NATIONAL WETLANDS INVENTORY
NOTES TO USERS FOR
SEWARD 1:63,360 SCALE MAPS

INTRODUCTION

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

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

(1) Fish and shellfish protection.

(2) Furbearer and other wildlife production.

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

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

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

(6) Erosion buffers to protect upland areas.

(7) Groundwater recharge and stream flow maintenance.

(8) Saltwater intrusion control.

(9) Coastal storm damage reduction.

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

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

NATIONAL WETLANDS INVENTORY PROGRAM

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

Two types of information are produced through the Inventory: detailed wetlands maps and status and trends reports. Detailed wetland maps are produced for geographic areas of critical concern for impact assessments of site-specific projects. The maps may be utilized by local, state and federal agencies as well as by private industry and organizations for comprehensive resource management planning, environmental impact assessments, permit reviews, facility and corridor siting, oil spill contingency plans, natural resource inventories, wildlife surveys and other uses. Estimates of the current status and trends (i.e., losses and gains) of wetlands provide information for reviewing the effectiveness of existing programs and policies, for identifying national or regional land-use problems and allocation, and for general public awareness. A summary of the major objectives of the Inventory project is as follows:

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

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

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

(4) Develop wetland status and trends reports.

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

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

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

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

User reports are also prepared for each completed 1:250,000 scale map area. These reports 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 Service's wetlands classification system was developed by Cowardin, et al. and is titled Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS - 79/31). The 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 United States.

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 Service participates with other Federal and state agencies in the Alaska High-Altitude Photography Program. The Inventory uses the 1:60,000 scale color-infrared photography that is obtained by this program. With the high altitude imagery, the Inventory is capable of detailed wetland mapping with a minimum mapping size of 1-3 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 base map.

These 1:63,360 scale Seward wetlands maps were produced using color-infrared aerial photographs at the scale of 1:65,000 (1:60,000 scale color-infrared was also used for quad A-8). The photography was flown in August of 1978.

Field checking was conducted in June of 1983, October of 1984, and August of 1985. Collateral information used in this mapping effort included the Soil Conservation Service's Exploratory Soil Survey of Alaska, the National Oceanic and Atmospheric Administration's coastal charts, and the U.S. Geological Survey's topographic maps.

To produce final Inventory maps, seven steps must be completed: (1) preliminary field investigations, (2) photointerpretation of high-altitude photographs, (3) review of existing wetlands information, (4) quality control of interpreted 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 Service 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 October 1987, the Inventory has produced wetland maps for approximately 14 percent of Alaska. The Inventory plans to map wetlands in Alaska at a rate of two percent annually.

MAPPING CONVENTIONS AND SPECIAL MAPPING PROBLEMS

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

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

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

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

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

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

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

- All linear wetlands and deepwater habitats are indicated by a dashed line. Linears are not included if they 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 U.S. Geological Survey 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 deepwater habitats modified by man or beaver.

STUDY AREA

Two ecoregion domains and three distinct land-surface forms exist within the Seward 1:250,000 scale quad area. The study area (area mapped) is restricted to the western half of the Seward 1:250,000 scale quad area.

The major ecoregion break parallels the northwestern edge of the Kenai Mountains separating the Chickaloon Flats and River Basin from the Resurrection Creek drainage. The ecoregion break roughly parallels the National Wildlife Refuge/National Forest Service boundary in this area. The Chickaloon Flats and River Basin are contained in the Coastal Trough Forest Province, Subarctic Division, of the Polar Domain. The Kenai Mountains and island areas within Prince William Sound are contained within the Hemlock-Spruce Forest Section of the Pacific Forest Province, Humid Maritime Regime Highlands, Humid Temperate Domain.

Of the three land-surface forms evident in the Seward quad area, the one covering the Kenai Mountains area is the most extensive. This land-surface form borders the smooth plains of the Chickaloon Flats to the northwest and the low mountains bordering Prince William Sound. The Kenai Mountain landform feature is characterized as high mountains with local relief exceeding 3,000 feet. Less than 20 percent of the area is gently sloping. The low mountains which surround, and are included within, Prince William Sound have a land-surface form feature similar to that of the Kenai Mountains, although local relief is only 1,000 to 3,000 feet. The Chickaloon River Basin area exhibits a local relief of between 100 and 300 feet on a smooth plain basin. More than 80 percent of the area is gently sloping with 50 - 75 percent of this gentle sloping area in lowlands.

The Kenai River provides the major drainage for the northern section of the Kenai Mountains. Several smaller drainages, (Resurrection Creek, Six Mile Creek, Ingram Creek, and the Placer and Twenty Mile Rivers) empty into Turnagain Arm in the northern part of the study area. Drainages to the south, which empty into Resurrection Bay, include Salmon Creek and the Resurrection River.

Numerous glaciers can be found within the study area, most being fed by the Harding icefield and Sargent icefield. A smaller icefield feeds the glaciers of the Placer River Valley and glaciers entering northwestern Prince William Sound.

Most of the native vegetation within the Seward 1:250,000 scale quad area has not been disturbed by land clearing, grazing, logging, or recent fires. Forests are dominant at elevations of less than 800 feet and native grasslands occurs mainly at elevations exceeding 800 feet.

The dominant grass is bluejoint and many stands are composed entirely of this plant. It is a course perennial that grows in tussocks that are as much as 18 inches tall. This grass may be as much as four to six feet tall. Other common plants are fescue, bluegrass, fireweed, geranium, cowparsnip, and horsetail.

At elevations of more than 1,500 feet and in abandoned clearings at lower elevations are mixed stands of bluejoint and low-growing shrubs and reedgrass. Monkshood, false hellebore, lupine, and water hemlock also grow in some areas. These plants are toxic to livestock. They are grazed only early in spring or where other vegetation is sparse in overgrazed pastures.

Most of the muskegs have a surface cover of sphaghum moss. Other plants are cottonsedge, bog-birch, Labrador-tea, dwarf-willow, lingenberry, crowberry, bog-blueberry, and cloudberry. Cottonsedge is dominant at elevations of more than 800 feet. Except for scattered stands of spindly black spruce that grow at the other edges of the muskegs, most muskegs are treeless.

Cook Inlet experiences an ocean tidal range that is one of the largest in the world. A mean tidal range of approximately 27 feet occurs near the upper reaches of Cook Inlet at Anchorage. Turnagain Arm is a large shallow tidal estuary with a channel depth of less than 20 feet. At extreme low tides, a major portion of the estuary becomes unconsolidated mud flats. Turnagain Arm features the largest mean tidal range (30.3 feet) of any area on the Pacific Coast in both the northern and southern hemispheres. Diurnal tidal ranges exceeding 33 feet have occurred. Tidal bores of up to six feet are common. The cities of Seward and Whittier have mean tidal ranges of 8.3 feet and 12.3 feet, respectively.

