NATIONAL WETLANDS INVENTORY
NOTES TO USER FOR
THE KODIAK ARCHIPELAGO 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 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 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 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

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 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.

The 1:63,360 scale wetlands maps for the Kodiak Archipelago were produced using color-infrared (CIR) aerial photography at a scale of 1:60,000. The following chart illustrates the date of photography for individual 1:63,360 scale quadrangles:

1:250,000 Map Area	1:63,360 Quadrangle	Photo Date(s)
Afognak	all quads	6/78
Kaguyak	all quads	7/79
Karluk	A-1,2	6/79
	B-1,2,3	6/78, 6/79, 7/79
Kodiak	A-3,4,5,6	7/79
	B-2,3,4,5,6	7/79
	C-1	7/83
	C-2,3,4	7/79
	D-1	6/78,6/79,7/79,8/82
	D-2	6/78, 8/82
	D-3,4,5,6	6/78
Trinity Islands	all quads	7/79

Field checking was conducted in August, 1985 and 1986. Collateral information used in this mapping effort included the Soil Conservation Service's Exploratory Soil Survey for Alaska, Soil Survey and Vegetation for Northeastern Kodiak Island, Vegetation Cover Map prepared by Arctic Geo Resource Associates, 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 1986, the NWI had produced wetlands maps for approximately 14% 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. 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 wetlands and deep-water habitats which are linear in nature 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 "cloud cover" or "photography not available."

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

STUDY AREA

The topography varies greatly on the Kodiak Archipelago from relatively low rolling hills, broad valleys, and long meandering streams in the southwest becoming progressively higher and much more precipitous with narrow steep walled valleys, deep, fjord-like bays, and fast flowing, relatively short streams toward the northeastern portions of Kodiak Island. The islands are intensely scoured and eroded by at least three glaciations that brought ice down Cook Inlet and across Shelikof Strait as well as from local sources. The most rugged terrain on Kodiak Island extends from Cape Alitak northeast to Kiznuyak Bay. The highest peaks here, including Koniag Peak and Mount Glottof, are over 4,000 feet high. On Afognak Island there are about 15 peaks reaching a height over 2,000 feet. Tugidak Island has a low rolling topography and Sitkinak's highest elevation is 1,600 feet.

Drainages flow predominantly northwest and southeast, following valleys deepened and straightened by glacial ice. The straits and elongated bays are fjords, representing former valleys over-deepened by ice to below present sea level. Many elonged lakes occupy ice-scoured trenches, dammed by moraines. Except for major rivers which drain large glacial lakes, the rivers are small, short, and steep. They flow in valleys straightened by glaciers and end quickly in bays. Kodiak Island's bays are indented to such an extent that there are no locations on the island more than 15 miles from the sea. Valleys are generally steep walled, u-shaped, with hanging tributaries. V-shaped and terraced canyons may be found where moraines have been breached or in areas where stream piracy or lateral diversion occurred (as is common in a glacial landscape).

Vegetation in the Archipelago can be classified into five major habitat types: (1) coastal western hemlock-Sitka spruce forests, (2) upland spruce hardwood forests, (3) high brush vegetation, (4) moist tundra and (5) wet tundra.

Coastal Western Hemlock - Sitka Spruce Forests occur on most of Afognak Island, Marmot Island, Spruce Island, on the fringes of Uyak Bay, an area north of Port Lyons and other small portions of Kodiak Island. Sitka Spruce (Picea sitchensis) is the native conifer on Kodiak and Afognak Islands.

Upland Spruce-Hardwood Forests are fairly dense and composed of white spruce (Picea glauca), Alaska paper birch (Betula papyrifera humilis), quaking aspen (Popula tremuloides), black cottonwood (Populus trichocarpa), and balsam poplar (Populus balsamifera). These stands are likely to occur along streams. There is a small amount of this forest type on the island complex.

