NATIONAL WETLANDS INVENTORY
NOTES TO USER FOR
VALDEZ 1:63,360 SCALE MAPS

INTRODUCTION

The U.S. Fish and Wildlife Service (FWS) 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 (NWI) in the administration of that act.

The FWS has always recognized the importance of wetlands to waterfowl and other migratory birds. Consequently, the FWS has a direct interest in protecting wetlands, especially the 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 water.

(5) Water quality maintenance by removing silt load, filtering pollution and absorbing water-borne 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 activites.

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

NATIONAL WETLANDS INVENTORY PROGRAM

The National Wetlands Inventory (NWI) was initiated in 1975 and made operational in 1977. The primary goal of the NWI 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 NWI: 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 NWI project is as follows:

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

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

(3) Develop reports on the utility of NWI maps for wetlands management decisions.

(4) Assist all potential users in evaluating the value of NWI products in meeting their needs.

(5) Development of wetlands status/trends reports.

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

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

(8) Correlate existing wetlands value information to the wetlands classification system.

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

User notes are also compiled 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.

DEVELOPMENT OF WETLANDS CLASSIFICATION SYSTEM

The FWS'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 purpose of the classification system is: (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 U.S.

The 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 hierarchical 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, Forested) or substrate where vegetation is inconspicuous or absent (e.g., Unconsolidated Shore, Rocky Shore, Streambed). Each Class is further subdivided into Subclasses. The classification system also includes modifiers to describe hydrology (water regime), water chemistry (pH, salinity and halinity) and special modifiers relating to man's activities (e.g., impounded, partly drained, farmed, artificial).

MAP PREPARATION

The FWS participates with other Federal and state agencies in the Alaska High-Altitude Photography Program. The NWI uses the 1:60,000 scale color-infrared photography that is obtained by this program. With this imagery the NWI is capable of detailed wetland mapping with a minimum mapping size of 2-5 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 deep-water habitats on a U.S. Geological Survey (USGS) base map.

These 1:63,360 scale Valdez wetlands maps were produced using color-infrared (CIR) aerial photography at scales of 1:60,000 and 1:65,000. The following chart illustrates the type of photography used, the scale of photography, and the date of photography for individual 1:63,360 scale quadrangles:

Quadrangle	Photo type	Photo scale	Photo Date
A-2,4	CIR	1:60,000	8/78
	CIR	1:65,000	7/78
A-3	CIR	1:60,000	8/78
	CIR	1:65,000	7/78
	CIR	1:65,000	8/78
A-5	CIR	1:60,000	8/78
A-6	CIR	1:60,000	8/78
	CIR	1:65,000	8/78
A-7	CIR	1:60,000	8/78
	CIR	1:65,000	8/78
	CIR	1:65,000	7/79
B-2,3,4	CIR	1:60,000	8/78
	CIR	1:60,000	8/79
C-1,2,3,4	CIR	1:60,000	8/78
	CIR	1:65,000	8/78
D-2,3,4	CIR	1:65,000	8/78

Field checking was conducted in September of 1980, May of 1982, and again in June of 1984. Collateral information used in this mapping effort included the Soil Conservation Service's Exploratory Soil Survey for Alaska, the National Oceanic and Atmospheric Administration's coastal charts, and the U.S. Geological Survey's topographic maps.

To produce final NWI 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 photos, (5) draft map production, (6) interagency review of draft maps, and (7) final map production.

MAPPING PRIORITIES

Mapping priorities are based principally on the needs of the FWS and other Federal and state agencies. The priority areas for mapping in Alaska include North Slope oil and gas development areas, population centers, transportation corridors, agriculture development areas, and the coastal zone. As of September 1985, the NWI had produced wetlands maps for approximately 12% of Alaska. The NWI plans to map wetlands in Alaska at a rate of 2% annually (18% of Alaska by 1988). This would encompass one-half of the FWS's top priorities for Alaska.

MAPPING CONVENTIONS AND SPECIAL MAPPING PROBLEMS

- Wetlands are classified according to the FWS's Classification of Wetlands and Deepwater Habitats of the U.S. (Cowardin et al. 1979).

- All wetlands three acres in size or greater have been delineated and classified.

- 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 classes are used in each wetland label.

- The higher vegetation life form is always listed first. The second cover type of a mixed class alpha-numeric is a lower level of vegetation, substrate, or water which comprises at least 30% or more area of the unit mapped.

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

- All emergents visible on the aerial photography are considered to be persistent emergents and are mapped as such unless field or collateral data is available.

- 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% of the total area of the unit delineated.

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

- All linear wetlands and deep-water habitats are indicated by a dashed line. Linears are not included if they would result in 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 shadow or light cloud cover have been approximated from the USGS topographic quad sheets or other collateral information. Areas totally obscured and consequently not mapped are labeled as a "holiday."

- Special modifiers are used to indicate wetlands and deep-water habitats modified by man or beaver.

STUDY AREA

Two distinct physiographic regions exist within the Valdez 1:250,000 scale quad area: the Chugach Mountains (and to a lesser extent the Wrangell Mountains) and the Copper River Plateau.

The Chugach Mountains extend west towards Cook Inlet and east to the Bagley Ice Field at Icy Bay. This mountain range reaches its most northern point at Tazlina Lake and stretches south into Prince William Sound and the Gulf of Alaska. The area is comprised mainly of glaciers and ice fields and includes several prominent features such as the Columbia and Bering Glaciers and the Copper River. Mountain peaks exceeding 8,000 feet are common. Baily (1977) describes this area as an inclusion within the Pacific Forest Province, Hemlock-Spruce Forest Section of the Humid Maritime Regime Highlands, Humid Temperate Domain. Hammond (1977) describes the land-surface form as high mountain with less than 20 percent of the area gently sloping with local relief over 3,000 feet. The Chugach Mountains encompass the entire lower two-thirds of the Valdez 1:250,000 scale quadrangle. The Wrangell-St. Elias and Chugach Mountain Range complex supports the largest ice fields, piedmont glaciers, and valley glaciers in North America.

The Copper River Plateau extends north from the Chugach Mountains and is contained by the Talkeetna Mountains to the west and the Wrangell Mountains to the east. This area is an intermontane plateau drained by the Copper River and its tributaries. The plateau ranges in elevation from 1500 to 3000 feet within the northern Valdez quad section, declining to between 1000 and 2000 feet in the Lower Tonsina and Chitina River areas. The plateau is densely forested with *Picea mariana* with an understory of ericaceous shrubs and contains many bog areas. Lakes are abundant and may be quite large (i.e., Tazlina Lake). Baily (1977) describes the Copper River Plateau as being within the Coastal Trough Forest Province of the Polar Domain (Subarctic Division). Hammond (1977) describes the land surface form as irregular plains with 50-80 percent of the area gently sloping lowlands. Local relief is relatively constant at 100-300 feet.

The Wrangell Mountains occupy the extreme northeast corner of the quad area (most of this area is outside the study area mapped). Hammond (1977) places the Wrangell Mountains within the same physical land-form division as the Chugach Mountains.

Permafrost occurs sporadically in parts of the Valdez 1:250,000 scale quadrangle. The coastal areas are generally free of permafrost, however, the Chugach Mountain area is underlain by isolated masses of permafrost. In areas underlain by permafrost, the soil will remain saturated during the growing season due to melting of the top few inches of permafrost. The frozen soil below this actively thawing layer prevents downward water movement, thus saturation of the soil occurs.

Vegetation below timberline is predominantly coastal spruce-hemlock forest. Bogs, similar to those of Southeastern Alaska, are prominant features of the landscape. A heath type of vegetation, not present near sea level in Southeast Alaska, occurs near sea level in this region and intergrades with bogs. Alpine timberline is at an elevation of approximately 1500 feet and above this level the vegetation consists of alpine tundra. Spruce species change quickly from Picea sitchensis in the coastal (maritime) area to Picea mariana in the mountains (transitional) and Copper River Plateau (continental).

The vegetation within the Port Valdez City area can be classified into four major habitat types: (1) deciduous forest, (2) alder shrub, (3) spruce forest, and (4) saltwater marsh.

Deciduous forest is the dominant vegetation type of the lower elevations (less than 100 feet) along the Mineral Creek Loop Road. Deciduous forest also occurs opposite Inner Point. This plant community is particularly associated with the older floodplain areas. Deciduous forest areas are dominated by Populus trichocarpa.

The alder shrub community is found primarily above the 100 foot contour. The dominant species is Alnus spp. with lesser occurrence of Sorbus sp. and Sambucus racemosa. The understory is dominated by Oplopanax horridus and Rubus spectabilis. Agrostis sp. and Veratrum viride occur in open areas throughout this community. This vegetation type is found on the barrier islands and north of the Richardson Highway.

Spruce forests are the least abundant vegetation type in eastern Port Valdez. In the older spruce forests, the species diversity is relatively low with the understory dominated by Oplopanax horridus, Alnus spp., and ferns. Picea sitchensis is the dominant tree species. Ribes bracteosum, Vaccinium spp. and Rubus spectabilis are present, although relatively sparse. Ground cover includes Gaultheria sp. and Circaea alpina. Spruce community type vegetation is prevalent on Dock Point and Inner Point.

