestris</i>      | Clear AFS                                 | 1995       |       |         |            |
| UAM Herbarium 86581 | <i>Oxytropis deflexa</i>         | Mile 284 Parks Hwy., 20 miles S of Nenana | 1969/07/00 | 64.29 | -149.08 |            |
| LaGory et al. 1996  | <i>Parnassia palustris</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Pedicularis capitata</i>      | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Pedicularis caudata</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Pedicularis labradorica</i>   | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Pedicularis odorata</i>       | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Petasites frigidus</i>        | Clear AFS                                 | 1995       |       |         |            |
| LaGory et al. 1996  | <i>Petasites hyperboreus</i>     | Clear AFS                                 | 1995       |       |         |            |

## Appendix II. (continued)

| Reference           | Scientific name                                | Specific locality                     | Date       | Lat   | Long    | Conservation Status |
|---------------------|--|---------------------------------------|------------|-------|---------|---------------------|
| LaGory et al. 1996  | <i>Picea glauca</i>                            | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Picea mariana</i>                           | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Plantago canescens</i>                      | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Plantago major</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Platantera obtusata</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Poa alpigna</i>                             | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Poa alpina</i>                              | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Poa glauca</i>                              | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Poa pratensis</i>                           | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Polemonium pulcherrimum</i>                 | Clear AFS                             | 1995       |       |         |                     |
| UAM Herbarium 86583 | <i>Polemonium acutiflorum</i>                  | Mile 278 Parks Hwy., 10 KM S OF CLEAR | 1965/08/31 | 64.22 | -149.23 |                     |
| LaGory et al. 1996  | <i>Polygonum aviculare</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Populus balsamifera</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Populus tremuloides</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Potentilla fruticosa</i>                    | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Potentilla multifida</i>                    | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Pulsatilla patens</i>                       | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Pyrola grandiflora</i>                      | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Pyrola secunda</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Ribes hudsonianum</i>                       | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Ribes triste</i>                            | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Rorippa islandica</i>                       | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Rosa acicularis</i>                         | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Rubus arcticus</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Rubus idaeus</i>                            | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix alaxensis</i>                         | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix arbusculoides</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix bebbiana</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix glauca</i>                            | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix hastata</i>                           | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix interior</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix monticola</i>                         | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix myrtillofolia</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix novae-angliae</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Salix setchelliana</i>                      | Clear AFS                             | 1995       |       |         | G4 S3               |
| LaGory et al. 1996  | <i>Senecio conterminus</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Senecio lugens</i>                          | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Senecio pauciflorus</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Shepherdia canadensis</i>                   | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Silene menziesii</i> ssp. <i>williamsii</i> | Clear AFS                             | 1995       |       |         | G5T4 S3S4           |
| LaGory et al. 1996  | <i>Solidago decumbens</i>                      | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Solidago multiradiata</i>                   | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Stellaria edwardsii</i>                     | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Stellaria longipes</i>                      | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Stellaria monantha</i>                      | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Taraxacum ceratophorum</i>                  | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Taraxacum lacerum</i>                       | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Taraxacum officinale</i>                    | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Thalictrum sparsiflorum</i>                 | Clear AFS                             | 1995       |       |         |                     |
| LaGory et al. 1996  | <i>Trientalis europaea</i>                     | Clear AFS                             | 1995       |       |         |                     |

**Appendix II. (continued)**

| Reference           | Scientific name              | Specific locality                     | Date       | Lat   | Long    | Conservation Status |  |
|---------------------|------------------------------|---------------------------------------|------------|-------|---------|---------------------|--|
| LaGory et al. 1996  | <i>Trisetum spicatum</i>     | Clear AFS                             | 1995       |       |         |                     |  |
| UAM Herbarium 86585 | <i>Typha latifolia</i>       | Mile 278 Parks Hwy., 10 KM S OF CLEAR | 1965/08/31 | 64.22 | -149.23 |                     |  |
| LaGory et al. 1996  | <i>Vaccinium uliginosum</i>  | Clear AFS                             | 1995       |       |         |                     |  |
| LaGory et al. 1996  | <i>Vaccinium vitis-idaea</i> | Clear AFS                             | 1995       |       |         |                     |  |
| UAM Herbarium 86588 | <i>Vaccinium vitis-idaea</i> | Mile 285 Parks Hwy., 2 KM N OF CLEAR  | 1965/06/19 | 64.3  | -149.06 |                     |  |
| LaGory et al. 1996  | <i>Valeriana capitata</i>    | Clear AFS                             | 1995       |       |         |                     |  |
| LaGory et al. 1996  | <i>Viburnum edule</i>        | Clear AFS                             | 1995       |       |         |                     |  |
| LaGory et al. 1996  | <i>Viola epipsila</i>        | Clear AFS                             | 1995       |       |         |                     |  |
| LaGory et al. 1996  | <i>Zygadenus elegans</i>     | Clear AFS                             | 1995       |       |         |                     |  |