High Brush vegetation occurs on the majority of Raspberry Island, western Afognak and in the proximity of Paramanof Island. This type also occurs in some northern portions of Kodiak Island and is less common in the southern areas. The dominant species in these brush systems are willow (Salix spp.), Sitka alder (Alnus sinuata), American green alder (Alnus crispa), and thinleaf alder (Alnus tenuifolia). Trees such as quaking aspen, Alaska paper birch and white spruce may be scattered throughout. The high brush vegetation type occupies a variety of sites, from poorly drained soils to well drained shallow upland soils on moraines. Other shrub species common in this system are Vaccinium spp., Rubus spp. and Cornus spp. Grasses and herbs frequently form

an understory that includes species such as Calamagrostis spp., Festuca spp., Achillea spp., Lupinus spp., Polemonium spp., Equisetum spp., and Epilobium angustifolium.

The moist tundra habitat type usually forms a complete ground cover and is extremely productive during the growing season. Composition varies from almost continuous cottongrass, with a sparse growth of sedges and dwarf shrubs, to stands where dwarf shrubs dominate. Underlying soils vary from wet, shallow and loamy with thin peat layers on upper slopes to deep wet clayey soils with peat in the lowlands. Shrub species common in this system are Salix spp., Betula nana, Ledum palustre, Alnus crispa, Rhododendron lapponicum, Vaccinium spp., and Vaccinium vitis-idaea. Herbaceous vegetation includes Eriophorum spp., Arctagrostis latifolia, Calamagrostis spp., Deschampsia spp., Festuca spp., Elymus arenarius, Polygonum spp., Achillea spp., Equisetum spp., Luzula spp., Carex spp., and Epilobium spp. The moist tundra system is found on the western side of Tugidak Island, in the southern portion of the Alivlik Peninsula, and on the outer rim of Sitkinak Island. It is also found on the western rim of Kodiak Island.

The dominant vegetation in the wet tundra system is cottongrass, occurring as an even mat rather than in a tussock form. A few woody plants occur on drier sites above the water table. This vegetation type also includes stands of rooted aquatic plants, in shallow lakes, tidal marshes and in wet areas with little topographic relief near sea level. In addition to cottongrass, the common emergent species in the wet tundra type are Arctophila fulva, Hippuris spp., and Carex spp., Salix spp. Low shrub species include Betula nana, Ledum palustre, Potentilla fruticosa and Vaccinium vitis-idaea. Wet tundra occurs primarily on the eastern portion of Tugidak Island, in the Ayakulik River valley and in an area west of Larson Bay along the Karluk River.

CLIMATE

The Kodiak Archipelago is within the maritime climate zone. Temperature variations are generally small (except in higher elevations), humidity and precipitation are high, fog and clouds are frequent, and freezing weather is rare. The overall mean annual temperature is about 40°F (4°C). Because of the warming effect of the Alaska Current (a northern eddy of the Japanese current) the climate is more temperate than is normal for the latitude. Summer air temperatures are seldom above 75°F (24°C), and winter temperatures are rarely below 0°F (-18°C). Periods of subfreezing temperatures can occur throughout the year.

Moist air is always present over the Archipelago, brought in by the Aleutian low in the winter and the continental low in the summer. Rain is generally light, but of long duration. More than 100 wet days (on which 0.1 inch (2mm) or more precipitation occurs) are expected per year, whereas most of Alaska has less than 50 wet days per year. At Kodiak the driest times are late winter and midsummer, but even then the probability of a wet day remains high (Johnson and Hartman, 1969). Average precipitation at Kodiak is 62 inches (157 cm.). Maximum precipitation, falling around the high peaks above Kilvida Bay (Karlstrom and Ball, 1969), is about 115 inches (292 cm). This amount is five times as much as the 23 inches (58 cm) on the Shelikof Strait side at Karluk River and Larson Bay (Jones and others, 1978).

HYDRIC SOILS

Detailed soils information is lacking for most of the Kodiak Archipelago. The only detailed soil survey in the area covers the northeastern part of Kodiak Island. Generalized soils information for the study areas 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.

The following section identifies the soil series described for the northeastern portion of Kodiak Island which exhibit hydric characteristics. This information was obtained from the Soil Survey and Vegetation - Northeastern Kodiak Island Area, Alaska.

