NATIONAL WETLANDS INVENTORY
NOTES TO USERS FOR
UPPER GULF OF ALASKA
(BERING GLACIER, ICY BAY and YAKUTAT)
1:63,360-SCALE MAPS

INTRODUCTION

User reports are generally prepared for each completed 1:250,000-scale map area. These notes describe the general landform features and vegetation communities and serve to familiarize the user with the various mapping conventions.

Due to the homogeneity of the upper Gulf of Alaska, only one User Report has been produced for this area. This report incorporates the indicated 1:63,360-scale wetlands maps within each of the following 1:250,000-scale quadrangle areas:

Yakutat	Icy Bay
(A) 1, 2, 3	(D) 1, 2/3
(B) 1, 2, 3, 4, 5	
(C) 3, 4, 5, 6, 7, 8	Bering Glacier
(D) 3, 4, 5, 6, 7, 8	(A) 1, 2, 3, 4, 5, 6, 7, 8

WETLAND LEGISLATION

The U.S. Fish and Wildlife Service (Service) has major responsibility for the protection and proper management of fish, wildlife and their habitats. The Fish and Wildlife Coordination Act authorizes the Secretary of the Interior "to make surveys and investigations of the wildlife of the public domain including lands and waters or interests therein acquired or controlled by any agency of the United States" (16 U.S.C. 669). This Act expands the concept of wildlife and wildlife resources to include not only animal life but also all types of "aquatic and land vegetation upon which wildlife is dependent". Within the last thirty years, a large amount of wetland modification has occurred. Increased emphasis on wetland preservation and management has been expressed through presidential executive orders and recent legislation. Amendments to the Clean Water Act of 1977 (33 U.S.C. 466) specify a major role for the National Wetlands Inventory in the administration of that act. The Emergency Wetlands Act of 1986 (16 U.S.C. 3901) directs the Service to continue the inventory of wetlands through 1998.

WETLAND FUNCTIONS AND VALUES

The Service has always recognized the importance of wetlands to waterfowl and other migratory birds. Consequently, the Service has a direct interest in protecting wetlands, especially the waterfowl breeding and overwintering wetlands. Wetlands, however, also provide a wealth of other values for the public including:

(1) Fish and shellfish protection.

(2) Furbearer and other wildlife production.

(3) Habitats for threatened or endangered plants and animals.

(4) Flood control through temporary storage of flood waters.

(5) Water quality maintenance by removing silt load, filtering pollutants, and absorbing waterborne chemicals and nutrients.

(6) Erosion buffers to protect upland areas.

(7) Groundwater recharge and stream flow maintenance.

(8) Saltwater intrusion control.

(9) Coastal storm damage reduction.

(10) Open space for aesthetic appreciation and recreational activities.

Because of their public values, wetlands represent one of the Nation's most important natural resources.

NATIONAL WETLANDS INVENTORY PROGRAM

The National Wetlands Inventory (Inventory) Program was initiated in 1975 and made operational in 1977. The primary goal of the Inventory is to generate and disseminate scientific information on the characteristics, extent, and trends of the Nation's wetlands. The purpose of this information is to foster wise use of wetlands and to provide data for making responsible resource decisions.

Two types of information are produced through the Inventory: detailed wetlands maps and status and trends reports. Detailed wetlands maps are produced for geographic areas of critical concern for impact assessments of site-specific projects. The maps may be utilized by local, state and federal agencies as well as by private industry and organizations for

comprehensive resource management planning, environmental impact assessments, permit reviews, facility and corridor siting, oil spill contingency plans, natural resource inventories, wildlife surveys and other uses. Estimates of the current status and trends (i.e., losses and gains) of wetlands provide information for reviewing the effectiveness of existing programs and policies, for identifying national or regional land-use problems and allocation, and for general public awareness. A summary of the major objectives of the Inventory project is as follows:

(1) Develop wetland maps and a computer data base on the extent and type of wetlands.

(2) Reproduce and disseminate wetland map products and reports.

(3) Assist all potential users in the interpretation of Inventory products.

(4) Develop wetland status and trends reports.

(5) Develop and implement a capability for updating inventory data to meet changing user needs.

(6) Continue development and implementation of the U.S. Fish and Wildlife Service's wetlands classification system.

(7) Correlate existing wetlands values information to the wetlands classification system.

(8) Provide expert technical assistance in the areas of wetland ecology, botany, soils and hydrology.

DEVELOPMENT OF THE WETLAND CLASSIFICATION SYSTEM

The Service's wetlands classification system was developed by Cowardin, et al. and is titled Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS - 79/31). The major purposes of the wetland classification system are:

(1) To describe ecological units having certain common natural attributes;

(2) To arrange these units in a system that will facilitate resource management decisions;

(3) To furnish units for inventory and mapping; and

(4) To provide uniformity in wetland concepts and terminology throughout the United States.

The wetlands classification system defines the limits of wetlands according to ecological characteristics and not according to administrative or regulatory programs. Three key attributes define the term "wetland": (1) the presence of wetland plants (hydrophytes) or (2) the presence of wet soils (hydric soils) or (3) soil saturation or flooding. Wetlands are naturally extremely diverse and complex. The classification system presents a method for grouping ecologically similar wetlands.

The classification system is hierarchial with wetlands divided among five major Systems at the broadest level: Marine, Estuarine, Riverine, Lacustrine and Palustrine. Each System is further subdivided by Subsystems which reflect hydrologic conditions (e.g., subtidal vs. intertidal in the Marine and Estuarine Systems). Below Subsystem is the Class level, which describes the appearance of the wetland in terms of vegetation (e.g., Emergent, Aquatic Bed, Scrub-Shrub, Forested) or substrate where vegetation is inconspicuous or absent (e.g., Unconsolidated Shore, Rocky Bottom, Streambed). Each Class is further subdivided into Subclasses. The classification system also includes modifiers for hydrology (water regime), water chemistry (pH, salinity and halinity) and special modifiers relating to man's activities (e.g., impounded, partly drained, farmed, excavated, artificial), or the activity of beavers.

MAP PREPARATION

To produce final Inventory maps, seven steps must be completed: (1) preliminary field investigations, (2) photointerpretation of high-altitude photographs, (3) review of existing wetlands information, (4) quality control of interpreted photography, (5) draft map production, (6) interagency review and field checking of draft maps, and (7) final map production.

The Service participates with other Federal and state agencies in the Alaska High-Altitude Aerial Photography Program. This program has obtained 1:60,000-scale color-infrared photography that covers approximately ninety percent of Alaska. With the high-altitude photography, the Inventory is capable of detailed wetlands mapping with a minimum mapping size of two to three acres. When the aerial photography is viewed through a stereoscope, the photointerpreter has the ability to see wetlands in three dimensions. The photointerpreter analyzes the vegetation, landforms, slope, and drainage patterns when identifying and classifying wetlands. This photo information is used in conjunction with ancillary data (e.g.; soil surveys, topographic maps, etc.), and data obtained during field investigations.

The primary map product is a large-scale map (1:63,360) which shows the location, shape, and characteristics of wetlands and deepwater habitats on a U.S. Geological Survey's topographic map.

All photography used for compiling these Upper Gulf of Alaska wetlands maps are color-infrared, vertical aerial photographs at scales ranging between 1:60,000 and 1:66,000. All photography was flown during periods of peak vegetative cover (late June through early September) from 1978 through 1984 (see Table 1). Field investigations were conducted in August of 1986 and August of 1987.

Table 1. Aerial photography used for Upper Gulf of Alaska wetlands mapping.

Quadrangle	Photography Date Scale Type
Bering Glacier	
A-1	8/78 1:65,000 CIR *
	8/84 1:65,000 CIR
A-2	8/78 1:65,000 CIR
	8/84 1:65,000 CIR
A-3	8/78 1:65,000 CIR
	7/82 1:65,000 CIR
	8/84 1:65,000 CIR
A-4	8/78 1:65,000 CIR
	7/82 1:65,000 CIR
	8/84 1:65,000 CIR
A-5	8/78 1:66,000 CIR
	7/82 1:65,000 CIR
A-6	8/78 1:66,000 CIR
	7/82 1:65,000 CIR
A-7	7/82 1:65,000 CIR
	8/82 1:66,000 CIR
A-8	8/78 1:66,000 CIR
	7/83 1:65,000 CIR
Icy Bay	
D-1	6/78 1:60,000 CIR
	8/78 1:60,000 CIR
D-2/3	6/78 1:60,000 CIR
	8/78 1:60,000 CIR
	8/84 1:60,000 CIR

Yakutat	
A-1	6/78 1:60,000 CIR
	8/79 1:60,000 CIR
	9/81 1:60,000 CIR
A-2	6/78 1:60,000 CIR
	9/81 1:60,000 CIR
A-3	6/78 1:60,000 CIR
	9/81 1:60,000 CIR
B-1	6/78 1:60,000 CIR
	9/81 1:60,000 CIR
B-2	6/78 1:60,000 CIR
	9/81 1:60,000 CIR
B-3	6/78 1:60,000 CIR
	9/81 1:60,000 CIR
B-4	6/78 1:60,000 CIR
B-5	6/78 1:60,000 CIR
C-3	8/78 1:65,000 CIR
C-4	6/78 1:60,000 CIR
C-5	6/78 1:60,000 CIR
C-6	6/78 1:60,000 CIR
C-7	6/78 1:60,000 CIR
C-8	6/78 1:60,000 CIR
D-3	6/78 1:60,000 CIR
D-4	6/78 1:60,000 CIR
D-5	6/78 1:60,000 CIR
D-6	6/78 1:60,000 CIR
D-7	6/78 1:60,000 CIR
D-8	6/78 1:60,000 CIR

* CIR - Color infrared

Collateral information used in this mapping effort included the Soil Conservation Service's Exploratory Soil Survey of Alaska, the Soil Survey for the City of Yakutat, and the U.S. Geological Survey's topographic maps.

MAPPING PRIORITIES

Mapping priorities are based principally on the needs of the Service and other Federal and state agencies. The priority areas for mapping in Alaska include the coastal zone, population centers, transportation corridors, agriculture development areas, waterfowl habitat areas, and North Slope oil and gas development areas. As of October 1991, the Inventory has produced wetlands maps for approximately 22 percent of Alaska. The Inventory is currently mapping wetlands in Alaska at the rate of two percent annually.

MAPPING CONVENTIONS AND SPECIAL MAPPING PROBLEMS

* Wetlands are classified according to the Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

* Some classes or subclasses within a classified polygon have not been delineated if the amount of detail was deemed excessive. Therefore, some classes became undelineated inclusions within another class. These polygons are labelled with a mixed-class alpha-numeric. A maximum of two wetland classes, or subclasses, are used in each label.

* Generally, the vegetative class which is spatially dominant is listed first. The second cover type of a mixed class alpha-numeric comprises at least 30 percent or more of the unit mapped but not more than 50 percent (e.g., PEM1/SS1B).

* An attempt was made to covertype wetlands according to their state at maximum vegetation development at the average low water level.

* The aerial photography prevails as the data source for mapping except where reliable collateral data is available. Changes which have taken place since the time of the photography (wetland gains or losses) were not included in the mapping effort.

* Substrate subclass divisions are made on the basis of material which represents more than 50 percent of the total area of the unit delineated.

* All wetlands are labelled using an alpha-numeric code which corresponds to the appropriate covertype listed in the Service's wetlands classification system. All upland (non-wetland) areas are labeled with an inverted omega symbol (℧).

* All linear wetlands and deepwater habitats are indicated by a dashed line. Linears are not included if they result in the crowding of polygons and code symbols. Changes in classification along a linear are indicated by a perpendicular solid line drawn across the linear.

* Small areas obscured by snow, shadow or light cloud cover have been approximated from the U.S. Geological Survey's topographic maps or other collateral information. Areas totally obscured, and consequently not mapped, are labeled "photography unavailable".

NATIONAL LIST OF WETLAND PLANT SPECIES

The Service has prepared a National List of Plant Species that Occur in Wetlands: Alaska Region A, 1988 which assigns an "indicator" to each plant species found in wetlands. This wetland indicator describes the frequency of occurrence of an individual species in wetlands versus non-wetlands within the State (similar plant lists are available for other Regions and states in the United States). Appendix A lists both the common name and scientific name, as well as the wetland indicator, for all wetland plants described in this text. The following wetland indicators have been assigned to plants which occur in wetlands:

Obligate (OBL): Always found in wetlands under natural (not planted) conditions (frequency greater than 99 percent), but may persist in non-wetlands if planted there by man or in wetlands that have been drained, filled, or otherwise transformed into non-wetlands.

Facultative Wetland (FACW): Usually found in wetlands (67-99 percent frequency), but occasionally found in non-wetlands.

Facultative (FAC): Sometimes found in wetlands (34-66 percent frequency), but also occurs in non-wetlands.

Facultative Upland (FACU): Seldom found in wetlands (1-33 percent frequency) and usually occurs in non-wetlands.

Non-wetland (UPL): Does not occur in wetlands within the State of Alaska (frequency less than 1 percent).

DESCRIPTION OF STUDY AREA

The study area stretches more than 200 miles along a coastal fringe between Glacier Bay National Park, then across the northern arc of the Gulf of Alaska, to Cape Suckling. The Saint Elias Mountains and the Chugach Mountains form a backdrop to the temperate rainforest nestled between glacial ice fields and the sea. Such outstanding features as the Malaspina Glacier, the Bering Glacier, Russell Fjord, the Situk and Alsek Rivers and the immense estuaries of Yakutat Bay and Icy Bay stand out as formidable obstacles on the landscape.