## Appendix III. List of plant species collected at Clear AFS in 2005 and abbreviated collection data.

| Colln    | Name  | ITIS_Nativity       | Global_ | State_Rank  | Wetland_    | Specific locality                             | Lat      | Long       | Hab                    | Substrate        | Assoc. spp.   | Day | Mont | Yea  |
|----------|---|---------------------|---------|-------------|-------------|---|----------|------------|------------------------|------------------|---|-----|------|------|
| 2005-001 | <i>Hedysarum boreale</i> Nutt                                 | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-002 | <i>Erigeron glabelhus</i> Nutt                                | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-003 | <i>Aster sibiricus</i> L.                                     | Native              | G5      | S5          |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-004 | <i>Calamagrostis canadensis</i> (Michx.) Beauv.               | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-005 | <i>Achillea millefolium</i> L.                                | Native & Introduced | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-006 | <i>Taraxacum officinale</i> ssp. <i>officinale</i> G.H.       | Introduced          | G5T5    | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-007 | <i>Salix arbusculoides</i> Anderss.                           | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26346 | -149.25839 | Alder thicket at river | sand and silt    | <i>Abies incana</i> ssp. <i>trousfieldii</i> , <i>Pogonias dalsonifera</i> .                        | 6   | July | 2005 |
| 2005-008 | <i>Cnidium cniidifolium</i> (Turcz.) Schischkin               | Native              | G5T4    | Alaska S4S5 | Facultative | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-009 | <i>Galium boreale</i> L.                                      | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-010 | <i>Elymus innotatus</i> Beal                                  | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-011 | <i>Poa pratensis</i> L.                                       | Native and          | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-012 | <i>Festuca alutica</i> Trin.                                  | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-013 | <i>Pedicularis labradorica</i> Wirsing                        | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-014 | <i>Gentiana propinqua</i> Richards.                           | Native              | G5T5?   | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-015 | <i>Zigadenus elegans</i> Pursh                                | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-016 | <i>Agrostis scabra</i> Willd.                                 | Native              | G5      | Not Ranke d | 35          | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-017 | <i>Lupinus arcticus</i> S. Wats.                              | Native              | G5      | S4          |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-018 | <i>Arctostaphylos uva-ursi</i> (L.) Spreng.                   | Native              | G5      | Not Ranke d | Obligate    | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-019 | <i>Shepherdia canadensis</i> (L.) Nutt                        | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-020 | <i>Solidago multiradiata</i> Ait.                             | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-021 | <i>Silene menziesii</i> ssp. <i>williamsii</i> (Britt) Hustén | Native              | G5T4    | Alaska      |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-022 | <i>Meertensia paniculata</i> (Ait.) G. Don                    | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-023 | <i>Chamerion angustifolium</i> (L.) Holub                     | Native              | G5      | Not Ranke d | Facultative | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-024 | <i>Linnaea borealis</i> L.                                    | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-025 | <i>Leidum groenlandicum</i> Oeder                             | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-026 | <i>Festuca saximontana</i> Rydb.                              | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-027 | <i>Festuca rubra</i> L.                                       | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-028 | <i>Salix bebbiana</i> Sarg.                                   | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-029 | <i>Salix cf. bebbiana</i> Sarg.                               | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-030 | <i>Poa glauca</i> Vahl  | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-031 | <i>Salix bebbiana</i> Sarg.                                   | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-032 | <i>Empetrum nigrum</i> L.                                     | Native              | G5      | Not Ranke d | Facultative | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-033 | <i>Geocaulon lividum</i> (Richards.) Fern.                    | Native              | G5      | S5          |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-034 | <i>Vaccinium vitis-idaea</i> L.                               | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-035 | <i>Castilleja caudata</i> (Pennell) Rebr.                     | Native              | G5      | Not Ranke d | Facultative | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-036 | <i>Astragalus alpinus</i> L.                                  | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-037 | <i>Arnica angustifolia</i> ssp. <i>toментosa</i> (Macoum)     | Native              | G5T5    | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-038 | <i>Senecio lugens</i> Richards.                               | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-039 | <i>Pyrola secunda</i> L.                                      | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-040 | <i>Pulsatilla patens</i> ssp. <i>multifida</i> (Fritz) Zamel  | Native              | G5T4    | Alaska Not  |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-041 | <i>Rosa acicularis</i> Lindl.                                 | Native              | G5      | Not Ranke d |             | Southwest corner of Clear AFS at Nenana River | 64.26301 | -149.25818 | Aspen-Willow tall      | mesic humid soil | <i>Pogonias tremuloidea</i> , <i>Picea glauca</i> , <i>5 abies dasdagi</i> , <i>5</i> .             | 6   | July | 2005 |
| 2005-042 | <i>Lycopodium complanatum</i> L.                              | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26141 | -149.25049 | Mixed Black Spruce-    | mesic humid      | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-043 | <i>Picea mariana</i> (P. Mill.) B.S.P.                        | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26141 | -149.25049 | Mixed Black Spruce-    | mesic humid      | <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i> ssp. <i>deambrens</i> .                        | 6   | July | 2005 |
| 2005-044 | <i>Salix cf. bebbiana</i> Sarg.                               | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26141 | -149.25049 | Mixed Black Spruce-    | mesic humid      | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-045 | <i>Populus tremuloides</i> Michx.                             | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26141 | -149.25049 | Mixed Black Spruce-    | mesic humid      | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i> ssp. <i>deambrens</i> . | 6   | July | 2005 |
| 2005-046 | <i>Viburnum edule</i> (Michx.) Raf.                           | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26202 | -149.24521 | Closed Aspen forest    | mesic humid soil | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-047 | <i>Pyrola asarifolia</i> Michx.                               | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26202 | -149.24521 | Closed Aspen forest    | mesic humid soil | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-048 | <i>Equisetum arvense</i> L.                                   | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26202 | -149.24521 | Closed Aspen forest    | mesic humid soil | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-049 | <i>Goodyera repens</i> (L.) R. Br. ex Ait f.                  | Native              | G5      | Not Ranke d |             | Southwest part of Clear AFS                   | 64.26202 | -149.24521 | Closed Aspen forest    | mesic humid soil | <i>Picea mariana</i> , <i>Pogonias tremuloidea</i> , <i>Lekont palastre</i>                         | 6   | July | 2005 |
| 2005-050 | <i>Elymus repens</i> (L.) Gould                               | Introduced          | Not     | Not Ranke d | Obligate    | Southern part of Clear AFS / road grade       | 64.26245 | -149.22951 | Closed Aspen forest    |                  | <i>Picea glauca</i> , <i>Pogonias tremuloidea</i> , <i>Pogonias</i>                                 | 6   | July | 2005 |



