A FLORISTIC INVENTORY
OF
FORT WAINWRIGHT MILITARY INSTALLATION, ALASKA

Prepared by

Gerald F. Tande, Rob Lipkin and Michael Duffy

Environment and Natural Resources Institute
ALASKA NATURAL HERITAGE PROGRAM
University of Alaska Anchorage
707 A Street
Anchorage, AK 99501

For

EAGAN, MCALLISTER ASSOCIATES, INC.
P.O. Box 986
Lexington Park, MD 20653

Contract No. N00140-95-C-H026

March 1996

TABLE OF CONTENTS

TABLE OF CONTENTS i

ACKNOWLEDGEMENTS ii

INTRODUCTION 1

STUDY AREA LOCATION 1

STUDY AREA DESCRIPTION 3

Geology and Physiography 3
Climate 4
Soils 4
Vegetation 5

METHODS 8

RESULTS AND DISCUSSION 16

LITERATURE CITED 22

APPENDIX A - Coordinates of Study Sites 33

APPENDIX B - Table of Vegetation Types for Collecting Units 38

APPENDIX C - Alphabetical Checklist of Vascular Plants 44

APPENDIX D - Checklist of Vascular Plants by Family 56

APPENDIX E - Matrix of Vascular Plants and Collecting Unit 71

APPENDIX F - List of Rare Vascular Plants for Fort Wainwright 91

LIST OF PLATES 93

ACKNOWLEDGEMENTS

We would like to acknowledge the assistance of Dr. Barbara Murray and Alan Batten of the Herbarium, University of Alaska Museum (ALA), for developing the label databases and their advice on their use throughout the project. Julia Lenz and Julie Michaelson of the Alaska Natural Heritage Program provided invaluable computer and database support over the course of the inventory. The field and lab assistance of Tako Raynolds and Peggy Robinson was greatly appreciated.

Thanks also go to Dr. Dave Murray, Carolyn Parker and Al Batten (ALA) for discussions on the local flora, and for making available their various unpublished field notes from investigations in the Fairbanks area. Dr. Les Viereck and Joan Foote from the Institute of Northern Forestry gave freely of their time and provided species lists from their ongoing, long-term studies of boreal forest ecology.

We would like to thank the biological staff of the Fort Wainwright Environment and Resources Division for their help in completing this survey. In particular, we greatly appreciated the efforts of Pam Bruce and Walt Van den Heuvel for making the necessary resources available, and helping us negotiate Base logistics whenever they were called upon in a very timely manner.

Remote field logistics on the Tanana Flats were shared with Alaska Biological Research, Inc., a private company contracted by CRREL to complete a terrain mapping and classification of the Base.

Finally, we would like to thank Dr. Charles Racine of the U.S. Army's Cold Regions Research Engineering Laboratory, and Bob Lichvar of the Army's Waterways Experiment Station for making this project possible.

INTRODUCTION

This report summarizes a vascular plant survey of Fort Wainwright Military Installation, Alaska, conducted in 1995 by the Alaska Natural Heritage Program (AKNHP) for the U.S. Army Corps of Engineer's Cold Regions Research and Engineering Laboratory (CRREL) and Waterways Experiment Station (WES).

The purpose of this study was to provide a baseline inventory of the existing flora of Fort Wainwright as an initial step in a program to assess military training impacts [Land-Condition Trend Analysis (LCTA)], a major component of the Integrated Training Area Management (ITAM) Program. This survey also provides a basis for evaluating any concerns for vascular plants under the Endangered Species Act and the National Environmental Policy Act.

No comprehensive flora has been produced for this part of Alaska even though the Fairbanks area is the center of activity for most of Interior Alaska's population, and is also a center for many of the State's natural resource agencies and research facilities. No Base-wide floristic inventory has been completed for the Fort Wainwright Military Installation.

The nearest detailed floristic surveys have been completed for the White Mountains 41 km (65 mi) north of the Base (Juday 1988, 1989); the Ray Mountains 81 km (130 mi) northwest of Fairbanks (Kassler 1980); and various bluffs along the Yukon and Charley rivers 81 km (130 mi) northeast of the Base (Alaska Planning Group 1974a, 1974b, 1974d, Batten et al. 1979, Kassler 1979, Howenstein et al. 1985, Young 1976a, 1976b). Various surveys of localized areas of interest have been conducted over the years by Herbarium researchers of the University of Alaska Museum (e.g. Murray 1994), and several species lists have been compiled by the Institute of Northern Forestry for the Bonanza Creek Experimental Forest over the course of ongoing, long-term, ecological research on the boreal forest (Foote 1992, 1995, Viereck et al. 1993). Other generally less complete lists have been made for area-specific vegetation studies of the Fairbanks area (see Methods).

STUDY AREA LOCATION

Fort Wainwright Military Installation (WRT) is located south and east of Fairbanks in Interior Alaska (Figure 1). The 370,445 ha (915,000 A) installation can be divided into three major units. The two largest of these are major training areas known respectively as the Tanana Flats - Blair Lakes Air Force Range south of the Tanana River; and the Yukon Maneuver Area (YMA) east of Eielson Air Force Base (Figure 1).

The Tanana Flats occupies an area between the Tanana and Wood rivers, extending south to Blair Lakes. The area is also drained by Bear, Clear and Willow creeks. Possessing no roads,

insert Figure 1

it is largely accessible only by helicopter. Airboats have limited access from the major rivers.

The Yukon Maneuver Area occupies an area south of the Chena River lowlands, extending south to the Little Salcha and Salcha rivers. The YMA is the headwaters of Moose and French creeks on its western slopes; Ninety-Eight Mile Creek and the Salcha River on the south; and the South Fork of the Chena River and Beaver Creek on the north. Like the Tanana Flats, the area is largely remote; however, the YMA possesses a limited road and trail network.

Most Base facilities and services are located in the third major unit on the eastern edge of the city of Fairbanks, referred to here as the Cantonment Area. It extends south from Birch Hill to the Tanana River. The Fairbanks Permafrost Experiment Station is an outlier of the Cantonment Area and is located on the west side of the Steese Expressway northwest of Birch Hill (Figure 1).

Study area boundaries for this investigation were defined by the Base boundaries found on the four "Fort Wainwright Military Installation Maps, North, South, East and West" (Edition 1-DMATC, Series Q701S, DMA Stock Nos.: Q701STWAIN**N**MIN, Q701SFTWAIN**S**MIN, Q701SFTWAIN**E**MIN, and Q701SFTWAIN**W**MIN, respectively).

STUDY AREA DESCRIPTION

Geology and Physiography

The Quaternary geology and geomorphology of the Fairbanks area have been summarized by Pewe (1975), Pewe and Regar (1983) and Pewe et al. (1966). The country rock is Birch Creek Schist, a Precambrian formation, consisting mainly of folded and strongly jointed quartz mica and quartzite schist (Pewe et al. 1966). Exposures of granitic or ultramafic intrusives also occur locally as rock outcrops. A series of tors is characteristic of nonforested alpine domes (hilltops) in the eastern part of the YMA.

Although the Fairbanks area itself has never been glaciated, hundreds of meters of sand and gravel were deposited in the Tanana floodplain during periods of maximum glaciation (Pewe and Reger 1983). These deposits have since been covered by finer sand and silt carried by the glacier-fed Tanana River. Glaciers that originate in the Alaska Range still contribute to the heavy silt load carried by the Tanana today.

Quaternary, micaceous loess deposits mantle the uplands. Thickness of this layer varies with elevation, exposure and distance from the plains. Since the original depositions, much of the material has been redeposited on the lower slopes and upland valleys.

Fort Wainwright lies within the Yukon-Tanana Upland and the Tanana-Kuskokwim Lowland Geographic Divisions of Wahrhaftig (1965). The latter includes the Tanana Flats (Pewe 1975).

Broad, flat floodplains of the Tanana River and its major local tributary, the Chena River, comprise

a large part of the area and maintain vast expanses of peatlands. The Tanana River approximates the boundary between the two major geographic divisions of the study area, and occupies a system of anastamasing channels sometimes split around islands and braided in other places (Plate 1). Seasonal or perennial side channels enclose densely vegetated islands, some of which are stable for decades or centuries (Viereck et al. 1993).

The Tanana Flats of the Tanana Lowland is a nearly level terrain sloping gradually north from the foothills of the Alaska Range to the Tanana River. It is broken by small, isolated, bedrock knobs that protrude through ancient accumulations of glacial and fluvial sediments from the Alaska Range (Plate 2). Examples of these features include the Wood River Buttes and Clear Creek Butte.

Rounded, even-topped ridges or domes with gentle to steep side slopes characterize the Yukon-Tanana Upland Geographic Division north of the Tanana River (Wahrhaftig 1965). The ridges in the eastern part of the YMA have numerous rock outcrops and granite tors (Plate 3). Valley bottoms are generally flat and 0.4-0.8 km (1/4-1/2 mi) wide within a few kilometers of the headwaters. The transition from lowland to hillslope in both geographic divisions is, in most cases, quite abrupt (e.g. Plate 27).

Floodplain elevations range from 123 m (370 ft) at the mouth of the Wood River in the western part of the study area, whereas the domes of the YMA bordering the floodplain to the east attain elevations of 996 m (3265 ft).

Climate

The Fairbanks area is characterized by a continental climate with extreme seasonal variations in temperature (Pewe and Reger 1983). The mean annual temperature is -3.28^0 C (26.1^0 F); the record high temperature is 37.2^0 C (99^0 F) and the record low temperature is -55^0 C (-66^0 F).

The transition from winter to summer and vice versa is rapid. The average last date of freezing temperatures occurs May 21 and the average date of frost reoccurrence is August 30, giving a growing season of approximately 100 days. The first frost of the season in 1995 had not occurred prior to the end of the field season on August 31; however, lowland depressions were displaying colors by August 20.

Annual precipitation for the Fairbanks area is 297 mm (11.7 in). Rains usually begin in May and reach a maximum in August, followed by a noticeable decline in precipitation from September through December. Average annual snowfall is 1692 mm (66.6 in). Snows begin as early as September (Racine and Walters 1991).

Soils

Soils of the Fort Wainwright area have been mapped and described in a broad exploratory level of survey (Rieger et al. 1979). On south-facing slopes, soils are generally well-drained and free of

permafrost, while poorly-drained north slope soils are usually underlain by permafrost. South slopes are occupied by well-drained, silt loams which grade from shallow, gravelly silt near ridgetops through silt loams of mid-slopes to deep, moist, silt loams of lower slopes. Drainage bottoms and depressions are occupied by shallow, gravelly, silt loam with a thick overlying peat layer and underlying permafrost. Soils of north-facing slopes are shallow, gravelly, silt loams with a thick organic mantle and permafrost.

The greater portion of the YMA is rolling to hilly upland, covered by silt loam soils developed in the silt mantle of hills and ridges bordering the Tanana River valley. Stratified, silty to gravelly stream-deposited materials occupy low terraces adjoining the Tanana and Chena rivers. Soils developed in these materials are well-drained, alluvial silty and sandy loams.

Wet depressions and much of the Tanana Flats and Chena River lowlands are covered by thick peat deposits underlain by permafrost. Polygonal ground, thaw lakes, pingos and other expressions of permanently-frozen ground were frequently observed in these areas.

Vegetation

No effort is made here to describe the wide variety of plant communities that occur on Fort Wainwright. The vegetation of Alaska has been classified by Viereck et al. (1992); these authors have summarized and described many of the vegetation types one would encounter on the Base. The U.S. Fish and Wildlife National Wetlands Inventory has completed wetland delineation and mapping for the Fairbanks area which includes Fort Wainwright, and a vegetation map has been completed identifying 97 covertypes using an earlier version of the Viereck classification (SCS/DNR 1990). A summary of SCS/DNR and Viereck Level IV plant communities surveyed in this study is presented later in this report.

In general, the vegetation of Fort Wainwright is a mosaic of forest, grassland, shrub, bog, fen, and alpine tundra types that have formed primarily as a result of slope, aspect, elevation, parent material, and succession following wildfire (Viereck et al. 1986). Because of the dry continental climate and low sun angle, there is a great contrast in the vegetation of north-facing vs. south-facing slopes. This is particularly evident in the forested slopes of the YMA (Plates 4, 27), and on the buttes of the Tanana Flats (Plate 2). The presence or absence of permafrost, closely correlated with slope and aspect, has also been shown to be a dominant factor in the distribution of vegetation types (Dyrness and Grigal 1979). Because of a high frequency of fires in Interior Alaska (Gabriel and Tande 1983, Viereck 1973), most of the Base tends to be in successional stages, masking the factors that control the distribution of more mature vegetation types.

Upland forest types of the Tanana Flats and the YMA vary from highly productive aspen (*Populus tremuloides*, Plate 5), paper birch (*Betula papyrifera*, Plate 6), and white spruce (*Picea glauca*) on south-facing, well-drained slopes, to slow-growing, moss-dominated black spruce (*Picea mariana*) forests on north-facing slopes (Plate 7), lowlands and lower slopes which are generally underlain by permafrost (Viereck 1986).

Highly productive floodplain forests of balsam poplar (*Populus balsamifera*) and white spruce occur on recently formed river alluvium where permafrost is absent. In these riparian situations, young stages of revegetation are dominated by willow (*Salix* spp.) and alder (*Alnus* spp.) thickets, intermediate stages by extensive stands of balsam poplar (Plate 8), and the later stages by well-developed stands of white spruce (Plate 9, Viereck 1989).

Black spruce is the most widespread forest type on the Base. Upland black spruce occupies north slopes at all elevations, and ridgetops and most slopes above 400 m (1200 ft) in elevation (Viereck et al. 1983). It is especially widespread in the rolling uplands of the YMA where loess deposits are shallow over bedrock (Plate 7).

Lowland black spruce occupies old terraces of the major rivers, small valley bottoms, and the lower slopes along microdrainages in the uplands (Plate 10). Lowland black spruce types are wetter, and *Sphagnum* mosses and *Eriophorum vaginatum* tussocks become more abundant in older stands. Tamarack (*Larix laricina*) may also occur with occasional scattered paper birch. Forested areas tend to be interspersed with bogs, lakes and old stream channels supporting a variety of aquatic plant communities (Plate 11).

Treeline vegetation in the YMA is characterized by open stands of black and white spruce that grade into alder and willow tall shrub thickets and hummocky, low shrub birch (*Betula glandulosa*) communities. Alpine dwarf shrub plant communities are typically found on the treeless ridge crests and domes at elevations above 186 m (2250 ft) and consist of plants capable of withstanding very cold temperatures and short growing seasons (Plate 12). Much of this alpine zone is covered by a crowberry (*Empetrum hermaphroditum*)/blueberry (*Vaccinium uliginosum*) dwarf shrub tundra (Plate 4). These dominant species intermingle; however, shallow, stony, fairly well-drained soils support blueberry tundra at slightly higher elevations than crowberry tundra. Blueberry tundra sites are generally exposed to the wind and do not accumulate much snow in the winter but usually are not as exposed as sites supporting *Dryas*-sedge-lichen tundra (Viereck et al. 1992). Crowberry tundra occurs in more protected areas at slightly lower elevations on thin, well-drained, mineral soil or poorly-drained peats.

A *Cassiope* dwarf shrub tundra (*Cassiope tetragona*) occurs on moist sites, commonly on north-facing slopes, or snow accumulation areas. It is found on sites well-protected by snow in winter that become snow-free in the early to middle part of the growing season (Viereck et al. 1992).

On the other end of this moisture gradient, occupying exposed, wind-swept, alpine sites, are species of the genus *Dryas* which form mats a few centimeters thick and have a strong sedge and lichen component. Exposure to strong winds leads to deflation of fines and organic material producing various-sized mats or islands of this *Dryas*-sedge-lichen dwarf shrub tundra along many of the higher ridges and slopes in the YMA (Plate 12). Ridgelines of the highest alpine areas are also characterized by tors. These rock outcrops are sparsely vegetated by alpine herbs, lichens and

mosses (Plate 13).

Nonforested sites at lower elevations are occupied by a wide variety of plant communities, many of which may be successional to forested site types. Alder (*Alnus tenuifolia*, *Alnus viridis*) and willow (*Salix bebbiana*, *Salix* spp.) shrub communities are very important successional species on exposed river bars, old alluvial deposits of creeks and rivers (Mann et al. 1995, Viereck 1989), and disturbed sites such as old trails and clearings (Plates 14, 24). They also occur in openings of spruce and birch forests (Plate 15) and become the dominant vegetation where they intermingle with spruce forests and dwarf birch low shrub types at treeline.

Much of the Chena River lowlands and Tanana Flats are characterized by treed and treeless bog and fen wetland types. Some are dominated by *Sphagnum* mosses, some by *Eriophorum vaginatum* tussocks, and some by mixtures of sedges (*Carex* spp.) and grasses. They may be completely treeless or have widely scattered black spruce, paper birch, and occasional tamarack. Much of the vegetation of the Tanana Flats is a complex mosaic of such stunted forests and expanses of dwarf birch low shrub communities heavily influenced by beaver activity and wildfire (Plate 2, Racine and Walters 1991).