The saltmarsh contains large expanses of intertidal mudflats which are extremely complex and relatively diverse in terms of frequently occurring plant species. Vegetation within the saltmarsh is subject to erratic changes in terms of coverage and frequency as well as the presence of plant species. These changes may be attributed to both natural and man-influenced causes. Six freshwater streams, which drain into the mudflats, provide habitat for many freshwater aquatic plant species. The surrounding saltmarsh consists of grasses, sedges, and herbaceous vegetation that is subject to frequent inundation by tidal waters. Five different plant communities have been described within this major habitat type. These communities are briefly described below:

I. Low Intertidal Marsh

This area is characterized by Fucus distichus with beds of Mytilus edulis. Carex lyngbyaei, Potentilla egedii, and Glaux maritima are found in the less frequently inundated areas northeast of Sontag Spit. Puccinellia nutkaensis and Spergularia canadensis form a vegetative band between the drier areas and the intertidal flats. As in all five areas, Carex lyngbyaei may be found along the channels intersecting the marsh. The soil is a sandy-mud with pebbles.

II. Low Marsh

The low marsh consists mainly of mudflats and is characterized by various algal species, predominantly Enteromorpha spp. Extensive beds of Carex lyngbyaei are commonly interspersed with Eleocharis kamtschatica. Potamogeton spp. and Zannichellia palustris are common in areas of standing water (less than three inches deep). The soil is composed of fine muds (silts and clay).

III. Middle Marsh

The middle marsh is characterized by two distinct areas of vegetation. Zones of Carex lyngbyaei and Eleocharis kamtschatica are found immediately adjacent to the intertidal flats. Moving upland, Eleocharis kamtschatica tends to be replaced by Potentilla egedii, Poa eminens and Festuca rubra. Elymus mollis dominates the higher area adjacent to the Mineral Creek Loop Road. Small patches of Myrica gale mixed with Deschampsia beringensis are evident in the better drained areas. Isolated ponds are vegetated by Zannichellia palustris and Potamogeton spp.

IV. Middle Marsh with Shallow Ponds

This habitat type is limited to the western edge of the Valdez Duck Flats. It is comprised mainly of Carex lyngbyaei with smaller areas of Eleocharis kamtschatica, Potentilla egedii, and Puccinellia nutkaensis with intermittent shallow ponds. The better drained areas to the west contain bands of Carex pluriflora, Deschampsia beringensis, Myrica gale, and Calamagrostis canadensis. Immediately adjacent to the Richardson Highway is a wide band of Alnus spp. and Salix spp. Isolated pockets of Elymus mollis and Carex mackenziei can be found. Poa eminens, Festuca rubra, Eriophorum russeolum, Juncus bufonius, and Triglochin maritima are also present.

V. North Marsh

This habitat type is confined to the stretch of marsh north of the Richardson Highway. It is utilized by wildlife less than the adjacent marsh. Shallow stagnant ponds of Eleocharis kamtschatica and Hippuris tetraphylla, interspersed with Carex lynbyaei, Deschampsia beringensis, and Potentilla egedii occupy much of this area. Galium trifidum, Elymus mollis, Poa eminens, Cicuta mackenzieana, Calamagrostis canadensis, and Carex mackenziei occur in smaller areas between the ponds and the base of the mountain.

The marine topography of eastern Port Valdez is characterized by a broad, steep sloping incline from the basin floor culminating in intertidal mud and sand flats, stream deltas, and marsh lands. Generally, four distinct benthic habitats can be found: (1) intertidal and subtidal rock; (2) intertidal mud and sand flats; (3) subtidal mud slopes; and (4) deep sedimentary basin.

The rocky intertidal area supports a community of low diversity, composed of Fucus distichus and Monostroma sp. Seasonal and spatial variations in population density are evident, possibly due to sedimentation patterns, salinity variations, temperature changes, and photoperiod.

The rocky subtidal area supports various macrophytes, primarily Laminaria saccharina. Kelp cover ranges from 15 to 55 percent depending on the season.

The intertidal mud and sand flats support Laminaria saccharina and Pylaiella sp.

The subtidal mud slopes and deep sedimentary basin support little to no plant life.

The marine system attains peak primary production in the spring followed by a drastic reduction in summer, due primarily to the suspended sediment load associated with early summer glacial melt. Saltmarshes and intertidal habitats supply material to the benthic communities. The energy pathways for the major marine communities are relatively simple. Phytoplankton, benthic diatoms, algae, seagrasses, and marsh and terrestrial plants contribute to the supply of organic material at the base of the food web.

Tides within Port Valdez are of the mixed, semi-diurnal type (two unequal highs and two unequal lows during a +/- 24 hour cycle). The mean tidal range is 9.4 feet with a diurnal range of 11.8 feet. The extreme tidal range has exceeded 22 feet.

Climatic data for the Valdez 1:250,000 scale quad area is available for the Port Valdez area. This is not, however, representative of the general area in that Port Valdez is coastal and out of the high mountains. Climatic data from Glennallen, which is just north of the study area, is applicable to the Copper River Plateau area in the northern section of the Valdez 1:250,000 scale quad area.

The Valdez 1:250,000 scale quad area is contained within three major climatic zones:

- Maritime - Coastal zone influenced by marine conditions. Climate is characterized by heavy precipitation, cool summers and mild winters. Surface winds are persistently strong in most areas.

- Continental - Includes the Copper River Plateau area north of the Chugach Mountains. Generally, both summer and winter temperatures are extreme and precipitation is light. Except for a few isolated locations, surface winds are light.

- Transition - Chugach Mountain area between the Maritime and Continental climatic zones. Weather is variable (combination of Maritime and Continental). On the average, temperatures are more extreme than in the Maritime, but less than in the Continental Zone. Precipitation also flucuates between the two.

The following climatic data is for the Port of Valdez:

Temperature:	Summer	42° to 60° F
	Winter	11° to 43° F
	Extremes	-28° to 87° F

Precipitation: 62 inches including 244 inches of snow

Average wind: Southwest at 5.7 knots
Extreme wind: 80 knots

The following climatic data is for the Tonsina area:

Temperature:	Summer	39° to 70° F
	Winter	-23° to 38° F
	Extremes	-61° to 90° F

Precipitation: 15 inches including 68 inches of snow

The following climatic data is for the Copper Center area:

Temperature:	Summer	39° to 69° F
	Winter	-22° to 27° F
	Extremes	-74° to 96° F

The following climatic data is for the Thompson Pass area:

Temperature:	Summer	36° to 58° F
	Winter	2° to 32° F
	Extremes	-39° to 75° F

Precipitation: 83 inches including 583 inches of snow

HYDRIC SOILS

Detailed soils information is lacking for the Valdez 1:250,000 scale quad area. Generalized soils information for the study area was obtained from the publication Exploratory Soil Survey of Alaska.

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 soils 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. For a technical definition, the reader is referred to Soil Taxonomy.

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, like 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 thirty feet in depth. Organic soils can be further subdivided into three groups based on the percent 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 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 for significant periods and/or are saturated within three feet of the surface from two to twelve months of the year. 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 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 and 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.

Much of the survey area has been glaciated and coarse gravelly moraines are common in the area. Areas of gravelly outwash occur in parts of the upland plains that border deeply incised valleys.

On the alluvial plains and in many of the upland depressions, the soils formed in material deposited by streams or washed in from surrounding slopes. Most of these soils are silty, but a few on valley bottoms are coarse textured. Many depressions are filled with peat soils that formed mostly from the accumulated remains of mosses and sedges. Peat bogs, or muskegs, range from many square miles to less than an acre in size.

On most, but not all, of the steep slopes, the silty mantle is somewhat thinner that it is in level areas. Soil development generally is about as far advanced on the steep parts of uplands as it is on the gently sloping or nearly level parts. Most of the depressions, however, are poorly drained, and the soils in them show characteristics related to wetness. Horizon differentiation is well advanced in most of the soils of the uplands, but wet soils show little profile development.

The following section identifies the soil classes in the Valdez 1:250,000 scale quad area that exhibit hydric characteristics. The information was obtained from the Exploratory Soil Survey of Alaska. The classes are based on Soil Taxonomy of the National Cooperative Soil Survey.

Typic Cryaquents-Typic Cryofluvents; very gravelly, nearly level association:

This association occupies outwash plains and alluvial fans between the foot slopes of coastal mountains and the northern coast of the Gulf of Alaska. Large areas are nearly level and less than 100 feet above sea level. The major streams are glacier fed and have broad flood plains 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 flood plains.

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 this 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 trichocarpa and dense patches of tall Salix spp. 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 this association are within National Forest boundaries 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 uses because of flooding or high water tables.

The following hydric soils are found within this association:

(Entisol: Typic Cryaquents, very gravelly, nearly level), are poorly drained soils on low, nearly level areas of outwash plains and flood plains. 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.

(Entisol: Typic Cryofluvents, very gravelly, nearly level), occupy natural levees and terraces bordering flood plains. 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 3 feet below the surface, but many areas are susceptible to occasional flooding. The dominant vegetation is a forest of either Populus trichocarpa or Picea sitchensis. Areas of typic cryofluvents that are not flooded annually are considered to be non-wetland.

(Histosol: Terric Sphagnofibrists, nearly level), 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 moss and is 24 to 50 inches thick over sandy or loamy sediment. The vegetation is mainly mosses, sedges, and low shrubs.

(Histosol: Typic Sphagnofibrists, nearly level), consist of very poorly drained thick sphagnum moss peat in small depressions in moraines.

(Entisol: Typic Cryaquents, clayey, nearly level), are marshes on low coastal plains and deltas. They are frequently inundated by tidewater.