Climatic data for the Seward 1:250,000 scale quad area is available for the Cities of Seward, Portage, Whittier, and the Cooper Lake area.

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

- Maritime - coastal zone including the City of Seward and east Prince William Sound. Climate is characterized by heavy precipitation, cool summers and mild winters. Surface winds are persistently strong in most areas.

- Continental - includes the higher elevations of the Kenai mountains. Generally, both summer and winter temperatures are extreme and precipitation is light. Except for a few isolated locations, surface winds are light.

- Transition - includes the coastal plain area of the Chickaloon River Basin and the area surrounding Turnagain Arm. 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 fluctuates between the two. Surface winds are generally light with numerous localized exceptions.

The following climatic data is for the city of Seward:

Temperature:	Summer	44° to 63°F
	Winter	18° to 46°F
	Extremes	-20° to 88°F
Precipitation:	67 inches including 81 inches of snow.	

The following climatic data is for the Portage area:

Temperature:	Summer	42° to 64°F
	Winter	19° to 45°F
	Extremes	-37° to 85°F
Precipitation:	58 inches including 138 inches of snow.	

The following climatic data is for the Whittier area:

Temperature:	Summer	45° to 63°F
	Winter	20° to 33°F
	Extremes	-29° to 88°F
Precipitation:	175 inches including 264 inches of snow.	

The following climatic data is for the Cooper Lake area:

Temperature:	Summer	42° to 65°F
	Winter	11° to 42°F
	Extremes	-25° to 84°F
Precipitation:	30 inches including 76 inches of snow.	

HYDRIC SOILS

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

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

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

Buildup of organic matter results from prolonged anaerobic soil conditions associated with long periods of flooding and/or soil saturation during the growing season. These saturated conditions impede aerobic decomposition (or oxidation) of the bulk organic materials, 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.

Most soils on uplands in the survey area formed in silty wind-laden material. This material is a mixture of materials derived from glacial drift and volcanic ash from the Aleutian Range to the west. The silty mantle ranges from a few inches to more than 60 inches in thickness. The entire survey area is underlain by sediments of the Kenai formation of Tertiary (Eocene) age. The sediments consist of poorly consolidated strata of sand, silt, and clay, and thin beds of lignite.

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. These peat bogs, or muskegs, range from many square miles to less than an acre in size.

Much of the study area has cool summers and moderately cold winters. Because the rates of evaporation and transpiration are comparatively low, much of the precipitation percolates through the soil and is effective in leaching. Under the native vegetation the well-drained soils are cool and moist throughout the summer, but the temperature is high enough in the soils to prevent the formation of permafrost.

In the survey area the well-drained soils of the uplands that are at elevations of less than 800 feet generally support a forest of white spruce or Sitka spruce and some paper birch. The native vegetation on the well-drained soils at an elevation of more than 800 feet is mainly a dense stand of native grasses. The poorly drained soils on the alluvial plains and in the upland depressions have a forest cover of willow, cottonwood, and black spruce in which there are many grassy areas. Low shrubs and black spruce grow in the muskegs.

The soils in this survey area are comparatively young, and the effect of relief and topographic position, though considerable, is not so great on them as on older soils. On most of the steep slopes, the silty mantle is somewhat thinner than 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.

All of the soils in this survey area developed in the relatively short time that has elapsed since the ice sheet that formerly covered part of the area receded. Horizon differentiation is well advanced in most of the soils of the uplands, but wet soils show little profile development.

Detailed soils information is lacking for the Seward 1:250,000 scale quad area. Generalized soils information was obtained from the Soil Conservation Service's publication Exploratory Soil Survey of Alaska.

The following section briefly describes key features of each hydric soil type identified for the study area.

Histosols

Histosols are made up completely or in large part of organic material. The organic material accumulates under wet conditions, in depressions or other low areas that are nearly always inundated, on slopes affected by seepage, or as a blanket on rolling hills in areas of very high rainfall. Most Histosols are considered to be wetland soils.

For classification in the order of Histosols, the organic material must be at least 16 inches thick except where bedrock or fragmental material is at a shallower depth. If the organic material consists principally of undecomposed moss, it must be more than 24 inches thick. Mineral layers, including a surface layer up to 16 inches thick, are permitted in soils classified as Histosols, but at least half (three-quarters in decomposed moss) of the upper 32 inches must be organic. The organic material may be mostly undecomposed (fibric), partially decomposed (hemic), or nearly completely decomposed (sapric). Many organic soils have layers with varying degrees of decomposition within the soil profile.

Sphagnic Borofibrists consist of deep, very poorly drained, extremely acid peat in muskegs. They occur in nearly level depressions between moraine hills, low areas on terraces, and outwash plains. The vegetation is mainly mosses, sedges, low shrubs, and, in places, forests of black spruce. Beneath a mat of live moss and roots, the upper 20 to 30 inches of peat consists mainly of dark yellowish brown, slightly decomposed sphagnum moss fibers. In the lower layers, the organic material is partially decomposed and consists of interbedded sphagnum moss and sedge peat. The organic material is usually more than 60 inches thick. The water table in these areas is usually near the surface.

Terric Cryohemists are very poorly drained organic soils that occur on gentle to steep slopes and terraces affected by seepage. This soil type ranges from sea level to elevations of several hundred feet. The vegetation is dominantly sedges and mosses with some shrub and possibly western hemlock. The soils are partially decomposed dark brown sedge peat 16 to 50 inches thick over firm very stony silt loam or glacial till. The upper 8 to 12 inches of the peat commonly is fibrous moss or sedge peat. The peat commonly contains woody fragments. Layers of fibrous moss peat and, in places, thin strata of buried volcanic ash are common. In places, a thin layer of highly decomposed peat is directly above the glacial till substratum.

Typic Cryohemists 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.

Typic Sphagnofibrists are very poorly drained organic soils consisting mainly of coarse sphagnum moss fibers up to and exceeding 60 inches in depth. They occur in depressions of rolling moraine hills underlain by compact glacial till. The vegetation is dominantly sphagnum moss, sedges, forbs, low shrubs, and other water-tolerant plants.

Lithic Cryohemists occur in hilly to steep areas mostly above treeline. They consist of partially decomposed sedge peat 10 to 40 inches thick over bedrock. The vegetation is dominantly sedges.

Terric Cryosaprists consist of very poorly drained mucky peat in drainageways and on slopes affected by seepage. The vegetation is dominantly a forest of slow-growing western hemlock and Sitka spruce 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.