Calmes (1976) described three major bog types from the Fairbanks area. The first type is a *Sphagnum* bog dominated by a moss layer of *Sphagnum* and with an important shrub component of dwarf birch, bog rosemary (*Andromeda polifolia*), and narrow leaf Labrador tea (*Ledum palustre* ssp.*decumbens*, Plate 16). *Sphagnum* bog types generally develop a substrate of sedge and *Sphagnum* peat that may form a floating mat on water along the shoreline of lakes and ponds (Plate 11).

A second bog type, found on wetter sites, is dominated by several species of sedges (*Carex* spp.) and grasses, and is nearly devoid of shrubs. *Sphagnum* mosses are present, but are much less important than in the *Sphagnum* bog. There is a gradual transition from *Sphagnum* bogs to sedge meadows on progressively wetter sites (Plate 17).

A third and widespread type of bog is dominated by tussocks of *Eriophorum vaginatum* similar to those found in many parts of more northerly arctic and alpine tundra areas. Low shrubs of *Ledum palustre* ssp.*decumbens*, *Vaccinium uliginosum*, *Vaccinium vitis-idaea*, *Betula nana*, *Betula glandulosa*, and *Salix* spp. are common in this tussock type. Vast portions of the Tanana Flats are covered by such dwarf birch-tussock sedge bogs (Plate 18).

A unique area of the Tanana Flats is covered by "fens", highly productive, floating, vegetation mats, made up of narrow-leaved graminoids and broad-leaved forbs that possess little or no *Sphagnum* moss (Gabriel and Talbot 1984). Woody plant species are also conspicuously absent from these wetlands (Racine and Waters 1991). Fens occur as both large open expanses and long linear corridors 100-500 m (300-1500 ft) wide and oriented southeast to northwest in the northwestern portion of the study area (Plates 19, 20).

In sharp contrast with the waterlogged conditions of these treed- and treeless bog and fen types, are xeric sites on steep, south-facing bluffs (Plate 21). These are found on the Wood River Buttes (Plate 2), Clear Creek Buttes and Blair Lake hills on the Tanana Flats, and bluffs adjacent to the Chena River floodplain along the base of Birch (Plate 22) and Sage Hill. Steppe-like communities exist on some of these sites which are too dry for tree growth and are dominated by sagebrush (*Artemisia frigida*), juniper (*Juniperus communis*), and grasses and forbs that include *Calamagrostis purpurascens*, *Festuca lenensis*, *Elytrigia spicata*, *Pulsatilla patens*, *Cnidium cnidiifolium*, and *Antennaria rosea*.

Artificially cleared and disturbed areas are common on the Base especially in the Cantonment Area (Plate 23). In general, vegetation on artificially cleared or disturbed sites is not well organized into discrete plant communities. Instead, the vegetation consists of a heterogenous mix of a wide variety of native and introduced plant species, the composition of which varies considerably from place to place over relatively short distances. This heterogeneity is in part due to soil and site conditions, which range from relatively undisturbed native soils, to shallow topsoil over coarse textured fill, to deep fill without topsoil. In addition, management of these areas has been a combination of varying degrees of soil disturbance, introduction and spread of numerous introduced forage plants and weeds, and natural revegetation by native plants, all coupled with periodic mowing of other forms of manmade disturbances.

Natural soils, which have been cleared long ago and subsequently received little additional disturbances, may exhibit distinct vegetation communities. These include alder and willow shrub, bluejoint (*Calamagrostis canadensis*) meadow, balsam poplar scrub, and mesic forb types consisting of native plants characteristic of early-to-mid seral forests (Plate 24).

At the other extreme are periodically disturbed areas that tend to be dominated more by native and introduced weeds. Tickle grass (*Agrostis scabra*), foxtail barley (*Hordeum jubatum*), bluegrass (*Poa pratensis*), clovers (*Trifolium* spp.), common dandelion (*Taraxacum officinale*), knotweed (*Polygonum aviculare*), pineapple weed (*Matricaria matricariodes*), and a number of other species are very common.

METHODS

A list of taxa that could potentially occur within the study area was compiled from prior studies in the region (Table 1). The Northern Plant Documentation Center (Herbarium, University of Alaska Museum) also provided a list of collections for an area centering on
WRT (Batten 1995). Interviews were conducted with area and regional experts, in particular, Herbarium staff at the University of Alaska Museum (A. Batten, D.F. Murray, C. Parker, pers. comm.), and researchers from the Institute of Northern Forestry, U.S. Forest Service, Fairbanks (J. Foote, L.A. Viereck, pers. comm.; Foote 1992, 1995).

The Base was divided into Floristic Collecting Units prior to the field season. These units were

predetermined by CRREL and WES staff in consultation with AKNHP scientists to insure representative sampling of the study area over the collecting season. Inventory units represented a combination of logistical considerations and biological and physical features that included

Table 1. A list of references used to construct an initial species list for Fort Wainwright Military Installation.

Alaska Planning Group (1974a)
Alaska Planning Group (1974b)
Alaska Planning Group (1974c)
Alaska Planning Group (1974d)
Anderson (1972)
Anderson (1974)
Anderson (1976)
Andreev (1978)
Batten (1986)
Batten (1995)
Batten et al. (1979)
Buckley and Libby (1957)
Buckley and Libby (1959)
Calmes (1976)
Cuccarese (1984)
Dachnowski-Stokes (1941)
Dingman and Koutz (1974)
Doe et al. (1985)
Drury (1956)
Dyrness and Grigal (1979)
Edwards and Armbruster (1989)
Elliott-Fisk (1988)
Farjon and Bogaers (1985)
Fleming (1968)
Flora of North America Editorial Committee (1993)
Foote (1976)
Foote (1983)
Foote (1995)
Fox (1992)
Friedman (1981)
Gjaerevoll (1954)
Hanson (1951)
Hanson (1953)
Heilman (1966)
Hitchcock et al. (1955-1969)
Holmes (1981)
Holmes (1982)
Howenstein et al. (1985)
Hulten (1968)

Hulten (1973)
Johnson and Kubanis (1978)
Johnson and Kubanis (1979)
Joint Federal-State Land Use Planning Commission for Alaska (1973)
Jorgenson and Smith (1995)
Jorgenson et al. (1986)
Juday (1983a)
Juday (1983b)
Juday (1988)
Juday (1989)
Juday and Zasada (1984)
Kassler (1979)
Kassler (1980)
Krasny (1986)
Krasny et al. (1988)
Krause et al. (1959)
Kreig and Reger (1982)
La Roi (1967)
La Roi and Stringer (1976)
LaBau et al. (1986)
LaPerriere et al. (1980)
Lee et al. (1982)
Lev (1987)
Luken and Billings (1983)
Lutz (1956)
Lutz (1963)
Lynch (1941)
Mann et al. (1995)
Murray (1993)
Murray (1994)
Murray and Armbruster (1992)
Murray et al. (1983)
Neiland (1975)
Neiland and Viereck (1977)
O'Sullivan (1986)
Ovenden and Brassard (1989)
Peale (1988)
Pewe (1975)
Petersen (1980)
Porsild (1939)
Racine et al. (1990)
Racine and Walters (1991)
Selkregg (1975)

Shacklette (1962)
Shacklette (1966)
Sjors (1985)
Smith and Larson (1984)
Spindler (1976)
Troth et al. (1975)
U.S. Soil Conservation Service (1991)
Van Cleve et al. (1971)
Van Cleve et al. (1980)
Van Hees (1990)
Viereck (1970)
Viereck (1975)
Viereck (1979)
Viereck (1989)
Viereck et al. (1986)
Viereck et al. (1992)
Viereck et al. (1993)
Walker (1985)
Wahrhaftig (1965)
Wahrhaftig et al. (1966)
Wesser (1991)
Wesser and Armbruster (1991)
Wesser and DeVoe (1987)
Young (1976a)
Young (1976b)
Young and Racine (1976)
Yurtsev (1984)

vegetation, topography, watershed, elevation, geology and soils.

Floristic Collection Units are delineated in Figure 2 and were defined as follows:

Tanana Flats of the Tanana-Kuskokwim Lowland

The area south of the Tanana River as defined by Wahrhaftig (1965) and Pewe (1975).

BLAIR LAKES UNIT (Plates 17, 25). Area surrounding three large lakes (Blair Lakes) and a series of low hills near the southeastern boundary of the Tanana Flats.

BUTTES UNIT (Plates 2, 20). Small unit consisting of the Wood River Buttes and Clear Creek Buttes. These isolated knobs of igneous and metamorphic bedrock project abruptly from the surrounding alluvial Lowlands Unit (Pewe 1975). Although small in total area, these features are significant because of their xeric, south-facing, nonforested slopes that contain steppe-like communities.

FENS UNIT (Plates 19, 20). Unique area of wetlands consisting of extensive, floating, vegetated mats northwest of Clear Creek Buttes between Crooked Creek, Salchaket Slough and the Tanana River Riparian Unit.

LOWLANDS UNIT (Plates 2, 18, 26). Largest unit of the Tanana Flats formed from a complex of ancient alluvial fans that extend from the Alaska Range north to the Tanana River. A low gradient and little topographic relief, coupled with the presence of permafrost and groundwater springs, results in large expanses of swampy, boggy wetlands surrounding the Fens, Buttes and Blair Lakes Collecting Units.

TANANA RIVER RIPARIAN UNIT (Plates 1, 14). Area largely influenced by riverine processes paralleling the Tanana River and consisting of the channel islands, backwaters, floodplains and terraces of the river.

Yukon-Tanana Upland

The area north of the Tanana River as defined by Wahrhaftig (1965) and Pewe (1975). Near Fairbanks, this geographic division includes the area north of the Chena River and Cantonment Area.

LOWLANDS UNIT (Plates 10, 11, 15, 16). Includes the Chena River lowlands and valley bottoms up to an elevation of approximately 229 m (750 ft) on the western portion of the YMA and 381 m (1250 ft) on the east. Near Fairbanks, the Lowlands Unit includes the Chena River lowlands north of the Chena River and Cantonment Area to the base of Birch Hill (153 m (500 ft). In both areas, the relatively flatter valley terrain abuts the abruptly steeper Slope Forests Unit.

insert Figure 2

SLOPE FORESTS UNIT (Plates 4, 7, 27). Includes slopes of the YMA from treeline downslope to approximately 229 m (750 ft) on the west side and 381 m (1250 ft) on the east where most slopes intercept the abruptly flatter Lowland Unit terrain. Near Fairbanks, the Slope Forests Unit includes Birch Hill upslope from the approximate 153 m (500 ft) elevation.

ALPINE UNIT (Plates 3, 4, 12, 13). Encompasses the occasional dome or hilltop summit in the YMA from treeline at approximately 186 m (2250 ft) to summits as high as 996 m (3265 ft).

Cantonment Area (Plate 23)

The area of Base housing, support facilities and services, and the airfields on the eastern edge of the city of Fairbanks, between the Chena and Tanana rivers. Largely artificially cleared or disturbed, including powerlines, roadsides, railroad right-of-ways, borrow pits and other human-modified areas.

Each Collecting Unit was surveyed to form a representative sampling of the Base. Within each Unit, as many different vegetation types and specialized habitats as possible were surveyed given the constraints of field logistics, time, resources and accessibility.

All of the vegetation types and specialized habitats within each Floristic Collecting Unit were not necessarily sampled. Special attention was given to those vegetation types and habitats that were considered unique or significant to a specific Collection Unit. Within the Buttes Unit, for example, widespread forest types of WRT were surveyed less intensively than the south-facing grassland communities that were considered unique to this Unit. The specialized features of each Unit included, but were not necessarily limited to:

Aquatic and bog communities - Lowlands Units;

Dry, south-facing, nonforested slopes (steppe-like communities) - Buttes Unit;

Forests over slope, elevation and aspect gradients - Slope Forest Unit;

Alpine/subalpine plant communities - Alpine Unit;

Riverine processes - Tanana Riparian Unit;

Artificially cleared or disturbed areas - Cantonment Area;

Bog lakes, burned forest and foothills species - Blair Lakes Unit.

Color infrared aerial photography, vegetation maps, topography maps, helicopter and field reconnaissances were used to determine the location of specific collection sites. The road and trail systems near Fairbanks and in the YMA provided relatively easy access by truck, all-terrain vehicle, and foot, and allowed us to revisit areas in order to obtain collections at full anthesis. Helicopter support provided access to the Tanana Flats throughout the field season. Much of the Flats was searched for specific and unique habitats while traveling by helicopter to predetermined sampling sites.

Various portions of the installation were closed to entry due to training maneuvers, unexploded ordinance and communications installations (Figure 3, Results and Discussion). In these instances, specialized habitats were visited in neighboring areas to insure adequate coverage for that portion of the Base.

Biological and physical site features were described for each collection location. Physical features included topography, moisture regime, aspect, topoposition, soils and geology. Vegetation types were noted and described to Level IV of Viereck et al. (1992), and species lists and abundances were compiled for all surveyed types.

Plants were opportunistically collected based on phenology, habitat and limitations of access to various parts of the Base due to field logistics, helicopter availability, military exercises and closed areas. Specimens were collected in triplicate whenever possible. All collections were processed by AKNHP staff including initial identifications and verifications, and database construction.

Field data was compiled in a spreadsheet for use in generating the herbarium collection labels. The specimens collection list and collection-site species lists were also used to construct a matrix of observed species by Floristic Collection Unit. Site records of rare plants ("Element Occurrence Records") were prepared and added to the AKNHP Biological and Conservation Database (BCD).

Carolyn Parker, Dr. David Murray and Al Batten at the Herbarium of the University of Alaska Museum, Fairbanks (ALA) identified critical taxa and verified all other identifications. Herbarium staff were ultimately responsible for the final curation and processing of the specimens, and the completion of the final label database.

One complete set of voucher specimens will reside at Fort Wainwright; the remaining two sets have been deposited at the Herbarium, University of Alaska Museum, Fairbanks (ALA), and the University of Alaska Anchorage, respectively.

RESULTS AND DISCUSSION

Alaska Natural Heritage Program (AKNHP) staff conducted field work for the Fort Wainwright floristic inventory between June 12 and August 31, 1995. Field staff and collection efforts were supplemented in early July with the addition of Dr. Chuck Racine and Peggy Robinson from the biological staff of CRREL, and Bob Lichvar of WES.

Study sites and collection areas are indicated in Figure 3; coordinates for more specific site locations are provided in Appendix A. A total of 123 sites were visited over the course of the study. Table 2 is a summary of these survey sites by Floristic Collection Unit. Logistics dictated that the majority of these sites would occur on the north side of the Tanana River: 50 sites were visited on the Tanana Flats while 73 sites were investigated on the north side of the Tanana in the Yukon-Tanana Uplands including the Cantonment Area.

A wide variety of vegetation types were surveyed across the study area. Ninety-seven land covertypes have previously been identified and mapped for the Tanana valley adjacent to the study area (SCS/DNR 1990). Sixty-four of these were visited over the course of the Wainwright study and many of them were surveyed repeatedly throughout the summer and across the various Floristic Collection Units. These results are summarized in a matrix of vegetation, barren and cultural types by Floristic Collection Unit in Appendix B.

Although the floristic survey can not be considered complete, the species lists presented in Appendix C and D provide an excellent basis for describing the flora of the Fort Wainwright Military Installation. One thousand five collections were completed during the field season representing 227 genera in 72 families. The 491 taxa (including subspecies and varieties) comprise approximately 26 percent of Alaska's vascular flora. This floristic diversity reflects the size of the study area, and the great variety of habitats found on Fort Wainwright from boreal wetlands, forests and grasslands to alpine tundra.

A matrix of taxa by Floristic Collection Unit for all collected specimens was prepared and is presented in Appendix E. This matrix was prepared for the use of LCTA investigators in their vegetation plot studies for impact assessment models for the Base.

Nomenclature follows that used by the Herbarium of the University of Alaska, Fairbanks. Synonyms are provided in parentheses for names that differ from those in Hulten (1968). References are provided for taxa not found in Hulten (1968).

Appendix E was derived from an analysis of collected species and the species lists recorded in all surveyed vegetation types. It was beyond the scope and objectives of this project to determine complete species lists for each Floristic Collection Unit and all plant community types of the region. Consequently, the annotated matrix should be read as a conservative statement of a taxon's distribution across the Base.

insert Figure 3

insert Table 2

Flora

The flora of Fort Wainwright is typical of the boreal region of Interior Alaska, and reflects the range of habitats found there. Many of the prominent species that give the forest its character are restricted to the North American boreal forest, including: *Picea glauca*, *P. mariana*, *Betula papyrifera*, *Viburnum edule*, and *Mertensia paniculata*. Some common taxa, however, are circumboreal in distribution, ranging across the boreal forest in North America and Eurasia. Examples of this element include: *Rosa acicularis*, *Betula nana*, *Vaccinium vitis-idaea*, and *V. uliginosum*. Wetland and aquatic species often show a discontinuous distribution reflecting both the disjunct nature of their habitat across the boreal region as well as being an artifact of the limited collecting this habitat usually receives. As additional surveys document the flora of wetlands in Alaska and Canada, many of these species that were previously thought to be disjunct or rare in their distribution are now proving to be more common or continuous in their range. Examples would include: *Myriophyllum verticillatum*, *Hammarbya paludosa*, and *Lysimachia thyrsiflora*.