## Appendix III. (continued)

|          |   |                     |       |             |             |   |           |             |                       |                    |  |   |      |      |
|----------|---|---------------------|-------|-------------|-------------|---|-----------|-------------|-----------------------|--------------------|--|---|------|------|
| 2003-031 | <i>Aster sibiricus</i> L.                                     | Native              | G5    | S5          |             | Southern part of Clear AFS / road grade       | 64.26245  | -149.22951  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-032 | <i>Botrychium pinnatum</i> St John                            | Native              | G4P   | Not Ranke d |             | Southern part of Clear AFS / road grade       | 64.26245  | -149.22951  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-033 | <i>Vaccinium uliginosum</i> L.                                | Native              | G5    | Not Ranke d |             | Southern part of Clear AFS / road grade       | 64.26245  | -149.22951  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-034 | <i>Erigeron acris</i> L.                                      | Native              | G5    | Not Ranke d |             | Southern part of Clear AFS / road grade       | 64.26245  | -149.22951  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-035 | <i>Silene menziesii</i> ssp. <i>williamsii</i> (Britt) Hultén | Native              | G5T4  | Alaska      |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-036 | <i>Chenopodium album</i> L.                                   | Native & Introduced | G5    | Not Ranke d | Facultative | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-037 | <i>Matricaria discoides</i> DC.                               | Introduced          | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-038 | <i>Rorippa palustris</i> ssp. <i>feraldiana</i> (Butters &    | Native              | G5T5  | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-039 | <i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>          | Native              | G5T5  | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-060 | <i>Senecio yukonensis</i> Forsk.                              | Native              | G4G5Q | Not Ranke d |             | Southwest corner of Clear AFS/gravel barren   | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Populus balsamifera</i> , <i>Elaeagnus commutata</i>                            | 6 | July | 2003 |
| 2003-061 | <i>Astragalus williamsii</i> Rydb.                            | Native              | G4    | Not Ranke d |             | Southwest corner of Clear AFS/gravel barren   | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Populus balsamifera</i> , <i>Elaeagnus commutata</i>                            | 6 | July | 2003 |
| 2003-062 | <i>Elymus sibiricus</i> L.                                    | Introduced          | Not   | Not Ranke d | Facultative | Southwest corner of Clear AFS/gravel barren   | 64.20259  | -149.26244  | Gravel Barren         | mesic, silty-sandy | <i>Populus balsamifera</i> , <i>Calamagrostis canadensis</i>                       | 6 | July | 2003 |
| 2003-063 | <i>Crepis elegans</i> Hook                                    | Native              | G5    | S5          |             | Southwest corner of Clear AFS/gravel barren   | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Populus balsamifera</i> , <i>Elaeagnus commutata</i>                            | 6 | July | 2003 |
| 2003-064 | <i>Trifolium hybridum</i> L.                                  | Introduced          | Not   | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-065 | <i>Plantago major</i> L.                                      | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-066 | <i>Festuca rubra</i> L.                                       | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-067 | <i>Melilotus alba</i> Medikus                                 | Introduced          | Not   | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-068 | <i>Festuca sadmontana</i> Rydb.                               | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-069 | <i>Potentilla norvegica</i> L.                                | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-070 | <i>Juncus bufonius</i> L.                                     | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-071 | <i>Salix arbusculoides</i> Anders.                            | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-072 | <i>Alopecurus aequalis</i> Sobol.                             | Native              | G5    | Not Ranke d | Obligate    | Southwest part of Clear AFS / road            | 64.27039  | -149.22264  | Closed Aspen forest   |                    | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-073 | <i>Alnus viridis</i> ssp. <i>sinuata</i> (Regel) A & D. Löve  | Native              | G5T5  | Not Ranke d | Facultative | Luna Road/south corner                        | 64.27351  | -149.22868  | Aspen-Black Spruce    | fine sand and mud  | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-074 | <i>Plantago major</i> L.                                      | Native              | G5    | Not Ranke d |             | Luna Road/south corner                        | 64.27351  | -149.22868  | Closed Aspen forest   | fine sand and mud  | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-075 | <i>Poa pratensis</i> L.                                       | Native and          | G5    | Not Ranke d |             | Luna Road/south corner                        | 64.27351  | -149.22868  | Closed Aspen forest   | fine sand and mud  | <i>Picea glauca</i> , <i>Populus tremuloides</i> , <i>Populus</i>                  | 6 | July | 2003 |
| 2003-076 | <i>Oxytropis campestris</i> (L.) DC.                          | Native              | G5    | Not Ranke d |             | Southwest corner of Clear AFS at Nenana       | 64.27063  | -149.25616  | Aspen-Spruce forest   | mesic humus over   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i> , <i>Limonium</i>        | 6 | July | 2003 |
| 2003-077 | <i>He dysarum boreale</i> Nutt                                | Native              | G5    | Not Ranke d |             | Southwest corner of Clear AFS/gravel barren   | 64.20259  | -149.26244  | Gravel Barren         | mesic, silty-sandy | <i>Populus balsamifera</i> , <i>Calamagrostis canadensis</i>                       | 6 | July | 2003 |
| 2003-078 | <i>He dysarum alpinum</i> L.                                  | Native              | G5    | Not Ranke d |             | Southwest corner of Clear AFS/gravel barren   | 64.20259  | -149.26244  | Gravel Barren         | mesic, silty-sandy | <i>Populus balsamifera</i> , <i>Calamagrostis canadensis</i>                       | 6 | July | 2003 |
| 2003-079 | <i>Salix setchelliana</i> Ball                                | Native              | G4    | Alaska S5;  |             | Southwest corner of Clear AFS / Nenana River  | 64.260707 | -149.281417 | River bars/95% bare   | sand and river     | <i>Populus balsamifera</i> , <i>S. alba</i> ssp.                                   | 7 | July | 2003 |
| 2003-080 | <i>Astragalus polaris</i> Benth.                              | Native              | G4    | S5S4        |             | Southwest corner of Clear AFS / Nenana River  | 64.260707 | -149.281417 | River bars/95% bare   | sand and river     | <i>Populus balsamifera</i> , <i>S. alba</i> ssp.                                   | 7 | July | 2003 |
| 2003-081 | <i>Bromus inermis</i> ssp. <i>inermis</i> Leyss.              | Introduced          | G5    | Not Ranke d |             | Southwest corner of Clear AFS / Nenana River  | 64.260707 | -149.281417 | River bars/95% bare   | sand and river     | <i>Populus balsamifera</i> , <i>S. alba</i> ssp.                                   | 7 | July | 2003 |
| 2003-082 | <i>Melilotus officinalis</i> (L.) Lam.                        | Introduced          | Not   | Not Ranke d |             | Southwest corner of Clear AFS / Nenana River  | 64.260707 | -149.281417 | River bars/95% bare   | sand and river     | <i>Populus balsamifera</i> , <i>S. alba</i> ssp.                                   | 7 | July | 2003 |
| 2003-083 | <i>Salix sitchensis</i> Sanson ex Bong                        | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-084 | <i>Salix arbusculoides</i> Anders.                            | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-085 | <i>Ribes hudsonianum</i> Richards.                            | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-086 | <i>Rubus arcticus</i> L.                                      | Native              | G5    | S5          |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-087 | <i>Trientalis europaea</i> L.                                 | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-088 | <i>Moneses uniflora</i> (L.) Gray                             | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-089 | <i>Thalictrum sparsiflorum</i> Turcz. ex Fisch. &             | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-090 | <i>Rubus idaeus</i> L.  | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.30134  | -149.25301  | White Spruce-Aspen    | mesic/humid soil   | <i>Rosa acedensis</i> , <i>Chamaenerion angustifolium</i>                          | 7 | July | 2003 |
| 2003-091 | <i>Salix barclayi</i> Anders.                                 | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.29848  | -149.25716  | Willow-Alder          | mesic silt and     | <i>Populus balsamifera</i> , <i>Picea glauca</i> , <i>Rosa acedensis</i>           | 7 | July | 2003 |
| 2003-092 | <i>Moehringia lateriflora</i> (L.) Fenzl                      | Native              | G5    | Not Ranke d |             | Southwest part of Clear AFS / at Nenana River | 64.29848  | -149.25716  | Willow-Alder          | mesic silt and     | <i>Populus balsamifera</i> , <i>Picea glauca</i> , <i>Rosa acedensis</i>           | 7 | July | 2003 |
| 2003-093 | <i>Comarum palustre</i> L.                                    | Native              | G5    | Not Ranke d | Obligate    | Western part of Clear AFS / at Nenana River   | 64.29803  | -149.25833  | Moist overgrown side  |                    | <i>Calamagrostis canadensis</i> , <i>Thalictrum sparsiflorum</i>                   | 7 | July | 2003 |
| 2003-094 | <i>Polemonium acutiflorum</i> Willd. ex Roemer &              | Native              | G5    | Not Ranke d |             | Western part of Clear AFS / at Nenana River   | 64.29803  | -149.25833  | Moist overgrown side  |                    | <i>Calamagrostis canadensis</i> , <i>Thalictrum sparsiflorum</i>                   | 7 | July | 2003 |
| 2003-095 | <i>Ribes triste</i> Pallas                                    | Native              | G5    | Not Ranke d |             | Western part of Clear AFS / at Nenana River   | 64.29354  | -149.25735  | Edge of river bar     | mesic humid soil   | <i>Abies balsamea</i> ssp. <i>trousfiori</i> , <i>S. alba</i> ssp. <i>interior</i> | 7 | July | 2003 |
| 2003-096 | <i>Spiraea stewartii</i> (Schneid) Rydb.                      | Native              | G5    | Not Ranke d |             | Western part of Clear AFS / at Nenana River   | 64.29354  | -149.25735  | Edge of river bar     | mesic humid soil   | <i>Abies balsamea</i> ssp. <i>trousfiori</i> , <i>S. alba</i> ssp. <i>interior</i> | 7 | July | 2003 |
| 2003-097 | <i>Chamaenerion latifolium</i> (L.) Holub                     | Native              | G5    | Not Ranke d | Facultative | Western part of Clear AFS / at Nenana River   | 64.29354  | -149.25735  | Open river bar/95%    |                    | <i>Melilotus alba</i> , <i>S. alba</i> ssp.  | 7 | July | 2003 |
| 2003-098 | <i>Elymus trachycaulis</i> ssp. <i>trachycaulis</i> (Lind)    | Native              | G5T5  | Not Ranke d | Facultative | Western part of Clear AFS / at Nenana River   | 64.29354  | -149.25735  | Open river bar/95%    |                    | <i>Melilotus alba</i> , <i>S. alba</i> ssp.  | 7 | July | 2003 |
| 2003-099 | <i>Pedicularis labradorica</i> Wirsing                        | Native              | G5    | Not Ranke d |             | Middle of Luna Road                           | 64.29446  | -149.24107  | Along old access road |                    | <i>Picea mariana</i> , <i>Larix laricina</i> , <i>Vaccinium vitis-idaea</i>        | 7 | July | 2003 |
| 2003-100 | <i>Beckmannia syzigachne</i> (Steud.) Fern                    | Native              | G5    | Not Ranke d |             | Middle of Luna Road                           | 64.29446  | -149.24107  | Along old access road |                    | <i>Populus tremuloides</i> , <i>Picea mariana</i> , <i>Abies balsamea</i>          | 7 | July | 2003 |