Kishyuak Series

The soils of this series are mostly in broad, low areas near the mouths of the main streams. In these areas the water table is high, commonly less than two feet from the surface. It is farther from the surface where these soils occur as low levees along some streams and at the foot of several hills.

The soils of this series have formed in thick accumulations of volcanic ash that washed from steep slopes shortly after the ash fall of 1912. The profile consisted of alternate layers, varying in thickness, of loose loamy fine sand and fine sand ash and massive coarse silt loam ash. As a rule, the uppermost layer is loamy fine sand. A mat of roots and straw covers the surface, and most plant roots do not penetrate below this layer into the ash. Normally, all the colors of ash in the area - light gray, grayish brown, and light yellowish brown - are represented in the soil profile, but the sequence of colors varies from place to place.

The Kishuyak soils are very infertile. The native vegetation draws most of its nutrients from the mat of decaying vegetation on the surface of the soil. The soils may be used for pasture, but the vegetation will deteriorate rapidly if overgrazed. If cut annually for hay or silage, native grasses will reestablish themselves only slowly.

Olds Series

Soils of the Olds series occur along the lower courses of main streams and in swales near the heads of bays. They are poorly drained. They make up about eight percent of the alluvial plains and areas near the heads of bays.

The Olds soils have a mantle of volcanic ash covered in many places by moss that is several inches thick. In some areas the ash has the sequence of layers that is normal in the area for most of the better drained soils. In most places, however, some of the ash has been washed away or additional ash deposited. The buried soil beneath the ash commonly has a surface layer of dark-brown, fibrous peat from four to five inches thick. The main body of the buried soil is a dark bluish-gray, heavy silt loam or silty clay loam. It

ranges from 15 to 30 inches or more in thickness. In some areas thin seams of peat or sand may occur in this layer. The lower part of the Olds profile is a deep deposit of coarse sand or gravel.

The vegetation on the Olds soils consists mostly of sedges and grasses that can survive wetness. Willow is also fairly common. Near the coast, beach ryegrass is fairly prominent.

Saltery Series

Soils of the Saltery series consist of poorly drained, thick accumulations of undecomposed or slightly decayed sedges and grasses. They occur in shallow depressions near the heads of bays and in poorly drained upland depressions in complex association with Ugak silt loam.

The Saltery soils were covered by a layer of volcanic ash that generally is about 12 inches thick. On top of the ash there is now three to four inches of fibrous peat. Under the ash is a dark grayish-brown, extremely acid, fibrous peat that extends to depths of 30 inches or more and grades to a black, mucky silt loam. In places near the coast, a thin layer of fine gravel occurs in the upper few inches of this buried peat.

The water table is always a foot or less from the surface, but in spring and after heavy rains water stands on the surface.

Ugak Series

Soils of the Ugak series occur in poorly drained areas of uplands mostly in strips at the heads of secondary drainageways. Some organic matter has accumulated at the surface of the volcanic ash. Below the volcanic ash is a dark-brown, peaty mat of roots and leaves about 1 inch thick. This is underlain abruptly by 3 to 5 inches of black silt loam. Below this is a moderately sticky, dark-brown silt loam that grades, within 6 inches, to an olive-colored silt loam substratum that is streaked with dark brown and black. The dark-brown and olive-colored layers commonly contain sharp-edged fragments of rock.

This section identifies soil classes for the entire Kodiak Archipelago which exhibit hydric characteristics. These classes are based on Soil Taxonomy of the National Cooperative Soil Survey.

Dystric Cryandepts, loamy, nearly level to rolling- Fluvaquentic Cryofibrists, nearly level association:

This association occupies nearly level coastal plains on southern Kodiak Island and other southwestern islands. Elevations range from sea level to about 100 feet (30 m). These are areas of gravelly alluvium, cinders, or weathered rock mantled by thick layers of loamy and sandy volcanic ash. Depressions are filled with sedge peat.

The vegetation in most areas is principally willow, crowberry, and other low shrubs and forbs. In some areas grass and alder are dominant. Sedges, mosses, and other water-tolerant species are the principal plants in the depressions.