The Gulf of Alaska coast is a narrow plain less than 200 feet high. It is characterized by numerous outwash plains and belts of unsorted glacial material and marked in places by longitudinal beach and dune ridges. Short meltwater streams cross the lowlands, carrying great volumes of sediment to the sea. A few large lakes, such as Harlequin Lake in the Yakutat area, occupy ice-carved basins. One of the most striking features of the coastal plain is the Malaspina Glacier, the largest piedmont glacier in the world.

In the northern part of the region lie the spectacular Saint Elias Mountains which extend across the border into Canada. They include more than a dozen isolated massifs that rise 14,000 to 19,000 feet. Still glacially active, the Saint Elias Mountain region is the third largest glaciated area in the world. Local relief is extensive, traversing jagged cliffs and basins of glacial ice field. Drainage is almost entirely by glaciers which are fed by extensive ice fields, such as the Bagly Ice Field.

Climate is one of the primary determinants of the northern Gulf of Alaska environment. Continual, relentless rain makes for lush forests of *Picea sitchensis* and *Tsuga heterophylla*. Precipitation also collects in depressions and forms sheets of slow moving water in foreland areas; the result being hundreds of square miles of seasonally flooded to permanently flooded freshwater marsh and shrub bog areas.

The Gulf of Alaska exerts a strong influence on the climate of this area. Winds are strong and storms, originating in the upper Gulf, are frequent and violent. The ocean, acting as a source of heat and moisture, produces mild temperatures and high rainfall/snowfall as clouds release moisture before climbing over the coastal mountain ranges.

The climate is primarily maritime within the coastal forest fringe. This accounts for the relatively small seasonal variations in temperature (average temperature of 40F). Coupled with high humidity, high precipitation (over 100 inches/year) and considerable cloudiness, these climatic conditions have produced a vegetation type found only along the Pacific Northwest coast.

Cape Yakataga	Mean Annual Precipitation:	103"
	Mean Seasonal Temperature:	30F (winter)
		50F (summer)
	Extreme Temperatures:	-11F to 78F
Yakutat	Mean Annual Precipitation:	55"
	Mean Seasonal Temperature:	25F (winter)
		50F (summer)
	Extreme Temperatures:	-24F to 84F
	Average Wind:	7 knots (east)
	Extreme Wind:	65 knots (east)

These cool, moist conditions produce a lush forest growth. The forest is broken here and there by rainshadow areas, muskegs, spruce bogs, glacial outwash plains and marshlands in the river valleys and deltas. The Yakutat Forelands, stretching from Yakutat Bay to the Alsek River, is an expansive plain of wetland areas.

High precipitation and cool temperatures slow decomposition of organic matter and are a major reason that soils along the upper Gulf of Alaska are covered with a thick organic duff layer that is high in organic content and constantly moist. The dark coloration of many

streams is largely due to iron and tannic acid staining from organic soil runoff.

Most plant roots, even those of the 200 foot tall *Picea sitchensis*, grow in the duff layer close to the ground surface, with only minimal root penetration into the mineral soil. The influence of microorganisms is also limited due to the lower soil temperatures and the acidic soil conditions.

TERRESTRIAL and AQUATIC VEGETATION

Coastal *Picea sitchensis-Tsuga heterophylla* Forest: The coastal forest system, primarily *Picea sitchensis* and *Tsuga heterophylla*, is an extension of the rainbelt forests along the Pacific coast. Timberline stays fairly constant at around the 1,000 foot level, increasing to about 2,000 feet at the extreme western end of the study area. Deciduous hardwood trees (e.g. *Populus balsamifera*) are present primarily within stream floodplains. The forest requires cool temperatures, high humidity and abundant rainfall. Soil types and conditions vary greatly throughout the forested area. This vegetation type generally occurs in areas where permafrost is absent. Typical vegetation may include:

Trees:

Sitka spruce	*Picea sitchensis*
Western hemlock	*Tsuga heterophylla*
Mountain hemlock	*Tsuga mertensiana*
Alaska cedar	*Chamaecyparis nootkatensis*
Black cottonwood	*Populus balsamifera*

Shrubs:

Sitka alder	*Alnus sinuata*
Devil's club	*Oplopanax horridus*
Salmonberry	*Rubus spectabilis*
Willow	*Salix* spp.
Pacific red elder	*Sambucus racemosa*
Rusty menziesia	*Menziesia ferruginea*
Copperbush	*Cladathamnus pyrolaeflorus*
Blueberry	*Vaccinium* spp.

Grasses, herbs and others:

Reed grass	*Calamagrostis* spp.
Lyme grass	*Elymus arenarius*
Lichens	
Mosses	

Alpine Tundra: This community generally lies above the 2,500 foot level. It occupies the region above the coastal forest and is separated from it by a subalpine or transition zone. Low, mat-forming vegetation covers much of the area and cushionlike plants occupy crevices on exposed outcrops and talus slopes. Although soils are generally thin, gravelly, and stony, organic soils may form locally in depressions. Snowpack and wind abrasion are considerable in this zone, and resident plants have adopted low growth habits to survive. Snow remains in some glacial basins year-round, particularly on north-facing slopes. Important plants of the Alpine Tundra community include:

Shrubs:

Black crowberry	*Empetrum nigrum*
Aleutian heather	*Phyllodoce aleutica*
Mountain heather	*Cassiope Mertensiana*
Alaska blueberry	*Vaccinium alaskaense*
Arctic willow	*Salix arctica*
Nagoonberry	*Rubus arcticus*
Salmonberry	*Rubus spectabilis*
Alpine azalea	*Loiseleuria procumbens*

Herbs, mosses and others:

Nootka lupine	*Lupinus nootkatensis*
Saxifrage	*Saxifraga* spp.
Aven	*Geum calthifolium*
Club moss	*Lycopodium annotinum*
Sedge	*Carex* spp.
Deer cabbage	*Fauria crista-galli*
Coastal fleabane	*Erigeron peregrinus*
Dwarf dogwood	*Cornus canadensis*
Alpine blue grass	*Poa alpina*
Holy grass	*Hierochloe alpina*
Gentian	*Gentiana platypetala*
Sibbaldia	*Sibbaldia procumbens*
Anemone	*Anemone narcissiflora*
Arctic wormwood	*Artemisia arctica*
Luetkea	*Luetkea pectinata*

Grass-Sedge Meadow: Grass-sedge meadows usually lie at low elevations, often along the coast. The largest example is the Yakutat Forelands, a glacial outwash plain dissected by numerous stream channels. The vegetation consists mainly of grasses, sedges and other herbaceous vegetation. Many of the stream channels are bordered by thickets of *Salix* spp. The following plants are typical within this type:

Grass and sedges:

Lyme grass	*Elymus arenarius*
Fescue grass	*Festuca* spp.
Bluejoint	*Calamagrostis canadensis*
Spear grass	*Poa eminens*
Bent reed grass	*Calamagrostis nutkaensis*
Bent grass	*Agrostis* spp.
Manna grass	*Puccinellia pauciflora*
Meadow barley	*Hordeum brachyantherum*
Sedge	*Carex* spp.

Herbs:

Beach peavine	*Lathyrus japonicus*
Beach lovage	*Ligusticum scoticum*
Nootka lupine	*Lupinus nootkatensis*
Goose tongue	*Plantago maritima*
Sea beach sandwort	*Honkenya peploides*
Sea milkwort	*Glaux maritima*
Bedstraw	*Galium trifidum*
Western buttercup	*Ranunculus occidentalis*
Monkey flower	*Mimulus guttatus*

Muskegs and Low Brush Bogs: Interspersed throughout the forest and in low-lying basins are openings occupied by muskegs or bog plant communities and dominated by mosses (e.g. *Sphagnum* spp.), sedges, low shrubs, forbs, and a few scattered trees. Such areas are usually very wet, commonly with standing water or small ponds in the peaty substrate. In the coastal muskegs, *Tsuga heterophylla* and *Chamaecyparis nootkatensis* are commonly scattered over the drier portions of the muskeg, with shrubs dominant on exposed and dry sites. Tussocks of *Eriophorum* spp. may exist in some areas. Examples of this type vary greatly in areal extent, ranging from small pockets where drainage has been retarded to such broad expanses as portions of the Yakutat Forelands. In some areas they may even exist on fairly steep slopes. The underlying substrate is highly organic and usually ranges from less than two feet to more than 40 feet in thickness. Dead trees commonly ring these bogs. Common plants may include the following:

Trees:

Lodgepole pine	*Pinus contorta*
Alaska cedar	*Chamaecyparis nootkatensis*
Mountain hemlock	*Tsuga mertensiana*
Western hemlock	*Tsuga heterophylla*
Sitka spruce	*Picea sitchensis*

Shrubs:

Black crowberry	*Empetrum nigrum*
Labrador tea	*Ledum groenlandicum*
Bog rosemary	*Andromeda polifolia*
Bog laurel	*Kalmia polifolia*
Bog cranberry	*Vaccinium microcarpus*
Willow	*Salix* spp.
Blueberry	*Vaccinium* spp.
Dwarf birch	*Betula nana*

Herbs, mosses and others:

Sphagnum	*Sphagnum* spp.
Cotton grass	*Eriophorum* spp.
Sedge	*Carex* spp.
Rush	*Juncus* spp.
Bulrush	*Scirpus* spp.
Skunk cabbage	*Lysichiton americanum*
Bracken fern	*Pteridium aquilinum*
Lichen	
Mosses	

High Brush areas: The dominant species in these dense to open deciduous brush systems range from dense *Salix* spp. along streams to dense *Alnus sinuata* above timberline. The type occurs between beach and forest, between treeline and alpine tundra, in avalanche paths through forests, on floodplains, and in old forest burn areas. Tree species may be present but are widely scattered. The high brush system occupies a great variety of soils, from poorly drained areas in low river valleys to well-drained shallow upland soils on moraines. Floodplain thickets develop quickly on periodically flooded river and stream alluvium. Such stands may reach 20 feet in height. The plants indicated below may be found within this vegetation type:

Shrubs:

Sitka alder	*Alnus sinuata*
Devil's club	*Oplopanax horridus*
Willow	*Salix* spp.
Currant	*Ribes* spp.
Blueberry	*Vaccinium* spp.
Raspberry	*Rubus* spp.
Soapberry	*Shepherdia canadensis*
Alaska spirea	*Spirea beauverdiana*
Thimbleberry	*Rubus parviflorus*
Salmonberry	*Rubus spectabilis*

Grasses, herbs and others:

Reed grass	*Calamagrostis* spp.
Fescue grass	*Festuca* spp.
Yarrow	*Achillea millefolium*
Nootka lupine	*Lupinus nootkatensis*
Jacob's ladder	*Polemonium* spp.
Horsetail	*Equisetum* spp.
Dwarf dogwood	*Cornus canadensis*
Fireweed	*Epilobium angustifolium*
Parsley fern	*Cryptogramma crispa*
Marsh fern	*Thelpteris phegopteris*
Lady fern	*Athyrium filix-femina*
Fragile fern	*Cystopteris fragilis*
Lichens	
Mosses	

Moist Tundra: This low-growing type usually forms a complete ground cover and is extremely productive during the growing season. Composition varies from almost continuous *Eriophorum* spp., with a sparse growth of sedges and dwarf shrubs, to stands where dwarf shrubs dominate. This type is generally characterized by tussocks of *Eriophorum* spp. Underlying soils vary from wet, shallow, and loamy with thin peat layers on upper slopes to deep, wet, clayey soils with peat in the river lowlands.

Shrubs:

Willow	*Salix* spp.
Dwarf birch	*Betula nana*
Labrador tea	*Ledum groenlandicum*
Sitka alder	*Alnus sinuata*
Lapland rosemary	*Rhododendron lapponicum*

Blueberry	*Vaccinium* spp.
Alpine azalea	*Loiseluria procumbens*
Mountain aven	*Dryas* spp.

Grasses, herbs and others:

Cotton grass	*Eriophorum* spp.
Polar grass	*Arctagrostis latifolia*
Reed grass	*Calamagrostis* spp.
Hair grass	*Deschampsia* spp.
Fescue grass	*Festuca* spp.
Lyme grass	*Elymus arenarius*
Bistort	*Polygonum bistorta*
Yarrow	*Achillea millefolium*
Geranium	*Geranium* spp.
Horsetail	*Equisetum* spp.
Fireweed	*Epilobium angustifolium*
Wood rush	*Luzula* spp.
Sedge	*Carex* spp.
Lichens	
Mosses	

Freshwater Aquatic: The lakes, ponds and streams support a greatly varied flora. These aquatic plants include the algae, graminoids and herbaceous species which grow in the more shallow fringes of the ponded basins.

Algae	*Chlorophyta*
Algae	*Cyanophyta*
Club moss	*Lycopodium* spp.
Spike moss	*Selaginella selaginella*
Quillwort	*Isoetes muricata*
Water horsetail	*Equisetum fluviatile*
Burreed	*Sparganium* spp.
Pondweed	*Potamogeton* spp.
Arrowhead	*Sagittaria cuneata*
Foxtail	*Alopecurus aequalis*
Manna grass	*Puccinellia pauciflora*
Spike rush	*Eleocharis palustris*
Water sedge	*Carex aquatilis*
Duckweed	*Lemna* spp.
Rush	*Juncus* spp.
Dwarf water lily	*Nymphaea tetragona*
Yellow pond lily	*Nuphar polysepalum*

Marsh marigold	*Caltha palustris*
Awlwort	*Subularia aquatica*
Water starwort	*Callitriche* spp.
Water milfoil	*Myriophyllum spicatum*
Mare's tail	*Hippuris* spp.
Water parsnip	*Sium suave*
Northern mudwort	*Limosella aquatica*
Bladderwort	*Utricularia* spp.