Terric Borohemists are very poorly drained, shallow organic soils made up of partially decomposed peat derived from sedges and mosses. They occur mostly in shallow depressions in terraces and low areas. Vegetation is either a forest of black spruce or a cover of sedges and mosses.

Typic Borohemists 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.

Spodosols

In Spodosols organic carbon, aluminum, and, in most places, iron, have been leached by percolating water from the upper part of the soil and deposited or precipitated at greater depth to form a spodic horizon. Most Spodosols in Alaska have a surface mat of organic litter, which is at least partially decomposed, and a gray mineral horizon (an albic horizon) above the spodic horizon. Colors at the top of the spodic horizon are normally black or dark reddish brown, and those in lower parts are dark brown to yellowish brown. Except in sandy soil, the spodic horizon has thixotropic properties and becomes smeary when worked. Plowing, logging, or other disturbance has obscured the horizon sequence in some soils, but at least the lower part of the spodic horizon is normally visible. In a few soils, there is a thin black horizon in place of the albic horizon directly beneath the mat of organic material.

Spodosols are dominant in areas with high precipitation, where moisture in excess of that required by the natural vegetation moves completely through the soil. In general, the amounts of organic carbon, aluminum, and iron accumulated in the spodic horizon are directly related to precipitation rates, but they depend in part on characteristics of the parent material, ground water levels, and other factors. Except in very coarse material and in special situations in tundra areas, Spodosols in Alaska normally occur only where mean annual precipitation exceeds 15 inches.

Sideric Cryaquods are somewhat poorly drained soils on gentle slopes and low areas that receive seepage. The vegetation is generally a forest of black spruce. The substratum ranges from gravelly sandy loam to gravelly silty clay loam.

Cryic Fragiaquods are poorly drained, acidic soils on lower hillsides affected by seepage. They formed under forests dominated by slow growing western hemlock and, to a lesser extent, Sitka spruce. 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. Seep water flows above the glacial till almost continuously. The substratum is very firm, slowly permeable till.

Entisols

In Entisols there is little or no evidence of change as a result of soil-forming processes. Most entisols have no diagnostic horizons other than an ochric epipedon. Wet mineral soils having a histic epipedon that consists entirely of organic material, but having no cambic horizon, are classified as entisols. In Alaska, Entisols occur most commonly (1) on flood plains and outwash plains which receive new deposits of sediment at frequent intervals, (2) on uplands adjacent to major rivers where new material blown from the river beds is deposited, (3) in other young material, such as recently exposed glacial moraines, and (4) in very cold or very steep areas where vegetation is sparse, where soils are unstable, or where parent material is exceptionally resistant to chemical weathering.

Typic Cryaquents are poorly drained soils on moraines at elevations ranging from sea level to more than 1,000 feet in areas above treeline. The topography is commonly irregular and includes many rock outcrops. The soils consist of partially to nearly completely decomposed sedge peat less than 16 inches thick over firm unweathered glacial till containing many stones and boulders. Thin layers of volcanic ash commonly occur in the organic mat. Both the organic material and the underlying glacial till are strongly acid. The till is normally only a few feet thick over bedrock.

Typic Cryorthents occupy parts of outwash plains and floodplains. They support thickets of alder and willow, but clumps of Sitka spruce also occur. The soils consist of about 10 inches of stratified gray sand and silt loam over a thick substratum of very gravelly sand. They are occasionally inundated. Other Typic Cryorthents occupy hilly moraines adjacent to receding glaciers and consist entirely of gray, very gravelly or stony silt loam.

Inceptisols

In Inceptisols there has been only relatively minor modification of the parent material by soil-forming processes. The modification has been sufficient to distinguish the soils from Entisols, but not intense enough to form the kinds of horizons that are required for classification in other soil orders. In general, soils are classified as Inceptisols if they have an umbric epipedon,

a histic epipedon composed of mixed mineral and organic material or a cambic horizon and no other diagnostic horizons. There are, however, some exceptions to this rule. Poorly drained soils with permafrost are considered to be Inceptisols even though they have no diagnostic horizon other than an ochric epipedon. Soils with a mollic epipedon are Inceptisols if the epipedon overlies ashy material or a cambic horizon with base saturation of less than 50 percent.

Most soils in Alaska are Inceptisols. They are dominant in all of the major land resource areas. They formed in many different parent materials and under a wide range of climatic conditions and vegetative types.

Typic Cryaquepts are poorly drained silt loams in gentle swales, drainageways, valley bottoms, and low areas bordering muskegs. The vegetation is commonly a forest of black spruce, alder or willow brush and various sedges, grasses and forbs.

Histic Cryaquepts are poorly drained soils in low areas bordering muskegs and in shallow depressions or drainageways. They have a thick peaty surface layer. The water table is usually near the surface. The vegetation is either a forest of black spruce or a cover of mosses, sedges and shrubs. Soils may be loamy and/or stony.

Humic Cryaquepts are poorly drained soils with black mucky silt loam upper layers. They occur in drainageways and depressions under a cover of alder, grasses, sedges, and birch or black spruce.

WETLANDS AND AQUATIC HABITATS

The following section describes the map codes used on the Seward 1:63,360 scale wetland maps. A general description and/or community type, including dominant vegetation, is provided for each code. For most vegetated wetland types, the corresponding classification according to the Classification System for Vegetation of Alaska (Viereck et al. 1982) is provided. Appendix A lists both the common name and scientific name for all wetland plants described in this text. A wetland indicator relating to the frequency of occurrence of individual plant species in wetlands is also given in Appendix A.

Some wetland types in the following section have two or more codes. On some wetland maps a code of FL (flats) or BB (beaches and bars) was used, while on more recently completed maps the code US (unconsolidated shore) is used for the same wetland category. The class order may also be rearranged for some wetland types (e.g., PSS1/EM1F and PEM1/SS1F). Both wetland types consist of the same plant species and degree of water permanency; however, the relative proportion of plant species is different. If two vegetative classes (or subclasses) are given, the first class will represent 50 - 70 percent of the mapped wetland unit while the second class will represent 30 - 50 percent of the mapped wetland unit. A vegetative class must represent at least 30 percent of the area to be included in the wetland code.