(Riverwash) consists of very gravelly and sandy deposits along streams.

(Gravelly beaches) occur along the coast.

Histic Pergelic Cryaquepts; clayey, nearly level to rolling association:

This association occupies the site of a large lake that existed during glacial times. A nearly level to rolling plain dotted with lakes and muskegs dominates the landscape, but the flood plains and terraces of major streams are included. Elevations range from about 1,500 to 3,000 feet above sea level. Although the overall drainage pattern is poorly defined, the lower stretches of a few large rivers fed by meltwater from glaciers in the adjoining mountains are deeply incised in narrow valleys. Most of the association drains into the Copper River system.

The major soils formed in clayey, nonacid to calcareous, glaciolacustrine sediment. Included are small areas of soils in very gravelly drift on terraces and moraines, stratified silty and sandy alluvial sediment on flood plains, and sand in old beach ridges and stabilized dunes. Organic soils occupy some depressions. Terraces near the larger rivers are commonly mantled with silty loess. Permafrost is shallow in most of the area but is deep or absent in some of the very gravelly and sandy material.

The vegetation is mainly Picea mariana forest interspersed with large areas of brushy tundra and scattered areas of sedges, mosses, and low shrubs in very poorly drained muskegs. Stands of Populus trichocarpa and tall brush are common on the larger flood plains, and alpine forbs and shrubs occur on isolated ridgetops.

The climatic and soil limitations are too severe for most crops and commercial timber. Most of the soils also have severe limitations for roads and building foundations, largely because of permafrost. The best construction sites are on very gravelly moraines and on narrow terraces that border the major streams. The area provides a wide variety of wildlife habitat that is utilized by many different species, including moose and caribou.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, clayey, nearly level), occupy a series of nearly level plains separated by short escarpements in a broad former lake basin. Gradients are generally less than 3 percent. The soils are poorly drained and formed in nonacid to calcareous clayey glaciolacustrine sediment over a shallow permafrost table. The principal vegetation is Picea mariana, mosses, sedges, Betula glandulosa, Salix spp., Alnus spp., and low shrubs. Typically, these soils have a thick peaty surface mat over mottled gray clay or clay loam. Under the natural vegetation the permafrost table is usually less than 20 inches below the mineral surface, but if the vegetation is removed or destroyed the permafrost table is lowered. During the summer the soil above the frozen material is usually wet.

(Inceptisol: Histic Pergelic Cryaquepts, loamy, nearly level to rolling), occupy long foot slopes of moraines and small isolated mountains. Solifluction lobes are fairly common. The soils, formed in silty colluvium or loess, are poorly drained and have a shallow permafrost table. The dominant vegetation is Picea mariana, mosses, sedges, Salix spp., Betula glandulosa, and low shrubs.

Typically, these soils have a thick peaty surface mat over gray or dark gray mottled silt loam that is perennially frozen at depths ranging from 15 to 30 inches below the mineral surface. During the summer thaw water perched above the frozen material keeps the soils wet. In places the soils contain a few stones and pebbles.

(Histosol: Pergelic Cryofibrists, nearly level), are very poorly drained, nearly level organic soils in low areas and depressions in undulating to rolling plains. The peat consists of fibrous material derived mainly from sedges. Sphagnum moss peat is at the surface. The permafrost table is generally shallow.

(Inceptisol: Pergelic Cryaquepts, loamy, nearly level to rolling), are poorly drained soils on foot slopes and in broad valleys. The vegetation is dominated by Picea mariana. Permafrost is shallow to moderately deep.

Histic Pergelic Cryaquepts; loamy, nearly level to rolling association:

Largely because of ice-rich permafrost, the dominant soils in all areas of the association have severe limitations for any intensive use and development. They are not potentially suitable for common agricultural crops and are not forested. Primarily the soils provide habitat for wildlife. Many provide suitable grazing for reindeer.

On the Copper River Plateau the association occupies extensive tracts of nearly level to rolling ground moraines, outwash plains, and long mountain foot slopes. Some moraine hills, small flood plains, and a few stream terraces are included. Elevations range from about 2,000 to 3,000 feet above sea level. Forests of Picea mariana and tundra dominated by sedges, mosses, and low shrubs, are the two principal kinds of vegetation. The dominant soils in the association are developed in silty material of variable thickness over very gravelly glacial drift. Most of the soils have a shallow permafrost table, but in some of the very gravelly well drained soils permafrost is deep or absent.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, loamy, nearly level to rolling), occur on nearly level to rolling ground moraines and long foot slopes of low mountains. The soils are poorly drained and have a shallow permafrost table. They consist of moderately deep to deep loamy colluvium or loess over gravelly and stony glacial drift. The principal types of vegetation are lowland tundra and Picea mariana forest.

The soils have a thick peaty surface mat and a mottled gray silt loam to sandy loam lower horizon. The permafrost table is usually 10 to 20 inches below the surface mat. Some of the soils are as much as 35 percent gravel by volume.

(Inceptisol: Histic Pergelic Cryaquepts, very gravelly, nearly level to rolling), are poorly drained soils on scattered outwash plains and a few moraines. They formed in very gravelly glacial drift and have a moderately deep permafrost table. They support forests of Picea mariana and tundra dominated by sedges, mosses, and low shrubs. Beneath a thick peaty surface mat, the soils are mottled dark gray very gravelly loam or sandy loam. They are perennially frozen below a depth of 20 to 30 inches.

(Histosol: Pergelic Cryofibrists, nearly level), occupy nearly level muskegs that are wet and spongy in the summer. The soils consist of fibrous moss and sedge peat that extends into ice-rich permafrost at depths of 10 to 30 inches below the surface. The dominant vegetation is sedges, mosses, and low shrubs.

(Inceptisol: Pergelic Cryaquepts, very gravelly, hilly to steep), are poorly drained soils with a moderately deep permafrost table. They are on low moraines. They occur in close association with Histic Pergelic Cryaquepts. The soils formed in very gravelly and stony glacial till. They have a thin peaty surface mat and a mottled gray cambic horizon developed in very gravelly loam. Depth to permafrost ranges from about 20 to 30 inches. The vegetation is mainly shrubs, sedges, lichens, mosses, and Picea mariana.

Typic Cryochrepts-Histic Pergelic Cryaquepts; loamy, nearly level to rolling association:

This association occupies extensive areas of terraces and low hills bordering flood plains in the lower part of the Copper River Valley. Though overall relief of the landscape is relatively smooth, the lower parts of terraces are commonly traversed by steep narrow valleys of deeply incised tributary rivers and streams. Elevations range from about 700 to 1,500 feet above sea level.

In poorly drained soils that commonly occur in nearly level depressions and on foot slopes, the permafrost table is shallow and the vegetation is either a forest of stunted Picea mariana or a tundra dominated by sedges, mosses, and low shrubs.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, loamy, nearly level to rolling), are poorly drained soils with a shallow permafrost table. They occur in valleys and in broad swales in terraces. The vegetation is stunted Picea mariana or a cover of sedges, mosses, and low shrubs. Typically, the soils have a peaty surface layer 8 to 16 inches thick over strongly mottled dark gray silt loam. The permafrost table is generally less than 20 inches beneath the organic mat.

Typic Cryochrepts-Entic Cryumbrepts; loamy, nearly level to rolling association:

This association occupies low moraines, former lake basins, and terraces in areas close to the Copper River. Elevations range from about 1,000 to 2,000 feet above sea level. Though much of the landscape is nearly level to rolling, a few steep narrow valleys of deeply incised streams are included.

The principal soils formed in a silty loess mantle of variable thickness over very gravelly drift on moraines and clayey lacustrine sediment in former lake basins and terraces. A thin layer of volcanic ash may occur at the surface. Scattered areas of poorly drained soils that have a shallow permafrost table are covered with either forests of stunted Picea mariana or tundra dominated by sedges, mosses, and low shrubs.

Soil limitations for buildings and construction are severe for poorly drained soils with permafrost.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, clayey, nearly level to rolling), are poorly drained soils with a shallow permafrost table in nearly level depressions and swales in terraces. The vegetation is a forest of Picea mariana or tundra dominated by sedges, mosses, and low shrubs. Typically, beneath a peaty surface mat, 8 to 16 inches thick, the soils consist of mottled gray calcareous silty clay loam or clay loam. The permafrost table is commonly less than 16 inches below the mineral surface.

(Histosol: Pergelic Cryofibrists, nearly level), are very poorly drained areas of fibrous organic soils in scattered depressions under a cover of sedges, mosses, and low shrubs. The peat consists mainly of dark brown coarse sedge and moss fibers. Depth to permafrost is commonly less than 20 inches.

Typic Cryochrepts-Typic Cryorthents; very gravelly, nearly level to rolling association:

This association occupies broad plains bordering the Chitina River and a few other streams tributary to the Copper River. Most of the areas are between 800 and 1,500 feet above sea level. Nearly level forested terraces interrupted by low flood plains along the rivers dominate the landscape.

Poorly drained soils with permafrost support forests of stunted Picea mariana or a cover of mosses, sedges, and low shrubs in valley bottoms and in broad swales in terraces. Also included are very poorly drained deep fibrous peat soils in scattered depressions under a cover of sedges and mosses.

Most of the soils of the association are thickly vegetated and provide habitat for moose, bear, caribou, small mammals, and birds.