## Appendix III. (continued)

|          |   |                      |       |             |             |   |          |             |                       |                     |   |   |      |      |
|----------|---|----------------------|-------|-------------|-------------|---|----------|-------------|-----------------------|---------------------|---|---|------|------|
| 2005-101 | <i>Trisetum spicatum</i> (L.) Richter                         | Native               | G5    | Not Ranke d |             | Middle of Luna Road                           | 6420446  | -140.24107  | Along old access road |                     | <i>Pogonias tremuloides</i> , <i>Picea mariana</i> , <i>Abies balsamea</i>  | 7 | July | 2005 |
| 2005-102 | <i>Lepidium densiflorum</i> Schrad.                           | Introduced (native?) | G5    | Not Ranke d |             | Confluence of two access roads near Lake      | 6420688  | -140.20181  | Aspen-Spruce forest   | thick organic layer | <i>Arctostaphylos uva-ursi</i> , <i>Taraxacum officinale</i> ssp.           | 7 | July | 2005 |
| 2005-103 | <i>Poa glauca</i> Vahl  | Native               | G5    | Not Ranke d |             | Confluence of two access roads near Lake      | 6420688  | -140.20181  | Aspen-Spruce forest   | thick organic layer | <i>Arctostaphylos uva-ursi</i> , <i>Taraxacum officinale</i> ssp.           | 7 | July | 2005 |
| 2005-104 | <i>Poa glauca</i> Vahl  | Native               | G5    | Not Ranke d |             | Confluence of two access roads near Lake      | 6420688  | -140.20181  | Aspen-Spruce forest   | thick organic layer | <i>Arctostaphylos uva-ursi</i> , <i>Taraxacum officinale</i> ssp.           | 7 | July | 2005 |
| 2005-105 | <i>Rumex salicifolius</i> var. <i>mexicanus</i> (Meisn.)      | Native               | G5T5  | Not Ranke d |             | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-106 | <i>Achillea sibirica</i> Ledeb.                               | Native               | G5    | Not Ranke d |             | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-107 | <i>Poa palustris</i> L.                                       | Native               | G5    | Not Ranke d |             | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-108 | <i>Hordeum jubatum</i> L.                                     | Native               | G5    | Not Ranke d |             | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-109 | <i>Elymus trachycaulis</i> ssp. <i>trachycaulis</i> (Link.)   | Native               | G5T5  | Not Ranke d | Facultative | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-110 | <i>Epilobium ciliatum</i> ssp. <i>ciliatum</i> Raf.           | Native               | G5T5  | Not Ranke d | Facultative | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-111 | <i>Polygonum cauricum</i> B.L. Robins.                        | Native               | G5?   | Alaska Not  |             | West margin of Lake Sansing                   | 6420906  | -140.19821  | Clearcuts             | soil saturated      | <i>Pogonias tremuloides</i> , <i>P. balsamifera</i> , <i>Shaghenia</i>      | 7 | July | 2005 |
| 2005-112 | <i>Pyrola grandiflora</i> Rostk.                              | Native               | G5    | Not Ranke d |             | West of northern corner of Lake Sansing       | 6430222  | -140.20271  | Black Spruce-Paper    | thick humic         | <i>Lakom groenlandicum</i> , <i>Chamaenerion angustifolium</i>              | 7 | July | 2005 |
| 2005-113 | <i>Eriophorum schenckii</i> Hoppe                             | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-114 | <i>Equisetum sylvaticum</i> L.                                | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-115 | <i>Larix laricina</i> (Du Roi) K. Koch                        | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-116 | <i>Carex canescens</i> L.                                     | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-117 | <i>Gnaphalium uliginosum</i> L.                               | Introduced           | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-118 | <i>Carex disperma</i> Dewey                                   | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309179 | -140.22267  | Black Spruce forest   | thick moss-humus    | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Lakom groenlandicum</i>   | 7 | July | 2005 |
| 2005-119 | <i>Carex foenea</i> Willd.                                    | Native               | Not   | Not Ranke d |             | Southwest part of Clear AFS                   | 6430972  | -140.22627  | Aspen-Black Spruce    | mesic silty-sandy   | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Vaccinium vitis-idaea</i> | 7 | July | 2005 |
| 2005-120 | <i>Festuca rubra</i> L.                                       | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 6430972  | -140.22627  | Aspen-Black Spruce    | mesic silty-sandy   | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Vaccinium vitis-idaea</i> | 7 | July | 2005 |
| 2005-121 | <i>Carex viridula</i> Michx.                                  | Native               | G5    | Not Ranke d | Obligate    | Southwest part of Clear AFS                   | 64309459 | -140.241087 | Black Spruce forest   | thickets deep       | <i>Calamagrostis canadensis</i> , <i>Viburnum edule</i> , <i>Cornus</i>     | 7 | July | 2005 |
| 2005-122 | <i>Carex scirpoides</i> Michx.                                | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309459 | -140.241087 | Black Spruce forest   | thickets deep       | <i>Calamagrostis canadensis</i> , <i>Viburnum edule</i> , <i>Cornus</i>     | 7 | July | 2005 |
| 2005-123 | <i>Carex vaginata</i> Tausch                                  | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309459 | -140.241087 | Black Spruce forest   | thickets deep       | <i>Calamagrostis canadensis</i> , <i>Viburnum edule</i> , <i>Cornus</i>     | 7 | July | 2005 |
| 2005-124 | <i>Lycopodium annotinum</i> L.                                | Native               | G5    | Not Ranke d |             | Southwest part of Clear AFS                   | 64309459 | -140.241087 | Black Spruce forest   | thickets deep       | <i>Calamagrostis canadensis</i> , <i>Viburnum edule</i> , <i>Cornus</i>     | 7 | July | 2005 |