Estuarine System

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

E1OWL	Subtidal, low-energy brackish open water. Includes the permanently flooded portion of bays, fjords, and adjacent brackish river channels. Also includes small brackish ponds (silt bottomed) which are inundated by high spring tides.
E2AB1N	Intertidal, low-energy, regularly flooded area containing aquatic beds (algae). This area is flooded and exposed on a daily basis. Rockweed is the dominant algal species in E2AB1N wetlands.
E2BBN E2USN	Regularly flooded, unvegetated beaches and bars along low-energy shorelines. Typically composed of sand-sized particles.
E2EM1/FLM E2EM1/USM	Lowest elevation area of a brackish marsh, interspersed with sand and/or mud flats, that is irregularly exposed by brackish water. Emergent species which occur include eelgrass, creeping alkaligrass, glasswort and sea blite.
E2EM1/FLN E2EM1/USN	Brackish marshes mixed with mud flats and/or tidal ponds. (See descriptions of the 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 maritime arrowgrass, Lyngby sedge, many-flowered sedge, glasswort, creeping alkaligrass, and plantain. Viereck et al. types - Halophytic grass wet meadow - Halophytic sedge wet meadow - Halophytic sedge marsh
E2EM1/FLP E2EM1/USP E2FL/EM1P E2US/EM1P	Irregularly flooded, higher elevation brackish marsh with areas of open or sparsely vegetated mud or sand flats. (See descriptions for the E2EM1P, E2FLP, E2EM1N and E2EM1/FLN wetland types).
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 the E2EM1N and E2EM1P types exist in close proximity to one another, making it difficult to delineate them separately).

The E2EM1N coastal marsh type 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. Lyngby sedge dominates the emergent flats areas particularly along tidal channels which are inundated for short durations. Lyngby sedge may form a dense peaty turf along these tidal guts. The higher areas (primarily vegetated levees) may also contain a sparse to dense vegetative cover of bluegrass, Pacific silverweed, bluejoint grass, hairgrass, and spearscale.

The lower, more regularly flooded areas may be dominated by Lyngby sedge, many-flowered sedge, maritime arrowgrass, and plantain.

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

E2EM1/OW — Brackish marsh interspersed with areas of open water. Dominant vegetation may include common marestail, pondweed, softstem bulrush and those described for the E2EM1N and E2EM1P wetland types.

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

Dominant species include Lyngby sedge, Ramenski sedge, and many-flowered sedge. These species may occur in pure stands or be associated with those species exposed to regular, but of short duration, inundation described for E2EM1N areas. Additional species of importance include tufted clubrush, shining alkaligrass, plantain, glasswort, three-flowered alkaligrass, bluegrass, bluejoint, bulrush, horsetail, spearscale, maritime arrowgrass, and various forbs.

The higher zones of coastal marshes, which are inundated by extremely high tides and are fairly well-drained, may produce a dense cover of hairgrass (often in pure stands), red fescue, Pacific silverweed, wildrye, lupine and various herbs. This classification type often represents a transitional zone dividing typical salt marsh areas from freshwater marsh.

Shrub thickets may occur along the highest shoreward portions which are still subjected to irregular inundation. These areas may contain sweet gale, willow, bluejoint grass and some herbaceous species associated with the lower elevation portions of the E2EM1P wetland type (e.g., bluegrass and alkaligrass).

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

E2FLM
E2USM

Intertidal, low-energy, irregularly exposed area of sand and mud flats.

E2FLN
E2USN

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. Species may include scurvy grass, rockweed, plantain, and alkali grass.

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 remins 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 tidal ponds.

E2FLP
E2USP

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

E2F05/EM1P

Similar to E2F05P. An understory of emergent vegetation consisting of Lyngbye sedge, alkaligrass, horsetail, wildrye, bluejoint grass, and lupine is present (covering at least 30 percent of the area). (See descriptions for the E2F05P and E2EM1P wetland types).

E2F05/FLP
E2F05/USP

Similar to the E2F05P wetland type, except that the substrate is composed of unconsolidated material (at least 30 percent of the total area) with little or no ground cover.

E2F05P

Irregularly flooded area of former forested wetland within the higher elevations of a brackish marsh. Tree species have died off, but remain standing, due to a change in the water table, or because of inundation by brackish water due to a lowering (by tectonic action) of the land surface.

E2RS/FLN E2RS/USN	Intertidal, low-energy, regularly flooded rocky shore area consisting of bedrock, boulders or stones interspersed with mud and/or sand flats. Vegetation is generally sparse, consisting of those species described for the E2FLN wetland type.
E2RSN	Intertidal, low-energy, regularly flooded rocky shore area consisting of bedrock, boulders, or stones.
E2RSP	Intertidal, low-energy, irregularly flooded rocky shore area consisting of bedrock, boulders or stones.
E2SS1/EM1P	Irregularly flooded, higher elevation portion of brackish marsh. Broad-leafed deciduous shrubs including sweetgale and willow, comprise at least 30 percent of the area with the remaining area being composed of graminoids and other herbaceous plants. (See the description for the E2EM1P wetland type).

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. Aquatic vegetation is lacking or sparse (less than 30 percent areal coverage).
L2AB4H	Permanently flooded, floating-leaved aquatics growing in shallow water of lakes. Dominant plant is yellow water lily. Pondweed and dwarf water lily are also common in some areas. (See the description for the PAB4H wetland type). Viereck et al. type - Aquatic vegetation (floating and submerged). Freshwater lakes, pondlily and fresh pondweed.
L2AB4H/OWH L2OW/AB4H L2OW/AB3H	Permanently flooded lakes supporting aquatic (floating-leaved/rooted vascular) vegetation. Vegetative cover is at least 30 percent of the lake area but does not exceed 70 percent of the total lake area. Vegetation for this type is described for the PAB4H and PAB4/OWH wetland types. Viereck et al. type - Aquatic vegetation (floating and submerged). Freshwater lakes, pondlily and fresh pondweed.
L2FLA L2USA	Temporarily flooded mud and sand flats along lake shorelines. These areas are typically devoid of vegetation.
L2FLC L2USC	Seasonally flooded mud and sand flats along lake shorelines. These areas are typically devoid of vegetation.

L2OWF	Semipermanently flooded, shallow areas of lakes. Lake substrate will occasionally be exposed during periods of extreme low water.

Riverine System

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

R1FLR R1USR	Seasonally flooded, tidal river flats and bars. These areas are not directly inundated by estuarine water but are flooded by fresh water which backs up into riverine channels during high tides.
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.
R2OWH	Permanently flooded, open water channels of lower perennial rivers and streams.
R3FLA R3USA	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 the description for the PSS1A wetland type).
R3FLC R3USC	Seasonally flooded river flats and bars. This type is extensive in major river channels. These areas are typically unvegetated or sparsely vegetated by broad-leaved deciduous shrubs or persistent emergents. Vegetative cover is less than 30 percent of the flats area. (See the descriptions for the PSS1C and PSS1/FLC wetland types).
R3OWH	Permanently flooded, open water channels of upper perennial rivers and streams.
R3OW/US	Complex of permanently flooded open water channels and temporarily and/or seasonally flooded gravel/sand bars and flats. Due to the complexity of these braided riverine areas, the entire water/flats area has been grouped together instead of delineating the open water channels and flats separately.
R3SBC	Complexes of river flats and open water channels. Braided streams are included in this mapping category. Occurs extensively throughout river channels. Typically unvegetated or sparsely vegetated by deciduous shrubs of less than 30 percent areal coverage. (See the descriptions for the PSS1C and PSS1/FLC wetland types).
R4SBA	A complex of river flats, bars and small open water pools of temporarily flooded intermittent streams.