Two of the more distinct elements of the flora of Fort Wainwright are the taxa of alpine areas and the taxa found on xeric sites, especially the steppe-like vegetation of steep, south-facing bluffs. The alpine flora is relatively depauperate in comparison with other alpine areas of Interior Alaska and includes only 80 taxa, less than half of which were also found in other regions of the Base. Most of the species of this distinctive azonal element are widespread across the arctic and alpine regions and include species such as *Dryas octopetala*, *Hierochloe alpina*, *Loiseleuria procumbens*, and *Pedicularis capitata*. A smaller number of the alpine taxa are more restricted in range, a good example being the Interior Alaskan endemic, *Syntheris borealis*. Notable by their absence were other common alpine endemics of Alaska such as *Claytonia scammaniana* and *Boykinia richardsonii*, and common, widespread, arctic-alpine species such as *Silene acaulis* and *Thalictrum alpinum*.

Steep, south-facing slopes in Interior Alaska are known to contain a distinctive flora which many have seen as an analogue of the steppe-tundra flora that is thought to have been widespread during glacial maxima. Some of the species found in these environments today are common members of the regional flora, but many of the taxa are only found on xeric slopes or their equivalent, such as dry river terraces and gravels. The signature species of these xeric, steppic sites are the shrub *Artemisia frigida*, and certain dry site sedges and bunch grasses. On the Wood River Buttes these included species of the Asian steppe such as *Festuca lenensis*, and *Carex duriuscula*, as well as North American grassland species such as *Elytrigia spicata*, and *Carex filifolia*. Other species, such as *Calamagrostis purpurascens*, are wide-ranging across dry grasslands in the circumpolar area.

The floristic survey found a number of range extensions for species and several new locations for rare taxa (Appendix E). Using the maps in Hulten (1968) as a base, many of the taxa collected could be considered to be new to the Fairbanks area. A number of these are introduced or have escaped from cultivation, and others are minor, peripheral extensions or range connections. The following 10 taxa may be considered to be significant range extensions of more than 150 km (90 mi), according to Hulten (1968):

Alisma triviale- this semiaquatic species had been collected previously in Interior Alaska, but the collection was never published. It is disjunct by hundreds of kilometers from its main range in boreal North America, but is likely to prove more common as more aquatic sites are investigated.

Carex krausei- this collection fills a gap between its northern and southern ranges in Alaska.

Cicuta bulbifera- this water hemlock is known from only two other collections in Alaska, one near Anchorage in Southcentral Alaska, and an earlier (unpublished) collection from Fort Wainwright. This species may also prove to be more common as additional collections are made in aquatic sites in Interior Alaska.

Drosera anglica- the Fort Wainwright collections represent a significant extension from the nearest location in Hulten (1968). It is likely to be more common.

Hammarbya paludosa- we now have several additional locations for this bog species in Interior and Southern Alaska, though it seems to have a very discontinuous distribution. It is an easily overlooked orchid but is never reported as common.

Pedicularis macrodonta (including *P. parviflora* ssp. *parviflora*)- found on floating bog and fen mats in the Tanana Flats. These collections extend this lousewort's range to the north.

Potentilla arguta- found here on a dry bluff site, this species is rare in Alaska and until now only known from sites to the south and near the Canadian border.

P. virgulata- another dry site species found here on a south-facing bluff, filling a large gap between its southern and northern ranges.

Rorippa curvisiliqua- rare in Alaska and otherwise known from the southeast portion of the state.

Rosa woodsii- a rare species of dry sites. A single location for this species was found on a bluff near Blair Lakes. It is otherwise known in Alaska from less than five sites in the Interior. It has been collected (but not reported) from the Bonanza Creek bluff across the Tanana River.

The survey located several populations of rare plants being tracked by the AKNHP (Appendix F). Most of the rare taxa were found on xeric sites (dry bluffs or river gravels) or in wetland (especially aquatic) sites. These areas (and alpine sites) are often the habitats where rare species are found in Alaska. The taxa are briefly discussed below; a summary of Heritage Program ranking is provided in Appendix F.

Artemisia laciniata- G5 S2 (G3Q S1): an Asian species closely related to *A. laciniatiformis*, both of which are rare in Alaska, being known from several dry Interior bluff sites or open woodlands.

Carex crawfordii- G5 S2S3: a species of dry sites and roadsides, this sedge is slowly being found at additional sites and may prove to be more common than now believed.

Ceratophyllum demersum- G5 S1S2: now known from at least five locations in Alaska, this aquatic species will likely be found at additional sites.

Cicuta bulbifera- G5 S1S2: Previously known in Alaska from only two locations, one near Anchorage and the other on Fort Wainwright.

Cryptogramma stelleri- G5 S2S3: known from an increasing number of sites in Alaska, but always reported to be rare.

Dodecatheon pulchellum ssp. *pauciflorum*- G5T5Q S2: a distinctive subspecies found on dry sites, especially south-facing bluffs, this taxon will likely be found to be more common.
Lycopus uniflorus- G5 S3: although relatively common in parts of Southeast Alaska, this species is restricted to a few disjunct locations in Interior Alaska.

Oxytropis tananensis- G3 S3: a distinctive endemic found on dry gravels and xeric bluffs of Interior Alaska, this species is restricted to a small geographic area, though it is often common on the sites where it is found.

Rorippa curvisiliqua- G5 S1: this mustard is apparently very rare in Alaska, and is mostly known from a few sites in Southeast Alaska.

Rosa woodsii- G5 S1S2: a very distinctive rose found on dry bluffs and in woodlands along rivers. It is only known from a few other sites in eastern Interior Alaska.

Syntheris borealis- G3G4 S3S4: a distinctive endemic of moist alpine sites in Interior Alaska, it is not uncommon within its limited range.

None of the taxa are listed by the U.S. Fish and Wildlife Service as Endangered or Threatened and none were listed on their Category 2 candidate list (this list is no longer being maintained).

LITERATURE CITED

Alaska Planning Group. 1974a. Proposed Beaver Creek National Wild River Alaska. Final environmental statement. U.S. Dept. of the Interior, Alaska Planning Group. 400 p.

Alaska Planning Group. 1974b. Proposed Fortymile National Wild and Scenic River, Alaska. Final environmental statement. U.S. Dept. of the Interior, Alaska Planning Group. 422 p.

Alaska Planning Group. 1974c. Proposed Wrangell Mountain National Forest, Alaska. Final environmental statement. U.S. Dept. of the Interior, Alaska Planning Group. 713 p.

Alaska Planning Group. 1974d. Proposed Yukon-Charley National Rivers Alaska. Final environmental statement. U.S. Dept. of the Interior, Alaska Planning Group. 669 p.

Anderson, J.H. 1972. Phytocenology and primary production at Eagle Summit, Alaska. Pp. 61-69. In: Proceedings, 1972 tundra biome symposium; July 1972; Seattle, WA. U.S. Tundra Biome.

Anderson, J.H. 1974. Plants, soils, phytocenology and primary production of the Eagle Summit Tundra Biome site. I-1 to VIII-2. U.S. Tundra Biome Data Rep. 74-42. Univ. of Alaska, Institute of Arctic Biology, Fairbanks, AK.

Anderson, J.H. 1976. On vegetation mapping in Alaska using Landsat imagery. Final report for NASA, research contract NAS5-21833, Task 3. Univ. of Alaska, Institute of Arctic Biology, Fairbanks, AK. 134 p.

Anderson, P.M. and L.B. Brubaker. 1986. Modern pollen assemblages from northern Alaska. Rev. Palaeobot. and Palynol. 46:273-291.

Andreev, V.N. 1978. Botanicheskie Nablyudeniya na Alyaske: Botanical observations on Alaska. Akademiya Nauk SSSR. 63(1):115-128.

Batten, A.R. 1986. A synopsis of Alaska wetland vegetation. Pp. 23-44 In: Vander Valk, A. and J. Hall (organizers). Alaska: Regional Wetland Functions. Proceedings of a Workshop held in Anchorage, Alaska, May 28-29, 1986. The Environmental Institute, Univ. Mass., Amherst.

Batten, A.R. 1995. Taxa documented by specimens at ALA from Fort Wainwright and vicinity. Northern Plant Documentation Center Report 120. Herbarium, University of Alaska Museum, Fairbanks, AK. 13p.

Batten, A.R., D.F. Murray and J.C. Dawe. 1979. Threatened and endangered plants in selected areas

of the BLM Fortymile Planning Unit, Alaska. BLM-Alaska Tech. Rep. 3. Anchorage, AK: Bureau of Land Management, Alaska State Office. 127 p.

Brown, J. and R.L. Berg. (eds.). 1980. Environmental engineering and ecological baseline investigations along the Yukon River-Prudhoe Bay Haul Road. CRREL Rep. 80-19. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory. 187 p.

Buckley, J.L. and W.L. Libby. 1957. Research and reports on aerial interpretation of terrestrial bioenvironments and faunal populations. Tech. Rep. 57-32. Alaska Air Command, Arctic Aeromedical Laboratory, Ladd Air Force Base, Fairbanks, AK. 105 p.

Buckley, J.L. and W.L. Libby. 1959. The distribution in Alaska of plant and animal life available for survival. Tech. Rep. 58-10. Alaska Air Command, Arctic Aeromedical Laboratory, Ladd Air Force Base, Fairbanks, AK. 43 p.

Calmes, M.A. 1976. Vegetation pattern of bottomland bogs in the Fairbanks area, Alaska. M.S. thesis. Univ. of Alaska, Fairbanks, AK. 104 p.

Cuccarese, S.V. 1984. Biological and socioeconomic systems of the BAR-M, POW-1, LIZ-3A, AND S-I-1 North Warning System sites, Alaska.Unpub. Rep. Prep. for Earth Technology Corporation, Anchorage, AK. Univ. of Alaska, Arctic Environmental Information and Data Center, Anchorage, AK. 60 p.

Dachnowski-Stokes, A.P. 1941. Peat resources in Alaska. Tech. Bull. 769. U.S. Dept. of Agriculture, Washington, DC. 84 p.

Dingman, S.L. and F.R. Koutz. 1974. Relations among vegetation, permafrost, and potential insolation in central Alaska. Arctic Alp. Res. 6(1):37-47.

Doe, W.W., C. Collins, J. Brown, R. Kreig, R. Haugen and B. Bailey. 1985. Mapping of terrain and environmental attributes, Blair Lakes, Ft. Wainwright Training Area, Alaska. CRREL contract report to DEH, 6th Light Infantry Division, Fort Richardson, Alaska.

Drury, W.H. 1956. Bog flats and physiographic processes in the Kuskokwim River region, Alaska. Contrib. Gray Herb. 178. Harvard Univ., Cambridge, MA. 130 p.

Dyrness, C.T., L.A. Viereck, M.J. Foote and J.C. Zasada. 1988. The effect on vegetation and soil temperature of logging flood-plain white spruce. Res. Pap. PNW-RP-392. U.S. Forest Service, Pacific Northwest Research Station, Portland, OR. 45 p.

Dyrness, C.T. and D.F. Grigal. 1979. Vegetation-soil relationships along a spruce forest transect in interior Alaska. Canad. J. Bot. 57(23):2644-2656.

Edwards, M.E. and W.S. Armbruster. 1989. A tundra-steppe transition on Kathul Mountain, Alaska, U.S.A. Arctic Alp. Res. 21(3):296-304.

Elliott-Fisk, D.L. 1988. The boreal forest. Chapt. 2. In: Barbour, M.G. and D.W. Billings. North American terrestrial vegetation. Cambridge Univ. Press. N.Y. 434 p.

Farjon, A. and P. Bogaers. 1985. Vegetation zonation and primary succession along the Porcupine River in interior Alaska. Phytocoenologia 13(4): 465-504.

Fleming, R.S. 1968. Phytosociology of birch-spruce forests on the Tanana upland, interior Alaska. M.S. thesis. Univ. of Alaska, Fairbanks, AK. 86 p.

Flora of North America Editorial Committee. 1993. Flora of North America north of Mexico.Oxford Univ. Press, New York, NY.

Foote, M.J. 1976. Classification, description and dynamics of plant communities following fire in the taiga of interior Alaska. Final Rep. for Bureau of Land Management. On file at U.S. Forest Service, Institute of Northern Forestry, Fairbanks, AK. 211 p.

Foote, M.J. 1983. Classification, description, and dynamics of plant communities after fire in the taiga of interior Alaska. Res. Pap. PNW-307. U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR.. 108 p.

Foote, M.J. 1992. List of scientific and common names for plant species found in the Bonanza Creek Experimental Forest and adjacent Tanana River floodplain. Unpub. Rep. compiled from vegetation plot data, May 1988; updated August 1992. U.S. Forest Service, Institute of Northern Forestry, Fairbanks, AK. 4 p.

Foote, M.J. 1995. Boreal forest species collections list. Unpub. computer file. Institute of Northern Forestry, U.S. Forest Service, Fairbanks, AK. 13 p.

Fox, J.F. 1992. Responses of diversity and growth-form dominance to fertility in Alaskan tundra fellfield communities. Arctic Alp. Res. 24(3):233-237.

Friedman, B.F. 1981. Fire ecology and population biology of two taiga shrubs, lingonberry (VACCINIUM VITAS-IDAEA) and alpine blueberry (VACCINIUM ULIGINOSUM). M.S. thesis. Univ. of Alaska, Fairbanks, AK. 162 p.

Gabriel, H.W. and G.F. Tande. 1983. A regional approach to fire history in Alaska. Bur. Land Mgmt. Tech. Rep. 9. BLM/AK/TR-83/09. Anchorage, AK. 34 p.

Gato, L.W. 1984. Relationships among bank recession, vegetation, soils, sediments and permafrost

on the Tanana River near Fairbanks, Alaska. CRREL Rep. 84-21. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, NH.

Gjaerevoll, O. 1954. Kobresieto-Dryadion in Alaska. Nytt Magasin for Botanikk. 3:51-54.

Hanson, H.C. 1951. Characteristics of some grassland, marsh, and other plant communities in western Alaska. Ecol. Monogr. 21(4):317-378.

Hanson, H.C. 1953. Vegetation types in northwestern Alaska and comparisons with communities in other arctic regions. Ecology 34(1):111-140.

Heilman, P.E. 1966. Change in distribution and availability of nitrogen with forest succession on north slopes in interior Alaska. Ecology 47(5): 825-831.

Hitchcock, C.L., A. Cronquist, M. Ownby and J.W. Thomson. 1955-1969. Vascular plants of the Pacific Northwest. Parts 1-5. Univ. Washington Press, Seattle, WA.

Holmes, K.W. 1981. Natural revegetation of dredge tailings at Fox, Alaska. Agroborealis 13: 26-29.

Holmes, K.W. 1982. Natural revegetation of gold dredge tailings at Fox, Alaska. M.S. thesis. Univ. of Alaska, Fairbanks, Alaska. 197 p.

Howenstein, R.E., D.F. Murray and W.S. Armbruster. 1985. Vegetation ecology of south-facing bluffs in subarctic interior Alaska. Pp. 167-168 In: Technology and the scientist: proceedings of the 1985 Arctic Science Conference. Amer. Ass. Advancement Sci., Arctic Div., Univ.of Alaska, Fairbanks, AK.

Hulten, E. 1968. Flora of Alaska and neighboring territories. Stanford Univ. Press, Stanford, CA. 1,008 p.

Hulten, E. 1973. Supplement to Flora of Alaska and neighboring territories. A study in the flora of Alaska and the Transberingian connections. Bot. Notiser 126:459-512.

Johnson, A.W., and S.A. Kubanis. 1978. Investigations of weeds and weedy vegetation along the Yukon River-Prudhoe Bay haul road. Pp. 5-24. In: J. Brown (principal investigator). Ecological baseline investigations along the Yukon River-Prudhoe Bay Haul Road, Alaska. Progress Rep. Corps of Engineers, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH.

Johnson, A.W. and S.A. Kubanis. 1979. Investigations of weeds and weedy vegetation along the Yukon River-Prudhoe Bay Haul Road: a second year annual report. CRREL Internal Rep. 594. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory,

Hanover, NH.

Joint Federal-State Land Use Planning Commission for Alaska,. 1973. Major ecosystems of Alaska. U.S. Geological Survey Map.Scale: 1:2,500,000. Fairbanks, AK; Denver, Co; Washington, DC.

Jorgenson, M.T. and M. Smith. 1995. Pilot scale ecological land survey for Fort Wainwright, Alaska. Unpub. Draft Rep. Prep. for U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. 25 p.

Jorgenson, M.T., C.W. Slaughter and L.A. Viereck. 1986. Relation of vegetation and terrain in the Caribou-Poker Creek research watershed, central Alaska. Gen. Tech. Rep. U.S. Forest Service, Pacific Northwest Research Station, Portland, OR. 89 p.