Poorly drained soils of the association have severe limitations for all intensive uses.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, very gravelly, nearly level to rolling), are poorly drained soils with a shallow permafrost table that occupy broad swales in terraces. The vegetation is either a forest of stunted Picea mariana and a thick ground cover of moss or a tundra dominated by sedges, mosses, and shrubs. Typically, beneath a thick peaty surface mat the soils consist of mottled dark gray shallow silt loam or sandy loam over very gravelly and stony loam. The permafrost table is usually less than 20 inches below the peaty surface mat.

(Histosol: Pergelic Cryofibrists, nearly level), consist of very poorly drained fibrous peat in scattered depressions under a cover dominated by sedges and mosses. Beneath the vegetative mat, the peat consists mainly of dark brown coarse sedge and moss fibers. These soils are usually wet in the summer, and the permafrost table is less than 20 inches below the surface.

Typic Cryochrepts; very gravelly, hilly to steep association:

This association occupies moraines and mountain foothills bordering the Copper and Chitina Valleys. Except for a few included flood plains and valleys, the landscape is made up of hills and ridges ranging from about 1,000 to 3,000 feet above sea level.

Poorly drained soils with permafrost occur in valleys and on steep north-facing slopes. They are under either a forest of stunted Picea mariana or a cover of mosses, sedges, and low shrubs. On high hills and ridges above 2,000 feet, the dominant vegetation is low alpine shrubs, mosses, lichens, and grasses.

Except for a few small areas in valleys and on low moraines, soils of the association are not potentially suitable for cultivation or forestry and have severe limitations for construction. Primarily, the soils provide habitat for wildlife.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, very gravelly, hilly to steep), are poorly drained soils with a shallow permafrost table on steep north-facing slopes, valley bottoms, and seepage areas on foot slopes. The vegetation is dominated by mosses, sedges, low shrubs, and scattered stands of stunted Picea mariana. Typically, the soils have a thick peaty surface mat over mottled dark gray very gravelly and stony silt loam or sandy loam. The permafrost table is usually less than 20 inches below the surface mat.

(Histosol: Pergelic Cryofibrists, nearly level), are very poorly drained organic soils with permafrost. They occur in scattered depressions in moraines under a cover of sedges and mosses.

Pergelic Cryumbrepts; very gravelly, hilly to steep-Rough mountainous land association:

This association occupies mountainous areas. The landscape is made up largely of hilly alpine plateaus, rocky peaks, sharp ridges, steep mountain valleys, and foot slopes. The dominant soils in most areas formed in very stony and gravelly colluvial material of variable thickness over bedrock, but some of the soils in valleys and on foot slopes in glaciated areas formed in deposits of till. The vegetation is low shrubs, mosses, lichens, and a wide variety of short grasses and associated forbs.

Soils of the association are not suitable for cultivation or forestry, and because of the rugged terrain they have severe limitations for construction and engineering uses. Primarily, the association provides wildlife habitat for birds and mammals that frequent alpine areas.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, very gravelly, hilly to steep), are poorly drained soils with a shallow permafrost table in swales and on slopes affected by seepage. The vegetation is dominantly sedges, mosses, and low shrubs. Beneath a thick peaty surface mat the soils have mottled, dark gray horizons formed in very stony and gravelly loam. Depth to permafrost is usually less than 20 inches.

(Inceptisol: Pergelic Cryaquepts, very gravelly, hilly to steep), are poorly drained soils with permafrost on steep slopes affected by seepage. The vegetation is dominantly sedges, mosses, and low shrubs, but the peaty accumulation on the surface is less than 8 inches thick. The soil surface is commonly frost scarred.

Humic Cryorthods; very gravelly, hilly to steep association:

The association occupies foothills and deep mountain valleys in the Chugach Range north of the Gulf of Alaska. Mountain foot slopes, high alpine benches, foothills, and steep-sided valleys dominate the landscape. Although most areas are 1,000 to 2,500 feet above sea level, the extreme elevations range from about 200 feet in a few valley bottoms to 3,500 feet on high ridgetops.

The dominant soils formed in very gravelly drift or colluvium capped with a thin mantle of silty loess or a mixture of loess and volcanic ash. On steep mountain-sides and high ridges, many soils are shallow over bedrock. All of the soils, except for a few in high alpine areas, are free of permafrost.

There are several principal types of vegetation. Forests dominated by Picea sitchensis and Betula papyrifera are common on valley bottoms and lower foot slopes. On intermediate slopes between tree line and high ridgetops, most of the soils support subalpine vegetation that is mainly Salix spp., Alnus spp., tall grasses, forbs, shrubs, and widely scattered stunted Picea mariana. At higher elevations, generally above 2,500 feet, most of the soils are covered with low alpine shrubs, mosses, lichens, and short grasses.

In general, soils of the association in these areas are not potentially suitable for cultivation and have severe limitations for most types of construction. A few of the soils at lower elevations support forests of commercial value. The wildlife habitat is utilized by relatively high populations of moose, bear, small mammals, and birds.

The following hydric soils are found within this association:

(Inceptisol: Typic Cryaquepts, very gravelly, nearly level to rolling), are poorly drained soils in drainageways and slight depressions in valley bottoms. The vegetation is dominantly Alnus spp., Salix spp., sedges, and forbs.

(Histosol: Typic Borohemists, nearly level), are very poorly drained organic soils in depressions in hills. The vegetation is mainly sedges and mosses. The peat is made up mostly of partially decomposed material derived from sedges and mosses.

(Histosol: Sphagnic Borofibrists, nearly level), are very poorly drained fibrous organic soils in depressions under a thick cover of sphagnum moss and low shrubs.

Humic Cryorthods, very gravelly, hilly to steep-Terric Cryohemists, nearly level to steep association:

This association occupies mountain foot slopes, moraine hills, and deep glaciated valleys close to the north coast of the Gulf of Alaska. Elevations in most areas range from sea level to about 2,000 feet on the upper parts of foot slopes.

The dominant soils in the association formed in very gravelly and stony glacial till under forests of Picea sitchensis and Tsuga heterophylla. Areas of very poorly drained peat covered with sedges, mosses, shrubs, and Tsuga heterophylla are common on many of the slopes affected by seepage and in areas of low rolling moraines. Because of mild winter temperatures and a heavy snow cover, the soils are seldom frozen.

The soils are potentially suitable for cultivation and most have severe limitations for structures and other engineering uses. Most of the areas are within National Forest boundaries. Though some of the soils support stands of commercial timber, logging in most places is limited. Primarily, the soils provide wildlife habitat for species that frequent the coastal forests.

The following hydric soils are found within this association:

(Histosol: Terric Cryohemists, nearly level to steep), are very poorly drained organic soils that occur on gentle to steep slopes affected by seepage. The vegetation is dominantly sedges, with Tsuga heterophylla and shrubs. The soils are mainly partially decomposed dark brown sedge peat 16 to 50 inches thick over firm glacial till. The peat commonly contains woody fragments. Layers of fibrous moss peat and, in places, thin strata of buried volcanic ash are common.

(Histosol: Terric Cryosaprists, nearly level to steep), consist of very poorly drained mucky peat in drainageways and on slopes affected by seepage. The vegetation is dominantly a forest of slow-growing Tsuga heterophylla and Picea sitchensis and a dense understory of shrubs and forbs. The peat consists mostly of highly decomposed, black finely divided organic material 16 to 50 inches thick over compact glacial till.

(Spodosol: Cryic Fragiaquods, very gravelly, hilly to steep), are poorly drained soils on slopes affected by seepage. They formed under forests dominated by Tsuga heterophylla and, to a lesser extent, Picea sitchensis. Typically, beneath a mat of partially decomposed forest litter, the soils have a mottled dark gray albic horizon and a mottled dark reddish brown spodic horizon 12 to 18 inches thick. Both horizons developed in very gravelly and stony glacial till. The substratum is very firm, slowly permeable till.

(Histosol: Typic Cryohemists, nearly level to steep), consist of deep, very poorly drained peat on slopes of foothills and moraines. The vegetation is dominantly sedges and mosses. The peat is made up mainly of dark brown, partially decomposed sedge fibers interbedded with a few layers of moss fibers. In places, there are also a few buried layers of volcanic ash. The peat is more than 50 inches thick over glacial till and is wet throughout the year.

(Histosol: Typic Sphagnofibrists, nearly level), are very poorly drained organic soils consisting mainly of coarse sphagnum moss fibers. They occur in depressions underlain by compact glacial till. The vegetation is dominantly sphagnum moss and low shrubs.

Pergelic Cryorthods, very gravelly, hilly to steep - Histic Pergelic Cryaquepts, loamy, nearly level to rolling association:

This association is extensive on foothills in northern parts of the Copper River Plateau. Choppy moraine hills with broad intervening valleys, high ridges with long foot slopes, small outwash plains, many lakes, streams, and scattered muskegs are major features of the landscape. Elevations range from about 2,500 to 4,500 feet above sea level. Solifluction lobes pattern some of the foot slopes, and frost-scarred soils are common on ridges at higher elevations.

The dominant soils formed in glacial till or loamy colluvial sediments, and most are covered with tundra vegetation. Betula glandulosa, other low shrubs, mosses, lichens, short grasses, and forbs are the principal plants on well drained soils, but sparse forests of Picea glauca occur at lower elevations. The vegetation on poorly drained soils that have a shallow permafrost table is mainly sedge tussocks, mosses, low shrubs, and scattered forests of Picea mariana.