| 2005-125 | <i>Anemone parviflora</i> Michx.                              | Native               | G5    | Not Ranke d | Facultative | Southwest part of Clear AFS                   | 64309459 | -140.241087 | Black Spruce forest   | deep organic        | <i>Calamagrostis canadensis</i> , <i>Viburnum edule</i> , <i>Cornus</i>     | 7 | July | 2005 |
| 2005-126 | <i>Carex media</i> R. Br.                                     | Native               | G5T5? | Not Ranke d |             | Southwest part of Clear AFS                   | 6430999  | -140.24686  | Black Spruce thicket  | thick Hylocomium    | <i>Rosa acedens</i> , <i>Cornus canadensis</i> , <i>Equisetum</i>           | 7 | July | 2005 |
| 2005-127 | <i>Elymus alaskanus</i> ssp. <i>hyperarcticus</i> (Polunin)   | Native               | G3G4  | Not Ranke d |             | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Cryptis elegans</i>       | 8 | July | 2005 |
| 2005-128 | <i>Deschampsia caespitosa</i> (L.) Beauv.                     | Native               | G5    | Not Ranke d | Facultative | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Cryptis elegans</i>       | 8 | July | 2005 |
| 2005-129 | <i>Salix interior</i> Rowlee ( <i>Salix exigua</i> Nutt.)     | Native               | G5    | Alaska      |             | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Cryptis elegans</i>       | 8 | July | 2005 |
| 2005-130 | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> (Nutt.) Breitung | Native               | G5T5  | Not Ranke d | Facultative | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Cryptis elegans</i>  | 8 | July | 2005 |
| 2005-131 | <i>Crepis elegans</i> Hook                                    | Native               | G5    | S5          |             | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i>                                | 8 | July | 2005 |
| 2005-132 | <i>Hierochloa odorata</i> (L.) Beauv.                         | Native               | G4G5  | Not Ranke d |             | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Cryptis elegans</i>       | 8 | July | 2005 |
| 2005-133 | <i>Elymus sibiricus</i> L.                                    | Introduced           | Not   | Not Ranke d | Facultative | Northwest corner of Clear AFS/ at Nenana      | 64315853 | -140.251601 | Barren river bar/95%  | sand and river      | <i>Abies balsamea</i> ssp. <i>tenuifolia</i> , <i>Cryptis elegans</i>       | 8 | July | 2005 |
| 2005-135 | <i>Stellaria crassifolia</i> Ehrh.                            | Native               | G5    | S5          |             | Northeast corner of Clear AFS/ Road to        | 6431505  | -140.13053  | Black Spruce          | thick moss layer    | <i>Lakom groenlandicum</i> , <i>Betula papyrifera</i> , <i>Vaccinium</i>    | 8 | July | 2005 |
| 2005-136 | <i>Potentilla multifida</i> auct. non L.                      | Native               | G5    | Not Ranke d |             | Northeast corner of Clear AFS/ Road to        | 6431505  | -140.13053  | Black Spruce          | thick moss layer    | <i>Lakom groenlandicum</i> , <i>Betula papyrifera</i> , <i>Vaccinium</i>    | 8 | July | 2005 |
| 2005-137 | <i>Elymus trachycaulis</i> ssp. <i>subsecundus</i> (Link.)    | Native               | G5T5  | Not Ranke d |             | Northeast corner of Clear AFS/ Road to        | 6431505  | -140.13053  | Black Spruce          | thick moss layer    | <i>Lakom groenlandicum</i> , <i>Betula papyrifera</i> , <i>Vaccinium</i>    | 8 | July | 2005 |
| 2005-138 | <i>Poa glauca</i> Vahl  | Native               | G5    | Not Ranke d |             | Northeast corner of Clear AFS/ Road to        | 6431505  | -140.13053  | Black Spruce          | thick moss layer    | <i>Lakom groenlandicum</i> , <i>Betula papyrifera</i> , <i>Vaccinium</i>    | 8 | July | 2005 |
| 2005-139 | <i>Fuccinella interior</i> Sorensen                           | Native               | G5    | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-140 | <i>Carex foenea</i> Willd.                                    | Native               | Not   | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-141 | <i>Stellaria longifolia</i> Muhl. ex Willd.                   | Native               | G5    | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-142 | <i>Hierochloa odorata</i> (L.) Beauv.                         | Native               | G4G5  | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-143 | <i>Petasites frigidus</i> (L.) Fries                          | Native               | G5    | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-144 | <i>Iris setosa</i> Fallas ex Link                             | Native               | G5?   | Not Ranke d |             | Intersection of Anderson and Clear Roads      | 6420035  | -140.13347  | Cleared grass and     | sand gravelly       | <i>Calamagrostis canadensis</i> , <i>Silene</i> sp., <i>Chamaenerion</i>    | 8 | July | 2005 |
| 2005-145 | <i>Borychnium lunaria</i> (L.) Sw.                            | Native               | G5    | Not Ranke d |             | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |
| 2005-146 | <i>Borychnium pinnatum</i> St. John                           | Native               | G4?   | Not Ranke d |             | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |
| 2005-147 | <i>Parassia palustris</i> L.                                  | Native               | G5    | Not Ranke d |             | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |
| 2005-148 | <i>Arctostaphylos rubra</i> (Rehd. & Wilson) Fern.            | Native               | G5    | Not Ranke d |             | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |
| 2005-149 | <i>Rorippa barbareifolia</i> (DC.) Kitagawa                   | Native to Alaska     | G4G5  | Alaska Not  |             | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |
| 2005-150 | <i>Agrostis scabra</i> Willd.                                 | Native               | G5    | Not Ranke d | Facultative | Parls Highway/ approximately .5 mile north of | 64207362 | -140.089655 | Aspen forest          | gravel-sandy soils  | <i>Pogonias balsamifera</i> , <i>Silene</i> sp., <i>Arctostaphylos</i>      | 8 | July | 2005 |