Estuarine vegetated areas: Various zones of vegetation, grading from marine to terrestrial, occur in the tidal marshes at the head of inlets, fjords and along low-lying coasts. In the lowest portions of the marsh, sedge and algae, commonly *Fucus* spp., are flooded twice daily by high tides. Slightly higher, although still flooded twice daily, is a zone characterized by *Puccinellia* spp. This zone often extends inland along major waterways entering salt water. A *Plantago* spp. community occurs slightly landward where flooding is light during the higher tides. Only the highest tides flood the *Elymus arenarius* zone occurring in the high intertidal zone. At the highest extent of the saltmarsh, in the transition area to terrestrial systems, is found a mixed *Carex* spp./*Juncus* spp. association. Areas of *Deschampsia* spp. may dominate this zone in some areas, particularly in the western portion of the study area. These marsh areas provide significant habitat for waterfowl. Plants typical of this zone may include:

Ditch grass	*Ruppia cirrhosa*
Horned pondweed	*Zanichellia palustris*
Goose tongue	*Plantago maritima*
Arrow grass	*Triglochin* spp.
Alkali grass	*Puccinellia* spp.
Sedge	*Carex* spp.
Rush	*Juncus* spp.
Reed grass	*Calamagrostis* spp.
Hair grass	*Deschampsia* spp.
Lyme grass	*Elymus arenarius*
Yarrow	*Achilla millefolium*
Chocolate lily	*Fritillaria camschatcensis*
Shooting star	*Dodecatheon pulchellum*
Buttercup	*Ranunculus* spp.
Beach peavine	*Lathyrus japonicus*
Indian paintbrush	*Castilleja* spp.
Marsh cinquefoil	*Potentilla palustris*

HYDRIC SOILS

Hydric soils have been defined by the U.S. Soil Conservation Service as soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Soils that were formerly wet, but are now completely drained, are not considered hydric soils. This condition must be determined on a site-specific basis. Also excluded from the definition of hydric soil are soils that were not naturally wet but are now subject to periodic flooding or saturation for specific management purposes (e.g. waterfowl impoundments) or flooded by accident (e.g. highway-created impoundments). Moreover, soils that are frequently flooded for short intervals, not long enough to support hydrophytes, do not represent hydric soils.

Hydric soils may be separated into two major categories on the basis of soil composition: (1) organic soils (histosols) and (2) mineral soils. In general, organic soils have more than 18 percent organic content, while mineral soils have less than 18 percent organic matter.

Buildup of organic matter results from prolonged anaerobic soil conditions associated with long periods of flooding and/or soil saturation during the growing season. These saturated conditions impede aerobic decomposition (or oxidation) of the bulk organic materials such as leaves, stems and roots, and encourage their accumulation as peat or muck over time. Consequently, most organic soils are characterized as very poorly drained soils. Organic soils typically form in water-logged depressions where peat or muck deposits range from one foot to more than forty feet in depth. Organic soils can be further subdivided into three groups based on the percentage of identifiable plant material in the soil: (1) muck (saprist) where two-thirds of the material is decomposed beyond recognition and one-third is identifiable plant remains; (2) peat (fibrist) with one-third decomposed and two-thirds identifiable; and (3) mucky peat or peaty muck (hemist) where between one-third and two-thirds of the material is both decomposed and identifiable.

In other wetlands, organic matter does not accumulate in the soil as peat or muck and here mineral soils have developed. These soils have standing water and/or are saturated within eighteen inches of the surface for at least one week during the growing season. Saturation may result from low-lying topographic position, groundwater seepage, or the presence of a slowly permeable layer (e.g., clay, confining bed, fragipan or hardpan). Poor aeration of these soils produces mottling characteristics associated with reduced iron. Mottling occurs where the water table fluctuates during the growing season. Poorly drained mineral soils have distinct mottles within six to ten inches of the surface, while mottling occurs immediately below the surface in very poorly drained mineral soils.

The major factors of soil formation are parent material, climate, vegetation, relief, and the passage of time. Climate, apart from its influence on soil properties, determines to a large

extent the kind of vegetation that grows in a particular area. The vegetation, in turn, has a profound influence on soil characteristics. The degree of modification of the parent material or rock by climatic or biologic forces and the degree of soil development depend largely on the length of time the soil-forming processes have been active. Local variations in relief also affect the nature and intensity of soil development.

The list of hydric or wetland soils for the Upper Gulf of Alaska area has been taken from the Soil Conservation Service's publication Exploratory Soil Survey of Alaska. Local soils information has been extracted from the Soil Conservation Service's soil survey Soils of the City of Yakutat. Published soil surveys for areas between Yakutat and Cape Suckling are not available. Limited soils information for the Yakutat Forelands area is contained in the U.S. Forest Service report Soils and Associated Ecosystems of the Tongass and the Yakutat Forelands IRI Study.

Within the study area are to be found broad areas of nearly level soils which occur on the floodplains of major streams. Most of these soils are formed in waterlaid sandy and silty sediments underlain by course sandy and gravelly materials. The depth to gravel ranges from only a few inches to many feet. Many of the soils have high seasonal water tables and are subject to flooding. The depth and frequency of flooding varies with the elevation and location of the soils in the valleys.

On the uplands, most of the soils are formed in glacial stony till which ranges from a few inches to many feet in thickness over bedrock. Generally, the steeper soils are very shallow and areas of these soils usually include rock outcrops. On benches and footslopes, where deposits of till are commonly thicker, many of the soils are poorly drained. The wet conditions are caused primarily by firm, compact, slowly permeable or impervious subsoil and substratum materials, which impede adequate percolation of water added to the soil by rains and by seepage from higher areas. On moraines and slopes that are not subject to seepage or runoff from higher areas, there are tracts of well drained soils.

Areas of very poorly drained peat soils occur both on the uplands and in the valleys. These soils have high water tables and are from about two feet to many feet thick over mineral materials. The peat materials, which are in various stages of decomposition, are derived from sedges, mosses, and woody vegetation.

Soils found within the mid to lower elevation areas of the northern coast of the Gulf of Alaska are represented by three distinct soil associations. The Typic Cryorthent-Typic Cryohemist association occupies the hilly moraines and sloping valleys which extend onto the coastal plain. The Typic Cryaquent-Typic Cryofluvent and Typic Cryaquent-Terric Sphagnofibrist associations encompass the outwash plains seaward of the glacial moraines. There are no detailed descriptions available for soils within high elevation zones of the study area.

Typic Cryorthent-Typic Cryohemist association: This association occupies moraines close to steep mountains and large glaciers. Sharply contrasting heavily forested hills and wet treeless sloping valleys and depressions are characteristic of the landscape. The moraines consist of very stony and gravelly till with large boulders on the surface. Sloping valleys and depressions between the hills are strongly affected by seepage, which has favored the accumulation of peaty material derived from sedges, mosses, and other water-tolerant plants. Elevations range from slightly above sea level near the coast to about 1,000 feet on the hilltops. The areas have a cool maritime climate with heavy precipitation, including snowfall. Summers are cool, and winters are relatively mild. There is no permafrost. The soils have severe limitations for intensive use, but many of the areas are suitable for forestry, wildlife habitat and recreation.

Approximately 60 percent of the soils within this association are considered upland soils. These include the Cryorthents and Cryorthods which are well drained soils on moraines. The following two hydric soil types account for the other 40 percent of this association:

> Typic Cryohemists - These are very poorly drained peat soils in valleys and in depressions in the moraines. They receive seepage from adjoining slopes, and the water table is usually near the surface. The peat is more than 50 inches thick and consists of dark brown to dark yellowish brown partially decomposed sedge fibers. The principal vegetation is sedges, mosses, and low shrubs.
>
> Terric Cryosaprists - These are very poorly drained soils in seepage areas on the slopes of moraines. Gradients range from about three to twenty percent. Under a thick mat of moss and forest litter, the soils consist of black, finely divided mucky peat about 16 to 50 inches thick over mottled gray very gravelly and stony till. The water table is usually near the surface. The soils commonly support a forest dominated by *Tsuga heterophylla.*

Typic Cryaquent-Typic Cryofluvent association: This association occupies outwash plains and alluvial fans between the foot slopes of coastal mountains and the coast. Although large areas are nearly level and less than 100 feet above sea level, a few hilly areas on dunes and moraines are included. The major streams are glacier fed and have broad floodplains braided with numerous channels. Many low areas are susceptible to frequent flooding, and a few areas along the coast are inundated by exceptionally high tides. The water table in these low areas is generally near the surface.

Most of the plains in the association consist of very gravelly outwash deposits capped with waterlaid sediment of variable thickness. Shallow basins on the plains are commonly filled with peat. Stabilized dunes of eolian sand border some of the beaches and parts of large floodplains. Hilly moraines near the mountains consist mainly of very gravelly and stony till.

The association occurs in a cool maritime climate. Summers are cool and winters are moderately cold. Precipitation, including snowfall, is heavy. The soils have no permafrost.

There are several principal types of vegetation in the association. Forests of *Picea sitchensis* and *Tsuga heterophylla* are dominant on the well drained soils on outwash plains, moraines, and stabilized dunes. Stands of *Populus balsamifera* and dense patches of tall *Salix* spp. brush are common on soils bordering the rivers and streams. Soils with a very high water table usually support sedges, mosses, *Salix* spp., and aquatic plants. Grasses, forbs, and patches of *Salix* spp. grow on some of the sandy soils along the beaches.

Most areas of the association are within the Tongass National Forest and are managed primarily for timber, wildlife and recreation. A few areas outside of the National Forest are used for expanded municipal and industrial development. In these areas, some of the soils that occupy low positions have severe limitations for intensive use because of flooding or high water tables.

Approximately 30 percent of the soils within this association are considered upland soils. These include the Cryorthods which are well drained soils, either gravelly or sandy, which occur on moraines, parts of outwash plains, and on stabilized coastal dunes. The following hydric soil types account for the other 70 percent of this association:

> Typic Cryaquents - These are poorly drained soils on low, nearly level areas of outwash plains and floodplains. The soils consist of 10 to 30 inches of mottled dark gray stratified silt loam and sand over loose very gravelly sand. The water table is usually near the surface and areas near streams are frequently flooded. The principal vegetation is sedges, mosses, and low *Salix* spp. and other shrubs.
>
> Typic Cryofluvents - This soil type occupies natural levees and terraces bordering floodplains. The soils have 10 to 30 inches of well drained dark gray silty and sandy waterlaid sediment containing black lenses and pockets of organic matter over coarse sand, gravel and cobblestones. Normally, the water table is more than three feet below the surface, but many areas are susceptible to occasional flooding. The dominant vegetation is a forest of either *Populus balsamifera* or *Picea sitchensis*.
>
> Terric Sphagnofibrists - These are very poorly drained organic soils in shallow basins of outwash plains. The water table is near the surface. The peat is derived chiefly from *Sphagnum* spp. moss and is 24 to 50 inches thick over sandy or loamy sediment. The vegetation is mainly mosses, sedges, and low shrubs.

<u>Typic Cryaquent-Terric Sphagnofibrist association</u>: This association occupies broad outwash plains. The plains commonly extend inland to the steep foot slopes of coastal mountains. Although most of the association is nearly level and less than 100 feet above sea level, a few hilly areas are included. Sandy beaches, tidal marshes, and a few small deltas are along the coast.

Most of the plains consist of sandy waterlaid sediment and irregular areas of fibrous peat that has accumulated in shallow basins. The water table is usually near the surface. Low

areas are frequently flooded by streams that originate in steep watersheds in the adjoining mountains. Many of the streams are glacier fed and have a rapidly fluctuating water level. Scattered terraces and natural levees bordering some of the streams are made up of very gravelly material capped with a thin mantle of silty and sandy sediment. These areas are slightly above the general level of the plains and the water table is usually deeper than four feet. Hilly sand dunes are common near the coast. A few moraines consisting of gravelly till occur near the mountains. This association is in a cool maritime climate. There is no permafrost.

The principal vegetation on outwash plains is sedges, mosses, and aquatic plants of coastal meadows, interspersed with many dense patches of tall *Alnus sinuata* and *Salix* spp. brush. Forests of *Tsuga heterophylla* and *Picea sitchensis* occur on moraines, a few terraces, and most of the stabilized dunes. Stands of *Populus balsamifera* are common on natural stream levees, and patches of grasses, forbs, *Salix* spp. and alder are on active dunes and low beach ridges along the coast.

Largely because of a high water table and frequent flooding, the dominant soils have severe limitations for crops, roads, and most other types of intensive use or development. Many of the soils support coastal meadows that are used heavily by migratory birds as stopover areas and nesting sites. Although their total acreage is small, a few soils are suitable for forage crops. These soils, which occur in small scattered areas on terraces and natural levees, are generally the best sites for roads and other types of development. The total acreage suitable for commercial forestry is small.

Approximately 15 percent of the soils within this association are considered upland soils. These include the Cryorthods and Cryorthents which are well drained sandy or gravelly soils on hilly dunes, moraines, and in parts of outwash plains. The following hydric soil types account for the other 85 percent of this association.