In general, soils of the association are not potentially suitable for cultivation or commerical forestry, and many also have severe limitations for roads and structures. Most of the soils provide habitat suitable for caribou, moose, and a wide variety of small mammals and birds.

The following hydric soils are found within this association:

(Inceptisol: Histic Pergelic Cryaquepts, loamy, nearly level to rolling), are poorly drained soils with a shallow permafrost table in valleys and on long foot slopes. Solifluction lobes are common. The vegetation is mainly sedge tussocks, mosses, low shrubs, and, in places, stands of stunted Picea mariana. Typically, the soils have a thick peaty surface mat over mottled gray or dark gray, frost-churned loam or silt loam. Depth to perennially frozen material is usually less than 20 inches below the surface mat.

(Inceptisol: Histic Pergelic Cryaquepts, very gravelly, nearly level to rolling), are very poorly drained soils with a shallow permafrost table in broad depressions in outwash plains. The vegetation is a cover of low shrubs, mosses, sedges, and scattered Picea mariana. Beneath a thick peaty surface mat the soils consist of mottled gray gravelly silt loam that is shallow over very gravelly sediment. The permafrost table is usually less than 20 inches below the peaty surface mat.

(Histosol: Pergelic Cryofibrists, nearly level), are very poorly drained organic soils in scattered depressions in moraines and terraces. The vegetation is mainly mosses, sedges, and low shrubs. Beneath a mat of live moss and roots the peat consists of coarse dark brown fibers derived from sedges and mosses. The permafrost table is shallow, and during the summer the peat is constantly wet.

(Inceptisol: Pergelic Cryaquepts, very gravelly, hilly to steep), are poorly drained soils with permafrost in steep drainageways under a cover of sedges, mosses, and low shrubs.

WETLANDS AND AQUATIC HABITATS

The following section describes the map codes used on the Valdez 1:63,360 scale wetland maps. A general description and/or community type, including dominant vegetation, is provided for each code. For vegetated wetland types, the corresponding classification according to the Classification System for Vegetation of Alaska (Viereck et al. 1982) is provided.

Marine System

There are no wetlands or deepwater habitats within the Marine system in the Valdez 1:250,000 scale quad area. The salt water areas within this region do not exhibit full sea strength salinity, shorelines are not exposed to the full force or impact of waves originating in the open ocean, and vegetation occuring along these shorelines is similar to that found in more "typical" estuarine situations than found along ocean shorelines. Although the depth of many canals and fjords is extremely deep (exceeding 300 feet), this factor alone is not sufficient for classifying these areas as marine.

Estuarine System

The Estuarine system is confined to bays, tidal marshes, 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 of the open ocean.

E1OWL — Subtidal, low-energy, brackish open water. Includes the permanently flooded portion of bays, fjords, and adjacent river channels. Also includes small brackish ponds (silt bottomed) which are inundated by high spring tides.

E2BBN — Intertidal, regularly flooded, unvegetated beaches and bars along low-energy shorelines. Typically composed of silt and sand-sized particles.

E2FLM — Intertidal, low-energy, irregularly exposed unvegetated areas of sand and mud flats.

E2FLN — Regularly flooded mud and sand flats in low-energy, brackish environments. Some of the higher elevation areas along the shore may have a sparse vegetative cover of herbaceous plants and algae. (See description for the E2EM1N wetland type.)

This code was also used to designate tidal ponds and pools that are frequently found at the higher elevations of brackish marsh areas. Although these ponds are generally only inundated by tidal water irregularly (once a year to a few times per month), the water often remains standing in the basins because they are not drained by tidal guts. Precipitation has a significant

effect on the water levels during periods between tidal flooding. The regularly flooded water regime modifier (N) was used in mapping to describe the wetter condition of these potholes.

E2FLP Irregularly flooded, unvegetated mud and sand flats in low-energy, brackish environments.

E2RSP Intertidal, low-energy, irregularly flooded areas of bedrock, boulders, or stones.

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 E2EM1N and E2EM1P exist in close proximity to one another, making it difficult to delineate).

The E2EM1N marsh exists in areas exhibiting estuarine features, particularly at the heads of fjords and sheltered embayments.

Areas inundated for extended periods (several days per month for up to six hours at a time) are generally sparsely vegetated by species dominant in the higher marsh areas. Carex lyngbyaei dominates the emergent flats areas, particularly along tidal channels which are inundated for short durations. Carex lyngbyaei may form a dense peaty turf, up to one meter in height, along these tidal guts. The higher areas (primarily vegetated levees) may also contain a sparse to dense vegetative cover of Calamagrostis canadensis, Deschampsia beringensis, Potentilla egedii, and Elymus arenarius.

The lower, more regularly flooded areas may be dominated by Carex lyngbyaei, Triglochin maritumum, Cochlearia officinalis, Puccinellia nutkaensis, and Spergularia canadensis. Fucus distichus and Enteromorpha clathrata (both marine algae) may occur in the lower intertidal zone.

Shrub thickets may occur along the highest shoreward portions which are still subjected to regular, but for short duration, inundation. Species subjected to irregular flooding, particularly those areas where water drains off rapidly and the surface mud dries somewhat, include various species described for the E2EM1P wetland type.

Viereck et al. types - Halophytic grass wet meadow
- Halophytic sedge wet meadow

E2EM1/FLN Brackish marshes mixed with mud flats and/or tidal ponds (see descriptions for E2EM1N, E2EM1P, and E2FLN wetland types). Typically found at the mouths of larger 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.

Viereck et al. types - Halophytic grass wet meadow
- Halophytic sedge wet meadow
- Halophytic sedge marsh

E2EM1P Higher elevation areas of brackish marsh that are flooded irregularly by tidal water. Surface drainage is good in these areas.

Dominant species include Carex lyngbyaei, Potentilla egedii and Elymus arenarius (which is restricted to the higher slough banks with a sand or gravel substrate). Carex lyngbyaei and Elymus arenarius may occur in pure stands. Additional species of importance include Deschampsia beringensis (which grows in tufts or on slough banks in the high tide margin), Calamagrostis canadensis, Equisetum arvense, Mertensia maritima, Honckenya peploides, Trientalis europaea, Poa eminens, Lathyrus maritimus, Achillea borealis, and various other herbaceous plants. Salix spp. may occur in the higher portions of the irregularly flooded marsh (see species description for the E2EM1N wetland type).

Viereck et al. types - Halophytic grass wet meadow
- Halophytic sedge wet meadow

E2EM1/FLP Irregularly flooded, higher elevation brackish marsh with areas of open or sparsely vegetated mud or sand flats (see descriptions for E2EM1P, E2FLP, E2EM1N, and E2EM1/FLN wetland types).

E2SS1/EM1P Irregularly flooded, higher elevation portion of brackish marsh. Broad-leafed deciduous shrubs comprise at least 30 percent of the area with the remaining area being composed of various graminoids and other herbaceous plants of the E2EM1P wetland type (see description for the E2EM1P wetland type).

Dominant shrubs may include Salix spp., Myrica gale, and possibly Alnus spp.

Lacustrine System

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

L1OWH Permanently flooded, open water areas of lakes. Generally, the water depth exceeds 2 meters. Vegetation (aquatic, floating-leaved) is lacking or sparse (less than 30 percent areal coverage).

L1OWV Permanently flooded, fresh water tidal lake with a water level that fluctuates when fresh water backs up into the lake during high tides.

L2FLC Seasonally flooded mud and sand flats along lake shorelines. Typically devoid of vegetation.

L2FLA Temporarily flooded mud and sand flats along lake shorelines. Typically devoid of vegetation.

L2FLR Seasonally flooded tidal shoreline of lakes which are not brackish, but have water levels which fluctuate when fresh water backs up into the lake basin during high tides.

L2AB4H Permanently flooded, floating-leaved aquatic vegetation growing in shallow water of lakes. Dominant plant is Nymphaea tetragona. Potamogeton spp. and Nuphar polysepalum are also common in some areas (see description for the PAB4H wetland type).

Viereck et al. type - Aquatic vegetation (floating and submerged) Freshwater lakes, pondlily and fresh pondweed

L2AB4/OWH Permanently flooded lakes supporting aquatic (floating-leaved) vegetation. Vegetative cover is at least 30 percent of the lake area but does not exceed 70 percent of the total lake area. This designation is also used for complexes of L2AB4H and L1OWH when it is not practicable to delineate the types separately. Vegetation for this type is described for L2AB4H, PAB4H and PAB4/OWH type wetlands.

Viereck et al. type - Aquatic vegetation (floating and submerged) Freshwater lakes, pondlily and fresh pondweed

Riverine System

All rivers and stream channels upstream from the influence of ocean-derived salinity are included in the riverine system.

R1OWV Permanently flooded, tidal, open water channels of rivers and streams. These channels are subject to tidal flux, but are upstream from the influence of ocean-derived salinity.

R1FLR 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 riverine channels during high tides.

R2OWH Permanently flooded, open water channels of lower perennial rivers and streams.

R3OWH Permanently flooded, open water channels of upper perennial rivers and streams.

R3FLC Seasonally flooded river flats and bars. This type is extensive in major river channels. Typically unvegetated or sparsely vegetated by broad-leaved deciduous shrubs. Shrub cover is less than 30 percent of the flats area (see descriptions for the PSS1C and PSS1/FLC wetland types).

R3FLA Temporarily flooded river flats and bars. Typically unvegetated or sparsely vegetated by broad-leaved deciduous shrubs. Shrub cover is less than 30 percent of the flats area (see description for the PSS1A wetland type).