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 the descriptions for the PSS1C and PSS1/FLC wetland types).

Palustrine System

The palustrine system includes all wetlands dominated by trees, shrubs, persistent emergents, emergent moss, and lichens that are not influenced by ocean-derived salinity. Wetland types commonly referred to as bogs, muskegs, fens, 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.

PAB4H — Permanently flooded, floating-leaved aquatic vegetation growing in ponds. Dominant plants include yellow water lily, dwarf water lily, and pondweed. Water milfoil can also be found in large ponds with mineral substrates and smaller sedge bog ponds. Associated species may include common marestail and horsetail.

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

PEM1A — Temporarily flooded, persistent emergent wetlands. This type is generally restricted to small depressions or on the floodplains of streams. Standing water is present for only brief periods during the growing season. Bluejoint grass is usually the dominant emergent. Associated species include Jacob's ladder, dock, meadow horsetail, marsh peavine, fireweed, lupine, and various sedges.

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

PEM1/AB4H Permanently flooded emergent marsh mixed with areas of floating-leaved aquatic beds. The emergent and aquatic bed vegetation both occupy at least 30 percent of the ponded basin. (See the descriptions for the PEM1H, PAB4H, and PEM1/OWH wetland types).

PEM1B Saturated, emergent, bog-type marshes. These areas are generally on saturated peat soils with a sphagnum mat covering the soil surface. Sedges and cottongrass dominate this wetland type. The common sedge species are water sedge and Lyngbye sedge in the wet meadow portions with Sitka sedge occurring in the higher, more well drained areas where it is associated with willow, sweet gale, dwarf birch, and black crowberry. Spike water milfoil and sheathed pondweed may be found in the small ponded areas associated with the PEM1B wetland type. This type can also be found as a floating mat on ponds (indicating an early stage of bog development). Buckbean and sphagnum moss dominate in this wetland situation. Additional species of importance include bog rosemary, shore sedge, rotund sedge, many-flowered sedge, swamp horsetail, marsh cinquefoil, whitebeaked rush, sundew, and various species of cottonsedge.

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

PEM1C Seasonally flooded, persistent emergent marshes. This emergent wetland type usually occurs on the floodplain of small streams and creeks. Standing water resulting from stream overflow is present early in the growing season. This type is also found in margins of ponds. Species of primary importance include Sitka sedge, beaked sedge, and water sedge. Associated species include meadow horsetail, swamp horsetail and marsh horsetail, bluejoint, manna grass, marsh cinquefoil, Jacob's ladder, marsh peavine, and sphagnum moss. Willow often occurs as a sparse cover.

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

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

PEM1F Semipermanently flooded, emergent marshes. These marsh areas usually exhibit standing water throughout the growing season.

This wetland type occurs frequently in patterned bog pools. Patterned bogs (string bogs, senescent string bogs, and reticulate bogs) typically consist of a complex of elevated

peat ridges and/or mounds interspersed with pools of standing water. The pools contain areas of open water and aquatic beds in addition to the stands of emergents. This wetland type also occurs in depresssions and pools not associated with patterned bogs, and along the periphery of ponds and lakes.

Dominant vegetation includes swamp horsetail, buckbean, marsh cinquefoil, water sedge, beaked sedge, shore sedge, livid sedge, tall cottonsedge, common marestail, spikerush, and various mosses.

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

PEM1/FLC
PEM1/USC

Seasonally flooded emergent marsh mixed with unvegetated flats. This emergent wetland type usually occurs on the floodplain of small streams and creeks. Standing water resulting from stream overflow is present for extended periods during the growing season. See the description for the PEM1C wetland type.

PEM1H

Permanently flooded, emergent marshes. These are marshes that exhibit standing water throughout the entire year in all years. The dominant vegetation consists of buckbean and swamp horsetail. Water sedge may occur along the wet meadow borders of these permanently flooded marshes. Other important species include softstem bulrush, Lyngby sedge, marestail, and bladderworts.

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. Sitka sedge, beaked sedge, buckbean, swamp horsetail, and marsh cinquefoil comprise the dominant species. Tall cottonsedge, bluejoint grass, and Barclay willow may dominate the higher fringe areas.

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

PEM1/OWH
POW/EM1H

Typically a PEM1H (or PEM1F) wetland type mixed with areas of permanently flooded open water. (See the descriptions for the PEM1H and PEM1F wetland types). These marshes may occupy an area within the brackish water/freshwater ecotone. Vegetation

is composed primarily of sedges (Lyngby sedge, Sitka sedge, water sedge, Ramenski sedge, many-flowered sedge), softstem bulrush, horned pondweed, horsetail, and four-leaf marestail.

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

PEM1/OWT — Similar to the PEM1T wetland type except that large areas of open water are evident. See the descriptions for the PEM1T, PEM1F and PEM1/OWF wetland types.

PEM1R — Seasonally flooded, tidal, persistent emergent marshes. These marshes occur on terraces along the banks of freshwater tidal channels (R1OWV). This wetland type is similar to the PEM1C wetland type but occurs closer to the mouth of streams entering estuarine waters. (See the descriptions for the PEM1C and PSS1/EM1C wetland types). Typical plant communities may include Lyngby sedge, Pacific silverweed, marsh peavine, red fescue, bluejoint grass, reed bent grass, water hemlock, and dock.

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

PEM1T — Semipermanently flooded, tidally influenced, persistent emergent marsh. This wetland type is similar to the PEM1F wetland type but occurs closer to the mouth of streams entering estuarine waters. See descriptions for the PEM1F and PEM1/OWF wetland types.

PEM1/USA — Temporarily flooded, persistent emergent wetlands mixed with unconsolidated sand and/or gravel bars. Similar to the PEM1A wetland type.

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

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

PFLC
PUSC — 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.

PFO1A — Temporarily flooded deciduous forested wetland occurring on river floodplains. Black cottonwood is the dominant tree species. It may occur in relatively pure stands or in mixed stands with balsam poplar. Understory vegetation is usually lacking or sparse consisting of various graminoid species (grasses and sedges). (See the description for the PEM1A wetland type).

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

PFO1C — Seasonally flooded deciduous forested wetland occurring on river floodplains. Black cottonwood is the dominant tree species, although it may occur in stands mixed with balsam poplar. Understory vegetation may be sparse to lacking. (See the description for the PSS1C wetland type).