> Typic Cryaquents - These consist of poorly drained sandy waterlaid sediment on nearly level plains. Gradients are usually less than one percent. Flooding is frequent, and the water table is usually near the surface. The vegetation is mosses, sedges, low shrubs, and patches of tall *Salix* spp. and *Alnus sinuata* brush. In a typical profile these soils have a thin peaty surface layer over mottled dark gray stratified sand. The sandy material commonly contains thin layers of fine gravel and is two to four feet thick over very gravelly sand.
>
> Terric Sphagnofibrists - This soil consists of very poorly drained peat that has accumulated in shallow depressions on the outwash plains. The peat is less than 60 inches thick over dark gray silty and sandy stratified sediment. The water table is always near the surface. Reaction is extremely acid. Frost seldom penetrates deeper than a few inches. The vegetation is *Sphagnum* spp. moss, sedges, and low shrubs.

Typic Sphagnofibrists - These consist of very poorly drained peat more than 63 inches thick. The peat is soft and spongy, and the water table is always near the surface. Frost seldom penetrates deeper than a few inches. The vegetation is mainly *Sphagnum* spp. moss, sedges, and low shrubs.

Typic Cryofluvents - These are well drained soils on low terraces and natural levees. Gradients are usually less than two percent. The soils consist of about 10 to 20 inches of dark gray stratified silt and fine sand over loose very gravelly sand. These soils are subject to occasional flooding. The principal vegetation is a forest of *Picea sitchensis* and *Tsuga heterophylla*, but a few areas support stands of *Populus balsamifera* and patches of tall brush.

WETLANDS AND AQUATIC HABITATS

The following section describes the map codes used on the Upper Gulf of Alaska 1:63,360-scale wetlands maps. A general description and/or community type, including dominant vegetation, is provided for each code. Also, the color-infrared tones (signatures), which the photointerpreter must analyze, are described for many of the wetland types. Appendix A lists both the common name and scientific name for all wetland plants described in this text. A wetland indicator relating to the frequency of occurrence of individual plant species in wetlands is also given in Appendix A.

In the following section, some wetland types may have two or more codes. Within these codes the Class order (e.g., PSS1/EM1B and PEM1/SS1B) and/or Subclass order (e.g., PSS1/4B and PSS4/1B) may be rearranged. In each example, both codes in parenthesis consist of the same species and degree of water permanency; however, the relative proportion of plant species is different. If two vegetative classes (or subclasses) are given, the first class will represent 50 to 70 percent of the mapped wetland unit while the second class will represent 30 to 50 percent of the mapped wetland unit. A vegetative class or subclass must represent at least 30 percent of the area to be included in the wetland code.

Marine System

The Marine System is restricted to areas offshore of the coastal bars, flats and associated channels. Wetlands and deepwater habitats within the Marine System generally exhibit full sea strength salinity, the shorelines are exposed to the full impact of waves originating in the open ocean, and vegetation occurring along these shorelines reflects that found in and around open ocean areas.

M1UBL Subtidal, open water areas with direct exposure to the waves of the open ocean. Salinity is higher than in adjacent estuarine areas. On the CIR photograph, these aquatic marine areas will appear dark blue or black, indicating an absence of vegetation. Kelp may occur in this area and would

appear as a dark reddish tone. Glacial silt entering the ocean from streams will appear as a cream color.

M2USN Intertidal, regularly flooded unvegetated beaches and flats with direct exposure to the high-energy waves of the open ocean. The substrate is typically composed of black sand-sized particles possibly mixed with small amounts of glacial silt, especially around the mouth of estuaries. The photographic signature on the CIR photographs is a gray or light bluish tone.

M2USP Intertidal, irregularly flooded unvegetated beaches and flats. This type of area is directly exposed to the waves of the open ocean, but is flooded less often than daily. This area is identified on the CIR photography as being at a slightly higher elevation (high intertidal) than the M2USN type. The CIR tone will appear more whitish than the low intertidal area. The regularly flooded zone and the irregularly flooded zone are delineated separately if the result is two well-distinguished polygons. On many occasions the two polygons (M2USN and M2USP) were too narrow on the photograph to be distinguished separately in the field.

M2RSN Intertidal, regularly flooded, unvegetated areas of boulders and larger rocks, including bedrock. This signature appears as a very textured gray on the CIR photography. The beach area below the Grand Plateau Glacier exemplifies this wetland type.

M2AB1N Intertidal, regularly flooded algal areas composed primarily of *Fucus* sp. and some filamentous *Enteromorpha* sp. A substrate dominated by these algal species will usually be seen as an orange signature on the CIR photography.

Estuarine System

The Estuarine System is confined to bays, tidal marshes, some fjords, and brackish river channels. Estuarine areas exhibit a salinity lower than that found in the Marine System. Estuarine coastlines are considered low-energy since they are protected from the full force of wave action from the open ocean.

E1UBL Subtidal, low-energy, brackish water including the permanently flooded portions of bays, lagoons, fjords, and adjacent river channels. This wetland type also includes small brackish ponds which are inundated by high spring tides. This CIR signature of these areas is usually a deep blue. A glacial stream entering the estuary may result in a whitish signature due to the high reflectance of the silt particles. Vegetation is not present.

E1AB3L Subtidal, low-energy, brackish water vegetated with rooted vascular aquatic beds. Typically this is found in lagoons; the dominant species being *Zostera mariana*. The CIR photographic signature is generally pinkish mixed in with the blue of the open estuarine water. If the *Zostera mariana* is completely submerged, the CIR signature may show only as a slight darkening of the blue tone beneath the water.

E2USN Intertidal, low-energy, regularly flooded, unvegetated beaches and flats. Typically the substrate is of glacially-derived silt or sand. The CIR signature of this wetland type is gray, or, if covered by very shallow water, a darker gray. With a gravel substrate it may appear pale blue, though somewhat greenish when mud is the substrate.

E2US/EM1N Brackish marsh mixed with mud flats and/or tidal ponds. Typically found at the mouth of large rivers, it is one of the most seaward vegetation types. The area is inundated daily; however, water drains off rapidly after flooding and the surface dries somewhat. Dominant species include those described for the E2EM1N wetland type. The CIR signature will be a mix of the gray-greenish tones of the unvegetated flats and the more reddish-orange tones of the salt marsh vegetation.

E2USP Irregularly flooded, unvegetated, low-energy, brackish beaches and flats. This area will be at a slightly higher elevation than the lower intertidal flats (E2USN). The signature on the CIR photography will be similar, or a slightly lighter shade of gray, to that noted for the E2USN wetland type.

E2US/EM1P Irregularly flooded, higher elevation brackish marsh with areas of open or sparsely vegetated mud or sand flats. This area may be a higher intertidal continuation of the E2US/EM1N or E2EM1/USN wetland types. Vegetation will include those species described for the E2EM1P wetland type. See descriptions for the E2USP and E2EM1P wetland types.

E2US/UB Mixture of intertidal flats with scattered areas of standing estuarine water. The flats may be either regularly flooded (N) or irregularly flooded (P).

E2AB1N Lower elevation areas of brackish flats and shorelines that are flooded regularly by tidal water and have algae as the dominant vegetation. The algae, primarily *Fucus* sp. and *Enteromorpha* spp., will give a bright orange signature on the CIR photography.

E2EM1N Lower elevation areas of brackish marshes that are flooded regularly by tidal water. Also includes complexes of low brackish marshes which are regularly flooded and high brackish marshes which are irregularly flooded (this complex represents an area where conditions pertinent to both the E2EM1N

and E2EM1P wetland types exist in close proximity to one another, making it difficult to delineate). This wetland type is vegetated with halophytic emergents that persist throughout the year. The E2EM1N marsh exists in areas exhibiting estuarine features, particularly at the heads of fjords and sheltered embayments. Vegetation within this wetland type includes *Carex Lyngbyei*, *Triglochin maritimum*, *Plantago maritima*, and *Puccinellia* spp.

E2EM1/USN Similar to the E2US/EM1N wetland type.

E2EM1P Higher elevation areas of brackish marsh that are flooded irregularly (less often than daily) by tidal estuarine water. Surface drainage is good in these areas. Vegetation includes some species associated more with the lower intertidal areas (E2EM1N) such as *Carex Lyngbyei* and *Triglochin maritimum*. Dominant vegetation found in the higher intertidal marshes include *Elymus arenarius*, *Stellaria humifusa*, *Potentilla Egedii*, *Juncus arcticus*, *Parnassia palustris*, *Rumex* sp., and small amounts of *Salix* spp. and *Myrica gale*.

E2EM1/USP Similar to the E2US/EM1P wetland type.

E2FO5N Regularly flooded brackish area vegetated with dead trees that presumably have become overly stressed due to the inundation of salt water. Their distinct CIR signature is a whitish to light gray tone with spindly trees visible. This type may have an understory of intertidal emergent marsh (E2EM1N).

Lacustrine System

This system includes all lakes greater than 20 acres in size.

L1UBH Permanently flooded, open water areas of lakes. Generally, the water depth exceeds two meters. Vegetation is lacking or sparse (less than 30 percent areal coverage). Unless altered by glacial silt, the CIR signature for open water areas will be a deep blue color.

L1UBV Permanently flooded, fresh water tidal lake with a water level that fluctuates when fresh water backs up into the lake during high tides. The CIR signature will usually be a deep blue, unless influenced by glacial silt (whitish-cream color) or vegetation.

L2UBF Semipermanently flooded, shallow areas of lakes. Lake substrate will occasionally be exposed during periods of extreme low water. Vegetation will be sparse to non-existent.

L2USC Seasonally flooded mud and sand flats along lake shorelines. Vegetation is sparse (less than 30 percent areal coverage) or lacking. The CIR signature is light gray or whitish where the substrate is exposed, and light blue where inundated by shallow water.

L2USR Seasonally flooded tidal shoreline of fresh water lakes which have a fluctuating water level due to the backup of fresh water into the lake basin during high tides. The CIR signature will be similar to that of the L2USC wetland type. Vegetation is sparse (less than 30 percent areal coverage) or lacking.

L2USA Temporarily flooded mud and sand flats along lake shorelines. Typically devoid of vegetation. On the CIR photography, this wetland type appears as a whitish to light gray tone.

L2AB3H Permanently flooded, floating-leaved aquatic vegetation growing in shallow water of lakes. Dominant plants may include *Nuphar polysepalum* and *Potamogeton* spp. The vegetation will appear pinkish on dark blue or black water on the CIR photography. This wetland type is common in the lowland lakes region close to the coast.

L2EM2H Permanently flooded, littoral, non-persistent emergent vegetation growing in lakes. These plants will not remain erect (above the water surface) during the non-growing season. Typical vegetation may include *Arctophila fulva, Hippuris vulgaris* and *Equisetum* sp. The CIR signature is a greenish-orange to pinkish-orange tone.

Riverine System

All river and stream channels upstream from the influence of ocean-derived salinity are included in the Riverine System.

R1UBV Permanently flooded, tidal, open water channels of rivers and streams. These fresh water channels are subject to tidal influence, being backed up by high tides, but are upstream from the influence of ocean-derived salinity. The CIR signature is typical of unvegetated open water: shades of blue depending on the concentration, if any, of glacial silt.

R1USR Seasonally flooded, tidal river flats and bars. These areas are not directly inundated by estuarine water but are flooded by fresh water which backs up into river channels during high tides. The unconsolidated river material is usually visible on the CIR photography, giving a characteristic pale blue signature. The color will be much lighter, almost a cream color, if the material is exposed.

R1US/UB Complex of freshwater tidal, open water channels and temporarily and/or seasonally flooded gravel/sand bars and flats. Due to the complexity of some braided riverine areas, the entire water/flats area has been grouped together instead of delineating the open water channels and flats separately.

R2UBH Permanently flooded, open water channels of lower perennial rivers and streams. Lower perennial streams exhibit the following characteristics: a fairly slow velocity, extensive braiding with numerous gravel or sand bars, a well developed floodplain, the watercourse is of low gradient, the substrate consists mostly of silts and sand, and the water lacks high concentrations of oxygen. Lower perennial streams are usually associated with flat valley bottoms and the non-mountainous areas adjacent to the coast.

R2UB/US Mixture of seasonally flooded and temporarily flooded river flats and bars and narrow open water channels of a lower perennial stream. This mixed alpha-numeric is often used for braided channels when it is difficult to delineate the main water course from the numerous flats and bars. Because of the three separate water regimes assumed in this alpha-numeric (permanently flooded for the water course and seasonally flooded and/or temporarily flooded for the unconsolidated shoreline features), the water regime indicator for this mixed code has been dropped. This mixed alpha-numeric is a combination of R2UBH, R2USC and R2USA.

R2USC Seasonally flooded river flats and bars. This type may be extensive in major river channels. These areas are typically unvegetated or sparsely vegetated by broad-leaved deciduous shrubs or persistent emergents. Vegetative cover is less than 30 percent of the flats/bars. See the descriptions for the PSS1C, PSS1/USC and PSS1/EM1C wetland types.

R2USA Similar to the R2USC type, except the river flats and bars are only temporarily flooded. Vegetative cover is less than 30 percent of the flats/bars. See the descriptions for the PSS1A, PSS1/USA and PSS1/EM1A wetland types.

R2US/UB Similar to the R2UB/US wetland type.