R3FL/OW Mixture of seasonally flooded river flats and bars and small open water channels. This code is used when it is difficult to delineate the main water course because of the numerous flats and bars which occur (note the absence of a water regime for this code, which is a combination of R3FLC and R3OWH).

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 short to extended periods each year. Sparse to dense vegetative cover of broad-leaved deciduous shrubs may occur along the intermittent stream banks (see descriptions for PSS1C and PSS1/FLC wetland types).

Palustrine System

The palustine 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, marshes, and swamps are grouped in the palustrine system. Lakes and ponds less than 20 acres in size are also a part of the palustrine system.

POWH 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 along the pond edge (see descriptions for PAB4H, PAB4/OWH, PEM1F, and PEM1H wetland types).

POWF Semipermanently flooded, small open water bodies (ponds) where sparse vegetative cover may occur, but is generally less than 30 percent (see descriptions for PAB4H, PAB4/OWH, PEM1F, and PEM1H wetland types).

PFLC Seasonally flooded, small basins that typically contain standing water only during the early part of the growing season. When surface water is absent, the exposed substrate will either remain unvegetated or will be colonized by herbaceous annuals.

PFLA Temporarily flooded, small basins that typically contain standing water only briefly during the early part of the growing season. When surface water is absent, the exposed substrate will either remain unvegetated or will be colonized by herbaceous annuals.

PAB4H Permanently flooded, floating-leaved aquatic plants growing in ponds. These small ponds are generally found in bogs of undrained hollows in the underlying bedrock surface. They may also form in step-like series on gentle slopes, apparently dammed by mats of Carex (especially Carex limosa). Dominant plants include Potamogeton vaginatus and Potamogeton diversifolium, Zannichellia palustrus, Nymphozanthus polysepalus, and Sparganium angustifolium in pools affected by glaciated rivers. Smaller sedge ponds formed in forested bog areas generally support Nymphaea tetragona, Potamogeton spp., and Myriophyllum spicatum. Deeper waters of many forest and bog ponds contain Nuphar polysepalum. Emergent plants growing about the margins of these ponds may include Hippuris vulgaris, Menyanthes trifoliata, various species of Equisetum spp., Potentilla palustris, Fauri crista-galli, Carex macrochaeta, sphagnum moss, and an assortment of graminoids (for a complete description of associated emergents, refer to the PEM1H and PEM1F wetland types). Ponds which may very infrequently be inundated by brackish water (but not frequently enough to be considered as estuarine) may support Ruppia spiralis, Hippuris tetraphylla, Potamogeton filiformis, and Myriophyllum spicatum.

Eventually, many of these smaller ponds will be taken over by mat-forming (peat-producing) sedges (see descriptions for PEM1/AB4H, PEM1H, and PEM1F wetland types). Once these sedges become firmly established (PEM1C wetland) the buildup of peat is rapid (PEM1B wetland) and these areas are rapidly transformed to young bogs (early colonization of low shrub) which in turn are often colonized by tall shrubs (PSS1/EM1B wetland).

Viereck et al. types - Aquatic vegetation (floating and submerged) Freshwater ponds, pondlily and fresh pondweed

PAB4/OWH Permanently flooded ponds supporting aquatic (floating-leaved) vegetation. This designation is used for complexes of PAB4H and POWH when it is not practicable to delineate the types separately. Vegetation for this type is described for the PAB4H wetland type.

Viereck et al. types - Aquatic vegetation (floating and submerged)
Freshwater ponds, pondlily and fresh pondweed

PEM1H Permanently flooded, emergent freshwater marsh. These are marshes that exhibit standing water throughout the entire year in all years. The dominant vegetation includes Menyanthes trifoliata, Hippuris vulgaris, Sparganium hyperboreum, Eleocharis palustris, Carex stricta, Carex aquatilis, Equisetum spp., and numerous sedges (see PEM1F wetland type). Bog ponds generally lack Eleocharis and Equisetum and uniquely contain Juncus organus, Carex saxatilis, and Callitriche verna.

Fringes of PEM1F and PEM1C wetland types may occur adjacent to the PEM1H wetland type, although they may not have been mapped due to minimum mapping size (approximately 3 acres).

Viereck et al. types - Fresh herb/grass marsh
Subarctic lowland, sedge/herb wet meadow

PEM1/OWH Typically a PEM1H (or PEM1F) wetland type mixed with areas of permanently flooded open water (see descriptions for the PEM1H and PEM1F wetland types). This type may occupy an area within the brackish water/freshwater ecotone. Vegetation may be very dense and composed primarily of sedges and those species described for the PEM1H wetland type.

Viereck et al. types - Fresh herb/grass marsh
Subarctic lowland, sedge/herb wet meadow

PEM1/AB4H Permanently flooded emergent marsh with aquatic bed. Both emergent and aquatic bed vegetation exceed 30 percent of the ponded area (see descriptions for the PEM1H and PAB4H wetland types).

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

Dominant vegetation consists primarily of graminoids including Eriophorum spp., Carex vulgaris, Carex aquatilis, Carex stricta, Juncus spp., Triglochin spp., Scirpus spp., and various forbs including Ranunculus cymbalaria, Potentilla palustris, and Cicuta douglasii. 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 wetland types (see these designated wetland types for a more complete listing of associated species).

Viereck et al. types - Fresh herb/grass marsh
Subarctic lowland, sedge/herb wet meadow

PEM1/OWF Typically a PEM1F wetland type mixed with areas of semipermanently flooded open water (see species description for the PEM1F wetland type).

Viereck et al. types - Fresh herb/grass marsh
Subarctic lowland, sedge/herb wet meadow

PEM1/AB4F Semipermanently flooded emergent marsh with aquatic bed. These marshes generally have standing water throughout the growing season except in years of drought. If standing water does not prevail throughout the entire marsh, small pockets of water with aquatic beds will usually remain (see descriptions for PEM1/AB4H and PEM1F wetland types).

PEM1E Seasonally flooded, persistent emergent marsh. The soil will remain saturated throughout the growing season after the standing water has dissipated (see description for PEM1C and PEM1F wetland types).

PEM1C Seasonally flooded, persistent emergent marsh. This emergent wetland type may occur on the floodplain of small streams and creeks and along pond 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 variegatum, Equisetum palustre, Potentilla palustris, Scirpus microcarpus, and Carex lyngbyaei.

Within and around sedge/sphagnum bog pools may be found Calamagrostis canadensis, various species of Carex (C. lyngbyaei, C. saxatilis, C. aquatilis, C. limosa, and C. pluriflora), Menyanthes trifoliata, two species of Eriophorum (E. scheuchzeri and E. russeolum) and those species described for the PEM1F wetland type.

Eleocharis palustris, Equisetum variegatum, and Equisetum palustre are associated more with emergent wetlands within deglaciated areas.

Associated species may include Drosera rotundifolia, Fritillaria camschatcensis, Tofieldia sp., Platanthera dilatata, Parnassia palustris, Mimulus guttatus, Pedicularis sudetica, Polygonum bistorta, Tricophorum caespitosum, Poa arctica, Equisetum arvense, and Lysichiton americanum.

A dense mat of sphagnum moss may underlie the herbaceous plants. Drepanocladus revolvens and Philonotis fontana may also occur.

Various shrub species such as Vaccinium uliginosum and Salix barclayi may also occur within the PEM1C wetland type (shrub communities are described under the PSS1C and PSS1B wetland types).

Alpine meadows support lush growths of sedges and grasses (described above) as well as succulent forbs such as Fauria crista-galli and Caltha biflora.

Freshwater marshes develop from lakes, ponds, sloughs, or rivers and may persist as they are for some time, but many probably develop into bogs (PEM1B wetland type). Some marshes are invaded by shrubs and develop into deciduous shrublands (PSS1/EM1B wetland type), further succeeding to various forest types (PF04B wetland type).

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

Viereck et al. type - Subarctic lowland, sedge wet meadow

PEM1/FLC Seasonally flooded, persistent emergent marsh with areas of unvegetated flats. Emergent vegetation covers at least 30 percent of the area but does not exceed 70 percent (see descriptions for the PEM1C and PFLC wetland types).

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

Several phases of bogs occur in the process of development, beginning with the formation of a floating mat (moss and sedge) which eventually covers 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. At maturity, the bog will have progressed to a less wet phase, becoming thicket-like with abundant broad-leaved deciduous shrubs and ericaceous shrubs (see description for the PSS1/EM1B wetland type).

Principal species throughout the various bog development phases may include the following: Carex pauciflora, Carex pluriflora, Carex nigricans, Carex limosa, Eriophorum angustifolum, Sphagnum spp., Calamagrostis inexpansia, Equisetum arvense, Hippuris vulgaris, Menyanthes trifoliata, Carex aquatilis, Carex rostrata, Agrostis spp., Spiranthes romanzoffiana, Galium trifidum, Polygonum viviparum, Parnassia palustris, Epilobium spp., Potentilla palustris, Trientalis europea, Sanguisorba stipulata, Iris setosa, Drosera rotundifolia, Cornus canadensis, Fauri crista-galli, Lycopodium annotinum, Fritillaria camschatcensis, Coptis trifolia, Geum calthifolium, Gentiana douglasiana, and an assemblage of other graminoids and forbs.