Juday, G.P. 1983. A preliminary report of ecological reserve project activity, Fairbanks District BLM: Identification of the type needs and candidate Research Natural Areas in the White Mountains NRA-Steese NCA; in the central Yukon planning area; in the Seward Peninsula. Rep. Prep. for Bureau of Land Management, Anchorage, AK.

Juday, G.P. 1983. Limestone landscapes of the White Mountains. Agroborealis 15: 24-28.

Juday, G.P. 1988. Alaska Research Natural Area: 1. Mount Prindle. Gen. Tech. Rep. PNW-GTR-224. U.S. Forest Service, Pacific Northwest Research Station, Portland, OR. 34 p.

Juday, G.P. 1989. Alaska Research Natural Area. 2:Limestone Jags. Gen. Tech. Rep. PNW-GTR-237. U.S. Forest Service, Pacific Northwest Research Station, Portland, OR. 58 p.

Juday, G.P. and J.C. Zasada. 1984. Structure and development of an old-growth white spruce forest on an interior Alaska floodplain. Pp. 227-234. In: Meehan, W.R., T.R. Merrell, Jr., and T.A. Hanley (eds.). Fish and wildlife relationships in old-growth forests. Proceedings of a symposium ... Held in Juneau, Alaska, April 12-15, 1982. American Institute of Fishery Research Biologists.

Kassler, K.C. 1979. Relicts of the late Pleistocene arctic-steppe: investigations of certain south-facing slopes in interior Alaska. Northern Studies Program, Middlebury College, Middlebury, VT. 65 p.

Kassler, K.C. 1980. Floristics. Pp. 101-146. In: Farquar, N. and J. Schubert (eds.). Ray Mountains, central Alaska: environmental analysis and resources statement. Northern Studies Program, Middlebury College, Middlebury, VT.

Krasny, M.E. 1986. Establishment of four Salicaceae species on river bars along the Tanana River, Alaska. Ph.D. Dissertation, Univ. of Washington, Seattle, WA.

Krasny, M.E., K.A. Vogt and J.C. Zasada. 1988. Establishment of four Salicaceae species on river bars in interior Alaska. Holarctic Ecology 11:210-219.

Krause, H.H., S. Reiger and S.A. Wilde. 1959. Soils and forest growth on different aspects in the Tanana watershed of interior Alaska. Ecology 40(3): 492-495.

Kreig, R.A. and R.D. Reger. 1982. Air-photo analysis and summary of landform soil properties along the route of the trans-Alaska pipeline system. Geologic Rep. 66. Alaska Division of Geological and Geophysical Surveys, College, AK. 149 p.

La Roi, G.H. 1967. Ecological studies in the boreal spruce-fir forests of the North American taiga. I. Analysis of the vascular flora. Ecol. Monogr. 37(3):229-253.

La Roi, G.H. and M.H. Stringer. 1976. Ecological studies in the boreal spruce-fir forests of the North American taiga. II. Analysis of the bryophyte flora. Canad. J. Bot.54(7):619-643.

LaBau, V.J., B.R. Mead, and D.A. Herman. 1986. Quantification of vegetation edge for the Tanana River Basin, Alaska. Pp. 335-341. In: Proceedings, 1986 ASPRS-ACSM fall convention;Sept. 18- Oct. 3, 1986; Anchorage, AK. American Society of Photogrammetry and Remote Sensing, Falls Church, VA.

LaPerriere, A.J., P.C. Lent, W.C. Gassaway and F.A. Nodler. 1980. Use of Landsat data for moose-habitat analyses in Alaska. J. Wildl. Manage. 44(4):881-887.

Lee, L.C., R.O. Teskey and T.M. Hinckley. 1982. Impact of water level changes on woody riparian and wetland communities. Vol. 11: Alaska. College of Forest Resources, Univ. of Washington, Seattle, WA. 170 p.

Lev, D. 1987. Balsam poplar (*Populus balsamifera*) in northern Alaska: ecology and growth response to climate. M.S. thesis. Univ. of Washington, Seattle, WA. 70 p.

Luken, J.O. and W.D. Billings. 1983. Changes in bryophyte production associated with a thermokarst erosion cycle in a subarctic bog. Lindbergia 9: 163-168.

Lutz, H.J. 1956. Ecological effects of forest fires in the interior of Alaska. Tech. Bull. 1133. U.S. Department of Agriculture. [Place of publication unknown]. 121 p.

Lutz, H.J. 1967. Early forest conditions in the interior of Alaska. An historical account with original sources. Northern Forest Experiment Station, U.S. Forest Service, Juneau, AK. 74 p.

Lynch, J.J. 1941. Origin and natural maintenance of some arctic waterfowl habitats. Unpubl. Rep. Biological Survey, Department of the Interior, Washington, DC. 47 p.

Mann, D.H., C.L. Fastie, E.L. Rowland and N.H. Bigelow. 1995. Spruce succession, disturbance, and geomorphology on the Tanana River floodplain, Alaska. Ecoscience 2(2):184-199.

Murray, D.F. 1993. Floristics, systematics, and community relationships in arctic vegetation. Manuscript submitted for publication: Vegetatio 1993.

Murray, D.F. 1994. Wood River Buttes botanical survey. Unpub. field notes. Herbarium, Univ. of Alaska Museum, Fairbanks, AK.

Murray, D.F. and W.S. Armbruster. 1992. Rare plants and communities in Alaska. Unpub. manuscript. University of Alaska Museum, Univ. of Alaska, Fairbanks AK.

Murray, D.F., B.M. Murray, B.A. Yurtsev and R. Howenstein. 1983. Biogeographic significance of steppe vegetation in subarctic Alaska. Pp. 883-888. In: Permafrost: 4th international conference proceedings; July 17-22, 1983; Fairbanks, AK. National Academy Press, Washington, DC.

Neiland, B.J. 1975. Investigations of possible correlations of vegetation, substrate, and topography in interior Alaska. Final Rep. School of Agriculture and Land Resources Management. Univ. of Alaska, Fairbanks, AK. 61 p.

Neiland, B.J., and L.A. Viereck. 1977. Forest types and ecosystems. Pp. 109-136. In: North American forest lands at latitudes north of 60 degrees: Proceedings of a symposium; September 19-22, 1977; Fairbanks, AK. Univ. of Alaska, School of Agriculture and Land Resources Management, Agricultural Experiment Station, Cooperative Extension Service, Fairbanks, AK.

O'Sullivan, K. 1986. The effects of vegetation and slope on trail erosion in the Yukon-Tanana uplands of interior Alaska. M.S. thesis. Univ. of Alaska, Fairbanks, AK.

Ovenden, L. and G.Y. Brassard. 1989. Wetland vegetation near Old Crow, northern Yukon. Can J. Bot. 67: 954-960.

Peale, M. 1988. An evaluation of the proposed Shaw Creek Tamarack Research Natural Area and the recommendation of an alternate site. Prepared for Alaska Dept. of Natural Resources, Division of Forestry. 81 p.

Pewe, T.L. 1975. Quaternary geology of Alaska. Professional Pap. 835. U.S. Geology Survey.

Pewe, T.L. and R.D. Reger (eds.). 1983. Guidebook to permafrost and Quaternary geology along

the Richardson and Glenn Highways between Fairbanks and Anchorage, Alaska. Guidebook 1. Fourth Intl. Conf. on Permafrost, July 18-22, 1983, Fairbanks, AK. AK Div. of Geol. and Geophys. Surveys, Anchorage, AK. 263 p.

Petersen, T.N. 1980. University of Alaska boreal arboretum preliminary vegetation covertype mapping and vascular plant inventory. Unpub. Special Univ. Project Rep. Univ. of Alaska, Fairbanks, AK. 31 p.

Porsild, A.E. 1939. Contributions to the flora of Alaska. Rhodora 41:141-301.

Racine, C.H. and J.C. Walters. 1991. Groundwater-discharge wetlands in the Tanana Flats, interior Alaska. CRREL Report 91-14. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, NH. 10 p.

Racine, C.H., R. Bishop, C. Collins, P. Kuropat and J.C. Walters. 1990. The use and environmental impacts of airboats on the Tanana Flats, Fort Wainwright, Alaska. Final Rep. to U.S. Army 6th Infantry Div. (Light), Dept. of Engineering and Housing, Fort Richardson, AK. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, NH. 123 p. plus Appendices.

Rieger, S., D.B. Schoephorster and C.E. Furbush. 1979. Exploratory soil survey of Alaska. USDA Soil Conservation Service Rep. 213 p.

SCS/DNR. (U.S. Soil Conservation Service and Alaska Department of Natural Resources). 1990. Tanana River Basin Study, Alaska: Timber and vegetation statistics of the Tanana Valley State Forest. "Draft". USDA Soil Conservation Service, Forest Service and AK Dept. Nat. Res. Division of Forestry, Anchorage, AK.

Selkregg, L.L. 1975. Alaska regional profiles: Yukon region. Vol. 6. Arctic Environmental Information and Data Center, Univ. of Alaska, Anchorage, AK. 346 p.

Shacklette, H.T. 1962. Influences of the soil on boreal and arctic plant communities. Ph.D. dissertation. Univ. of Michigan, Ann Arbor, MI. 349 p.

Shacklette, H.T. 1966. Phytoecology of a greenstone habitat at Eagle, Alaska. Geol. Surv. Bull. 1198-F. U.S. Government Printing Office, Washington, DC. 36 p.

Sjors, H. 1985. A comparison between mires of southern Alaska and Fennoscandia. Aquilo 21:89-94.

Smith, K.C. and F.R. Larson. 1984. Overstory-understory relationships in the black spruce type of interior Alaska.Pp.103-112 In: LaBau, V.J. and C.L. Kerr (eds.). Inventorying forest and other vegetation of the high latitude and high altitude regions: Proceedings of an

international symposium, Society of American Foresters regional technical conference; July 23-26, 1984, Fairbanks, AK. Society of American Foresters, Bethesda, MD.

Spindler, M.A. 1976. Ecological survey of the birds, mammals and vegetation of Fairbanks Wildlife Management Area. M.S. thesis. Univ. of Alaska, Fairbanks, AK. 258 p.

Troth, J.L., F.J. Deneke and L.M. Brown. 1975. Subarctic plant communities and associated litter and soil profiles in the Caribou Creek research watershed, interior Alaska. Research Rep. 330. U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH. 25 p.

U.S. Soil Conservation Service. 1991. Alaska plant cover types. Unpubl. manuscript for Alaska portion of U.S. Soil Conservation Service National Range Classification System. Dept. of Agriculture, Anchorage, AK.

Van Cleve, K., L.A. Viereck and R.L. Schlentner. 1971. Accumulation of nitrogen in alder (*Alnus*) ecosystems near Fairbanks, Alaska. Arctic Alp. Res. 3(2): 101-114.

Van Cleve, K., T. Dyrness and L.A. Viereck. 1980. Nutrient cycling in interior Alaska flood plains and its relationship to regeneration and subsequent forest development. Pp.11-18 In: Murray, M. and R.M. Van Veldhuizen (eds.). Forest regeneration at high latitudes: Proceedings of an international workshop; November 15-16, 1979; Fairbanks, AK. Gen. Tech. Rep. PNW-107. Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Portland, OR.

Van Hees, W.W.S. 1990. Boreal forested wetlands - what and where in Alaska. For. Ecol. Manage. 33/34:425-438.

Viereck, L.A. 1970. Forest succession and soil development adjacent to the Chena River in interior Alaska. Arctic Alp. Res. 2(1):1-26.

Viereck, L.A. 1973. Wildfire in the taiga of Alaska. Quat. Res. 3:465-495.

Viereck, L.A. 1975. Forest ecology of the Alaska taiga. Pp. I-1 to I-22. In: Proceedings of the circumpolar conference on northern ecology; September 15-18, 1975; Ottawa, Ontario. National Research Council of Canada, Ottawa, Ontario, Canada.

Viereck, L.A. 1979. Characteristics of treeline plant communities in Alaska. Holarct. Ecology 2(4):228-238.

Viereck, L.A. 1989. Floodplain succession and vegetation classification in interior Alaska. Pp. 197-203. In: Ferguson, D.E., P. Morgan, and F.D. Johnson. (comps.). Proceedings--land classifications based on vegetation: applications for resource management;November 17-19,

1987; Moscow, ID. Gen. Tech. Rep. INT-257. Intermountain Research Station, U.S. Forest Service, Ogden, UT.

Viereck, L.A., C.T. Dyrness, A.R. Batten and K.J. Wenzlick. 1992. The Alaska vegetation classification. Gen. Tech. Rep. PNW-GTR-286. Pacific Northwest Research Station, U.S. Forest Service, Portland, OR. 278 p.

Viereck, L.A., C.T. Dyrness and M.J. Foote. 1993. An overview of the vegetation and soils of the floodplain ecosystems of the Tanana River, interior Alaska. Canad. J. For. Res. 23:889-898.

Viereck, L.A., C.T. Dyrness, K. Van Cleve, and M.J. Foote. 1983. Vegetation, soils, and forest productivity in related forest types in interior Alaska. Canad. J. For. Res.13(5):703-720.

Viereck, L.A., K. Van Cleve and C.T. Dyrness. 1986. Forest ecosystem distribution in the taiga environment. Pp. 22-43. In: Van Cleve, K., F.S. Chapin, III, P.W. Flanagan, L.A.Viereck and C.T. Dyrness (eds.). Forest ecosystems in the Alaskan taiga: a synthesis of structure and function. Springer-Verlag, New York, NY.

Walker, L.R. 1985. The processes controlling primary succession on an Alaskan flood plain. Ph.D. dissertation. Univ. of Alaska, Fairbanks, AK.

Wahrhaftig, C. 1965. Physiographic divisions of Alaska. Geol. Surv. Prof. Pap. 482. 52 p.

Wahrhaftig, C., T.L. Pewe and F. Weber. 1966. Geologic map of the Fairbanks Quadrangle, Alaska. U.S. Geol. Surv. Misc. Inv. Map I-455. Scale 1:250,000.

Wesser, S. D. and W. S. Armbruster. 1991. Species distribution controls across a forest-steppe transition: a causal model and experimental test. Ecol. Monogr. 61(3):323-342.

Wesser, S. and D. DeVoe. 1987. A vegetation survey of some south-facing bluffs on the Yukon River. Unpubl. field report. National Park Service, Anchorage, AK. 8 p.

Wesser, S.W. 1991. The effects of light and moisture on two species from contiguous communities of south-facing bluffs in interior Alaska, U.S.A. Arctic Alp. Res. 23(1):99-103.

Wilde, S.A. and H.H. Krause. 1960. Soil-forest types of the Yukon and Tanana Valleys in subarctic Alaska. J. Soil Sci. 11(2): 266-279.

Yarie, J., 1983. Effects of selected forest management practices on environmental parameters related to successional development on the Tanana River floodplain, interior Alaska. Canad. J. For. Res. 23: 1001-1014.

Young, S.B. 1976a. An annotated checklist of the vascular flora of the Yukon-Charley study area.

Pp.59-96. In: Young, S.B. (ed.). The environment of the Yukon-Charley rivers area of Alaska: results of The Center for Northern Studies biological survey of the Yukon-Charley river area 1974-1975. Contributions from the Center for Northern Studies 9. Center for Northern Studies, Wolcott, VT.

Young, S.B. 1976b. Floristic investigations in the "arctic-steppe" biome. Pp. 124-145. In: Young, S.B. (ed.). The environment of the Yukon-Charley rivers area Alaska: results of the Center for Northern Studies biological survey of the Yukon-Charley rivers area 1974-1975. Contributions from the Center for Northern Studies 9. Center for Northern Studies, Wolcott, VT.

Young, S.B. and C.H. Racine. 1976. General vegetation studies. Pp 40-58 In: Young, S.B. (ed.). The environment of the Yukon-Charley rivers area Alaska: results of the Center for Northern Studies biological survey of the Yukon-Charley rivers area 1974-1975. Contributions from the Center for Northern Studies 9. Center for Northern Studies, Wolcott, VT.

Yurtsev, B.A. 1984. Forest-steppe meso-landscapes of south-facing slopes in the northern taiga parts of the eastern Alaska. Bot. Zhurn. 69(7):881-889.

APPENDIX A

Longitude-latitude and UTM coordinates for Fort Wainwright study sites (S).