Agriculture is limited to grasses and a few hardy vegetables. No forestry is feasible. The native vegetation is well suited to grazing by reindeer. There are few limitations to construction on the dominant well drained soils, but limitations are severe on the organic soils.

The following soil class within this association exhibits hydric characteristics:

Fluvaquentic Cryofibrists, nearly level, (30 percent of association) are very poorly drained fibrous peat soils that have the water table always at the surface. They occupy depressions in the coastal plains. The dominant vegetation is sedges, low willows, and mosses.

Typically, the soils consist of dark brown fibrous sedge peat more than 60 inches (150 cm) thick over a mineral substratum. Seams and patches of ash are common.

Dystic Cryandepts, loamy hilly to steep association:

This association mostly occupies steep hills and foot slopes on Kodiak Island and adjacent islands. Elevations range from sea level to 3,000 feet (900 m).

Most of the hills and foot slopes are covered by deep and moderately deep volcanic ash over glacial till or cinders. Depressions are filled with fibrous peat.

In most areas the vegetation is dominantly grasses and alder. Some areas in the north are forested and low tundra plants grow at high elevations. Sedges and other water-tolerant plants grow in depressions.

Most of the area is too steep for crops, but grasses and vegetables can be grown on included level to moderately sloping patches, especially in valley bottoms. Most of the area is suitable as rangeland, but there is a serious conflict with brown bears on Kodiak Island. The forested areas contain much harvestable timber. Steep hillsides and flooding in valley bottoms create severe limitations for most kinds of construction.

The following soil classes within this association exhibit hydric characteristics:

Fluvaquentic Cryofibrists, nearly level, (10 percent of association) are very poorly drained fibrous sedge peat soils in depressions on foot slopes and hills. The vegetation is dominantly sedges and mosses.

Typically, the soils consist of dark brown sedge peat more than 5 feet (150 cm) deep. Seams and patches of ash are common.

Andic Cryaquepts, loamy, nearly level to rolling, are somewhat poorly drained to poorly drained soils on valley bottoms and in depressions in uplands. They consist of dark brown to black thixotropic material over a very gravelly substratum. The vegetation is grasses, alder, cottonwood, and willows in valley bottoms and sedges and mosses in upland depressions.

Andaqueptic Cryaquents, loamy, nearly level, are poorly drained mottled soils formed entirely in accumulations of recent volcanic ash in valley bottoms. The vegetation is mostly grasses and sedges.

WETLANDS AND AQUATIC HABITATS

The following section describes the map codes used on the Afognak, Kodiak, Karluk, Kaguyak, and Trinity Islands 1:63,360 scale wetland maps. A general description and/or community type, including dominant vegetation, is provided for each code.

MARINE SYSTEM

The only marine habitat with the Karluk 1:250,000 scale quad area is Shelikof Strait. Tugidak Passage, Sitkinak Strait, and the Pacific Ocean make up the marine habitats in the Trinity Islands and Kaguyak 1:250,000 quad areas. Shelikof Strait and the Gulf of Alaska are the primary marine environments in the Afognak 1:250,000 quad area. In the Kodiak 1:250,000 quad the marine habitats are restricted to the Gulf of Alaska and the Pacific Ocean. The water within these marine areas is characterized by full sea strength salinity. Shorelines are generally exposed to the full force or impact of waves originating in open ocean.

M1UBL — Subtidal, high energy, and high salinity (full sea strength) open water areas.

M2USN — Intertidal, regularly flooded, unvegetated beaches exposed to high-energy wave action. The substrate is typically composed of cobble, gravel or sand-sized particles.

M2USP — Intertidal irregularly flooded, unvegetated beaches exposed to high-energy wave action. Substrate is typically composed of sand and gravel-sized particles.

M2US/AB1N — Intertidal regularly flooded, partially vegetated sand or cobble flats exposed to high-energy wave action along marine shorelines. Vegetative cover (algae) is between 30-50% of the area (see M2AB1N for dominant algal species).