As the bog progresses towards maturity, shrubs begin to invade the higher mounds within the bog complex. Such species as Rubus chamemorus, Rubus arcticus, Oxycoccus microcarpus, Empetrum nigrum, Vaccinium vitis-idaea, Vaccinium caespitosum, Ledum groenlandicum, Vaccinium uliginosum, Andromeda polifolia, and various species of Salix (most notably S. commutata and S. barclayi) may commonly occur.

Saturated, emergent bogs occuring at higher elevations and on slopes have a similar flora; however, shrubs may appear at an earlier stage than that which occurs in similar bogs at lower elevations. These higher elevation saturated areas may not go through the floating mat stage of bog development. Slope muskegs are usually mixed communities of sedge and moss. Especially prominent are: Scirpus caespitosus, Eriophorum angustifolium, Eriophorum vaginatum, Rhynchospora alba, and Sphagnum spp.

Bogs are dominated by either sedges or sphagnum, and this dominance is probably partially controlled by pH (affected by water supply, mineral concentration, etc.). 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.

Viereck et al. type - Subarctic lowland, sedge bog meadow

PEM1A Temporarily flooded, persistent emergent wetlands. Where it occurs, it is generally restricted to small depressions or on the floodplains of streams. Standing water is present for only brief periods during the growing season. Calamagrostis canadensis and Deschampsia beringensis are usually the dominant emergents. Associated species may include Hordeum brachyantherum, Poa eminens, Agrostis alaskana, Festuca rubra, Juncus mertensianus, Honckenya peploides, Montia fontana, Spergularia canadensis, Parnassia palustris, Epilobium spp., and Dodecathon pulchellum. Iris setosa, Stellaria crispa, Aster sp., Sanguisorba stipulata, Galium trifidum, and various

shrubs including Salix barclayi, Alnus crispa, Rubus chamemorous, Rubus spectabilis and several ericaceous shrubsmay also occur (see description for the PSS1/EM1A and PSS1/EM1C wetland types). Small permanently flooded pools of standing water may remain throughout the growing season in these temporarily flooded areas. Small pools may contain Ranunculus hyperboreus, Menyanthes trifoliata and Caltha palustris. For a more complete listing of plants able to withstand periods of freshwater inundation, see the description for the PEM1C wetland type.

Viereck et al. type - Mesic graminoid herbaceous, bluejoint-mixed herbs

PEM1/FLA Temporarily flooded, persistent emergent wetland with open flats areas (see descriptions for the PEM1A and PFLA wetland types).

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 beaver activity. Dominant shrub vegetation consists primarily of Salix spp.

PSS1/OWH Permanently flooded scrub shrub wetland with open water bodies. 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.

PSS1/OWF Same as the PSS1F wetland type except that small open water bodies would be present within the shrub stand.

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 peat islands.

The ridges and islands in a patterned bog are dominated by broad-leaved deciduous shrubs. Important species include various species of Salix (particularly S. barclayi), Vaccinium uliginosum, Rubus spectabilis, Empetrum nigrum, Ledum palustre, 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 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 and PEM1F wetland types.

Viereck et al. types - Ridges (strangs): Dwarf birch - ericaceous shrub - sphagnum bog
- Pools (flarks): Fresh herb/grass marsh
- Subarctic lowland, sedge/herb wet meadow

PSS1/EM1E Seasonally flooded open shrub area. The soil remains saturated after the standing water has dissipated. This wetland type generally occurs in very wet meadow areas (see description for the PSS1/EM1C wetland type).

PSS1C Seasonally flooded dense shrub areas on river and stream floodplains consisting of Salix spp. and Alnus spp. Terrain may be hummocky with flooded depressions. Alnus crispa is generally the dominant tall shrub species along with Salix barclayi, Salix alaxensis, Myrica gale, Betula glandulosa, and Ledum palustre. 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 alder and willow combined may exceed 75 percent cover in this type of wetland. Other common species occuring in the understory include those species described for the PEM1C wetland type.

Viereck et al. type - Closed tall shrub scrub, alder-willow

PSS1/FLC Seasonally flooded areas on river and stream floodplains consisting of a mix of shrubs and non-vegetated riverine flats. Shrub species are primarily Salix spp. and Alnus spp. The flats are typically composed of sand and gravel-sized particles, and are situated at a slightly lower elevation than the shrub areas (see descriptions for the PSS1/FLA, PSS1C, and PSS1A wetland types).

Viereck et al. type - Open tall shrub scrub, alder-willow

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 spp. dominate the hummock areas with emergent vegetation dominating the lower elevation areas. 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 alder. Rivulets and slow moving water occur between hummocks. A continuous canopy of Alnus spp. occur with an understory of Calamagrostis canadensis, Equisetum spp., and various shrubs and herbs (see description for the PEM1C wetland type).

Viereck et al. type - Open tall shrub scrub, alder-willow

PSS1/4C Seasonally flooded areas adjacent to streams and small rivers that are a shrub complex dominated by Salix spp. and Alnus spp. Picea sitchensis and Picea mariana also occur on somewhat higher terraces. Similar to the PSS4/1C wetland type.

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 of the cover. Typical tall shrub vegetation may include Alnus crispa, Alnus sinuata, Salix barclayi, and Salix alaxensis. Low mat-type shrub vegetation may include those species indentified for saturated shrub/emergent wetlands (see description for the PSS1/EM1B wetland type). Associated emergent vegetation is most likely to include Calamagrostis canadensis and Carex pauciflora. A dense mat of sphagnum moss may cover the soil surface in some areas. Additional species may include scattered Pinus contorta, Ledum palustre, Empetrum nigrum, Kalmia polifolia, Vaccinium oxycoccus, Vaccinium vitis-idaea, Vaccinium uliginosum, Rubus arcticus, and those emergent species described for the PEM1B wetland type. Saturated shrub areas may also occur as hillside seeps.

Viereck et al. type - Dwarf birch - ericaceous shrub - sphagnum bog

PSS1/EM1B Saturated shrub bog with a 30 percent or greater 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 or Picea mariana, Vaccinium uliginosum, Ledum palustre, Empetrum nigrum, Oxycoccus microcarpus, Vaccinium vitis-idaea, Betula glandulosa, Andromeda polifolia, and various species of Salix.

Dominant emergent species include Carex pauciflora, Carex pluriflora, Scirpus spp., Eriophorum angustifolium, Drosera rotundifolia, Coptis trifolia, Potentilla palustris, Sanguisorba stipulata, Cornus canadensis, Rubus chamaemorus, Veratrum sp., Sphagnum spp., Lycopodium sp., as well as other species described for the PEM1B wetland type.

Viereck et al. type - Dwarf birch - ericaceous shrub - sphagnum bog

PSS1/4B Saturated deciduous shrub bog mixed with stunted Picea sitchensis or Picea mariana (see descriptions for the PSS1B, PSS4/1B, PSS4B, and PSS1/EM1B wetland types).

Viereck et al. type - Dwarf birch - ericaceous shrub - sphagnum bog

PSS1A Temporarily flooded dense shrub areas on river and stream floodplains consisting primarily of Salix (S. barclayi, S. alaxensis, and S. sitchensis), Viburnum edule, Rubus spectabilis, and Alnus crispa. 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 Carex lyngbyaei, Calamagrostis canadensis, Equisetum arvense, Athyrium filix-femina, Deschampsia beringensis, Gymnocarpium dryopteris, Poa alpina, Trisetum spicatum, and those species listed for the PEM1A wetland type. Peat development is usually lacking.

PSS1/FLA Temporarily flooded areas on river and stream floodplains consisting of a mix of shrubs and non-vegetated riverine flats. Shrub species are primarily Salix spp. and Alnus spp. The flats are typically composed of sand and gravel-size particles, and are situated at a slightly lower elevation than the shrub areas (see description for the PSS1A wetland type).

Viereck et al. type - Open tall shrub scrub, alder-willow

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

Viereck et al. type - Open tall shrub scrub, alder-willow

PSS1/4A Temporarily flooded areas adjacent to streams and small rivers that are a shrub complex dominated by broad-leaved deciduous shrubs (primarily Salix spp. and Alnus spp.). The shrub-height Picea sitchensis and/or Picea mariana generally occurs on somewhat higher terraces than the deciduous shrubs (see description for the PSS1A wetland type).

PSS1R Seasonally 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 PSS1C wetland type (see descriptions for the PSS1C, PEM1C, and PSS1/EM1C wetland types).

Viereck et al. type - Closed tall shrub scrub, alder-willow

PSS1/FLR Seasonally flooded, tidal areas of dense broad-leaved deciduous shrubs with unvegetated or sparsely vegetated mud or sand flats. Vegetation is periodically inundated by fresh water which becomes backed up due to tidal action. This wetland type is similar to PSS1/FLC.

PSS1/EM1R Seasonally flooded, tidal areas of open broad-leaved deciduous shrubs. Open areas support persistent emergent vegetation with scattered deciduous shrubs. Vegetation is periodically inundated by tidally influenced fresh water (see description for the PSS1/EM1C wetland type.

Viereck et al. type - Open tall shrub scrub, alder-willow

PSS4C Seasonally flooded, scrub-shrub area generally confined to river floodplains. Dominant species is stunted Picea sitchensis or Picea mariana.

PSS4/EM1C Seasonally flooded areas on floodplains and in drainageways that are a mixture of scrub Picea sitchensis or Picea mariana and emergents. The emergent vegetation occurs in the lower elevation areas corresponding to historic river channels. The common emergent species are listed for the PEM1C wetland type.