S	Longitude-Latitude	UTM
1. 1474048	645005467734.6223	7190014.598
2. 1480530	642815447504.3418	7149738.696
3. 1480529	642813447516.6343	7149676.561
3b.1480534	6426134474467149851	
4. 1480541	642815447357.4186	7149741.226
5. 1480538	642812447395.8886	7149647.677
6. 1480508	642807447793.9545	7149486.035
7. 1480457	642805447939.8344	7149421.62
8. 1480558	642821447133.5719	7149930.867
9. 1480609	642822446987.1954	7149964.368
10. 1473508	645202472249.3254	7193591.771
11. 1473647	645115470931.9814	7192149.137
12. 1461109	644024538862.3853	7172104.513
13. 1461208	644028538078.573	7172218.388
13c.1461223	6440455378767172930	
14. 1463557	643801519161.1609	7167488.617
15. 1473329	645108473537.8395	7191908.311

16. 1465814 645040501396.6288 7190925.156

17. 1465830 645026501185.9881 7190491.654

18. 1465825 645030501251.8247 7190615.512

19. 1473345 645005473309.7635 7189959.883

20. 1473144 645120474923.9577 7192267.922

20c 1473150 645116 4748487192331

21. 1473148 645130474873.8703 7192577.935

22. 1470203 644539498374.3556 7181606.967

23. 1473444 645126472555.0717 7192474.41

24. 1473312 645105473760.9439 7191813.474

25. 1463421 643429520480.137 7160934.181

26. 1464548 644037511295.4605 7172278.463

27. 1473545 644912471712.7129 7188333.641

28. 1473731 645124470355.232 7192433.418

29. 1473810 645153469850.6543 7193336.285

30. 1471748 642315485690.1263 7140033.941

31. 1472624 642558478811.3867 7145119.777

32. 1471257 642348489592.6214 7141039.762

33. 1473947 645037468548.9741 7190996.682

34. 1480949 642815444044.994 7149800.141

35. 1480949 642815444044.994 7149800.141

36. 1482556 643608431460.1896 7164703.817

37. 1483431 643725424674.4339 7167249.26

38. 1481014 642528443615.7952 7144637.254

39. 1480056 642733451143.3003 7148377.922

40. 1481138 642610442516.3973 7145958.158

41. 1481300 642557441412.0817 7145576.597

41b.1481320 642618441139 7146229

42. 1473638 645144471059.1766 7193045.742

43. 1470528 643310495631.6261 7158422.726

43b.1470540 6433304954567159255

44. 1470644 643318494619.8807 7158672.002

45. 1473635 645114471089.7293 7192116.653

46. 1473848 645004469315.8982 7189967.068

47. 1470338 644537497118.7176 7181545.991

48. 1473433 645125472699.6498 7192442.132

49. 1475737 644313454242.9899 7177433.46

50. 1473439 645052472611.3134 7191421.27

51. 1472038 644321483614.6948 7177378.85

52. 1463948 643542516116.6491 7163167.801

53. 1464720 643551510105.2446 7163420.459

54. 1470225 644628498084.5546 7183124.063

55. 1470260 644629497622.2302 7183155.351

56. 1465815 644757501385.7778 7185879.013

57. 1473740 644937470203.8571 7189122.214

58. 1473407 644958473017.8551 7189745.775

59. 1473351 644947473225.7169 7189403.362

60. 1473503 644946472276.2897 7189381.013

61. 1473600 645132471555.9848 7192669.473

62. 1473518 645123472106.4604 7192385.668

63. 1473838 645144469479.1912 7193061.401

64. 1471031 641957491528.464 7133882.941

65. 1471418 642157488494.7979 7137607.541

66. 1474737 644947462337.0975 7189520.134

67. 1480110 643141451079.5102 7156057.366

68. 1480751 643330445794.7944 7159521.79

69. 1474843 643722461401.3857 7166381.15

70. 1474651 644431462822.8595 7179730.525

71. 1461255 644034537453.1463 7172396.341

72. 1464947 643559508150.0168 7163662.237

73. 1470208 644203498304.52 7174920.182

74. 1471804 644229485645.2691 7175758.703

75. 1473727 644918470369.4475 7188532.341

76. 1473727 644919470369.7527 7188563.298

77. 1474439 644714464627.8586 7184755.339

78. 1474452 644712464455.4884 7184695.449

79. 1475716 644657454625.4114 7184363.15

80. 1482003 643055435948.3909 7154913.661

81. 1481755 642948437612.748 7152804.502

82. 1475956 642000451724.5825 7134343.435

83. 1470231 643003497985.1235 7152631.364

84. 1470230 643804498008.2462 7167521.58

85. 1470748 643341493769.0442 7159385.633

86. 1472205 643246482349.1301 7157727.818

87. 1474702 644000462573.6093 7171343.365

88. 1464035 644521515400.1592 7181088.629

89. 1464055 643931515190.1615 7170252.302

90. 1465540 643934503449.1992 7170309.034

91. 1470630 644823494854.2042 7186687.999

92. 1474030 645230468019.733 7194500.776

93. 1474410 644730465016.5038 7185246.162

APPENDIX B

Level IV vegetation types (Viereck et al. 1992), and barren and cultural types (SCS/DNR 1990) that were surveyed in each Floristic Collection Unit during the 1995 Fort Wainwright floristic inventory. Numbers refer to collection sites from which actual collections were completed.

APPENDIX C

Alphabetical checklist of vascular plants collected from Fort Wainright Military Installation, Alaska, 1995.

ACHILLEA BOREALIS Bong.
ACHILLEA MILLEFOLIUM L.
ACHILLEA SIBIRICA Ledeb.
ACONITUM DELPHINIFOLIUM DC.
ACTAEA RUBRA (Aiton) Willd.
ADOXA MOSCHATELLINA L.
AGROSTIS SCABRA Willd.
ALISMA TRIVIALE Pursh
ALNUS TENUIFOLIA Nutt.
ALNUS VIRIDIS Villar ssp. CRISPA (Aiton) A. Loeve & D. Loeve
ALOPECURUS AEQUALIS Sobol.
ALOPECURUS ALPINUS Smith
ALOPECURUS PRATENSIS L.
AMELANCHIER ALNIFOLIA (Nutt.) Nutt.
ANDROMEDA POLIFOLIA L.
ANDROSACE SEPTENTRIONALIS L.
ANEMONE NARCISSIFLORA L. var. MONANTHA DC.
ANEMONE PARVIFLORA Michaux
ANEMONE RICHARDSONII Hook.
ANTENNARIA FRIESIANA (Trautv.) Ekman
ANTENNARIA PULCHERRIMA (Hook.) E. Greene
ANTENNARIA ROSEA (D. C. Eaton) E. Greene
ANTHEMIS COTULA L.
APOCYNUM ANDROSAEMIFOLIUM L.
AQUILEGIA BREVISTYLA Hook.
ARABIS DIVARICARPA Nelson
ARABIS HIRSUTA (L.) Scop.
ARABIS HOLBOELLII Hornem.
ARABIS LYRATA L.
ARCTAGROSTIS LATIFOLIA (R. Br.) Griseb. var. ARUNDINACEA (Trin.) Griseb.
ARCTOPHILA FULVA (Trin.) Andersson
ARCTOSTAPHYLOS UVA-URSI (L.) Sprengel
ARCTOUS ALPINA (L.) Niedenzu
ARCTOUS RUBRA (Rehder & E. Wilson) Nakai

ARNICA ALPINA (L.) Olin ssp. ATTENUATA (E. Greene) Maguire
ARNICA ANGUSTIFOLIA M. Vahl
ARNICA GRISCOMII Fern. ssp. FRIGIDA (C. Meyer ex Iljin) S. J. Wolf
ARTEMISIA ALASKANA Rydb.
ARTEMISIA ARCTICA Less.
ARTEMISIA FRIGIDA Willd.
ARTEMISIA FURCATA M. Bieb.
ARTEMISIA LACINIATA Willd.
ARTEMISIA TILESII Ledeb. ssp. ELATIOR (Torr. & A. Gray) Hulten
ASTER JUNCIFORMIS Rydb.
ASTER SIBIRICUS L.
ASTRAGALUS ADSURGENS Pallas ssp. VICIIFOLIUS (Hulten) Welsh
ASTRAGALUS ALPINUS L.
ASTRAGALUS BODINII E. Sheldon
ATHYRIUM FILIX-FEMINA (L.) Roth
AVENA FATUA L.
BARBAREA ORTHOCERAS Ledeb.
BECKMANNIA ERUCAEFORMIS (L.) Host
BETULA GLANDULOSA Michaux
BETULA HYBRIDS
BETULA NANA L.
BETULA PAPYRIFERA Marshall
BIDENS CERNUA L.
BISTORTA PLUMOSA (Small) E. Greene
BISTORTA VIVIPARA (L.) Gray
BOSCHNIAKIA ROSSICA (Cham. & Schldl.) B. Fedtsch.
BOTRYCHIUM LUNARIA (L.) Sw.
BRASSICA RAPA L.
BROMOPSIS INERMIS (Leysser) Holub
BROMOPSIS PUMPELLIANA (Scribner) Holub ssp. PUMPELLIANA
CALAMAGROSTIS CANADENSIS (Michaux) P. Beauv.
CALAMAGROSTIS INEXPANSA A. Gray
CALAMAGROSTIS LAPPONICA (Wahlenb.) Hartman F.
CALAMAGROSTIS NEGLECTA (Ehrh.) Gaertner
CALAMAGROSTIS PURPURASCENS R. Br.
CALLA PALUSTRIS L.
CALLITRICHE VERNA L. emend. Kutz.
CALTHA NATANS Pallas
CALTHA PALUSTRIS L.
CALYPSO BULBOSA (L.) Oakes
CAMPANULA LASIOCARPA Cham.
CAMPANULA UNIFLORA L.
CAPSELLA BURSA-PASTORIS (L.) Medikus

CARAGANA ARBORESCENS Lam.
CARDAMINE PRATENSIS L. ssp. ANGUSTIFOLIA (Hook.) O. E. Schulz
CAREX AENEA Fern.
CAREX AQUATILIS Wahlenb.
CAREX ATHERODES Sprengel
CAREX BIGELOWII Torrey
CAREX BONANZENSIS Britton
CAREX BRUNNESCENS (Pers.) Poiret
CAREX CANESCENS L.
CAREX CAPILLARIS L.
CAREX CAPITATA Sol.
CAREX CHORDORRHIZA Ehrh.
CAREX CONCINNA R. Br.
CAREX CRAWFORDII Fern.
CAREX DIANDRA Schrank
CAREX DISPERMA Dewey
CAREX DURIUSCULA C.A Mey.
CAREX ELEUSINOIDES Turcz.
CAREX FILIFOLIA Nutt.
CAREX GARBERI Fern. ssp. BIFARIA (Fern.) Hulten
CAREX KRAUSEI Boeckeler
CAREX LASIOCARPA Ehrh.
CAREX LEPTALEA Wahlenb.
CAREX LIMOSA L.
CAREX MAGELLANICA Lam. ssp. IRRIGUA (Wahlenb.) Hulten
CAREX MARITIMA Gunnerus
CAREX MEDIA R. Br.
CAREX MICROCHAETA Holm ssp. MICROCHAETA
CAREX MICROCHAETA Holm ssp. NESOPHILA (Holm) D. Murray
CAREX OBTUSATA Lilj.
CAREX OEDERI Retz.
CAREX PECKII Howe
CAREX PHYLLOMANICA W. Boott
CAREX PODOCARPA R. Br.
CAREX ROSSII Boott
CAREX ROSTRATA Stokes
CAREX ROTUNDATA Wahlenb.
CAREX RUPESTRIS All.
CAREX SAXATILIS L.
CAREX SUPINA Willd. ssp. SPANIOCARPA (Steudel) Hulten
CAREX TENUIFLORA Wahlenb.
CAREX UTRICULATA F. Boott
CAREX VAGINATA Tausch

CASSIOPE TETRAGONA (L.) D. Don ssp. TETRAGONA
CASTILLEJA CAUDATA (Pennell) Rebrist.
CASTILLEJA ELEGANS Malte
CERATOPHYLLUM DEMERSUM L.
CHAMAEDAPHNE CALYCULATA (L.) Moench
CHENOPODIUM ALBUM L.
CHENOPODIUM CAPITATUM (L.) Asch.
CHENOPODIUM HYBRIDUM L.
CHRYSANTHEMUM LEUCANTHEMUM L.
CHRYSOSPLENIUM TETRANDRUM (N. Lund) T. C. E. Fries
CICUTA BULBIFERA L.
CICUTA VIROSA L.
CIRCAEA ALPINA L.
CIRSIUM ARVENSE (L.) Scop.
CNIDIUM CNIDIIFOLIUM (Turcz.) Schischkin
COLLOMIA LINEARIS Nutt.
COMARUM PALUSTRE L.
CONSOLIDA AMBIQUA (L.) P. Bass & Heyw.
CONYZA CANADENSIS (L.) Cronq.
CORALLORRHIZA TRIFIDA Chatel.
CORNUS CANADENSIS L.
CORNUS CANADENSIS X SUECICA L.
CORYDALIS AUREA Willd.
CORYDALIS SEMPERVIRENS (L.) Pers.
CREPIS ELEGANS Hook.
CREPIS TECTORUM L.
CRYPTOGRAMMA STELLERI (S. Gmelin) Prantl
CYPRIPEDIUM GUTTATUM Sw. ssp. GUTTATUM
CYPRIPEDIUM PASSERINUM Richardson
CYSTOPTERIS FRAGILIS (L.) Bernh.
DELPHINIUM GLAUCUM S. Watson
DESCHAMPSIA CESPITOSA (L.) P. Beauv.
DESCURAINIA SOPHIA (L.) Prantl
DESCURAINIA SOPHIOIDES (Fischer) O. Schulz
DIANTHUS BARBATUS L.
DIAPENSIA LAPPONICA L. ssp. OBOVATA (F. Schmidt) Hulten
DODECATHEON PULCHELLUM (Raf.) Merr. ssp. PAUCIFLORUM (E. Greene) Hulten
DRABA FLADNIZENSIS Wulfen
DRABA GLABELLA Pursh
DRABA NEMOROSA L.
DRACOCEPHALUM PARVIFLORUM Nutt.
DROSERA ANGLICA Hudson

DROSERA ROTUNDIFOLIA L.
DRYAS DRUMMONDII Richardson
DRYAS OCTOPETALA L. var. OCTOPETALA
DRYOPTERIS FRAGRANS (L.) Schott
ELEOCHARIS ACICULARIS (L.) Roemer & Schultes
ELEOCHARIS PALUSTRIS (L.) Roemer & Schultes
ELYMUS ALASKANUS (Scribner & Merr.) A. Loeve ssp. BOREALIS (Turcz.) A. Loeve & D. Loeve
ELYMUS MACROURUS (Turcz.) Tzvelev
ELYMUS SUBSECUNDUS (Link) A. Loeve & D. Loeve
ELYMUS TRACHYCAULUS (Link) Gould ex Shinners
ELYMUS TRACHYCAULUS (Link) Gould ex Shinners ssp. TRACHYCAULUS
ELYMUS TRACHYCAULUS (Link) Gould ex Shinners ssp. VIOLACEUS (Hornem.) A. Loeve & D. Loeve
ELYTRIGIA REPENS (L.) Nevski
ELYTRIGIA SPICATA (Pursh) D. R. Dewey
EMPETRUM HERMAPHRODITUM (Lange) Hagerup
EPILOBIUM ANGUSTIFOLIUM L.
EPILOBIUM CILIATUM Raf.
EPILOBIUM CILIATUM Raf. ssp. ADENOCAULON (Hausskn.) Hoch & Raven
EPILOBIUM HORNEMANNII Reichb. ssp. HORNEMANNII
EPILOBIUM LATIFOLIUM L.
EPILOBIUM PALUSTRE L.
EQUISETUM ARVENSE L.
EQUISETUM FLUVIATILE L. ampl. Ehrh.
EQUISETUM HIEMALE L.
EQUISETUM PALUSTRE L.
EQUISETUM PRATENSE Ehrh.
EQUISETUM SCIRPOIDES Michaux
EQUISETUM SILVATICUM L.
EQUISETUM VARIEGATUM Schleicher
ERIGERON ACRIS L.
ERIGERON CAESPITOSUS Nutt.
ERIGERON COMPOSITUS Pursh
ERIGERON ELATUS E. Greene
ERIGERON GLABELLUS Nutt.
ERIGERON LONCHOPHYLLUS Hook.
ERIOPHORUM ANGUSTIFOLIUM Honck. ssp. SCABRIUSCULUM Hulten
ERIOPHORUM GRACILE Koch
ERIOPHORUM RUSSEOLUM Fries
ERIOPHORUM SCHEUCHZERI Hoppe
ERIOPHORUM VAGINATUM L.
ERODIUM CICUTARIUM (L.) L'Her.