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

PFO1/EM1A — Temporarily flooded, open deciduous forested wetland occurring on river floodplains. This type has an open canopy dominated by black cottonwood and balsam poplar with an understory of persistent emergent vegetation dominated by bluejoint grass and horsetail.

Viereck et al. type - Open deciduous forest.

PFO1/EM1C — Seasonally flooded areas usually occurring 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 black cottonwood and balsam poplar. Willow and alder may occasionally reach tree height (greater than 6 meters). Persistent emergent vegetation is described for the PEM1C wetland type. (Also see the descriptions for the PSS1C and PSS1/EM1C wetland types).

Viereck et al. type - Open deciduous forest.

PFO1/SS1A
PSS1/FO1A — 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 are primarily balsam poplar and black cottonwood. Willow and alder 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 alder with invading paper birch and balsam poplar. Understory is generally sparse, consisting of willow, bluejoint grass, horsetail, and fireweed.

Viereck et al. type - Open deciduous forest, paper birch - poplar.

PFO1/SS1B An area with saturated soil conditions and an open canopy of deciduous trees, primarily balsam poplar and black cottonwood. Broad-leaved deciduous shrubs comprise the dominant understory vegetation. (See the descriptions for the PSS1B and PSS1/EM1B 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 are primarily balsam poplar and black cottonwood. Willow and alder 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. White spruce may also occur in the more well-drained areas. Understory vegetation may include high bush cranberry, prickly rose, red current, bluejoint grass, horsetail, cloudberry, Jacob's ladder, wintergreen bunchberry, and various other herbs. (See the description for the PSS1C wetland type).

Viereck et al. type - Open deciduous forest.

PFO1/SS1R An open canopy deciduous forested wetland which is seasonally inundated by tidally influenced fresh water systems. Broad-leaved deciduous shrubs are the dominant understory vegetation. Similar to the PFO1/SS1C wetland type.

PFO1/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. Similar to the PFO1/SS1A wetland type.

PFO1/USA Mixture of temporarily flooded deciduous forested wetlands and unconsolidated gravel/sand flats occurring on river floodplains. Similar to the PFO1A wetland type.

PFO4B Saturated, black spruce bogs. These areas are dominated by black spruce greater than 6 meters in height. 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 thinleaf alder, dwarf birch, prickly rose, leatherleaf, Labrador tea, bog cranberry, low bush cranberry, bog blueberry, bog rosemary, and black crowberry. Herbaceous vegetation may include bunchberry, meadow horsetail, woodland horsetail, cloudberry, and cottonsedge. Sphagnum moss may at times provide a very dense ground cover.

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

PF04/EM1B

Saturated, black spruce bog with an emergent ground layer. Emergent species for this type are described for the PEM1B wetland type. (Also see the description for the PF04B wetland type).

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

PF04/SS1A
PSS1/F04A

Temporarily flooded areas on river floodplains consisting of open canopy needle-leaved evergreen trees. Open areas or areas under a semi-open tree canopy support broad-leaved deciduous shrubs. Dominant tree species include black spruce and white spruce. Understory vegetation is described for the PSS1A wetland type. (Also see the description for the PF01/SS1A wetland type).

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

PF04/SS1B
PSS1/F04B

Same as the PF04B wetland type, but the black spruce canopy cover is generally less than in the PF04B type. The understory scrub-shrub vegetation in these areas exceeds 30 percent areal coverage. Standing water may occur between frost-heaved hummocks. Peat soil is saturated year round and may exceed 1 meter in depth.

Dominant species include: black spruce, Labrador tea, dwarf birch, low bush cranberry, bog blueberry, dwarf birch, horsetail, cloudberry, feathermoss and sphagnum moss. (See the descriptions for the PF04B and PSS1B wetland types).

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

PF04/SS1C	Seasonally flooded areas adjacent to streams and small rivers that are a complex of black spruce on higher terraces and deciduous shrubs on lower terraces. Willow and alder are the common shrub species. (See the description for the PSS1C wetland type). Viereck et al. type - Open conifer forest, black spruce.
PF04/1A PF01/4A	Temporarily flooded mixed forested wetland occurring on river floodplains. Black spruce is the dominant tree species but contains at least 30 percent black cottonwood and/or balsam poplar. (See the descriptions for the PF04A and PF01A wetland types).
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/EM1C	Seasonally flooded dead tree area generally found along stream floodplains and small river deltas where divergence of water from the main stream channel has occurred. This situation may also occur as a result of beaver activity. The understory is dominated by persistent emergent vegetation. (See the description for the PEM1C wetland type).
PF05/EM1F	Semipermanently flooded dead tree swamp often created by beaver activity. Understory vegetation consists of persistent emergents occupying at least 30 percent of the area. (See the description for the PEM1F wetland type).
PF05/EM1R	Same as the PF05R wetland type except that an understory vegetative cover of persistent emergents occurs. (See the descriptions for the PF05R, PF05C, and PEM1C wetland types).
PF05F	Semipermanently flooded dead tree swamp. (See the description for the PF05H wetland type).
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 areas of open water. This situation may occur as a result of damming by beavers, a rise in pond water elevation, or by changes in the direction of stream flow. (See the description for the PF05H wetland type).

PF05R	Seasonally flooded dead tree forested wetland which is flooded by tidally influenced freshwater systems. (See the description for the PF05H wetland type).
PF05/SS1C	Seasonally flooded dead tree area 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. Willow and alder are the dominant shrub species.
PF05/SS1R	A dead tree forested wetland which is seasonally flooded by tidally influenced fresh water systems. Broad-leaved deciduous shrubs provide dense understory vegetative cover. (See the descriptions for the PF05/SS1C, PF05R, and PSS1R wetland types).
PF05/1C PF01/5C	Same as the PF05C wetland type except that living broad-leaved deciduous trees cover at least 30 percent of the area. Living tree species are either black cottonwood or balsam poplar.
POWF	Semipermanently flooded, small open water bodies (ponds) where sparse vegetative cover may occur, but is generally less than 30 percent. (See the descriptions for the PAB4H, PAB4/OWH, PEM1F, and PEM1H wetland types).
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 the PAB4H, PAB4/OWH, PEM1F and PEM1H wetland types).
POWT	Semi-permanently flooded, small open water bodies which are inundated by fresh, tidally influenced water.
POWV	Permanently flooded, small open water bodies which are inundated by fresh, tidally influenced water.
PSS1A	Temporarily flooded dense shrub areas on river and stream floodplains consisting primarily of willow and alder. 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 bluejoint grass and horsetail. Peat development is usually lacking. Viereck et al. type - Closed tall shrub scrub, alder-willow.