## Appendix III. (continued)

|          |  |                     |        |             |             |  |           |             |                       |                    |   |    |        |      |
|----------|--|---------------------|--------|-------------|-------------|--|-----------|-------------|-----------------------|--------------------|---|----|--------|------|
| 2005-151 | <i>Carex foenea</i> Willd.                                   | Native              | Not    | Not Ranked  |             | Parls Highway/ approximately 5 mile north of   | 64.297362 | -149.089655 | Aspen forest          | gravel-sandy soils | <i>Pogonias dahongfere, Salsix pulchra, Arctostaphylos</i>      | 8  | July   | 2005 |
| 2005-152 | <i>Potentilla fruticosa</i> L.                               | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-153 | <i>Elaeagnus commutata</i> Bernh. ex Rydb.                   | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-154 | <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> (Link)   | Native              | G5T5   | Not Ranked  | Facultative | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-155 | <i>Calamagrostis canadensis</i> (Michx.) Beauv.              | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-156 | <i>Artemisia tilesii</i> Ledeb.                              | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel/ barren        | coarse gravel/     | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-157 | <i>Elymus imnovatus</i> Beal                                 | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-158 | <i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>         | Native              | G5T5   | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-159 | <i>Onyctropis campestris</i> (L.) DC.                        | Native              | G5     | Not Ranked  |             | Southwest corner of Clear AFS/gravel barren    | 64.26379  | -149.259    | Gravel Barren         | coarse gravel/moss | <i>Pogonias dahongfere, Eileagnus commutata,</i>                | 6  | July   | 2005 |
| 2005-160 | <i>Achillea millefolium</i> L.                               | Native & Introduced | G5     | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-161 | <i>Erigeron caespitosus</i> Nutt                             | Native              | G5     | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-163 | <i>Phleum pratense</i> L.                                    | Introduced          | Not    | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-164 | <i>Poa interior</i> Rydb.                                    | Native              | G5T4T5 | Alaska Not  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-165 | <i>Puccinellia interior</i> Sorensen                         | Native              | G5     | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-166 | <i>Crepis tectorum</i> L.                                    | Introduced          | Not    | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-167 | <i>Fragaria virginiana</i> Duchesne                          | Native              | G5     | Not Ranked  |             | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-168 | <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> (Link)   | Native              | G5T5   | Not Ranked  | Facultative | Parls Highway/ southeast part of Clear AFS/    | 64.2715   | -149.11504  | Mixed shrub-forb      | imported gravel    | <i>Bromus inermis, Agrostis scabra, Miliatum ada,</i>           | 8  | August | 2005 |
| 2005-169 | <i>Salix arbusculoides</i> Anders.                           | Native              | G5     | Not Ranked  |             | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-170 | <i>Epilobium homomallus</i> Reichenb.                        | Native              | G5     | Alaska S4S5 | Facultative | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Carex foenea, Dracophyllum parryi, Dryas</i>                 | 8  | August | 2005 |
| 2005-171 | <i>Carex foenea</i> Willd.                                   | Native              | Not    | Not Ranked  |             | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Dracophyllum parryi, Dryas</i>         | 8  | August | 2005 |
| 2005-172 | <i>Dracopcephalum parviflorum</i> Nutt                       | Native              | G5     | Not Ranked  | Facultative | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea, Dryas</i>                | 8  | August | 2005 |
| 2005-173 | <i>Astragalus williamsii</i> Rydb.                           | Native              | G4     | Not Ranked  |             | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-174 | <i>Dryas integrifolia</i> ssp. <i>crenulata</i> (Juz.) J.    | Native              | G5     | Not Ranked  | Facultative | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-175 | <i>Rorippa palustris</i> ssp. <i>hispida</i> (Desv.) Jonsell | Native              | G5T5   | Not Ranked  |             | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-176 | <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> (Link)   | Native              | G5T5   | Not Ranked  | Facultative | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-177 | <i>Deschampsia caespitosa</i> (L.) Beauv.                    | Native              | G5     | Not Ranked  | Facultative | Parls Highway/Southeast corner of Clear        | 64.259763 | -149.166118 | Black Spruce-Paper    |                    | <i>Epilobium homomallus, Carex foenea,</i>                      | 8  | August | 2005 |
| 2005-178 | <i>Poa glauca</i> Vahl                                       | Native              | G5     | Not Ranked  |             | Clear AFS Road between gates and dormitory     | 64.290238 | -149.154575 | Aspen-Black Spruce    |                    | <i>Silene meyeri ssp. mullensis, Taraxacum</i>                  | 9  | August | 2005 |
| 2005-179 | <i>Betula papyrifera</i> Marsh.                              | Native              | G5     | Not Ranked  |             | Southeast corner of developed area/ Alaska     | 64.2795   | -149.158512 | Black Spruce-Paper    |                    | <i>Rosa acedensis, Lakom palustris, Salsix sp</i>               | 9  | August | 2005 |
| 2005-180 | <i>Castilleja caudata</i> (Pennell) Rebr.                    | Native              | G5     | Not Ranked  | Facultative | Alaska Railroad/ off railroad trail to leading | 64.264066 | -149.178779 | Closed Black Spruce-  |                    | <i>Lakom palustris, Vaccinium vitis-idaea</i>                   | 9  | August | 2005 |
| 2005-181 | <i>Elymus trachycaulus</i> ssp. <i>subsecundus</i> (Link)    | Native              | G5T5   | Not Ranked  |             | Southern part of the base                      | 64.269486 | -149.206333 | Closed Aspen forest   |                    | <i>Pogonias dahongfere, Rosa acedensis, Salsix</i>              | 9  | August | 2005 |