ERYSIMUM CHEIRANTHOIDES L. ssp. CHEIRANTHOIDES
ERYSIMUM INCONSPICUUM (S. Watson) Macmillan
ESCHSCHOLZIA CALIFORNICA Cham.
EUPHRASIA DISJUNCTA Fern. & Wieg.
FESTUCA ALTAICA Trin.
FESTUCA BRACHYPHYLLA Schultes & Schultes F.
FESTUCA LENENSIS Drobov
FESTUCA SAXIMONTANA Rydb.
FRAGARIA VIRGINIANA Duchesne
GAILLARDIA PULCHELLA Foug.
GALEOPSIS BIFIDA Boenn.
GALIUM BOREALE L.
GALIUM BRANDEGEI A. Gray
GALIUM TRIFIDUM L. ssp. TRIFIDUM
GALIUM TRIFLORUM Michaux
GASTROLYCHNIS AFFINIS (Vahl) Tolm. & Kozhanch.
GASTROLYCHNIS OSTENFELDII (A. Pors.) V. V. Petrovsky
GENTIANA GLAUCA Pallas
GENTIANELLA AMARELLA (L.) Boerner
GENTIANELLA PROPINQUA (Richardson) J. M. Gillett
GENTIANOPSIS DETONSA (Rottb.) Malte ssp. YUKONENSIS (J.M. Gillett) J. M. Gillett
GEOCAULON LIVIDUM (Richardson) Fern.
GERANIUM BICKNELLII Britton
GEUM PERINCISUM Rydb.
GLYCERIA BOREALIS (Nash) Batch.
GLYCERIA MAXIMA (Hartman F.) O. Holmb.
GLYCERIA PULCHELLA (Nash) Schum.
GNAPHALIUM ULIGINOSUM L.
GOODYERA REPENS (L.) R. Br.
GYMNOCARPIUM DRYOPTERIS (L.) Newman
GYMNOCARPIUM ROBERTIANUM (Hoffm.) Newman
HALIMOLOBUS MOLLIS (Hook.) Rollins
HAMMARBYA PALUDOSA (L.) Kuntze
HEDYSARUM ALPINUM L. ssp. AMERICANUM (Michaux) B. Fedtsch.
HEDYSARUM MACKENZII Richardson
HESPERIS MATRONALIS L.
HIEROCHLOE ALPINA (Sw.) Roemer & Schultes
HIEROCHLOE ODORATA (L.) P. Beauv.
HIPPURIS VULGARIS L.
HORDEUM BRACHYANTHERUM Nevski
HORDEUM JUBATUM L.
HUPERZIA SELAGO (L.) C. Martius

IMPATIENS NOLI-TANGERE L.
IRIS SETOSA Pallas
JUNCUS ALPINUS Villars
JUNCUS ARCTICUS Willd. ssp. ALASKANUS Hulten
JUNCUS ARCTICUS Willd. ssp. ATER (Rydb.) Hulten
JUNCUS BUFONIUS L.
JUNCUS CASTANEUS Smith ssp. CASTANEUS
JUNCUS CASTANEUS Smith ssp. LEUCOCHLAMYS (I. Zinserl.) Hulten
JUNCUS FILIFORMIS L.
JUNCUS STYGIUS L.
JUNCUS TRIGLUMIS L. ssp. ALBESCENS (Lange) Hulten
JUNIPERUS COMMUNIS L.
KOBRESIA SIMPLICIUSCULA (Wahlenb.) Mackenzie
LAPPULA MYOSOTIS Moench
LARIX LARICINA (Du Roi) K. Koch
LEDUM GROENLANDICUM Oeder
LEDUM PALUSTRE L. ssp. DECUMBENS (Aiton) Hulten
LEMNA MINOR L.
LEMNA TRISULCA L.
LEPIDIUM DENSIFLORUM Schrader
LEPIDIUM RUDERALE L.
LEYMUS INNOVATUS (Beal) Pilger
LINARIA VULGARIS Miller
LINNAEA BOREALIS L.
LINUM LEWISII Pursh
LISTERA BOREALIS Morong
LOISELEURIA PROCUMBENS (L.) Desv.
LOLIUM MULTIFLORUM Lam.
LOMATOGONIUM ROTATUM (L.) E. Fries
LUPINUS ARCTICUS S. Watson
LUZULA CONFUSA Lindeb.
LUZULA KJELLMANIANA Miyabe & Kudo
LUZULA MULTIFLORA (Retz.) Lej.
LUZULA PARVIFLORA (Ehrh.) Desv.
LUZULA RUFESCENS Fischer
LYCOPODIUM ALPINUM L.
LYCOPODIUM ANNOTINUM L. ssp. ANNOTINUM
LYCOPODIUM ANNOTINUM L. ssp. PUNGENS (La Pyl.) Hulten
LYCOPODIUM COMPLANATUM L.
LYCOPODIUM OBSCURUM L.
LYCOPUS UNIFLORUS Michaux
LYSIMACHIA THYRSIFLORA L.
MATRICARIA MATRICARIOIDES (Less.) Porter

MEDICAGO FALCATA L.
MEDICAGO SATIVA L.
MELILOTUS ALBUS Desrr.
MELILOTUS OFFICINALIS (L.) Lam.
MENYANTHES TRIFOLIATA L.
MERTENSIA PANICULATA (Aiton) G. Don
MINUARTIA ARCTICA (Steven) Asch. & Graebner
MINUARTIA YUKONENSIS Hulten
MOEHRINGIA LATERIFLORA (L.) Fenzl
MONESES UNIFLORA (L.) A. Gray
MYRICA GALE L.
MYRIOPHYLLUM SIBIRICUM Kom.
MYRIOPHYLLUM VERTICILLATUM L.
NEMOPHILA MENZIESII Hook. & Arn.
NUPHAR POLYSEPALUM Engelm.
NYMPHAEA TETRAGONA Georgi
ORTHILIA SECUNDA (L.) House
ORTHILIA SECUNDA (L.) House ssp. OBTUSATA (Turcz.) Bocher
OXYCOCCUS MICROCARPUS Turcz. ex Rupr.
OXYTROPIS DEFLEXA (Pallas) DC. var. FOLIOLOSA (Hook.) Barneby
OXYTROPIS DEFLEXA (Pallas) DC. var. SERICEA Torrey & A. Gray
OXYTROPIS TANANENSIS B. A. Yurtsev
OXYTROPIS VARIANS (Rydb.) Schumann
PARNASSIA PALUSTRIS L.
PARRYA NUDICAULIS (L.) Regel
PEDICULARIS CAPITATA J. Adams
PEDICULARIS LABRADORICA Wirs.
PEDICULARIS LANATA Cham. & Schldl.
PEDICULARIS LANGSDORFFII Fischer ex Steven
PEDICULARIS MACRODONTA Richardson
PENTAPHYLLOIDES FLORIBUNDA (Pursh) A. Loeve
PETASITES FRIGIDUS (L.) Franchet
PETASITES NIVALIS E. Greene
PETASITES SAGITTATUS (Banks) A. Gray
PHLEUM PRATENSE L.
PICEA GLAUCA (Moench) Voss
PICEA MARIANA (Miller) Britton, Sterns, Pogg.
PINGUICULA VILLOSA L.
PLAGIOBOTHRYS COGNATUS (E. Greene) I. M. Johnston
PLANTAGO MAJOR L. var. MAJOR
PLATANTHERA HYPERBOREA (L.) Lindley
PLATANTHERA OBTUSATA (Pursh) Lindley
POA ALPINA L.

POA ANNUA L.
POA ARCTICA R. Br.
POA GLAUCA M. Vahl
POA PALUSTRIS L.
POA PRATENSIS L.
PODISTERA MACOUNII (J. Coulter & Rose) Mathias & Constance
POLEMONIUM ACUTIFLORUM Willd.
POLYGONUM ALASKANUM (Small) W. Wight
POLYGONUM AMPHIBIUM L.
POLYGONUM AVICULARE L.
POLYGONUM CONVOLVULUS L.
POLYGONUM LAPATHIFOLIUM L.
POLYGONUM PENNSYLVANICUM L. ssp. ONEILLII (Brenckle) Hulten
POLYPODIUM VULGARE L. ssp. COLUMBIANUM (Gilbert) Hulten
POPULUS BALSAMIFERA L. ssp. BALSAMIFERA
POPULUS TREMULOIDES Michaux
POTAMOGETON ALPINUS Balbis
POTAMOGETON EPIHYDRUS Raf.
POTAMOGETON FILIFORMIS Pers.
POTAMOGETON FRIESII Rupr.
POTAMOGETON GRAMINEUS L.
POTAMOGETON PECTINATUS L.
POTAMOGETON PRAELONGUS Wulfen
POTAMOGETON PUSILLUS L. var. TENUISSIMUS Mert. & Koch
POTAMOGETON RICHARDSONII (A. Bennett) Rydb.
POTAMOGETON VAGINATUS Turcz.
POTAMOGETON ZOSTERIFORMIS Fernald
POTENTILLA ARGUTA Pursh
POTENTILLA EGEDII Wormsk.
POTENTILLA HOOKERIANA Lehm.
POTENTILLA MULTIFIDA L.
POTENTILLA NORVEGICA L.
POTENTILLA PENSYLVANICA L.
POTENTILLA UNIFLORA Ledeb.
POTENTILLA VIRGULATA Nelson
PRIMULA INCANA M. E. Jones
PUCCINELLIA BOREALIS Swallen
PUCCINELLIA INTERIOR T. Sorensen
PULSATILLA PATENS (L.) Miller
PYROLA ASARIFOLIA Michaux
PYROLA CHLORANTHA Sw.
PYROLA GRANDIFLORA Radius

RANUNCULUS GMELINII DC.
RANUNCULUS HYPERBOREUS Rottb.
RANUNCULUS LAPPONICUS L.
RANUNCULUS MACOUNII Britton
RANUNCULUS PENNSYLVANICUS L. F.
RANUNCULUS REPTANS L.
RANUNCULUS SCELERATUS L. ssp. MULTIFIDUS (Nutt.) Hulten
RANUNCULUS TRICHOPHYLLUS Chaix
RHINANTHUS MINOR L.
RIBES HUDSONIANUM Richardson
RIBES LACUSTRE (Pers.) Poiret
RIBES TRISTE Pallas
RORIPPA BARBAREAEFOLIA (DC.) Kitigawa
RORIPPA CURVISILIQUA (Hook.) Besser
RORIPPA PALUSTRIS (L.) Besser ssp. HISPIDA (Desv.) Jonsell
RORIPPA PALUSTRIS (L.) Besser ssp. PALUSTRIS
ROSA ACICULARIS Lindley
ROSA WOODSII Lindley
RUBECKIA HIRTA L.
RUBUS ARCTICUS L. ssp. ARCTICUS
RUBUS CHAMAEMORUS L.
RUBUS IDAEUS L.
RUMEX ARCTICUS Trautv.
RUMEX FENESTRATUS E. Greene
RUMEX MEXICANUS Meissner
RUMEX SIBIRICUS Hulten
SAGITTARIA CUNEATA E. Sheldon
SALIX ALAXENSIS (Andersson) Cov. var. LONGISTYLIS (Rydb.) C. Schneider
SALIX ARBUSCULOIDES Andersson
SALIX ARCTICA Pallas
SALIX BEBBIANA Sarg.
SALIX BRACHYCARPA Nutt.
SALIX BRACHYCARPA Nutt. ssp. NIPHOCLADA (Rydb.) Argus
SALIX FUSCESCENS Andersson
SALIX GLAUCA L.
SALIX GLAUCA L. var. ACUTIFOLIA (Andersson) C. Schneider
SALIX HASTATA L.
SALIX Rowlee
SALIX LUCIDA Muhl. ssp. LASIANDRA (Benth.) Argus
SALIX MYRTILLIFOLIA Andersson
SALIX NOVAE-ANGLIAE Andersson
SALIX PHLEBOPHYLLA Andersson
SALIX PLANIFOLIA Pursh

SALIX PLANIFOLIA Pursh ssp. PULCHRA (Cham.) Argus
SALIX PSEUDOMONTICOLA C. Ball
SALIX SCOULERIANA J. Barratt
SANGUISORBA OFFICINALIS L.
SAUSSUREA ANGUSTIFOLIA (Willd.) DC.
SAXIFRAGA CERNUA L.
SAXIFRAGA NELSONIANA D. Don
SAXIFRAGA REFLEXA Hook.
SAXIFRAGA TRICUSPIDATA Rottb.
SCIRPUS MICROCARPUS C. Presl
SCIRPUS VALIDUS M. Vahl
SCUTELLARIA GALERICULATA L.
SELAGINELLA SIBIRICA (Milde) Hieron.
SENECIO ATROPURPUREUS (Ledeb.) B. Fedtsch.
SENECIO CONGESTUS (R. Br.) DC.
SENECIO LUGENS Richardson
SENECIO PAUCIFLORUS Pursh
SENECIO TUNDRICOLA Tolm.
SENECIO VULGARIS L.
SHEPHERDIA CANADENSIS (L.) Nutt.
SILENE WILLIAMSII Britton
SIUM SUAVE Walter
SOLIDAGO CANADENSIS L.
SOLIDAGO DECUMBENS E. Greene
SOLIDAGO MULTIRADIATA Aiton
SONCHUS ARVENSIS L.
SONCHUS ASPER (L.) Hill
SORBUS SCOPULINA E. Greene
SPARGANIUM ANGUSTIFOLIUM Michaux
SPARGANIUM HYPERBOREUM Laest.
SPARGANIUM MINIMUM (Hartman F.) Fries
SPERGULARIA RUBRA (L.) J. S. Presl & C. Presl
SPIRAEA STEVENII (C. Schneider) Rydb.
SPIRANTHES ROMANZOFFIANA Cham.
STACHYS PALUSTRIS L. ssp. PILOSA (Nutt.) Epling
STELLARIA BOREALIS Bigelow ssp. BOREALIS
STELLARIA CALYCANTHA (Ledeb.) Bong.
STELLARIA CRASSIFOLIA Ehrh.
STELLARIA LAETA Richardson
STELLARIA LONGIFOLIA Muhlenb. ex Willd.
STELLARIA LONGIPES Goldie
STELLARIA MEDIA (L.) Villars
SWIDA STOLONIFERA (Michx.) Rydb.

SYNTHYRIS BOREALIS Pennell
TARAXACUM CERATOPHORUM (Ledeb.) DC.
TARAXACUM OFFICINALE G. Weber
THALICTRUM SPARSIFLORUM Turcz.
THLASPI ARVENSE L.
TOFIELDIA COCCINEA Richardson
TRICHOPHORUM ALPINUM (L.) Pers.
TRIENTALIS EUROPAEA L. ssp. ARCTICA (Fischer) Hulten
TRIFOLIUM HYBRIDUM L.
TRIFOLIUM PRATENSE L.
TRIFOLIUM REPENS L.
TRIGLOCHIN MARITIMUM L.
TRIGLOCHIN PALUSTRIS L.
TRIPLEUROSPERMUM INODORUM (L.) Schultz-Bip.
TRISETUM SPICATUM (L.) K. Richter
TYPHA LATIFOLIA L.
URTICA DIOICA L. ssp. GRACILIS (Aiton) Selander
UTRICULARIA INTERMEDIA Hayne
UTRICULARIA MINOR L.
UTRICULARIA VULGARIS L.
VACCINIUM ULIGINOSUM L. ssp. ALPINUM (Bigelow) Hulten
VACCINIUM VITIS-IDAEA L.
VALERIANA CAPITATA Pallas
VERONICA SCUTELLATA L.
VIBURNUM EDULE (Michaux) Raf.
VICIA ANGUSTIFOLIA (L.) Reichard
VICIA CRACCA L.
VIOLA BIFLORA L.
VIOLA EPIPSILA Ledeb.
VIOLA RENIFOLIA A. Gray
VIOLA TRICOLOR L.
WILHELMSIA PHYSODES (Fischer) Mcneill
WOODSIA ILVENSIS (L.) R. Br.
ZYGADENUS ELEGANS Pursh

APPENDIX D

Checklist of collected vascular plants by family from Fort Wainwright Military Installation, Alaska, 1995.

Adiantaceae
- CRYPTOGRAMMA STELLERI (S. Gmelin) Prantl

Adoxaceae
- ADOXA MOSCHATELLINA L.

Alismataceae
- ALISMA TRIVIALE Pursh
- SAGITTARIA CUNEATA E. Sheldon

Apiaceae
- CICUTA BULBIFERA L.
- CICUTA VIROSA L.
- CNIDIUM CNIDIIFOLIUM (Turcz.) Schischkin
- PODISTERA MACOUNII (J. Coulter & Rose) Mathias & Constance
- SIUM SUAVE Walter

Apocynaceae
- APOCYNUM ANDROSAEMIFOLIUM L.

Araceae
- CALLA PALUSTRIS L.

Aspleniaceae
- ATHYRIUM FILIX-FEMINA (L.) Roth
- CYSTOPTERIS FRAGILIS (L.) Bernh.
- DRYOPTERIS FRAGRANS (L.) Schott
- GYMNOCARPIUM DRYOPTERIS (L.) Newman
- GYMNOCARPIUM ROBERTIANUM (Hoffm.) Newman
- WOODSIA ILVENSIS (L.) R. Br.

Asteraceae
- ACHILLEA BOREALIS Bong.