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 thinleaf alder, planeleaf willow (in wetter areas), feltleaf willow, sweetgale, dwarf birch, and bog blueberry. Associated emergent vegetation is most likely to include bluejoint grass and water sedge. A dense mat of sphagnum moss covers the soil surface in many PSS1B areas. Additional species may include Polar grass, burnet, Labrador tea, nagoonberry, prickly rose, diamond willow, shrubby cinquefoil, cloudberry, Jacob's ladder, bluejoint grass, water sedge, lowbush cranberry, and an assemblage of various herbs and mosses. (See the description for the PSS1/EM1B wetland type).

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

PSS1C

Seasonally flooded dense shrub areas on river and stream floodplains consisting of willow and alder. Terrain may be hummocky with flooded depressions. Thinleaf alder and ovalleaf willow are generally the dominant tall shrub species. Emergent vegetation, dominated by bluejoint grass, 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 occurring in the understory include swamp horsetail, marsh cinquefoil, nagoonberry, marsh peavine, red current, prickly rose, meadowrue and sedge.

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

PSS1/EM1A

Temporarily flooded areas occurring 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/EM1B
PEM1/SS1B

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. Common shrub species include sweet gale, thinleaf alder, dwarf birch, Labrador tea, leatherleaf, shrubby cinquefoil, bog blueberry, lowbush cranberry, bog cranberry, bearberry, bog rosemary, black crowberry, cloudberry, and various species of willow (primarily feltleaf willow, planeleaf willow, netleaf willow, and bog willow).

Dominant emergent species include bluejoint grass, various species of sedge (primarily livid sedge, water sedge, beaked sedge, Sitka sedge, many-flowered sedge), swamp horsetail, tufted clubrush, cowparsnip, helebore, burnet, parnassia, rush, fireweed, and various species of cottonsedge. The saturated peaty soils in this wetland type are covered with a mat of sphagnum moss. Scattered stunted black spruce may be present in some areas.

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

PSS1/EM1C
PEM1/SS1C

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. Willow and alder 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) and in drained beaver meadows. In addition to the willow and alder, these areas may include the following species: sweet gale, tufted clubrush, tall cottonsedge, buckbean, livid sedge, shore sedge, rotund sedge, beaked sedge, maritime arrowgrass, northern asphodel, bog cranberry, cloudberry, black crowberry, dwarf birch, lowbush cranberry, bog blueberry, horsetail, bog willow, bog rosemary, bluejoint grass, marsh cinquefoil, shrubby cinquefoil, and various mosses.

This wetland 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 thinleaf alder and paper birch occurs with an understory of bluejoint grass, swamp horsetail, and various shrubs and herbs noted above.

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

PSS1/EM1F
PEM1/SS1F

This delineation 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.

The ridges and islands in a patterned bog are dominated by broad-leaved deciduous shrubs. Important species include dwarf birch, Labrador tea, bog rosemary, sweet gale, black crowberry, bog blueberry, and lowbush cranberry.

The flarks (ponds) are typically dominated by emergent vegetation and are characterized by a semipermanently flooded or permanently flooded water regime. Sphagnum moss may form around flarks and on thebog 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/EM1R

Seasonally flooded, tidal wetlands consisting of a mix of broad-leaved deciduous shrubs and persistent emergents. Vegetation is periodically inundated by tidally influenced fresh water. (See the description for the PSS1/EM1C wetland type).

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

PSS1F

Semipermanently flooded, deciduous scrub-shrub community. These areas are usually influenced by beaver activity. (See the description for the PSS1C wetland type).

PSS1/FLA
PSS1/USA

Temporarily flooded areas on river and stream floodplains consisting of a mix of shrubs and non-vegetated riverine flats. Shrub species are primarily willow and alder. The flats are typically composed of sand and gravel-sized particles, and are situated at a slightly lower elevation than the shrub areas. (See the description for the PSS1A wetland type).

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

PSS1/FLC
PSS1/USC

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

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

PSS1/FLR
PSS1/USR

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 the PSS1/FLC 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 the description for the PSS1C wetland type).

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

PSS1S

Temporarily flooded, tidal areas of dense broad-leaved deciduous shrubs. Vegetation is periodically inundated by fresh water which becomes backed up due to tidal action. This wetland type is similar to the PSS1A wetland type. Typical vegetation consists of willow, alder, sweet gale, and various forbs as described for the PSS1A and PSS1C wetland types.

PSS4B

Saturated, black spruce bog. The black spruce in these areas are shrub height (less than 6 meters) and generally exceed 50 percent areal coverage. (See the descriptions for the PSS4/1B, PSS1B, and PF04B wetland types).

PSS4/EM1B

Saturated black spruce bog with an emergent vegetative layer. The black spruce in these areas are shrub height (less than 6 meters). Emergent species are those described for the PEM1B wetland type. (Also see the description for the PSS4/1B wetland type).

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

PSS4/EM1C

Seasonally flooded areas on floodplains and in drainageways that are a mixture of scrub black spruce and emergent covertypes. 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, black spruce, mixed with subarctic lowland sedge wet meadow.

PSS4/1B
PSS1/4B

Saturated, open canopy black spruce bog. The spruce in these wetlands are shrub height (less than 6 meters). A dense deciduous shrub understory is present and is dominated by sweet gale, willow, Labrador tea, leatherleaf, black crowberry, cloudberry, dwarf birch, bog blueberry, bog cranberry, and lowbush cranberry. This type also occurs adjacent to coastal wetlands below bluffs which provide groundwater seepage. In these areas, common species include black spruce, thinleaf alder, dwarf birch, Labrador tea, bluejoint grass, horsetail, bog willow, and various species described for the PSS1B and PSS1/EM1B wetland types.

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

PSS5/1F

Semipermanently flooded area of standing dead shrubs with an understory of live broad-leaved deciduous shrubs. These areas are usually influenced by beaver activity.