| 2005-182 | <i>Gentiana propinqua</i> Richards.                          | Native              | G5T5P  | Not Ranked  |             | Southern part of the base                      | 64.269486 | -149.206333 | Closed Aspen forest   |                    | <i>Pogonias dahongfere, Rosa acedensis, Salsix</i>              | 9  | August | 2005 |
| 2005-183 | <i>Astragalus alpinus</i> L.                                 | Native              | G5     | Not Ranked  |             | Access road/ southwest of developed area       | 64.27723  | -149.20711  | Aspen-Black Spruce    |                    | <i>Lakom palustris, Cornus canadensis, Galium boreale</i>       | 9  | August | 2005 |
| 2005-184 | <i>Galium boreale</i> L.                                     | Native              | G5     | Not Ranked  |             | At southwest corner of developed area          | 64.28278  | -149.19847  | Black Spruce forest   |                    | <i>Lepidodermis densiflorum, Potentilla multijida, Plantago</i> | 9  | August | 2005 |
| 2005-185 | <i>Carex foenea</i> Willd.                                   | Native              | Not    | Not Ranked  |             | At southwest corner of developed area          | 64.28278  | -149.19847  | Black Spruce forest   |                    | <i>Lepidodermis densiflorum, Potentilla multijida, Plantago</i> | 9  | August | 2005 |
| 2005-186 | <i>Rumex salicifolius</i> var. <i>mexicanus</i> (Meisn.)     | Native              | G5T5   | Not Ranked  |             | At southwest corner of developed area          | 64.28288  | -149.19328  | Roadside              | large gravel       | <i>Tofieldia hybridum</i>                                       | 9  | August | 2005 |
| 2005-186 | <i>Rumex salicifolius</i> var. <i>mexicanus</i> (Meisn.)     | Native              | G5T5   | Not Ranked  |             | At southwest corner of developed area          | 64.28288  | -149.19328  | Roadside              | large gravel       | <i>Tofieldia hybridum</i>                                       | 9  | August | 2005 |
| 2005-187 | <i>Erigeron glabellus</i> Nutt                               | Native              | G5     | Not Ranked  |             | At southwest corner of developed area          | 64.28288  | -149.19328  | Roadside              | large gravel       | <i>Tofieldia hybridum</i>                                       | 9  | August | 2005 |
| 2005-188 | <i>Arabis X divaricarpa</i> A. Nels. (pro sp.)               | Native              | Not    | Not Ranked  | Facultative | Developed area/building "day sleepers"         | 64.285336 | -149.16708  | Herbaceous roadside   | large gravel       | <i>Lepidodermis densiflorum, Potentilla multijida, Achillea</i> | 9  | August | 2005 |
| 2005-189 | <i>Arnica angustifolia</i> ssp. <i>angustifolia</i> Vahl     | Native              | G5T5   | Not Ranked  |             | Road to radars                                 | 64.28721  | -149.17847  | Roadside              | imported gravel    | <i>Equisetum arvense, Tofieldia hybridum, Rhinanthus</i>        | 9  | August | 2005 |
| 2005-190 | <i>Erigeron glabellus</i> Nutt                               | Native              | G5     | Not Ranked  |             | Road to radars                                 | 64.28721  | -149.17847  | Roadside              | imported gravel    | <i>Equisetum arvense, Tofieldia hybridum, Rhinanthus</i>        | 9  | August | 2005 |
| 2005-191 | <i>Erysimum cheiranthoides</i> L.                            | Introduced          | G5     | Not Ranked  |             | Road along east shore of Lake Sansing          | 64.29858  | -149.198547 | Roadside              | imported gravel    | <i>Lepidodermis densiflorum, Galium boreale, Rosa acedensis</i> | 10 | August | 2005 |
| 2005-192 | <i>Carex aquatilis</i> Wahlenb.                              | Native              | G5     | Not Ranked  |             | Sansing Lake/North edge of lake                | 64.30299  | -149.19658  | Lake                  |                    | <i>Salsix spp.</i>  | 10 | August | 2005 |
| 2005-193 | <i>Pulsatilla patens</i> (L.) P. Mill.                       | Native              | G5     | Not Ranked  |             | Northwest of Lake Sansing                      | 64.30253  | -149.19789  | Black Spruce forest   |                    | <i>Empetrum nigrum, Vaccinium vitis-idaea, Lepidodermis</i>     | 10 | August | 2005 |
| 2005-194 | <i>Solidago decumbens</i> Greene                             | Native              | G5T5   | Not Ranked  |             | Road along Lake Sansing/ north of lake         | 64.3047   | -149.19417  | Mixed shrub-forb      | imported gravel    | <i>Achillea millefolium, Galium boreale, Vaccinium</i>          | 10 | August | 2005 |
| 2005-195 | <i>Picea glauca</i> (Moench) Voss                            | Native              | G5     | Not Ranked  |             | Road along Lake Sansing/ north of lake/ at     | 64.31119  | -149.18739  | Clearcut/ Aspen shrub | imported gravel    | <i>Potentilla norvegica, Polygomon acedense, Rosa</i>           | 10 | August | 2005 |
| 2005-196 | <i>Chenopodium capitatum</i> (L.) Ambrosi                    | Native              | G5     | Not Ranked  |             | Road along Lake Sansing/ north of lake/ at     | 64.31119  | -149.18739  | Clearcut/ Aspen shrub | imported gravel    | <i>Potentilla norvegica, Polygomon acedense, Rosa</i>           | 10 | August | 2005 |
| 2005-197 | <i>Corydalis sempervirens</i> (L.) Pers.                     | Native              | G4G5   | Not Ranked  |             | Road along Lake Sansing/ north of lake/ at     | 64.31119  | -149.18739  | Clearcut/ Aspen shrub | imported gravel    | <i>Potentilla norvegica, Polygomon acedense, Rosa</i>           | 10 | August | 2005 |
| 2005-198 | <i>Solidago multiradiata</i> Ait                             | Native              | G5     | Not Ranked  |             | North of developed area/ access road           | 64.3009   | -149.16948  | Mixed Black Spruce-   |                    | <i>Lepidodermis densiflorum, Potentilla multijida, Achillea</i> | 10 | August | 2005 |
| 2005-199 | <i>Petasites frigidus</i> (L.) Pries                         | Native              | G5     | Not Ranked  |             | Gravel pit north of developed area             | 64.30081  | -149.15552  | Black Spruce wetland  | thick moss layer   | <i>Picea mariana</i>  | 10 | August | 2005 |
| 2005-200 | <i>Epilobium homomallus</i> ssp. <i>behrengianum</i>         | Native              | G5T4   | Alaska S4   | Facultative | Gravel road to north from dormitory            | 64.29923  | -149.1609   | Mixed Black Spruce-   | imported gravel    | <i>Calamagrostis canadensis, Tofieldia hybridum,</i>            | 10 | August | 2005 |
| 2005-201 | <i>Carex foenea</i> Willd.                                   | Native              | Not    | Not Ranked  |             | Northwest corner of dormitory building/        | 64.29362  | -149.16867  | Waste ground at the   | imported gravel    | <i>Chenopodium album, Matricaria discolor, Hordeum</i>          | 10 | August | 2005 |