R3UBH Permanently flooded, open water channels of upper perennial rivers and streams. Upper perennial streams exhibit the following characteristics: a fairly high velocity; the stream channel is narrow, of relatively even width and lacks extensive braiding or channeling; a lack of floodplain development; the watercourse is of high gradient; the substrate consists mostly of gravel, boulder or bedrock; and the water has a relatively high concentration of oxygen. Upper perennial streams are usually associated with mountainous areas. Once a stream exits a mountainous area and enters the flats or lower

valleys it will usually revert to a lower perennial stream.

Many of the rivers draining glaciers, lakes and ponds of the upper elevations are steep and characterized by a bright white spotted CIR signature typical of a fast moving river. Rivers containing a large glacial silt load will appear a milky blue color. The Alsek River is a good example of this. Where glacially-fed streams enter an estuary or other body of clear water, the CIR signature will become a lighter shade of blue (area of mixing) compared to the deep navy blue color of the open clear water.

R3UB/US — Mixture of seasonally flooded and temporarily flooded river flats and bars and narrow open water channels of upper perennial streams. This mixed alpha-numeric is used when it is difficult to delineate the main water course from the shoreline gravel bars. Because of the three separate water regimes assumed in this alpha-numeric (permanently flooded for the water course and seasonally flooded and/or temporarily flooded for the unconsolidated shoreline features), the water regime indicator for this mixed code has been dropped. This mixed alpha-numeric is a combination of R3UBH, R3USC and R3USA. Generally, upper perennial streams will not have a braided configuration, as will lower perennial streams.

R3USC — Seasonally flooded river flats and bars. This wetland type may be found as a shoreline gravel bar feature in major river channels. Typically it is unvegetated or sparsely vegetated (less than 30 percent areal cover) by broad-leaved deciduous shrubs. See the description for the PSS1C wetland type. On the CIR photography, this wetland type will appear a grayish blue for that part of the substrate which is inundated, a whitish or light gray for exposed unconsolidated shore material, and small reddish specks where sparse clumps of deciduous shrubs have become established.

R3USA — Temporarily flooded river flats and bars. Identical to the R3USC wetland type except for the degree of inundation. Some areas designated as R2USA may be sparsely vegetated (less than 30 percent areal cover) by broad-leaved deciduous shrubs. See the description for the PSS1A wetland type.

R3US/UB — Similar to the R3UB/US wetland type.

R4SBC — A complex of river flats, bars, and small open water pools of seasonally flooded intermittent streams. These streams do not carry water throughout the year, but do have a moving water flow for extended periods each year. Sparse to dense cover of broad-leaved deciduous shrubs may occur along the intermittent stream banks. See the description for the PSS1C wetland type. The CIR signature is a faint grayish linear feature with or without visible water.

R4SBA A complex of river flats, bars, and small open water pools of temporarily flooded intermittent streams. These streams do not carry water throughout the year, but do have a moving water flow for brief periods each year. Sparse to dense cover of broad-leaved deciduous shrubs may occur along the intermittent stream banks. See the description for the PSS1A wetland type. The CIR signature is a faint light gray to white color with or without visible water.

Palustrine System

The Palustrine System includes all wetlands dominated by trees, shrubs, persistent emergents, emergent moss, and lichens that are not influenced by ocean-derived salinity. Wetland types commonly referred to as bogs, muskegs, fens, freshwater marsh and swamps are grouped in the Palustrine System. Most ponds less than twenty acres in size are also included in this system.

Many of the palustrine areas, especially the large wetlands in the Yakutat Forelands, are a mixture of many wetland types that are too small and intertwined to be delineated and classified separately. The usefulness of the mapping is of prime consideration when determining the complexity of photographic interpretation. Split classes (mixed alpha-numerics) are an accurate description of the classification for most wetlands; however, this was avoided in this area, if possible, in order to minimize the complexity. In the field, *Salix* spp. and *Myrica gale* were often found in emergent meadows, and wet pockets of semipermanent water were often observed in seasonally flooded or saturated meadows. These features were delineated separately only when the resulting polygons did not significantly add to the complexity of the map.

The Palustrine System is often influenced by beaver activity, which is noted by using the "b" special modifier (e.g., PEM1Hb or PUBHb). The beaver indicators on the CIR photography are a white dot in the pond (beaver lodge), a thin silver, whitish or pinkish line across the lower end of the impoundment (beaver dam), or scattered dead trees around the impounded area. Often the dam will raise the water level enough to kill the woody vegetation surrounding the pond. It should be noted, however, that the presence of beaver activity in an area, even a beaver lodge within a pond, does not necessarily mean that the special modifier should be used. In order for the area to be designated as "beaver influenced", the area must have been either created by beaver or changed by beaver activity in such a way as to alter the character of the area (usually there will be a change in water regime).

Man-made influences on this System are noted by using the "x" special modifier with the appropriate alpha-numeric. Excavations will usually be of unconsolidated material which may be either exposed or permanently flooded.

PUBH Permanently flooded, small open water bodies (ponds). Vegetation is generally lacking within the open water area, but aquatic beds or persistent emergents may provide sparse cover (less than 30 percent areal coverage). Similar wetland types include PAB3H, PAB3/UBH and PEM1H. The CIR signature for open water bodies is black (if water is completely clear with no vegetation) or a shade of blue (depending upon amount of sediment or vegetation in the water).

PUB/AB3H Permanently flooded pond supporting aquatic, rooted, vascular vegetation. This designation is used for complexes of PAB3H and PUBH when it is not practical to delineate the types separately. In this situation, the open water area will account for 50 to 70 percent of the polygon and the aquatic vegetation will occupy at least 30 percent but not more than 50 percent of the delineated area. Vegetation for this type is described for the PAB3H wetland type. The CIR signature will be small dots or streaks of reddish orange (aquatic vegetation) mixed with black, blue or bluish green (open water).

PUB/EM1H Permanently flooded, freshwater emergent marsh. The inundated area will contain 30 to 50 percent persistent emergent vegetation, usually around the fringe of the ponded basin, while 50 to 70 percent of the area will remain as open water. See the description for the PEM1H wetland type.

PUB/SS1H Permanently flooded, scrub shrub wetland with large areas of open water. In this type, the non-vegetated, open water exceeds 50 percent of the area with the broad-leaved deciduous shrubs occupying 30 to 50 percent of the area. See the description for the PSS1/UBH wetland type.

PUBF Semipermanently flooded, small open water bodies (ponds). Vegetation may be sparse or lacking; if present, vegetative cover will be less than 30 percent. The CIR signature will be a pale blue.

PUB/SS1 Complex of small shrub islands within an enclosed, permanently flooded basin. This situation may be found within the lakes formed at the terminus of many glaciers. The deciduous shrub islands consist primarily of *Alnus sinuata* and *Salix* spp. See the description for the PSS1C wetland type.

PUSC Seasonally flooded, small basins that typically contain standing water for extended periods during the growing season. The exposed portion of this unconsolidated substrate will remain unvegetated. The CIR signature will appear light gray for the exposed substrate and a bluish-gray for that portion which is inundated.

PUS/SS1C Similar to the PSS1/USC wetland type, except that within this type the nonvegetated areas will exceed 50 percent of the delineated area. See the description for the PSS1/USC wetland type.

PUSA Temporarily flooded, small basins that typically contain standing water briefly during the growing season. When surface water is absent, the exposed substrate will either remain unvegetated or will be colonized by herbaceous annuals. The CIR signature of this unconsolidated substrate will be whitish to gray for the exposed substrate and a bluish-gray for the inundated substrate.

PUS/EM1A Temporarily flooded, persistent emergent wetland with large areas of unvegetated sand or gravel bars. The emergent vegetation will cover 30 to 50 percent of the area. This wetland type is almost always found within the active floodplain of lower perennial streams. Similar to the PEM1/USA wetland type. See the descriptions for the PUSA and PEM1A wetland types.

PUS/SS1A Temporarily flooded, open shrub area within the floodplain of lower perennial rivers. The nonvegetated flats will account for at least 50 percent of the area. See the descriptions for the PSS1A and PSS1/USA wetland types.

PAB3H Permanently flooded, rooted vascular aquatic plants growing in ponds. These small ponds are generally found in bog complexes. The dominant vegetation in the deeper bog ponds and forest ponds is *Nuphar polysepalum*. The typical CIR signature is an orange swirl or mass of orange colored dots on the black to bluish-green water body. A mottling of green can also indicate vegetated ponds.

Many of these smaller ponds will, eventually, be taken over by mat-forming (peat producing) mosses and sedges (see the description for the PEM1/AB3H, PEM1H and PEM1C wetland types). Once the mosses create a more stable rooting environment, sedges will become established (PEM1C wetland type), and the buildup of peat becomes rapid (PEM1B wetland type). These areas are rapidly transformed into young bogs (early colonization by low shrubs) which in turn develop into taller shrub bogs (PSS1/EM1B wetland type). A mature forest may eventually replace the bog feature. Many stages of this successional pattern may be seen within the larger bog complexes.

PAB3/UBH Permanently flooded ponds supporting aquatic vegetation. Same as the PAB3H wetland type, except that this type has large areas of open water that do not support rooted vascular aquatic vegetation. The open water areas account for less than 50 percent of the delineated area. See the

description for the PAB3H wetland type.

PAB3/EM1H Permanently flooded, freshwater marsh with areas of deeper water which support rooted vascular aquatic vegetation. In this situation, the rooted aquatic vegetation (AB3) will occupy at least half of the ponded basin. The persistent emergent vegetation (EM1) will account for 30 to 50 percent of the vegetated area. See the descriptions for the PAB3H and PEM1H wetland types.

PEM1H Permanently flooded, emergent freshwater marsh. These are marsh areas that exhibit standing water throughout the year. Dominant vegetation may include *Menyanthes trifoliata, Hippuris vulgaris, Caltha palustris* and *Cicuta Douglasii*. On the CIR photography, this type of marsh will often appear as a basin with mottled shades of bluish-green with pinkish (graminoid vegetation) or reddish (dense broad-leaved herbaceous vegetation) areas, usually along the shoreline in shallower water. Areas of clear blue or black open water may exist in the middle of the basin.

Fringes of PEM1F and PEM1C may occur adjacent to the PEM1H wetland. These areas may not have been delineated separately due to the minimum mapping size (approximately 3 acres). In these cases the wetland fringe areas were included in the larger PEM1H wetland.

PEM1/UBH Permanently flooded, emergent freshwater marsh with areas of unvegetated open water. See the description for the PEM1H wetland type.

PEM1/AB3H Similar to the PAB3/EM1H wetland type, except that the persistent emergent vegetation (EM1) will occupy a greater portion of the flooded basin than will the rooted aquatic vegetation (AB3). See the descriptions for the PEM1H and PAB3H wetland types.

PEM1F Semipermanently flooded emergent marsh. These marsh areas usually exhibit standing water throughout the growing season in most years. This wetland type occurs in patterned bog pools, in depressions and pools not associated with patterned bogs, and along the periphery of ponds, streams and lakes.

Dominant vegetation may include *Eriophorum* spp., *Carex sitchensis* and other sedges, and *Caltha palustris*. Species included in the PEM1H wetland type may also be found in these semipermanently flooded areas. The PEM1F wetland type generally contains small elevated areas of PEM1C and/or PSS1/EM1C wetlands. See these designated wetland types for a more complete listing of associated species.

The CIR signature is similar to the PEM1H signature; however, the slightly lighter shade of blue or dark green indicates that the water is somewhat more shallow than in the permanently flooded PEM1H wetland type.

PEM1/SS1F Similar to the PSS1/EM1F wetland type, except that this type is dominated by the wetter persistent emergent vegetation, which will account for at least 50 percent of the delineated area. The drier broad-leaved deciduous shrub vegetation, occupying the ridges within this wet bog setting, will account for at least 30 percent of the area but will not exceed that of the emergent vegetation. See the description for the PSS1/EM1F wetland type.

PEM1T Semipermanently flooded, tidal, persistent emergent marshes. This wetland type is similar to the PEM1F wetland type but occurs where fresh water is backed-up by high tides. This type of wetland is located close to the mouth of streams where the stream empties into an estuary. See the description for the PEM1F wetland type. The CIR signature is also similar to that of the PEM1F wetland type.

PEM1C Seasonally flooded, persistent emergent marsh. This emergent wetland type may occur on the floodplain of small streams and creeks and along pool margins. Standing water resulting from stream overflow is present early in the growing season. Species of primary importance along low-gradient streams may include *Equisetum* spp., *Potentilla palustris, Aster sibirica, Pedicularis parviflora, Sanguisorba canadensis*, *Carex* spp., and ferns.

This cover type is also a major one associated with the wet herbaceous marsh of the Yakutat Forelands and other areas with little topographic relief. Within and around sedge/sphagnum bog pools may be found *Carex* spp., *Eriophorum* spp., *Eleocharis palustris*, *Equisetum* spp., *Platanthera* sp., *Juncus* sp., *Solidago* sp., and various grasses. *Potentilla palustris, Fauria crista-galli, Ranunculus repens, Gentiana Douglasiana, Geum calthifolium, Rubus chamaemorus*, and *Tofieldia glutinosa* may also be present.

A dense mat of sphagnum moss may underlie the herbaceous plants. Various shrubs such as *Myrica gale, Salix* spp., and *Vaccinium* spp. may also occur within this cover type.

Seasonally flooded areas in subalpine environments support lush growth of sedges and grasses as well as succulent forbs such as *Fauria crista-galli.*

Freshwater marshes develop from lakes, ponds, sloughs, or rivers and may persist for long periods of time. Many, however, will develop into bogs (PEM1B wetland type). Some marshes are later invaded by shrubs and develop into deciduous shrublands (PSS1/EM1B wetland type), further

succeeding to various forest types (PFO4B wetland type).