ACHILLEA MILLEFOLIUM L.
ACHILLEA SIBIRICA Ledeb.
ANTENNARIA FRIESIANA (Trautv.) Ekman
ANTENNARIA PULCHERRIMA (Hook.) E. Greene
ANTENNARIA ROSEA (D. C. Eaton) E. Greene
ANTHEMIS COTULA L.
ARNICA ALPINA (L.) Olin ssp. ATTENUATA (E. Greene) Maguire
ARNICA ANGUSTIFOLIA M. Vahl
ARNICA GRISCOMII Fern. ssp. FRIGIDA (C. Meyer ex Iljin) S. J. Wolf
ARTEMISIA ALASKANA Rydb.
ARTEMISIA ARCTICA Less.
ARTEMISIA FRIGIDA Willd.
ARTEMISIA FURCATA M. Bieb.
ARTEMISIA LACINIATA Willd.
ARTEMISIA TILESII Ledeb. ssp. ELATIOR (Torr. & A. Gray) Hulten
ASTER JUNCIFORMIS Rydb.
ASTER SIBIRICUS L.
BIDENS CERNUA L.
CHRYSANTHEMUM LEUCANTHEMUM L.
CIRSIUM ARVENSE (L.) Scop.
CONYZA CANADENSIS (L.) Cronq.
CREPIS ELEGANS Hook.
CREPIS TECTORUM L.
ERIGERON ACRIS L.
ERIGERON CAESPITOSUS Nutt.
ERIGERON COMPOSITUS Pursh
ERIGERON ELATUS E. Greene
ERIGERON GLABELLUS Nutt.
ERIGERON LONCHOPHYLLUS Hook.
GAILLARDIA PULCHELLA Foug.
GNAPHALIUM ULIGINOSUM L.
MATRICARIA MATRICARIOIDES (Less.) Porter
PETASITES FRIGIDUS (L.) Franchet
PETASITES NIVALIS E. Greene
PETASITES SAGITTATUS (Banks) A. Gray
RUBECKIA HIRTA L.
SAUSSUREA ANGUSTIFOLIA (Willd.) DC.
SENECIO ATROPURPUREUS (Ledeb.) B. Fedtsch.
SENECIO CONGESTUS (R. Br.) DC.
SENECIO LUGENS Richardson
SENECIO PAUCIFLORUS Pursh
SENECIO TUNDRICOLA Tolm.
SENECIO VULGARIS L.

SOLIDAGO CANADENSIS L.
SOLIDAGO DECUMBENS E. Greene
SOLIDAGO MULTIRADIATA Aiton
SONCHUS ARVENSIS L.
SONCHUS ASPER (L.) Hill
TARAXACUM CERATOPHORUM (Ledeb.) DC.
TARAXACUM OFFICINALE G. Weber
TRIPLEUROSPERMUM INODORUM (L.) Schultz-Bip.

Balsaminaceae
IMPATIENS NOLI-TANGERE L.

Betulaceae
ALNUS TENUIFOLIA Nutt.
ALNUS VIRIDIS Villar ssp. CRISPA (Aiton) A. Loeve & D. Loeve
BETULA GLANDULOSA Michaux
BETULA HYBRIDS
BETULA NANA L.
BETULA PAPYRIFERA Marshall

Boraginaceae
LAPPULA MYOSOTIS Moench
MERTENSIA PANICULATA (Aiton) G. Don
PLAGIOBOTHRYS COGNATUS (E. Greene) I. M. Johnston

Brassicaceae
ARABIS DIVARICARPA Nelson
ARABIS HIRSUTA (L.) Scop.
ARABIS HOLBOELLII Hornem.
ARABIS LYRATA L.
BARBAREA ORTHOCERAS Ledeb.
BRASSICA RAPA L.
CAPSELLA BURSA-PASTORIS (L.) Medikus
CARDAMINE PRATENSIS L. ssp. ANGUSTIFOLIA (Hook.) O. E. Schulz
DESCURAINIA SOPHIA (L.) Prantl
DESCURAINIA SOPHIOIDES (Fischer) O. Schulz
DRABA FLADNIZENSIS Wulfen
DRABA GLABELLA Pursh
DRABA NEMOROSA L.
ERYSIMUM CHEIRANTHOIDES L. ssp. CHEIRANTHOIDES
ERYSIMUM INCONSPICUUM (S. Watson) Macmillan
HALIMOLOBUS MOLLIS (Hook.) Rollins
HESPERIS MATRONALIS L.

LEPIDIUM DENSIFLORUM Schrader
LEPIDIUM RUDERALE L.
PARRYA NUDICAULIS (L.) Regel
RORIPPA BARBAREAEFOLIA (DC.) Kitigawa
RORIPPA CURVISILIQUA (Hook.) Besser
RORIPPA PALUSTRIS (L.) Besser ssp. HISPIDA (Desv.) Jonsell
RORIPPA PALUSTRIS (L.) Besser ssp. PALUSTRIS
THLASPI ARVENSE L.

Callitrichaceae
CALLITRICHE VERNA L. emend. Kutz.

Campanulaceae
CAMPANULA LASIOCARPA Cham.
CAMPANULA UNIFLORA L.

Caprifoliaceae
LINNAEA BOREALIS L.
VIBURNUM EDULE (Michaux) Raf.

Caryophyllaceae
DIANTHUS BARBATUS L.
GASTROLYCHNIS AFFINIS (Vahl) Tolm. & Kozhanch.
GASTROLYCHNIS OSTENFELDII (A. Pors.) V. V. Petrovsky
MINUARTIA ARCTICA (Steven) Asch. & Graebner
MINUARTIA YUKONENSIS Hulten
MOEHRINGIA LATERIFLORA (L.) Fenzl
SILENE WILLIAMSII Britton
SPERGULARIA RUBRA (L.) J. S. Presl & C. Presl
STELLARIA BOREALIS Bigelow ssp. BOREALIS
STELLARIA CALYCANTHA (Ledeb.) Bong.
STELLARIA CRASSIFOLIA Ehrh.
STELLARIA LAETA Richardson
STELLARIA LONGIFOLIA Muhlenb. ex Willd.
STELLARIA LONGIPES Goldie
STELLARIA MEDIA (L.) Villars
WILHELMSIA PHYSODES (Fischer) Mcneill

Ceratophyllaceae
CERATOPHYLLUM DEMERSUM L.

Chenopodiaceae
CHENOPODIUM ALBUM L.

CHENOPODIUM CAPITATUM (L.) Asch.
CHENOPODIUM HYBRIDUM L.

Cornaceae
CORNUS CANADENSIS L.
CORNUS CANADENSIS_X_SUECICA L.
SWIDA STOLONIFERA (Michx.) Rydb.

Cupressaceae
JUNIPERUS COMMUNIS L.

Cyperaceae
CAREX AENEA Fern.
CAREX AQUATILIS Wahlenb.
CAREX ATHERODES Sprengel
CAREX BIGELOWII Torrey
CAREX BONANZENSIS Britton
CAREX BRUNNESCENS (Pers.) Poiret
CAREX CANESCENS L.
CAREX CAPILLARIS L.
CAREX CAPITATA Sol.
CAREX CHORDORRHIZA Ehrh.
CAREX CONCINNA R. Br.
CAREX CRAWFORDII Fern.
CAREX DIANDRA Schrank
CAREX DISPERMA Dewey
CAREX DURIUSCULA C.E. Mey.
CAREX ELEUSINOIDES Turcz.
CAREX FILIFOLIA Nutt.
CAREX GARBERI Fern. ssp. BIFARIA (Fern.) Hulten
CAREX KRAUSEI Boeckeler
CAREX LASIOCARPA Ehrh.
CAREX LEPTALEA Wahlenb.
CAREX LIMOSA L.
CAREX MAGELLANICA Lam. ssp. IRRIGUA (Wahlenb.) Hulten
CAREX MARITIMA Gunnerus
CAREX MEDIA R. Br.
CAREX MICROCHAETA Holm ssp. MICROCHAETA
CAREX MICROCHAETA Holm ssp. NESOPHILA (Holm) D. Murray
CAREX OBTUSATA Lilj.
CAREX OEDERI Retz.
CAREX PECKII Howe
CAREX PHYLLOMANICA W. Boott

CAREX PODOCARPA R. Br.
CAREX ROSSII Boott
CAREX ROSTRATA Stokes
CAREX ROTUNDATA Wahlenb.
CAREX RUPESTRIS All.
CAREX SAXATILIS L.
CAREX SUPINA Willd. ssp. SPANIOCARPA (Steudel) Hulten
CAREX TENUIFLORA Wahlenb.
CAREX UTRICULATA F. Boott
CAREX VAGINATA Tausch
ELEOCHARIS ACICULARIS (L.) Roemer & Schultes
ELEOCHARIS PALUSTRIS (L.) Roemer & Schultes
ERIOPHORUM ANGUSTIFOLIUM Honck. ssp. SCABRIUSCULUM Hulten
ERIOPHORUM GRACILE Koch
ERIOPHORUM RUSSEOLUM Fries
ERIOPHORUM SCHEUCHZERI Hoppe
ERIOPHORUM VAGINATUM L.
KOBRESIA SIMPLICIUSCULA (Wahlenb.) Mackenzie
SCIRPUS MICROCARPUS C. Presl
SCIRPUS VALIDUS M. Vahl
TRICHOPHORUM ALPINUM (L.) Pers.

Diapensiaceae
DIAPENSIA LAPPONICA L. ssp. OBOVATA (F. Schmidt) Hulten

Droseraceae
DROSERA ANGLICA Hudson
DROSERA ROTUNDIFOLIA L.

Elaeagnaceae
SHEPHERDIA CANADENSIS (L.) Nutt.

Empetraceae
EMPETRUM HERMAPHRODITUM (Lange) Hagerup

Equisetaceae
EQUISETUM ARVENSE L.
EQUISETUM FLUVIATILE L. ampl. Ehrh.
EQUISETUM HIEMALE L.
EQUISETUM PALUSTRE L.
EQUISETUM PRATENSE Ehrh.
EQUISETUM SCIRPOIDES Michaux
EQUISETUM SILVATICUM L.

EQUISETUM VARIEGATUM Schleicher

Ericaceae
ANDROMEDA POLIFOLIA L.
ARCTOSTAPHYLOS UVA-URSI (L.) Sprengel
ARCTOUS ALPINA (L.) Niedenzu
ARCTOUS RUBRA (Rehder & E. Wilson) Nakai
CASSIOPE TETRAGONA (L.) D. Don ssp. TETRAGONA
CHAMAEDAPHNE CALYCULATA (L.) Moench
LEDUM GROENLANDICUM Oeder
LEDUM PALUSTRE L. ssp. DECUMBENS (Aiton) Hulten
LOISELEURIA PROCUMBENS (L.) Desv.
OXYCOCCUS MICROCARPUS Turcz. ex Rupr.
VACCINIUM ULIGINOSUM L. ssp. ALPINUM (Bigelow) Hulten
VACCINIUM VITIS-IDAEA L.

Fabaceae
ASTRAGALUS ADSURGENS Pallas ssp. VICIIFOLIUS (Hulten) Welsh
ASTRAGALUS ALPINUS L.
ASTRAGALUS BODINII E. Sheldon
CARAGANA ARBORESCENS Lam.
HEDYSARUM ALPINUM L. ssp. AMERICANUM (Michaux) B. Fedtsch.
HEDYSARUM MACKENZII Richardson
LUPINUS ARCTICUS S. Watson
MEDICAGO FALCATA L.
MEDICAGO SATIVA L.
MELILOTUS ALBUS Desrr.
MELILOTUS OFFICINALIS (L.) Lam.
OXYTROPIS DEFLEXA (Pallas) DC. var. FOLIOLOSA (Hook.) Barneby
OXYTROPIS DEFLEXA (Pallas) DC. var. SERICEA Torrey & A. Gray
OXYTROPIS TANANENSIS B. A. Yurtsev
OXYTROPIS VARIANS (Rydb.) Schumann
TRIFOLIUM HYBRIDUM L.
TRIFOLIUM PRATENSE L.
TRIFOLIUM REPENS L.
VICIA ANGUSTIFOLIA (L.) Reichard
VICIA CRACCA L.

Fumariaceae
CORYDALIS AUREA Willd.
CORYDALIS SEMPERVIRENS (L.) Pers.

Gentianaceae

GENTIANA GLAUCA Pallas
GENTIANELLA AMARELLA (L.) Boerner
GENTIANELLA PROPINQUA (Richardson) J. M. Gillett
GENTIANOPSIS DETONSA (Rottb.) Malte ssp. YUKONENSIS (J.M. Gillett) J.M. Gillett
LOMATOGONIUM ROTATUM (L.) E. Fries
MENYANTHES TRIFOLIATA L.

Geraniaceae
ERODIUM CICUTARIUM (L.) L'Her.
GERANIUM BICKNELLII Britton

Grossulariaceae
RIBES HUDSONIANUM Richardson
RIBES LACUSTRE (Pers.) Poiret
RIBES TRISTE Pallas

Haloragaceae
HIPPURIS VULGARIS L.
MYRIOPHYLLUM SIBIRICUM Kom.
MYRIOPHYLLUM VERTICILLATUM L.

Hydrophyllaceae
NEMOPHILA MENZIESII Hook. & Arn.

Iridaceae
IRIS SETOSA Pallas

Juncaceae
JUNCUS ALPINUS Villars
JUNCUS ARCTICUS Willd. ssp. ALASKANUS Hulten
JUNCUS ARCTICUS Willd. ssp. ATER (Rydb.) Hulten
JUNCUS BUFONIUS L.
JUNCUS CASTANEUS Smith ssp. CASTANEUS
JUNCUS CASTANEUS Smith ssp. LEUCOCHLAMYS (I. Zinserl.) Hulten
JUNCUS FILIFORMIS L.
JUNCUS STYGIUS L.
JUNCUS TRIGLUMIS L. ssp. ALBESCENS (Lange) Hulten
LUZULA CONFUSA Lindeb.
LUZULA KJELLMANIANA Miyabe & Kudo
LUZULA MULTIFLORA (Retz.) Lej.
LUZULA PARVIFLORA (Ehrh.) Desv.
LUZULA RUFESCENS Fischer

Juncaginaceae
- TRIGLOCHIN MARITIMUM L.
- TRIGLOCHIN PALUSTRIS L.

Lamiaceae
- DRACOCEPHALUM PARVIFLORUM Nutt.
- GALEOPSIS BIFIDA Boenn.
- LYCOPUS UNIFLORUS Michaux
- SCUTELLARIA GALERICULATA L.
- STACHYS PALUSTRIS L. ssp. PILOSA (Nutt.) Epling

Lemnaceae
- LEMNA MINOR L.
- LEMNA TRISULCA L.

Lentibulariaceae
- PINGUICULA VILLOSA L.
- UTRICULARIA INTERMEDIA Hayne
- UTRICULARIA MINOR L.
- UTRICULARIA VULGARIS L.

Liliaceae
- TOFIELDIA COCCINEA Richardson
- ZYGADENUS ELEGANS Pursh

Linaceae
- LINUM LEWISII Pursh

Lycopodiaceae
- HUPERZIA SELAGO (L.) C. Martius
- LYCOPODIUM ALPINUM L.
- LYCOPODIUM ANNOTINUM L. ssp. ANNOTINUM
- LYCOPODIUM ANNOTINUM L. ssp. PUNGENS (La Pyl.) Hulten
- LYCOPODIUM COMPLANATUM L.
- LYCOPODIUM OBSCURUM L.

Myricaceae
- MYRICA GALE L.

Nymphaceae
- NUPHAR POLYSEPALUM Engelm.
- NYMPHAEA TETRAGONA Georgi

Onagraceae
- CIRCAEA ALPINA L.
- EPILOBIUM ANGUSTIFOLIUM L.
- EPILOBIUM CILIATUM Raf.
- EPILOBIUM CILIATUM Raf. ssp. ADENOCAULON (Hausskn.) Hoch & Raven
- EPILOBIUM HORNEMANNII Reichb. ssp. HORNEMANNII
- EPILOBIUM LATIFOLIUM L.
- EPILOBIUM PALUSTRE L.

Ophioglossaceae
- BOTRYCHIUM LUNARIA (L.) Sw.

Orchidaceae
- CALYPSO BULBOSA (L.) Oakes
- CORALLORRHIZA TRIFIDA Chatel.
- CYPRIPEDIUM GUTTATUM Sw. ssp. GUTTATUM
- CYPRIPEDIUM PASSERINUM Richardson
- GOODYERA REPENS (L.) R. Br.
- HAMMARBYA PALUDOSA (L.) Kuntze
- LISTERA BOREALIS Morong
- PLATANTHERA HYPERBOREA (L.) Lindley
- PLATANTHERA OBTUSATA (Pursh) Lindley
- SPIRANTHES ROMANZOFFIANA Cham.

Orobanchaceae
- BOSCHNIAKIA ROSSICA (Cham. & Schldl.) B. Fedtsch.

Papaveraceae
- ESCHSCHOLZIA CALIFORNICA Cham.

Pinaceae
- LARIX LARICINA (Du Roi) K. Koch
- PICEA GLAUCA (Moench) Voss
- PICEA MARIANA (Miller) Britton, Sterns, Pogg.