## Appendix III. (continued)

|          |  |            |     |            |  |   |          |            |                     |                 |   |                |
|----------|--|------------|-----|------------|--|---|----------|------------|---------------------|-----------------|---|----------------|
| 2005-202 | Carex foenea Willd.                                | Native     | Not | Not Ranked |  | Northwest corner of dormitory building/       | 64.29362 | -149.16867 | Waste ground at the | imported gravel | <i>Chenopodium album</i> , <i>Matricaria discolor</i> , <i>Hoskotea</i> | 10 August 2005 |
| 2005-203 | Poa pratensis L.                                   | Native and | G5  | Not Ranked |  | Northwest corner of dormitory building/       | 64.29362 | -149.16867 | Waste ground at the | imported gravel | <i>Chenopodium album</i> , <i>Matricaria discolor</i> , <i>Hoskotea</i> | 10 August 2005 |
| 2005-204 | Stellaria longipes Goldie                          | Native     | G5  | Not Ranked |  | Northwest corner of dormitory building/       | 64.29362 | -149.16867 | Waste ground at the | imported gravel | <i>Chenopodium album</i> , <i>Matricaria discolor</i> , <i>Hoskotea</i> | 10 August 2005 |
| 2005-206 | Solidago multiradiata Ait                          | Native     | G5  | Not Ranked |  | Northwest corner of dormitory building/       | 64.29362 | -149.16867 | Waste ground at the | imported gravel | <i>Chenopodium album</i> , <i>Matricaria discolor</i> , <i>Hoskotea</i> | 10 August 2005 |
| 2005-207 | Rhisanthus minor L.                                | Native     | G5  | Not Ranked |  | Parks Highway and Clear AFS Road intersection | 64.28638 | -149.09744 | Cleared grass and   |                 | <i>Achillea millefolium</i> , <i>Melilotus alba</i> , <i>Hoskotea</i>   | 8 August 2005  |
| 2005-208 | Salix glauca L.                                    | Native     | G5  | Not Ranked |  | Parks Highway and Clear AFS Road intersection | 64.28638 | -149.09744 | Cleared grass and   |                 | <i>Achillea millefolium</i> , <i>Melilotus alba</i> , <i>Hoskotea</i>   | 8 August 2005  |
| 2005-209 | Salix bebbiana Sarg.                               | Native     | G5  | Not Ranked |  | Parks Highway and Clear AFS Road intersection | 64.28638 | -149.09744 | Cleared grass and   |                 | <i>Achillea millefolium</i> , <i>Melilotus alba</i> , <i>Hoskotea</i>   | 8 August 2005  |
| 2005-210 | Salix interior Rowlee ( <i>Salix exigua</i> Nutt.) | Native     | G5  | Alaska     |  | Parks Highway and Clear AFS Road intersection | 64.28638 | -149.09744 | Cleared grass and   |                 | <i>Achillea millefolium</i> , <i>Melilotus alba</i> , <i>Hoskotea</i>   | 8 August 2005  |
| 2005-211 | Lolium perenne ssp. multiflorum (Lam.)             | Introduced | Not | Not Ranked |  | Parks Highway/ southeast part of Clear AFS/   | 64.2715  | -149.11504 | Mixed shrub-forb    | imported gravel | <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i>  | 8 August 2005  |
| 2005-212 | Carex foenea Willd.                                | Native     | Not | Not Ranked |  | Parks Highway/ southeast part of Clear AFS/   | 64.2715  | -149.11504 | Mixed shrub-forb    | imported gravel | <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i>  | 8 August 2005  |
| 2005-213 | Lupinus arcticus S. Wats.                          | Native     | G5  | S4         |  | Parks Highway/ southeast part of Clear AFS/   | 64.2715  | -149.11504 | Mixed shrub-forb    | imported gravel | <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i>  | 8 August 2005  |
| 2005-214 | Astragalus alpinus L.                              | Native     | G5  | Not Ranked |  | Parks Highway/ southeast part of Clear AFS/   | 64.2715  | -149.11504 | Mixed shrub-forb    | imported gravel | <i>Bromus inermis</i> , <i>Agrostis scabra</i> , <i>Melilotus alba</i>  | 8 August 2005  |

**Appendix IV.** Vegetation classification (after Viereck et al. 1992) used during avian bird surveys, Clear AFS.

| Level I         | Level II                       | Level III  |
|-----------------|--------------------------------|--|
| I. Forest       | A. Needleleaf (conifer) forest | 1. Closed needleleaf forest<br>2. Open needleleaf forest<br>3. Needleleaf woodland                       |
|                 | B. Broadleaf forest            | 1. Closed broadleaf forest<br>2. Open broadleaf forest<br>3. Broadleaf woodland                          |
|                 | C. Mixed forest                | 1. Closed mixed forest<br>2. Open mixed forest<br>3. Mixed woodland                                      |
| II. Scrub       | A. Dwarf tree scrub            | 1. Closed dwarf tree scrub<br>2. Open dwarf tree scrub<br>3. Dwarf tree scrub woodland                   |
|                 | B. Tall scrub                  | 1. Closed tall scrub<br>2. Open tall scrub   |
|                 | C. Low scrub                   | 1. Closed low scrub<br>2. Open low scrub   |
|                 | D. Dwarf scrub                 | 1. Dryas dwarf scrub<br>2. Ericaceous dwarf scrub  |
| III. Herbaceous | A. Graminoid herbaceous        | 1. Dry graminoid herbaceous<br>2. Mesic graminoid herbaceous<br>3. Wet graminoid herbaceous              |
|                 | B. Forb herbaceous             | 1. Dry forb herbaceous<br>2. Mesic forb herbaceous<br>3. Wet forb herbaceous                             |
|                 | C. Bryoid herbaceous           | 1. Bryophyte (mosses)<br>2. Lichens  |
|                 | D. Aquatic herbaceous          | 1. Freshwater aquatic herbaceous<br>2. Brackish water aquatic herbaceous<br>3. Marine aquatic herbaceous |

**Appendix V.** Bird species detected by LaGory et al. (1996) during surveys at Clear AFS that were not observed during the 2007 avian surveys.

| Common Name                 | Scientific Name               | G Rank | S Rank   | Classification |
|-----------------------------|-------------------------------|--------|----------|----------------|
| Spruce Grouse               | <i>Falcapennis canadensis</i> | G5     | S5       | grouse         |
| Arctic Warbler              | <i>Phylloscopus borealis</i>  | G5     | S5B      | passerine      |
| Belted Kingfisher           | <i>Megaceryle alcyon</i>      | G5     | S5       | passerine      |
| Bohemian Waxwing            | <i>Bombycilla garrulus</i>    | G5     | S5B      | passerine      |
| Hoary Redpoll               | <i>Carduelis hornemanni</i>   | G5     | S5       | passerine      |
| Violet-green Swallow        | <i>Tachycineta thalassina</i> | G5     | S5B      | passerine      |
| American Kestrel            | <i>Falco sparverius</i>       | G5     | S4B      | raptor         |
| Great Horned Owl            | <i>Bubo virginianus</i>       | G5     | S5       | raptor         |
| Red-tailed Hawk             | <i>Buteo jamaicensis</i>      | G5     | S4S5B    | raptor         |
| Greater Yellowlegs          | <i>Tringa melanoleuca</i>     | G5     | S5B      | shorebird      |
| Least Sandpiper             | <i>Calidris minutilla</i>     | G5     | S5B      | shorebird      |
| Western Sandpiper           | <i>Calidris mauri</i>         | G5     | S5B      | shorebird      |
| Whimbrel                    | <i>Numenius phaeopus</i>      | G5     | S3S4B    | shorebird      |
| Greater White-fronted Goose | <i>Anser albifrons</i>        | G5     | S5B      | waterfowl      |
| Green-winged Teal           | <i>Anas crecca</i>            | G5     | S4N,S5B  | waterfowl      |
| Red-breasted Merganser      | <i>Mergus serrator</i>        | G5     | S5B, S5N | waterfowl      |
| White-winged Scoter         | <i>Melanitta fusca</i>        | G5     | S5B, S5N | waterfowl      |