An increase in the prevalence of sedges is the primary characteristic that distinguishes this wetland type from the PEM1A wetland type.

The PEM1C wetland type appears as a dark greenish area on the CIR photography. When it is associated with other wetlands, it may be difficult to distinguish breaks between the various types. As a depression in the upland forest, it can appear as a grayish-blue tone. On river floodplains it will appear as a dark gray tone due to the gravel substrate. When dominated by sedges, it may appear as a smooth orange tone.

PEM1/USC Seasonally flooded, persistent emergent marsh with areas of unvegetated flats. The emergent vegetation will cover at least 50 percent of the area. See the descriptions for the PEM1C and PUSC wetland types.

PEM1/SS1C Same as the PSS1/EM1C wetland type, except that the area is dominated by persistent emergent vegetation with 30 to 50 percent broad-leaved deciduous shrubs. See the description for the PSS1/EM1C wetland type.

PEM1/FO4C Similar to the PFO4/EM1C wetland type, except that the canopy of the *Picea sitchensis* will be more open. See the description for the PFO4/EM1C wetland type.

PEM1R Seasonally flooded, tidal, persistent emergent marshes. These marshes occur on low terraces along the banks of freshwater tidal channels (R1UBV wetland type). This wetland type is similar to the PEM1C wetland type but occurs closer to the mouth of streams entering estuarine waters where freshwater is backed up due to the high tides. *Triglochin* spp. and *Parnassia palustris* occupy most of these seasonally flooded low terraces. See the description for the PEM1C wetland type.

If very dense broad-leaf emergent vegetation is present, the CIR signature will appear as an orange tone. A gray-blue tone will appear if the vegetation is sparse and the substrate shows through.

PEM1/SS1R Seasonally flooded, tidal, persistent emergent marsh with a 30 to 50 percent cover of broad-leaved, deciduous shrubs. Species are described for the PEM1R and PSS1R wetland types.

PEM1B Saturated, emergent, bog-type marsh. These areas are generally saturated peat soils with a *Sphagnum* spp. moss mat covering the soil surface. This particular type of wetland contains the greatest variety and abundance of wetland plant species of any wetland type.

Several phases of bogs occur in the process of development, beginning with the formation of a floating mat (moss and sedge) which eventually cover the underlying water body. In time, peat accumulation will increase until the shallow pond beneath is completely filled with saturated peat. The bog will then take on a meadow-like appearance, typical of the PEM1B wetland type.

Herbaceous vegetation associated with this meadow-like bog type may include several graminoid species (*Carex* spp.and *Equisetum* spp.) along with the following forbs: *Lathyrus* sp., *Iris setosa*, *Sanguisorba canadensis*, *Polemonium acutiflorum*, *Artemisia arctica*, *Cornus canadensis*, *Aruncus sylvester*, *Fauria crista-galli*, *Plantago* sp., *Aconitum delphinifolium*, *Dodecatheon pulchellum*, *Tiarella trifoliata*, *Pedicularis parviflora*, *Conioselinum chinense*, *Fritillaria camschatcensis*, *Cicuta Douglasii*, *Streptopus roseus*, *Veratrum viride*, *Eriophorum angustifolium*, *Potentilla palustris*, and very frequently *Drosera rotundifolia* all within a *Sphagnum* spp. moss mat.

At maturity, the bog will have progressed to a less wet phase, becoming thicket-like with abundant broad-leaved deciduous shrubs and ericaceous shrubs. Such species as *Rubus chamaemorus*, *Rubus arcticus*, *Vaccinium microcarpus*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, *Vaccinium uliginosum*, *Andromeda polifolia*, and various species of *Salix* spp. (most notably *Salix commutata*) may commonly occur. See the description for the PSS1/EM1B wetland type.

Saturated, emergent bogs occurring at higher elevations and on slopes have a similar flora; however, shrubs may appear at an earlier stage than is typical of similar bogs at lower elevations. These higher elevation saturated areas generally do not go through the floating mat stage of bog development. Slope muskegs are usually mixed communities of sedge and moss.

Saturated, emergent bogs are dominated by sedges and *Sphagnum* spp. moss, and this dominance is partially controlled by pH (affected by water supply and mineral concentration). Many of the peat profiles taken show sedge peat at the bottom and through much of the profile, and often contain one or two layers of stumps of spruce or pine below the surface, presumably representing previously forested conditions during drier intervals. Wetter depressions frequently occur within this wetland type.

The CIR signature for this wetland type varies greatly depending upon the dominant vegetation. The signature may be a smooth yellowish green or pale tan. Often it is dotted with stunted *Picea sitchensis* which appear as brown specks.

PEM1/SS1B Saturated, open bog area, comprised mainly of persistent emergent vegetation. Broad-leaved deciduous shrubs will cover 30 to 50 percent of the area. This wetland type is similar to the PSS1/EM1B wetland type, except that it is more open and the scrub-shrub component is generally shorter. This type is usually slightly wetter than PSS1/EM1B wetland areas. See the description for the PEM1B, PSS1B and the PSS1/EM1B wetland types.

PEM1/SS4B Saturated, open shrub spruce bog. Similar to the PSS4/EM1B wetland type, except that persistent emergent vegetation is the dominant vegetation type. Shrubby spruce will occupy 30 to 50 percent of the described area. See the description for the PSS4/EM1B wetland type.

PEM1/FO4B Similar to the PFO4/EM1B wetland type; however, the persistent emergent vegetation will dominate and the forest canopy will be more open. See the description for the PFO4/EM1B wetland type.

PEM1A Temporarily flooded, persistent emergent wetlands. This wetland type is generally restricted to small depressions or to the floodplains of streams. Standing water is present for only brief periods during the growing season. *Calamagrostis canadensis* and *Deschampsia cespitosa* are usually the dominant emergents. Associated species may include *Hordeum jubatum, Lupinus nootkatensis, Aster junciformis, Parnassia palustris, Fragaria virginiana, Aconitum delphinifolium, Ranunculus pennsylvanicus, Solidago* sp., *Heracleum lanatum, Achillea millefolium, Rhinanthus minor, Galium trifidum, Dryopteris dilatata* and *Rumex occidentalis*. Various shrub species including *Salix Barclayi, Alnus crispa, Rubus chamaemorus, Rubus spectabilis* and several ericaceous shrubs may also occur, although they will constitute less than 30 percent of the area. See the description for the PSS1/EM1A wetland type.

Small pools of standing water (PEM1F or PEM1H) may remain throughout the growing season in these temporarily flooded areas. These small pools may be permanently flooded and contain *Ranunculus hyperboreus, Menyanthes trifoliata* and *Caltha palustris*. For a more complete listing of aquatic plants and emergents able to withstand extended periods of freshwater inundation, see the PAB3H, PAB3F, PEM1H, PEM1F and PEM1C wetland types.

The CIR signature may vary depending upon the density of plant material and the substrate. Signatures will be mostly light shades of gray (darker if recently inundated) to beige.

PEM1/USA Temporarily flooded, persistent emergent wetland with unvegetated sand and/or gravel areas. This wetland type is usually found within the active floodplains of lower perennial streams. See the descriptions for the PEM1A

and PUSA wetland types. The CIR signature is a mix of pale blue-gray and a greenish tone.

PEM1/SS1A Temporarily flooded areas occurring on stream and creek floodplains. These wetlands are characterized by a mixture of emergent vegetation and broad-leaved deciduous shrubs, with emergents being the dominant vegetation type. Species are described for the PEM1A and PSS1A wetland types.

PEM1S Temporarily flooded, tidal, persistent emergent marsh. These areas are similar to the PEM1A wetland type. They occur upstream from the freshwater/estuarine interface, where the freshwater is backed up due to high tides. These temporarily flooded areas will be situated at a slightly higher elevation along freshwater tidal channels than will the PEM1R wetland type.

Dominant vegetation may include the following: *Elymus arenarius, Dendranthema arcticum, Plantago maritima, Deschampsia cespitosa, Juncus arcticus* and *Lathyrus japonicus.*

See the descriptions for the PEM1A and PEM1R wetland types. The CIR signature is typically a pale greenish blue or it can be a pale, smooth orange tone.

PEM1/SS1S Temporarily flooded tidal area of persistent emergents and broad-leaved deciduous shrubs. The vegetation is periodically inundated by fresh water which becomes backed up due to tidal action. This type is similar to the PEM1/SS1A wetland type. Typical shrub vegetation may consist of *Salix* spp., *Alnus sinuata, Myrica gale* and various forbs described for the PSS1A wetland type.

PSS1H Permanently flooded, broad-leaved deciduous scrub-shrub swamp. *Salix* spp. and possibly *Myrica gale* will occur in these flooded basins. This situation results from the overflow of a stream channel or from the rise in water level in a beaver pond. *Alnus crispa* may occur in those areas inundated due to beaver activity. Although the water may be permanent, the woody vegetation will not persist for more than a few years. Eventually, this wetland type will become a PSS5H wetland.

PSS1/UBH Permanently flooded, scrub-shrub wetland with areas of open water. Broad-leaved deciduous shrubs are predominantly *Salix* spp. and *Alnus* spp. This wetland type may occur in areas of extensive flooding by river or lake overflow or where beaver activity has altered the existing water level. If this situation were to persist for several years, the shrubs would die off and the

area would change to a PSS5/UBH wetland type. See the description for the PSS1H wetland type.

PSS1F Semipermanently flooded wetland consisting of broad-leaved deciduous shrubs. This wetland type may occur along the edge of ponds where the water level has risen and fluctuates somewhat due to the activity of beavers. Dominant shrub vegetation consists primarily of *Salix* spp. and *Myrica gale*. The CIR signature will appear as an orange tone mixed with the dark tone of the water.

PSS1/EM1F This designation is used primarily to indicate patterned bogs (string bogs and reticulate bogs). Patterned bogs are composed of bog ridges (strangs) and wet hollows (flarks). The string bog type has roughly parallel strangs separated by the wet flarks. The strangs are oriented perpendicular to water movement within the bog complex. The ridges in the reticulate bog type form a net-like pattern. Small ponds may exist and are irregularly sized, spaced and shaped. Larger ponds, if any, may contain vegetated peat islands.

The ridges and islands in a patterned bog are dominated by broad-leaved deciduous shrubs. Important species include various species of *Salix*, *Vaccinium uliginosum*, *Rubus spectabilis*, *Empetrum nigrum*, and those species described for the PSS1B and PSS1C wetland types.

The flarks (ponds) are typically dominated by emergent vegetation and are characterized by a semipermanently flooded water regime. *Sphagnum* spp. moss may form around flarks and on the bog strangs. Other shrub and emergent species which may be present include those described for the PSS1/EM1B, PEM1C and the PEM1F wetland types.

Within the study area, this wetland type would sometimes take on the appearance of a wide slough, with the wetter low ground dominated by persistent emergents with small islands of shrubs on the higher elevations. These shrubs may be more seasonally flooded or saturated, but due to the degree of complexity, they are included as a single wetland unit.

This wetland type may also indicate an area recently flooded by increasing water levels due to extensive beaver activity.

The CIR signature will show the wetter emergent vegetation as a dark green tone with interspersed clumps of dull, salmon-colored dots representing the deciduous shrubs.

PSS1C Seasonally flooded, dense shrub areas on river and stream floodplains. The terrain may be hummocky with flooded depressions. *Alnus sinuata* and *Salix* spp. (particularly *S. commutata*) are commonly mixed with *Myrica gale, Vaccinium vitis-idaea, Vaccinium uliginosum* and *Betula nana*. Emergent vegetation, dominated by *Calamagrostis canadensis*, may be present in some areas.

This wetland type often occurs on river bars that have become stable enough to support persistent woody vegetation. The *Alnus sinuata* and *Salix* spp. combined may exceed 75 percent cover in this wetland type. Other common species occurring in the understory include those species described for the PEM1C wetland type.

The CIR signature for areas exhibiting seasonally flooded shrubs will generally be an orange to dark orange tone.

PSS1/USC Seasonally flooded areas on river and stream floodplains, or around the perimeter of lakes with widely fluctuating water levels, consisting of a mix of broad-leaved deciduous shrubs and non-vegetated flats. Shrub species are primarily *Salix* spp. and *Alnus sinuata*. The flats are typically composed of sand and gravel-sized particles, if located within active floodplains, or of silt, possibly mixed with organic material, if found around the perimeter of lakes. See the descriptions for the PSS1/USA, PSS1C and PSS1A wetland types. The CIR signature is a mixture of the orange dots of shrub clumps on the bluish-gray substrate.

PSS1/EM1C Seasonally flooded areas occurring on floodplains in stream and creek corridors. These wetlands are characterized by a mixture of broad-leaved deciduous shrubs and emergent vegetation. Surface water resulting from stream overflow is present during the early growing season. The substrate consists of an interspersion of raised mounds (hummocks) and lower basins and drainageways. *Salix* spp. and *Alnus sinuata* dominate the hummock areas while emergent species occur in the wetter low areas surrounding the hummocks. This is one of the most extensive shrub vegetation types. It occurs in some elongated depressions (flarks) between raised bog ridges (strangs), as a floating bog mat along large ponds, and in drained beaver meadows. It is a species rich area and may include most of the species described for the PSS1C and PEM1C wetland types.