Viereck et al. type - Open conifer forest, spruce, mixed with subarctic lowland, sedge wet meadow

PSS4/1C Seasonally flooded areas adjacent to streams and small rivers that are a shrub complex dominated by Picea sitchensis or Picea mariana. The shrub-height Picea sitchensis or Picea mariana generally occurs on somewhat higher terraces than the deciduous shrub vegetation. Salix spp. and Alnus spp. are the common deciduous shrub species (see description for the PSS1C wetland type).

Viereck et al. type - Open conifer forest, spruce, mixed with closed tall shrub, alder-willow

PSS4B Saturated shrub bog. The Picea sitchensis or Picea mariana in these areas is shrub height (less than 6 meters) and generally exceeds 50 percent areal coverage (see descriptions for the PSS4/1B, PSS1B, and PF04B wetland types).

Viereck et al. type - Closed conifer forest, spruce

PSS4/EM1B Saturated shrub bog with an emergent vegetative layer. The Picea sitchensis or Picea mariana in these areas is shrub height (less than 6 meters). Emergent species are those described for the PEM1B wetland type (see also description for the PSS4/1B wetland type).

Viereck et al. type - Open conifer forest, spruce

PSS4/1B Saturated, open canopy shrub bog. The Picea sitchensis or Picea mariana in these wetlands are shrub height (less than 6 meters). A dense deciduous shrub understory is present and is dominated by those species described for the PSS1B and PSS1/EM1B wetland types. This type also occurs adjacent to coastal wetlands below bluffs which provide groundwater seepage. Common plants may include Ledum palustre, Chamadaphne sp., Salix spp., and Carex spp.

Viereck et al. type - Open conifer forest, spruce

PSS5H Permanently flooded dead shrub swamp. The area is essentially an open water type (POWH) wetland with scattered dead shrub covering at least 30 percent of the open water area.

PSS5/1H Permanently flooded dead shrub swamp. Similar to the PSS5H wetland type except that at least 30 percent of the area consists of living broad -leaved deciduous shrubs. Conditions such as these are usually attributed to extensive beaver activity.

PSS5/EM1F Semipermanently flooded dead shrub swamp. The area is essentially a flooded emergent basin with dead shrub. These areas are generally created by beaver activity. The evidence of emergent vegetation may indicate an older beaver site.

PF01C Seasonally flooded deciduous forested wetland occuring on river floodplains. Populus trichocarpa is the dominant tree species. Understory vegetation may be sparse to lacking (see description for the PSS1C wetland type.

Viereck et al. type - Closed deciduous forest, black cottonwood and balsam poplar

PFO1/EM1C Seasonally flooded areas usually occuring on river floodplains supporting an open to semi-dense canopy of deciduous trees. Persistent emergent vegetation is the dominant understory plant form. Dominant tree species include Populus trichocarpa and Populus balsamifera. Salix spp. and Alnus spp. may occasionally reach tree height (greater than 6 meters). Persistent emergent vegetation is described for PEM1C wetlands (see also descriptions for PSS1C and PSS1/EM1C wetland types).

Viereck et al. type - Open deciduous forest

PFO1/SS1C Seasonally flooded areas on river and stream floodplains consisting of a mix of broad-leaved deciduous forest and broad-leaved deciduous shrubs. Dominant tree species is Populus trichocarpa. Salix spp. and Alnus spp. 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. Other understory vegetation includes those species described for PSS1C and PSS1/EM1C wetland types.

Viereck et al. type - Open deciduous forest

PFO1/EM1B An area with saturated soil conditions and an open to semi-dense canopy of deciduous trees. Persistent emergent vegetation is the dominant understory plant form (see descriptions for the PEM1B and PSS1/EM1B wetland types).

Viereck et al. type - Open deciduous forest

PFO1A Temporarily flooded deciduous forested wetland occurring on river floodplains. Populus trichocarpa is the dominant tree species. It may occur in relatively pure stands or in mixed stands with tree-size alder. Understory vegetation is usually lacking or sparse, consisting of various graminoid species (see description for the PEM1A wetland type for understory vegetation).

Viereck et al. type - Closed deciduous forest, black cottonwood and balsam poplar

PFO1/FLA Similar to the PFO1A wetland type except that extensive flats areas are intermixed with deciduous trees.

PFO1/SS1A Temporarily flooded areas on river and stream floodplains consisting of a mix of broad-leaved deciduous forest and broad-leaved deciduous shrubs. Dominant tree species is Populus trichocarpa. Salix spp. and Alnus crispa 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 spp. The understory is generally sparse, consisting of Salix spp., Calamagrostis canadensis, Equisetum spp., and those species described for the PSS1A wetland type.

Viereck et al. type - Open deciduous forest

PF01/4A Temporarily flooded, mixed forested wetland occurring on river floodplains. Populus trichocarpa is the dominant tree species but contains at least 30 percent Picea sitchensis or Picea mariana (see descriptions for the PF01A and PF04A wetland types).

PF01/5A Temporarily flooded areas on river and stream floodplains or in small depressions consisting of a mixture of broad-leaved deciduous trees and dead trees. Small pockets of standing water may remain throughout most of the growing season which would contribute to the dead or dying trees. Old beaver activity may be evident. Similar to the PF01A wetland type.

PF01/SS1S An open canopy deciduous forested wetland which is temporarily inundated by tidally influenced fresh water systems. Broad-leaved deciduous shrubs are the dominant understory vegetation (see description for the PF01/SS1A wetland type).

PF04/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.

PF04/SS1C Seasonally flooded areas adjacent to streams and small rivers that are a complex of Picea sitchensis or Picea mariana on higher terraces and deciduous shrubs on lower terraces. Salix spp. and Alnus spp. are the common shrub species (see description for the PSS1C wetland type).

Viereck et al. type - Open conifer forest, black spruce

PF04/SS1E Similar to the PF04/SS1C wetland type. Soil remains saturated throughout the growing season after standing water has subsided (see vegetation descriptions for the PF04/SS1C and PSS1C wetland types).

PF04B Saturated spruce bog. These areas are dominated by Picea sitchensis or Picea mariana 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 patterned bog complex.

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

PF04/EM1B Saturated, open conifer forest bog with an emergent ground layer. Emergent species for this wetland type are described for the PEM1B wetland type (see also description for the PF04B wetland type).

Viereck et al. type - Open conifer forest

PF04/SS1B Same as PF04B wetland type, but Picea sitchensis or Picea mariana canopy cover is generally less than the PF04B wetland type. The understory scrub shrub vegetation in this wetland type exceeds 30 percent areal coverage. Typical scrub shrub vegetation would include those dominant species described for the PSS1B wetland type. Standing water may occur between frost-heaved hummocks. Peat is saturated year round and may exceed 1 meter in depth (see descriptions for the PF04B and PSS1B wetland types).

Viereck et al. type - Open conifer forest, black spruce

PF04/SS4B Same as the PF04/SS1B wetland type with a greater understory of stunted Picea sitchensis or Picea mariana (occupying at least 30 percent of the understory cover). Dominant vegetation is similar to that described for the PF04B, PF04/SS1B, and PSS1B wetland types.

Viereck et al. type - Open conifer forest

PF04/1B Similar to the PF04B wetland type, but mixed with broad-leaved deciduous trees (greater than 6 meters in height). The Picea sitchensis or Picea mariana has a canopy coverage of 30-70 percent and the broad-leaved deciduous trees have at least 30 percent areal coverage but not exceeding that of the Picea spp. Understory vegetation is generally sparse. Soil conditions remain saturated throughout the year. Populus trichocarpa and Populus balsamifera are the dominant broad-leaved deciduous trees mixed with primarily Picea sitchensis or Picea mariana. (See descriptions for the PF04B and PF01/4B wetland types).

Viereck et al. type - Closed mixed forest, spruce-poplar

PF04A Temporarily flooded areas with a closed canopy of needle-leaved evergreen trees generally occurring on river floodplains. Little to no understory vegetation is evident.

PF04/SS4A Temporarily flooded areas with an open canopy of needle-leaved evergreen trees. Open areas or areas under a semi-open tree canopy support needle-leaved evergreen shrubs (small coniferous trees less than 6 meters in height). Dominant tree species include Picea sitchensis or Picea mariana and Tsuga heterophylla. Understory vegetation is described for the PSS1A wetland type (see also description for the PF01/SS1A wetland type).

Viereck et al. type - Open conifer forest

PF04/1A Temporarily flooded mixed forested wetland occuring on river floodplains. Picea sitchensis or Picea mariana are the dominant tree species but contains at least 30 percent Populus trichocarpa and/or Populus balsamifera (see descriptions for PF04A, PF01A, and PF01/4A wetland types).

PF05H Permanently flooded dead tree swamp. Area is essentially an open water type wetland with scattered dead trees (either deciduous or evergreen) covering at least 30 percent of the open water area.

PF05/OWH 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 (permanent) flooding of a stream or river channel (see description for the PF05H wetland type).

PF05F Semipermanently flooded dead tree swamp (see description for the PF05H wetland type).

PF05/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.

PF05C Seasonally flooded dead tree forested wetland generally found along streams and small river deltas where divergence of water from the main channel has occurred. Little or no understory vegetation is present.

PF05/SS1C Seasonally flooded dead tree areas generally found along streams and small river deltas where divergence of water from the main channel has occurred. Broad-leaved deciduous shrubs comprise the dominant understory vegetation. Salix spp., Alnus crispa, and Populus trichocarpa are the dominant shrub species.