Plantaginaceae
- PLANTAGO MAJOR L. var. MAJOR

Poaceae
- AGROSTIS SCABRA Willd.
- ALOPECURUS AEQUALIS Sobol.
- ALOPECURUS ALPINUS Smith

ALOPECURUS PRATENSIS L.
ARCTAGROSTIS LATIFOLIA (R. Br.) Griseb. var. ARUNDINACEA (Trin.) Griseb.
ARCTOPHILA FULVA (Trin.) Andersson
AVENA FATUA L.
BECKMANNIA ERUCAEFORMIS (L.) Host
BROMOPSIS INERMIS (Leysser) Holub
BROMOPSIS PUMPELLIANA (Scribner) Holub ssp. PUMPELLIANA CALAMAGROSTIS CANADENSIS (Michaux) P. Beauv.
CALAMAGROSTIS INEXPANSA A. Gray
CALAMAGROSTIS LAPPONICA (Wahlenb.) Hartman F.
CALAMAGROSTIS NEGLECTA (Ehrh.) Gaertner
CALAMAGROSTIS PURPURASCENS R. Br.
DESCHAMPSIA CESPITOSA (L.) P. Beauv.
ELYMUS ALASKANUS (Scribner & Merr.) A. Loeve ssp. BOREALIS (Turcz.) A. Loeve & D. Loeve
ELYMUS MACROURUS (Turcz.) Tzvelev
ELYMUS SUBSECUNDUS (Link) A. Loeve & D. Loeve
ELYMUS TRACHYCAULUS (Link) Gould ex Shinners
ELYMUS TRACHYCAULUS (Link) Gould ex Shinners ssp. TRACHYCAULUS ELYMUS TRACHYCAULUS (Link) Gould ex Shinners ssp. VIOLACEUS (Hornem.) A. Loeve & D. Loeve
ELYTRIGIA REPENS (L.) Nevski
ELYTRIGIA SPICATA (Pursh) D. R. Dewey
FESTUCA ALTAICA Trin.
FESTUCA BRACHYPHYLLA Schultes & Schultes F.
FESTUCA LENENSIS Drobov
FESTUCA SAXIMONTANA Rydb.
GLYCERIA BOREALIS (Nash) Batch.
GLYCERIA MAXIMA (Hartman F.) O. Holmb.
GLYCERIA PULCHELLA (Nash) Schum.
HIEROCHLOE ALPINA (Sw.) Roemer & Schultes
HIEROCHLOE ODORATA (L.) P. Beauv.
HORDEUM BRACHYANTHERUM Nevski
HORDEUM JUBATUM L.
LEYMUS INNOVATUS (Beal) Pilger
LOLIUM MULTIFLORUM Lam.
PHLEUM PRATENSE L.
POA ALPINA L.
POA ANNUA L.
POA ARCTICA R. Br.
POA GLAUCA M. Vahl
POA PALUSTRIS L.

POA PRATENSIS L.
PUCCINELLIA BOREALIS Swallen
PUCCINELLIA T. Sorensen
TRISETUM SPICATUM (L.) K. Richter

Polemoniaceae
COLLOMIA LINEARIS Nutt.
POLEMONIUM ACUTIFLORUM Willd.

Polygonaceae
BISTORTA PLUMOSA (Small) E. Greene
BISTORTA VIVIPARA (L.) Gray
POLYGONUM ALASKANUM (Small) W. Wight
POLYGONUM AMPHIBIUM L.
POLYGONUM AVICULARE L.
POLYGONUM CONVOLVULUS L.
POLYGONUM LAPATHIFOLIUM L.
POLYGONUM PENNSYLVANICUM L. ssp. ONEILLII (Brenckle) Hulten
RUMEX ARCTICUS Trautv.
RUMEX FENESTRATUS E. Greene
RUMEX MEXICANUS Meissner
RUMEX SIBIRICUS Hulten

Polypodiaceae
POLYPODIUM VULGARE L. ssp. COLUMBIANUM (Gilbert) Hulten

Potamogetonaceae
POTAMOGETON ALPINUS Balbis
POTAMOGETON EPIHYDRUS Raf.
POTAMOGETON FILIFORMIS Pers.
POTAMOGETON FRIESII Rupr.
POTAMOGETON GRAMINEUS L.
POTAMOGETON PECTINATUS L.
POTAMOGETON PRAELONGUS Wulfen
POTAMOGETON PUSILLUS L. var. TENUISSIMUS Mert. & Koch
POTAMOGETON RICHARDSONII (A. Bennett) Rydb.
POTAMOGETON VAGINATUS Turcz.
POTAMOGETON ZOSTERIFORMIS Fernald

Primulaceae
ANDROSACE SEPTENTRIONALIS L.
DODECATHEON PULCHELLUM (Raf.) Merr. ssp. PAUCIFLORUM (E. Greene) Hulten

LYSIMACHIA THYRSIFLORA L.
PRIMULA INCANA M. E. Jones
TRIENTALIS EUROPAEA L. ssp. ARCTICA (Fischer) Hulten

Pyrolaceae
MONESES UNIFLORA (L.) A. Gray
ORTHILIA SECUNDA (L.) House
ORTHILIA SECUNDA (L.) House ssp. OBTUSATA (Turcz.) Bocher
PYROLA ASARIFOLIA Michaux
PYROLA CHLORANTHA Sw.
PYROLA GRANDIFLORA Radius

Ranunculaceae
ACONITUM DELPHINIFOLIUM DC.
ACTAEA RUBRA (Aiton) Willd.
ANEMONE NARCISSIFLORA L. var. MONANTHA DC.
ANEMONE PARVIFLORA Michaux
ANEMONE RICHARDSONII Hook.
AQUILEGIA BREVISTYLA Hook.
CALTHA NATANS Pallas
CALTHA PALUSTRIS L.
CONSOLIDA AMBIQUA (L.) P. Bass & Heyw.
DELPHINIUM GLAUCUM S. Watson
PULSATILLA PATENS (L.) Miller
RANUNCULUS GMELINII DC.
RANUNCULUS HYPERBOREUS Rottb.
RANUNCULUS LAPPONICUS L.
RANUNCULUS MACOUNII Britton
RANUNCULUS PENNSYLVANICUS L. F.
RANUNCULUS REPTANS L.
RANUNCULUS SCELERATUS L. ssp. MULTIFIDUS (Nutt.) Hulten
RANUNCULUS TRICHOPHYLLUS Chaix
THALICTRUM SPARSIFLORUM Turcz.

Rosaceae
AMELANCHIER ALNIFOLIA (Nutt.) Nutt.
COMARUM PALUSTRE L.
DRYAS DRUMMONDII Richardson
DRYAS OCTOPETALA L. var. OCTOPETALA
FRAGARIA VIRGINIANA Duchesne
GEUM PERINCISUM Rydb.
PENTAPHYLLOIDES FLORIBUNDA (Pursh) A. Loeve
POTENTILLA ARGUTA Pursh

POTENTILLA EGEDII Wormsk.
POTENTILLA HOOKERIANA Lehm.
POTENTILLA MULTIFIDA L.
POTENTILLA NORVEGICA L.
POTENTILLA PENSYLVANICA L.
POTENTILLA UNIFLORA Ledeb.
POTENTILLA VIRGULATA Nelson
ROSA ACICULARIS Lindley
ROSA WOODSII Lindley
RUBUS ARCTICUS L. ssp. ARCTICUS
RUBUS CHAMAEMORUS L.
RUBUS IDAEUS L.
SANGUISORBA OFFICINALIS L.
SORBUS SCOPULINA E. Greene
SPIRAEA STEVENII (C. Schneider) Rydb.

Rubiaceae
GALIUM BOREALE L.
GALIUM BRANDEGEI A. Gray
GALIUM TRIFIDUM L. ssp. TRIFIDUM
GALIUM TRIFLORUM Michaux

Salicaceae
POPULUS BALSAMIFERA L. ssp. BALSAMIFERA
POPULUS TREMULOIDES Michaux
SALIX ALAXENSIS (Andersson) Cov. var. LONGISTYLIS (Rydb.) C. Schneider
SALIX ARBUSCULOIDES Andersson
SALIX ARCTICA Pallas
SALIX BEBBIANA Sarg.
SALIX BRACHYCARPA Nutt.
SALIX BRACHYCARPA Nutt. ssp. NIPHOCLADA (Rydb.) Argus
SALIX FUSCESCENS Andersson
SALIX GLAUCA L.
SALIX GLAUCA L. var. ACUTIFOLIA (Andersson) C. Schneider
SALIX HASTATA L.
SALIX Rowlee
SALIX LUCIDA Muhl. ssp. LASIANDRA (Benth.) Argus
SALIX MYRTILLIFOLIA Andersson
SALIX NOVAE-ANGLIAE Andersson
SALIX PHLEBOPHYLLA Andersson
SALIX PLANIFOLIA Pursh
SALIX PLANIFOLIA Pursh ssp. PULCHRA (Cham.) Argus
SALIX PSEUDOMONTICOLA C. Ball

SALIX SCOULERIANA J. Barratt

Santalaceae
GEOCAULON LIVIDUM (Richardson) Fern.

Saxifragaceae
CHRYSOSPLENIUM TETRANDRUM (N. Lund) T. C. E. Fries
PARNASSIA PALUSTRIS L.
SAXIFRAGA CERNUA L.
SAXIFRAGA NELSONIANA D. Don
SAXIFRAGA REFLEXA Hook.
SAXIFRAGA TRICUSPIDATA Rottb.

Scrophulariaceae
CASTILLEJA CAUDATA (Pennell) Rebrist.
CASTILLEJA ELEGANS Malte
EUPHRASIA DISJUNCTA Fern. & Wieg.
LINARIA VULGARIS Miller
PEDICULARIS CAPITATA J. Adams
PEDICULARIS LABRADORICA Wirs.
PEDICULARIS LANATA Cham. & Schldl.
PEDICULARIS LANGSDORFFII Fischer ex Steven
PEDICULARIS MACRODONTA Richardson
RHINANTHUS MINOR L.
SYNTHYRIS BOREALIS Pennell
VERONICA SCUTELLATA L.

Selaginellaceae
SELAGINELLA SIBIRICA (Milde) Hieron.

Sparganiaceae
SPARGANIUM ANGUSTIFOLIUM Michaux
SPARGANIUM HYPERBOREUM Laest.
SPARGANIUM MINIMUM (Hartman F.) Fries

Typhaceae
TYPHA LATIFOLIA L.

Urticaceae
URTICA DIOICA L. ssp. GRACILIS (Aiton) Selander

Valerianaceae
VALERIANA CAPITATA Pallas

Violaceae
VIOLA BIFLORA L.
VIOLA EPIPSILA Ledeb.
VIOLA RENIFOLIA A. Gray
VIOLA TRICOLOR L.

APPENDIX E

Matrix of vascular plant taxa and the Floristic Collection Unit they were collected (C) or observed (X) in. See text for definition of Geographic Divisions and Floristic Collection Units.

NOTES:

xxVascular plants currently being tracked in the Alaska Natural Heritage Program's Biological Conservation Database.

RE Major range extensions (>150 km), not including introduced taxa, based on the maps in Hulten (1968)

re Minor range extensions (<150 km), not including introduced taxa, based on the maps of Hulten (1968).

APPENDIX F

List of Fort Wainwright vascular plants currently being tracked by the Alaska Natural Heritage Program's Biological Conservation Database for interior Alaska with global (G) and state (S) rankings*****.

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

*****The Nature Conservancy's ranking system assigns each taxon a global and a state rank from 1 - 5 based on several factors such as abundance, range, degree of threat, existing

protection, and the number of occurrences. These ranking categories are as follows:

Alaska Natural Heritage Program Rare Species Global Rankings

G1: Critically imperiled globally (typically 5 or fewer occurrences, or very few remaining individuals or acres).
G2: Imperiled globally (typically 6 - 20 occurrences, or few remaining individuals or acres).
G3: Either very rare and local throughout its range or found locally in a restricted range (typically 21 - 100 occurrences).
G4: Apparently secure globally.
G5: Demonstrably secure globally.
G#Q: Taxonomically questionable.
G#T#: Global rank of species and global rank of the described variety or subspecies.
G#G#: Global rank of species uncertain, best described as a range between the two ranks.

Alaska Natural Heritage Program Rare Species State Rankings

S1: Critically imperiled in state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state (typically 5 or fewer occurrences, or very few remaining individuals or acres).
S2: Imperiled in state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (typically 6 - 20 occurrences, or few remaining individuals or acres).
S3: Rare or uncommon in the state (typically 21 - 100 occurrences).
S4: Apparently secure in state, with many occurrences.
S5: Demonstrably secure in state, with many occurrences.
SR#: Reported from the state, but not yet verified.
SP: Occurring in nearby state or province; not yet reported in state, but probably will be encountered with further inventory.
S#S#: State rank of species uncertain, best described as a range between the two ranks.

LIST OF PLATES

Plate 1. Tanana River approximating the boundary between the Yukon-Tanana Upland and the Tanana Flats section of the Tanana-Kuskokwim Lowlands Geographic Divisions (Wahrhaftig 1965). Note braided channels and islands in early stages of plant succession, and late-successional riparian spruce forests that parallel the river.

Plate 2. View northwest across the Tanana Flats to the south-facing grassland slopes of the Wood River Buttes.

Plate 3. View west across alpine and slope forest habitats of the Yukon Maneuver Area in the Yukon-Tanana Upland Geographic Division. Note numerous rocky tors along ridgeline in the center of the picture.

Plate 4. Contrasting forest vegetation of north-facing vs. south-facing slopes due to dry continental climate and low sun angles. Much of the alpine zone is covered by a crowberry (*Empetrum hermaphroditum*)/blueberry (*Vaccinium uliginosum*) dwarf shrub tundra (foreground).

Plate 5. A closed aspen (*Populus tremuloides*) broadleaf forest on a south-facing slope.

Plate 6. A closed paper birch (*Betula papyrifera*) broadleaf forest.

Plate 7. A north-facing slope of the Yukon Maneuver Area covered by an open black spruce (*Picea mariana*) needleleaf forest.

Plate 8. An open balsam poplar (*Populus balsamifera*) broadleaf forest along the Tanana River.

Plate 9. A closed riparian white spruce (*Picea glauca*) needleleaf forest on the Tanana River floodplain.

Plate 10. An open black spruce (*Picea mariana*) needleleaf forest type of lowland sites.

Plate 11. A shrub birch (*Betula nana*)-sweet gale (*Myrica gale*) low-shrub bog community on a floating mat surrounding a typical bog lake of the study area. Note aquatic community of yellow water-lily (*Nuphar polysepala*).

Plate 12. Treeless, alpine, ridge crest and dome habitats of the Yukon Maneuver Area supporting dwarf shrub plant communities. A *Dryas* spp.-sedge-lichen dwarf shrub tundra occurs along the higher more exposed ridges and slopes (foreground).

Plate 13. Sparsely vegetated alpine tors supporting scattered herbs, mosses and lichens.

Plate 14. Alder (*Alnus* spp.) closed tall shrub communities occupying stabilized islands of the Tanana River floodplain.

Plate 15. A willow (*Salix* spp.) closed low shrub community associated with an open black spruce (*Picea mariana*) needleleaf forest in the lowlands of the Yukon Maneuver Area.

Plate 16. A dwarf birch (*Betula nana*)-sweetgale (*Myrica gale*)-*Sphagnum* moss bog surrounding Manchu Lake in the lowlands of the Yukon Maneauver Area. Note the wet sedge (*Carex* spp.) meadow occupying a depression in the foreground.

Plate 17. A wet sedge meadow surrounding a bog lake in the Blair Lakes Floristic Collection Unit on the Tanana Flats.

Plate 18. A dwarf birch (*Betula nana*)-tussock sedge (*Eriophorum vaginatum*) bog typical of the Lowlands Floristic Collection Unit of the Tanana Flats.

Plate 19. Aerial view of the Fen Floristic Collection Unit on the Tanana Flats. These floating mats occur as long linear corridors oriented southeast to northwest and support a graminoid forb community. An airboat trail runs down the center.

Plate 20. A fen floating mat community dominated by buckbean (*Menyanthes trifoliata*) and sedges (*Carex* spp.).

Plate 21. Grassland communities on south-facing slopes of the Wood River Buttes, Tanana Flats.

Plate 22. Grassland communities on south-facing slopes of Birch Hill north of the Cantonment Area. Note the dwarf birch (*Betula nana*)-tussock sedge (*Eriophorum vaginatum*) bog in foreground.

Plate 23. An artificially cleared and disturbed area (Wainwright community gardens) typical of the Cantonment Area supporting a heterogenous mix of a wide variety of native and introduced plant species.

Plate 24. A closed alder (*Alnus* spp.) tall shrub community occupying a roadside and an old Nike missile site on the Yukon Maneuver Area.

Plate 25. Blair Lakes Floristic Collection Unit on the Tanana Flats.

Plate 26. View south across the Lowlands Floristic Collection Unit of the Tanana Flats from the north end of Clear Creek Butte.

Plate 27. View west of the Slope Forests Floristic Collection Unit from the Lowlands Floristic Collection Unit in the Yukon Maneuver Area. Note contrasting forest vegetation of north- and south-facing slopes.