This type also occurs in seepage areas on flats at the base of bluffs along the coast where it forms a hummocky surface beneath thick stands of *Alnus sinuata*. Rivulets and slow moving water occur between a series of seasonal emergent drainages braiding through the slightly higher elevated shrubs. These higher elevation areas are usually sprinkled with less than 30 percent

coverage of stunted spruce. The CIR signature is a vivid salmon tone with patches and strips of green.

PSS1/4C Seasonally flooded areas adjacent to streams and small rivers that are a shrub complex dominated by *Salix* spp. and *Alnus sinuata*. *Picea sitchensis* also occurs on somewhat higher terraces. The broad-leaved deciduous shrubs occupy 50 to 70 percent of the delineated area while the needle-leaved evergreen shrubs occupy 30-50 percent of the area. This covertype is a textured orange tone with brown dots mixed throughout the wetland.

PSS1/FO4C Similar to the PFO4/SS1C wetland type, except that the *Picea sitchensis* canopy is more open and broad-leaved deciduous shrubs compose the dominant vegetation strata. The CIR signature is similar to the PFO4/SS1C wetland type.

PSS1/FO5C Seasonally flooded, broad-leaved deciduous scrub-shrub area with 30 to 50 percent of the area consisting of dead trees. This wetland type is generally found along streams and small river floodplains where divergence of water from the main channel has occurred. It may also occur in areas inundated by rapid glacial melt or in areas behind beaver dams. See the species description for the PSS1C wetland type.

PSS1R Seasonally flooded, tidal areas of dense broad-leaved deciduous scrub-shrub. The vegetation is periodically inundated by fresh water which becomes backed up due to the rise in the tide. This wetland type is similar to the PSS1C and PSS1/EM1C wetland types.

PSS1B Saturated shrub bog with greater than 70 percent of the canopy consisting of broad-leaved deciduous shrubs. Emergent vegetation comprises less than 30 percent cover within the delineated area. Typical tall shrub vegetation may include alder and willow. Low mat-type shrub vegetation may include those species identified for saturated shrub/emergent wetlands. See the description for the PSS1/EM1B wetland type. A dense mat of sphagnum moss may cover the soil surface in some areas. Additional species may include scattered *Empetrum nigrum, Rubus spectabilis, Vaccinium oxycoccos, Vaccinium vitis-idaea, Vaccinium ovalifolium, Vaccinium uliginosum, Oplopanax horridus, Viburnum edule, Myrica gale, Andromeda polifolia*, and those emergent species described for the PEM1B wetland type. Scattered shrub areas may also occur as hillside seeps.

On the CIR photography, this wetland type may appear as an orange tone with slight texturing or a mottled brownish orange tone.

PSS1/EM1B Saturated shrub bog with a 30 to 50 percent canopy coverage consisting of broad-leaved deciduous shrubs. The remaining portion of the vegetative cover consists of persistent emergents. This is one of the more common wetland types occurring in both basin areas and as hillside seeps. Common shrub species include stunted *Picea sitchensis, Vaccinium uliginosum, Empetrum nigrum, Vaccinium microcarpus, Vaccinium vitis-idaea, Betula nana, Andromeda polifolia*, and various species of *Salix*. Due to the difficulty in distinguishing broad-leaved deciduous shrubs from broad-leaved evergreen shrubs, in a consistent manner, on the CIR photography, many of the broad-leaved evergreen shrubs (SS3) have been included within this wetland type.

Dominant emergent species include *Carex* spp., *Eriophorum angustifolium, Drosera rotundifolia, Potentilla palustris, Sanguisorba canadensis, Cornus canadensis, Rubus chamaemorus, Veratrum viride, Sphagnum* spp., as well as other species described for the PEM1B wetland type. The CIR signature is a sandy beige with a mottling of pale peach.

PSS1/4B Saturated, deciduous shrub bog mixed with stunted *Picea sitchensis*. See the descriptions for the PSS1B, PSS4B, and the PSS1/EM1B wetland types. The CIR signature has the characteristic brown dots of the stunted spruce with a rough textured orange tone for the deciduous shrub understory.

PSS1/FO4B Similar to the PFO4/SS1B wetland type; however, the forest canopy is more open and broad-leaved deciduous shrubs will be the dominant vegetation type. See the descriptions for the PSS1B, PFO4B, and the PFO4/SS1B wetland types.

PSS1A Temporarily flooded, dense shrub areas on river and stream floodplains consisting primarily of *Salix* spp. (particularly *Salix sitchensis*), *Viburnum edule, Rubus spectabilis*, and *Alnus sinuata*. This wetland type often occurs on river bars that have become stable enough to support persistent woody vegetation. Understory vegetation is generally sparse, but may contain *Calamagrostis canadensis, Equisetum arvense, Athyrium filix-femina, Deschampsia cespitosa*, and those species listed for the PEM1A wetland type. Peat development is usually lacking in these temporarily flooded areas.

On the CIR photography, these areas appear as a textured orange tone mixed with the grayish to bluish-gray tone of the substrate.

PSS1/USA Temporarily flooded, open shrub areas on river and stream floodplains. This type is similar to the PSS1A wetland type, except that the shrub area is less dense and is interspersed with nonvegetated flats. The nonvegetated portion may account for up to 50 percent of the area. Vegetation is described for the PSS1A wetland type.

PSS1/EM1A Temporarily flooded areas occurring on stream and creek floodplains. These wetlands are characterized by a mixture of broad-leaved deciduous shrubs and persistent emergent vegetation. Species are described for the PSS1A and PEM1A wetland types.

PSS1/4A Temporarily flooded, broad-leaved deciduous, scrub-shrub wetland with 30 to 50 percent needle-leaved evergreen shrubs. Deciduous shrub species are described for the PSS1A wetland type. The evergreen component is comprised of *Picea sitchensis.*

PSS1/FO1A Similar to the PFO1/SS1A wetland type. In this type, however, the broad-leaved deciduous shrubs are the dominant vegetation type. Shrub areas occupy 50 to 70 percent of the delineated area and broad-leaved deciduous trees (exceeding 6 meters in height) account for 30 to 50 percent of the areal coverage. See the descriptions for the PFO1/SS1A, PFO1A, and PSS1A wetland types.

PSS1/FO4A Similar to the PFO4/SS1A wetland type, except that the broad-leaved deciduous shrubs become the dominant vegetation under a more open canopy of needle-leaved evergreen trees. See the description for the PFO4/SS1A wetland type.

PSS1S Temporarily flooded, tidal areas of dense broad-leaved deciduous shrubs. Vegetation is periodically inundated by fresh water which becomes backed up due to tidal action. This wetland type is similar to the PSS1A wetland type. Typical vegetation will consist of *Salix* spp., *Alnus sinuata, Myrica gale* and various forbs described for the PSS1A and PSS1C wetland types.

PSS1/UB Similar to the PUB/SS1 wetland type.

PSS4C Seasonally flooded area on floodplains and in drainageways with a composition of 70 to 100 percent needle-leaved evergreen scrub-shrub. Similar to the PSS4/1C wetland type.

PSS4/1C Same as the PSS1/4C wetland type, except the area has more mounds and terraces containing *Picea sitchensis*. The needle-leaved evergreen species occupies 50 to 70 percent of the delineated area while the broad-leaved deciduous shrubs occupy only 30 to 50 percent of the area.

PSS4B Saturated, stunted spruce bog. The *Picea sitchensis* in these areas is shrub height (less than 6 meters) and exceeds 50 percent of the area. See the descriptions for the PSS4/1B, PSS1B and PFO4B wetland types. The CIR signature will be similar to the PSS1/4B type, except that there will be more brown dots indicating the stunted spruce.

PSS4/EM1B Saturated, shrub spruce bog with an understory of persistent emergent vegetation. The *Picea sitchensis* in these areas is shrub height (less than 6 meters). Emergent species are described for the PEM1B wetland type. See, also, the description for the PSS1/4B wetland type. The CIR photographic signature is a mixture of the two signatures of the PEM1B and PSS4B wetland types.

PSS4/1B Saturated shrub spruce bog. *Picea sitchensis* is the dominant evergreen shrub. Broad-leaved deciduous shrubs account for 30 to 50 percent of the ground cover. Deciduous shrub species are described for the PSS1B wetland type. Also, see the description for the PSS4B wetland type.

PSS4/FO4B Similar to the PFO4/SS4B wetland type, except that the forest canopy is more open. The stunted *Picea sitchensis* occupies 50 to 70 percent of the area. See the description for the PFO4/SS4B wetland type.

PFO1C Seasonally flooded, closed canopy, broad-leaved deciduous forested wetland. *Populus balsamifera* is the dominant tree species; however, tree-size *Alnus sinuata* (greater than 6 meters in height) may dominate in some streamside areas. Understory vegetation is sparse (less than 30 percent areal cover) or lacking. This wetland type is usually found in low lying areas adjacent to stream and river corridors, although it may be found in areas inundated due to beaver activity. The CIR signature will appear as a dense to semi-dense pattern of light pink to reddish dots with a dark background. If the area is inundated by water from a glacial-fed stream, the background may appear as a chalky texture.

PFO1/SS1C Seasonally flooded, open canopy, broad-leaved deciduous forested wetland. This is similar to the PFO1C wetland type, except that the canopy is more open, allowing for an understory of broad-leaved deciduous shrubs. *Populus balsamifera* is the dominant tree species; however, tree-size *Alnus sinuata* (greater than 6 meters in height) may dominant in some areas, particularly in and around areas of beaver activity. See descriptions for the PFO1C and PSS1C wetland types. The CIR signature will be similar to the PFO1C wetland type, with slightly more reddish or orange tone in the understory.

PFO1/4B Similar to the PFO4/1B wetland type. In this type, the closed canopy forest contains a higher percentage of broad-leaved deciduous trees than needle-leaved evergreen trees.

PFO1A Temporarily flooded, deciduous forested wetland occurring on river floodplains. *Populus balsamifera* is the dominant tree species. They may occur in either pure stands or in mixed stands with tree-size *Alnus sinuata*. These trees have a distinctively large crowned feature which is generally an

orangish tone. Understory vegetation is usually lacking or sparse; if present, consisting of various graminoid species. See the description for the PEM1A wetland type.

PFO1/SS1A Temporarily flooded areas on river and stream floodplains consisting of a mix of broad-leaved deciduous trees and broad-leaved deciduous shrubs. Dominant tree species is *Populus balsamifera*. *Salix* spp. and *Alnus sinuata* are the dominant species in the shrub areas. The shrubs often occur in bands along the river channels and at a slightly lower elevation than the forested areas.

This community may also occupy exposed peaty, sandy soil around partially dewatered lakes. The present vegetation is primarily *Alnus sinuata, Calamagrostis canadensis, Equisetum* spp., and those species described for the PSS1A wetland type. The CIR signature is a textured orange tone indicating a tree and shrub mix.

PFO1/4A Temporarily flooded, mixed forested wetland occurring on river floodplains. *Populus balsamifera* is the dominant deciduous tree species and *Picea sitchensis* is the dominant evergreen. See the descriptions for the PFO1A and PFO4A wetland types.

PFO4C Seasonally flooded, closed canopy, needle-leaved evergreen forested wetland. *Picea sitchensis* is the dominant vegetation type. An understory of broad-leaved deciduous shrubs, if any, will occupy less than 30 percent of the area. Wetlands of this type may be associated with a major overflow of a river corridor or be found in an area adjacent to a recently created beaver pond. The CIR signature will usually show as a semi-dense brown dot pattern with a dark brown background. If the area is inundated by water from a glacial-fed stream, the background will have a chalky appearance.

PFO4/EM1C A seasonally flooded open canopy forested wetland with an understory of persistent emergents. Shrub vegetation is sparse (less than 30 percent) to non-existent. Dominant vegetation will be *Picea sitchensis*. For a listing of understory species, see the description for the PEM1C wetland type.

PFO4/SS1C Seasonally flooded areas adjacent to streams and small rivers that are a complex of *Picea sitchensis* on higher terraces and deciduous shrubs on lower terraces. *Salix* spp. and *Alnus sinuata* are the common shrub species. See the descriptions for the PFO4C and PSS1C wetland types. The CIR signature is an orange textured mat with brownish trees.

PFO4/1C Seasonally flooded, closed canopy forested area dominated by *Picea sitchensis*. This needle-leaved evergreen tree species accounts for 50 to 70 percent of the delineated area. Broad-leaved deciduous trees, such as *Populus balsamifera*, will occupy 30 to 50 percent of the area. See the descriptions for the PFO4C and PFO1C wetland types.

PFO4B Saturated spruce bog. These areas are dominated by *Picea sitchensis* greater than 6 meters in height. Stunted *Tsuga heterophylla* may also occur. This wetland type often occurs as a fringe (slightly elevated margin) bordering the upland edge of muskegs, or as "islands" within a bog complex.

Dominant shrubby understory vegetation includes *Alnus sinuata, Empetrum nigrum, Equisetum* spp., *Rubus chamaemorus, Betula nana,* stunted *Picea mariana, Vaccinium vitis-idaea,* and *Vaccinium uliginosum,* as well as other shrub species described for the PSS1B and PSS1/EM1B wetland types. Herbaceous vegetation may include *Cornus canadensis, Calamagrostis canadensis, Carex* spp., and those species listed for the PEM1B and PSS1/EM1B wetland types. *Sphagnum* spp. moss may provide a dense ground cover.

This is a common wetland type with a distinct CIR signature contrasting with the surrounding upland forest. The trees in the wetter substrate are shorter and have a less dense crown. They also have a lighter grayish tint to them as compared to the drier upland forest. The signature of the shrub and emergent understory may be visible in areas where the canopy is less dense.