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APPENDIX A

The Service has prepared a list of "Wetland Plants of the State of Alaska, 1986" which assigns an "indicator" to each plant species found in wetlands. This wetland indicator describes the frequency of occurrence of an individual species in wetlands versus non-wetlands within the State (similar plant lists are available for other Regions and States in the United States). The following wetland indicators have been assigned to plants which occur in wetlands:

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

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

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

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

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

The following list identifies the dominant plant species found in wetlands within the Seward 1:250,000 scale quad area. The wetland indicator category for most of the species is also provided:

	COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR CATEGORY
Trees	Betula papyrifera	Paper birch	FACU
	Picea glauca	White spruce	FACU
	Picea mariana	Black spruce	FACW
	Populus balsamifera	Balsam poplar	FACU
	Populus trichocarpa	Black cottonwood	FACU
Shrubs	Alnus sp.	Alder	FAC
	Alnus tenuifolia	Thinleaf alder	FAC
	Andromeda polifolia	Bog rosemary	OBL
	Arctostaphylus sp.	Bearberry	FAC-UPL
	Betula nana	Dwarf arctic birch	FAC
	Chamadaphne calyculata	Leatherleaf	FACW
	Empetrum nigrum	Black crowberry	FAC

	COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR CATEGORY
	Ledum sp.	Labrador tea	FACW
	Ledum palustre	Northern labrador tea	FACW
	Myrica gale	Sweet gale	OBL
	Oxycoccus microcarpus	Bog cranberry	OBL
	Ribes triste	Red current	FAC
	Rosa acicularis	Prickly rose	FACU
	Rubus arcticus	Nagoonberry	FAC
	Rubus chamaemorus	Cloudberry	FACW
	Salix sp.	Willow	OBL-UPL
	Salix alaxensis	Feltleaf willow	FAC
	Salix barclayi	Barclay willow	FAC
	Salix fuscescens	Bog willow	FACW
	Salix glauca	Diamond willow	FAC
	Salix ovalfolia	Ovalleaf willow	FAC
	Salix planifolia	Planeleaf willow	FACW
	Salix reticulata	Netleaf willow	FAC
	Vaccinium oxycoccos	Bog cranberry	OBL
	Vaccinium uliginosum	Bog blueberry	FAC
	Vaccinium vitis-idaea	Low bush cranberry	FAC
	Viburnum edule	High bush cranberry	FACU
Forbs	Atriplex sp.	Saltbush	FACW
	Atriplex patula	Spearscale	FACW
	Chrysanthemum arcticum	Arctic daisy	FACW
	Cicuta douglasii	Water hemlock	OBL
	Cornus canadensis	Bunchberry	FACU
	Drosera sp.	Sundew	OBL
	Epilobium sp.	Fireweed	OBL-FACU
	Equisetum sp.	Horsetail	OBL-FACU
	Equisetum arvense	Meadow horsetail	FACU
	Equisetum fluviatile	Swamp horsetail	OBL
	Equisetum palustre	Marsh horsetail	FACW
	Equisetum silvaticum	Woodland horsetail	FACU
	Glaux maritima	Sea milkwort	OBL
	Hippuris tetraphylla	Four-leaf marestail	OBL
	Hippuris vulgaris	Common marestail	OBL
	Lathyrus palustris	Marsh peavine	OBL
	Lupinus sp.	Lupine	FAC
	Menyanthes trifoliata	Buckbean	OBL
	Myriophyllum sp.	Water milfoil	OBL
	Myriophyllum spicatum	Spike water milfoil	OBL
	Nuphar polysepalum	Yellow water lily	OBL
	Nymphaea tetragona	Dwarf water lily	OBL
	Parnassia palustris	Parnassia	FACW
	Plantago maritima	Plantain	FACW
	Polemonium acutiflorum	Jacob's ladder	FAC

	COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR CATEGORY
	Potamogeton sp.	Pondweed	OBL
	Potamogeton filiformis	Filiform pondweed	OBL
	Potamogeton friesii	Fries pondweed	OBL
	Potamogeton pectinatus	Fennel-leaf pondweed	OBL
	Potamogeton perfoliatus	Clasping-leaf pondweed	OBL
	Potamogeton vaginatus	Sheathed pondweed	OBL
	Potentilla egedii	Pacific silverweed	FACW
	Potentilla fruiticosa	Shrubby cinquefoil	FAC
	Potentilla palustris	Marsh cinquefoil	OBL
	Pyrola asarifolia	Wintergreen	FAC
	Ranunculus cymbalaria	Shore buttercup	OBL
	Rumex sp.	Dock	OBL-FAC
	Salicornia europaea	Glasswort	OBL
	Sanguisorba sp.	Burnet	FAC
	Sparganium sp.	Bur reed	OBL
	Spergularia canadensis	Spurry	FACW
	Suaeda maritima	Sea blite	FACW
	Thalictrum sp.	Meadowrue	FAC
	Tofieldia coccinea	Northern Asphodel	FAC
	Utricularia sp.	Bladderwort	OBL
Graminoids	Arctagrostis sp.	Polar grass	FACW
	Calamagrostis canadensis	Bluejoint grass	FAC
	Calamagrostis deschampsioides	Reed bent grass	FACW
	Carex sp.	Sedge	OBL-UPL
	Carex aquatilis	Water Sedge	OBL
	Carex limosa	Shore sedge	OBL
	Carex livida	Livid sedge	OBL
	Carex lyngbyaei	Lyngbye sedge	OBL
	Carex pluriflora	Many-Flowered Sedge	OBL
	Carex ramenski	Ramenski sedge	OBL
	Carex rostrata	Beaked sedge	OBL
	Carex rotundata	Rotund sedge	OBL
	Carex sitchensis	Sitka sedge	OBL
	Cochlearia officinalis	Scurvy grass	FAC
	Deschampsia beringensis	Hairgrass	FAC
	Eleocharis palustris	Spikerush	OBL
	Elymus arenarius	Wildrye	FAC
	Eriophorum sp.	Cotton sedge	OBL-FACW
	Eriophorum angustifolium	Tall cotton sedge	OBL
	Festuca rubra	Red fescue	FAC
	Glyceria sp.	Mannagrass	OBL
	Heracleum lanatum	Cow parsnip	FACU
	Juncus oreganus	Rush	OBL
	Poa eminens	Bluegrass	FAC

	COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR CATEGORY
	Puccinellia sp.	Alkaligrass	OBL-FAC
	Puccinellia glabra	Anderson alkaligrass	OBL
	Puccinellia grandis	Shining alkaligrass	OBL
	Puccinellia lucida	Lucida alkaligrass	OBL
	Puccinellia nutkaensis	Pacific alkaligrass	OBL
	Puccinellia phyryganodes	Creeping alkaligrass	OBL
	Puccinellia triflora	Three-flowered alkaligrass	FACW
	Ruppia spiralis	Ditchgrass	OBL
	Rynchospora alba	Whitebeaked rush	OBL
	Scirpus paludosus	Bulrush	OBL
	Scirpus validus	Softstem bulrush	OBL
	Trichophorum sp.	Tufted Clubrush	
	Triglochin maritimum	Maritime arrowgrass	OBL
	Triglochin palustris	Marsh arrowgrass	OBL
	Veratrum eschscholtzii	Helebore	FACU
	Zannichellia palustris	Horned pondweed	OBL
Mosses	*Pleurozeum schreberi*	Feathermoss	
	Sphagnum sp.	Moss	
Alga	*Fucus sp.*	Rockweed	
	Lamineria sp.		
	Macrocystis sp.		
	Nerocystis sp.		