PFO4/EM1B Saturated, open conifer forest bog with an emergent ground layer. *Picea sitchensis* dominates the forested layer. Emergent species are described for the PEM1B wetland type. Also, see the description for the PFO4B wetland type.

The CIR signature will be a blending of the two component wetland types. On some photography, however, this wetland type may appear as a purplish tone (forested areas) over a pale mustard color understory.

PFO4/SS1B Open canopy, forested bog with an understory of broad-leaved deciduous shrubs. *Picea sitchensis* is the dominant tree species. The understory scrub-shrub vegetation exceeds 30 percent of the area but is generally less than 50 percent of the total area delineated. Typical shrub vegetation would include those dominant species described for the PSS1B wetland type. The peat is saturated year round and may exceed one meter in depth. See the descriptions for the PFO4B and PSS1B wetland types.

PFO4/SS4B Forested wetland, composed primarily of needle-leaved evergreen trees. The understory is composed of stunted or shrub-height evergreen vegetation. The dominant evergreen species is *Picea sitchensis* in both the canopy and the understory. Broad-leaved deciduous shrubs may also be prevalent in the understory, consisting of up to 50 percent of the understory species. See the descriptions for the PSS1B and the PFO4/SS1B wetland types.

PFO4/1B Forested wetland consisting of both needle-leaved evergreen and broad-leaved deciduous trees. The evergreen component consists of *Picea sitchensis* which occupies 50 to 70 percent of the area. *Populus balsamifera* is the dominant deciduous tree, occupying 30 to 50 percent of the area. Both the evergreen and deciduous trees exceed 6 meters in height. Understory vegetation is usually sparse in these closed canopy forests. If present, it will be similar to that described for the PSS1B wetland type. See the descriptions for the PFO4B and PFO1B wetland types.

PFO4A Temporarily flooded areas with a closed canopy of tree-sized *Picea sitchensis.* This wetland type generally occurs on river floodplains. Understory vegetation, if evident, will likely consist of broad-leaved deciduous shrubs. See the description for the PSS1A wetland type.

PFO4/SS1A Temporarily flooded forests with an open canopy of *Picea sitchensis* and an understory of broad-leaved deciduous shrubs. The trees may not be as spindly-looking as are those in the pure spruce wetlands since they occupy a slightly higher topographic position and are better drained. See the description for the PSS1A wetland type. The CIR signature is a rough orange mat tone mixed with brown dots.

PFO4/1A Similar to the PFO1/4A wetland type. In this type, however, the needle-leaved evergreen tree species will be the dominant vegetation type (exceeding 50 percent areal coverage). The broad-leaved deciduous species will collectively be greater than 30 percent but not more than 50 percent. See the description for the PFO1/4A wetland type for both a species description and CIR signature.

PFO5H Permanently flooded, dead tree swamp. The area is essentially an open water wetland type with scattered dead trees (either deciduous or evergreen) covering at least 30 percent of the open water area. Beavers are typically a cause of this wetland community type. The CIR signature is a mix of distinct white trees in blue or black water. Dead trees will always appear white-gray.

PFO5/UBH Permanently flooded, dead tree forested wetland with open water bodies. This situation may occur as a result of damming by beavers, a rise in pond water elevation, or by major flooding of a stream or river channel. See the description for the PFO5H wetland type.

PFO5F Semipermanently flooded, dead tree swamp. Similar to the PFO5H wetland type, except that the water depth may be less and the degree of water permanency may occasionally be altered. Waterways impounded by beaver activity may be surrounded by this type of wetland. As the dam raises the water level, the trees become stressed and eventually die. The CIR signature is the same as that of the PFO5H wetland type.

PFO5/EM1F Semipermanently flooded, dead tree swamp often created by beaver activity. Emergent vegetation is present below the dead trees. Emergent species are described for the PEM1F wetland type.

PFO5C Seasonally flooded, dead tree forested wetland. This situation is generally found surrounding ponds where the water level at one time was raised enough to kill the trees. Shrub vegetation may be sparse to non-existent; emergent vegetation, however, may include those species described for the PEM1C wetland type. See the descriptions for the PSS1C and PEM1C wetland types.

PFO5/SS1C Seasonally flooded, dead tree forested wetland. Similar to the PFO5C wetland type, except that the standing dead trees are less dense and there is an increase in the amount of understory broad-leaved deciduous shrubs. See the description for the PSS1C wetland type.

ATTACHMENT A: Wetland plants described in this report and their indicator status:

TREES-

Chamaecyparis nootkatensis	Alaska cedar	FAC
Picea sitchensis	Sitka spruce	FACU
Picea mariana	Black spruce	FACW
Pinus contorta	Lodgepole pine	FAC
Populus balsamifera	Black cottonwood	FACU
Tsuga heterophylla	Western hemlock	FAC
Tsuga mertensiana	Mountain hemlock	FAC

SHRUBS-

Alnus crispa	Green alder	FAC
Alnus sinuata	Sitka alder	FAC
Andromeda polifolia	Bog rosemary	OBL
Betula nana	Dwarf birch	FAC
Cassiope Mertensiana	Mountain heather	UPLAND
Cladathamnus pyrolaeflorus	Copperbush	UPLAND
Dryas spp.	Mountain aven	Variable
Empetrum nigrum	Black crowberry	FAC
Kalmia polifolia	Bog laurel	FACW
Ledum groenlandicum	Labrador tea	FACW
Loiseleuria procumbens	Alpine azalea	UPLAND
Luetkea pectinata	Luetkea	UPLAND
Menziesia ferruginea	Rusty menziesia	UPLAND
Myrica gale	Sweetgale	OBL
Oplopanax horridus	Devil's club	FACU
Phyllodoce aleutica	Aleutian heather	UPLAND
Ribes spp.	Currant	Variable
Rhododendron lapponicum	Lapland rosemary	FAC
Rubus spp.	Raspberry	Variable
Rubus arcticus	Nagoonberry	FAC
Rubus spectabilis	Salmonberry	FACU
Rubus parviflorus	Thimbleberry	FACU
Salix spp.	Willow	Variable
Salix arctica	Arctic willow	FAC
Salix barclayi	Barclay willow	FAC
Salix commutata	Willow	FAC
Salix sitchensis	Sitka willow	FAC
Sambucus racemosa	Pacific red elder	FACU

Shepherdia canadensis	Soapberry	UPLAND
Spirea beauverdiana	Alaska spirea	FAC
Vaccinium spp.	Blueberry	Variable
Vaccinium alaskaense	Alaska blueberry	FAC
Vaccinium ovalifolium	Blueberry	FAC
Vaccinium oxycoccos	Bog cranberry	OBL
Vaccinium vitis-idaea	Mountain cranberry	FAC
Vaccinium uliginosum	Bog blueberry	FAC
Viburnum edule	Highbush cranberry	FACU

GRAMINOIDS-

Agrostis spp.	Bent grass	Variable
Alopecurus aequalis	Foxtail	OBL
Arctagrostis latifolia	Polar grass	FACW
Arctophila fulva	Pendent grass	OBL
Calamagrostis spp.	Reed grass	Variable
Calamagrostis canadensis	Bluejoint	FAC
Calamagrostis nutkaensis	Bent reed grass	FAC
Carex spp.	Sedge	Variable
Carex aquatilis	Water sedge	OBL
Carex Lyngbyei	Lyngbye sedge	OBL
Carex sitchensis	Sitka sedge	OBL
Deschampsia spp.	Hair grass	Variable
Deschampsia cespitosa	Tufted hair grass	FAC
Eleocharis palustris	Spike rush	OBL
Elymus arenarius	Lyme grass	FAC
Eriophorum spp.	Cotton grass	Variable
Eriophorum angustifolium	Cotton grass	OBL
Festuca spp.	Fescue grass	Variable
Hierochloe alpina	Holy grass	UPLAND
Hordeum brachyantherum	Meadow barley	FACW
Hordeum jubatum	Foxtail barley	FAC
Juncus spp.	Rush	Variable
Juncus arcticus	Arctic rush	OBL
Luzula spp.	Wood rush	Variable
Poa alpina	Alpine blue grass	FACU
Poa eminens	Spear grass	FAC
Puccinellia spp.	Alkali grass	Variable
Puccinellia pauciflora	Manna grass	FACW
Scirpus spp.	Bulrush	Variable

FORBS-

Achillea millefolium	Yarrow	FACU
Aconitum delphinifolium	Monkshood	FAC
Anemone narcissiflora	Anemone	UPLAND
Artemisia arctica	Arctic wormwood	UPLAND
Aruncus sylvester	Goat's beard	UPLAND
Aster junciformis	Rush aster	OBL
Aster sibiricus	Siberian aster	FAC
Caltha palustris	Marsh marigold	OBL
Castilleja spp.	Indian paintbrush	Variable
Cicuta Douglasii	Water hemlock	OBL
Conioselinum chinense	Parsley hemlock	FACW
Cornus canadensis	Dwarf dogwood	FACU
Dendranthema arcticum	Arctic Daisy	FACW
Dodecatheon pulchellum	Shooting star	FACW
Drosera rotundifolia	Sundew	OBL
Epilobium angustifolium	Fireweed	FACU
Erigeron peregrinus	Coastal fleabane	FACW
Fauria crista-galli	Deer cabbage	FACW
Frageria virginiana	Strawberry	UPLAND
Fritillaria camschatcensis	Chocolate lily	FAC
Galium trifidum	Bedstraw	FACW
Gentiana Douglasiana	Swamp gentian	FACW
Gentiana platypetala	Gentian	UPLAND
Geranium spp.	Geranium	Variable
Geum calthifolium	Aven	FACW
Glaux maritima	Sea milkwort	OBL
Heracleum lanatum	Cow parsnip	FACU
Hippuris sp.	Mare's tail	OBL
Hippuris vulgaris	Mare's tail	OBL
Honkenya peploides	Seabeach sandwort	OBL
Iris setosa	Blue flag	FAC
Lathyrus spp.	Peavine	Variable
Lathyrus japonicus	Beach peavine	FAC
Lemna spp.	Duckweed	OBL
Ligusticum scothicum	Beach lovage	FAC
Limosella aquatica	Northern mudwort	OBL
Lupinus nootkatensis	Nootka lupine	FAC
Lysichiton americanum	Skunk cabbage	OBL
Menyanthes trifoliata	Buckbean	OBL
Mimulus guttatus	Monkey flower	OBL

Myriophyllum spicatum	Water milfoil	OBL
Nuphar polysepalum	Yellow pond lily	OBL
Nymphaea tetragona	Dwarf water lily	OBL
Parnassia palustris	Grass of Parnassia	FACW
Pedicularis parviflora	Lousewort	FACW
Plantago spp.	Plantain	Variable
Plantago maritima	Goose tongue	FACW
Platanthera spp.	Orchid	Variable
Polemonium spp.	Jacob's ladder	Variable
Polemonium acutiflorum	Jacob's ladder	FAC
Polygonum spp.	Smartweed	Variable
Potamogeton spp.	Pondweed	OBL
Potentilla Egedii	Silverweed	FACW
Potentilla palustris	Marsh cinquefoil	OBL
Ranunculus spp.	Buttercup	Variable
Ranunculus hyperboreus	Arctic buttercup	OBL
Ranunculus occidentalis	Western buttercup	FACW
Ranunculus pennsylvanicus	Buttercup	FACW
Ranunculus repens	Creeping buttercup	FAC
Rhinanthus minor	Yellow rattle	FAC
Rubus chamaemorus	Cloudberry	FACW
Rumex spp.	Dock	Variable
Rumex occidentalis	Western dock	OBL
Ruppia cirrhosa	Ditch grass	OBL
Sagittaria cuneata	Arrowhead	OBL
Sanguisorba canadensis	Canada burnet	FACW
Saxifraga spp.	Saxifrage	Variable
Sibbaldia procumbens	Sibbaldia	UPLAND
Sium suave	Water parsnip	OBL
Solidago spp.	Goldenrod	FACU
Sparganium spp.	Burreed	OBL
Streptopus roseus	Twisted stalk	FACU
Subularia aquatica	Awlwort	OBL
Stellaria humifusa	Starwort	OBL
Tiarella trifoliata	Foam flower	FAC
Tofieldia glutinosa	False asphodel	FACW
Triglochin sp.	Arrow grass	Variable
Triglochin maritimum	Seaside arrow grass	OBL
Utricularia spp.	Bladderwort	OBL
Veratrum viride	False hellebore	FACU
Zanichellia palustris	Horned pondweed	OBL
Zostera mariana	Eelgrass	OBL

OTHER (prevascular, ferns, algae, moss, lichen)-

Athyrium filix-femina	Lady fern	FAC
Chlorophyta	Algae	
Cryptogramma crispa	Parsley fern	UPLAND
Cyanophyta	Algae	
Cystopteris fragilis	Fragile fern	FACU
Dryopteris dilatata	Mountain wood fern	FACU
Enteromorpha spp.	Algae	
Equisetum spp.	Horsetail	Variable
Equisetum arvense	Field horsetail	FACU
Equisetum fluviatile	Water horsetail	OBL
Fucus spp.	Algae	
Isoetes muricata	Quillwort	OBL
Lycopodium sp.	Club moss	Variable
Lycopodium annotinum	Club moss	FAC
Pteridium aquilinum	Braken fern	FACU
Selaginella selaginella	Spike moss	FACU
Sphagnum spp.	Moss	Variable
Thelpteris phegopteris	Marsh fern	Unknown