M2RSN — Intertidal, high energy, rocky coastlines where tidal water floods and exposes the substrate at least once daily. The area consists of 75% or more coverage of bedrock, stones or boulders. Vegetative cover is less than 30%.

M2RSP — Marine intertidal, high energy, rocky coastlines where tidal water floods the substrate less often than daily. The area consists of 75% or more coverage of bedrock, stones or boulders. Vegetative cover is less than 30%.

M1AB1L — Subtidal vegetated areas (algal aquatic bed) within the shallow subtidal zone. Dominant species include Alaria spp., Nereocystis luetkeana, Laminaria spp., and Agarum cribrosum.

M2AB1N — Intertidal regularly flooded, vegetated areas (algal aquatic bed) exposed to high energy wave action along marine shorelines. Algae may be attached to rocks (e.g., rockweed) or other substrates. Dominant algal species include Fucus distichus, Endocladia muricata, and Halosaccion glandiforme.

ESTUARINE SYSTEM

The estuarine system is confined to bays, inlets, tidal marshes, 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.

E1UBL — Subtital, low-energy, brackish open water. Includes the permanently flooded portion of bays, inlets and adjacent brackish river channels. Also includes small tidal ponds located in high marsh zones which are inundated by high tides.

E2USN — Intertidal, regularly flooded, unvegetated beaches and flats along low energy snorelines. This type is also associated with river deltas at the heads of bays and inlets. The substrate consists of mud and sand-sized particles.

E2US/EM1N — Intertidal, regularly flooded, partially vegetated mud and sand flats in brackish environments. Persistent herbaceous emergent vegetation occupies 30-50% of the substrate. Dominant emergent species include Carex lyngbyaei, Puccinellia spp., and Potentilla egedii.

E2USP — Intertidal, irregularly flooded, unvegetated beaches and flats in low energy brackish environments. The substrate consists primarily of mud and sand-sized particles.

E2RSN — Intertidal, low-energy rocky coastlines where tidal water floods and exposes the substrate at least once daily. The area consists of 75% or more coverage of bedrock, stones, or boulders. Vegetative cover is less than 30%.

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

E1AB1L — Subtidal low-energy, brackish open water with aquatic bed (algae). Algal species include Laminaria spp., Nereocystis luetkeana, and Alaria spp.

E2AB1N — Intertidal, low-energy, regularly flooded areas containing algal aquatic beds. These areas are flooded and exposed daily by brackish tidal water. Fucus distichus is the dominant algal species.

E1AB3L — Subtidal, low-energy, brackish open water with aquatic bed (rooted vascular). Zostera marina is the common species in these areas.

E2AB3N — Intertidal, low-energy, irregularly flooded vegetated areas (rooted vascular aquatic bed). Zostera marina is the dominant species.

E2EM1N — Lower elevation areas of brackish marshes that are flooded regularly by tidal water. This type exists in areas exhibiting estuarine features, particularly at the heads of fjords and sheltered embayments. The persistent emergent species dominating the regularly flooded tidal marshes include Carex lynbyaei, Triglochin maritima, Puccinellia spp. and Potentilla egedii.

E2EM1P Higher elevation areas of brackish marsh that are flooded irregularly by tidal water. Surface drainage following tidal inundation is generally good in these areas. Dominant persistent emergent species include Carex lyngbyaei, Elymus arenarius, Triglochin palustris, Deschampsia sp., and Lathyrus maritimus, and Senecio sp.

E2EM1/UB Higher elevation areas of brackish marsh that are flooded irregularly and contain tidal ponds covering 30-50% of the area. Dominant species include those described for the E2EM1P wetland type.

LACUSTRINE SYSTEM

This system includes all bodies of water greater than 20 acres in size.

L1UBH Permanently flooded, open water areas of lakes. Generally, water depth exceeds 2 meters. Vegetation has less than 30% coverage.

L2AB3H Permanently flooded lakes supporting aquatic (floating leaved) vegetation. Vegetative coverage is at least 70%. The dominant species are Nuphar polysepalum, Nymphaea tetragona, and Potamogeton spp.

RIVERINE SYSTEM

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

R1UBV Permanently flooded, tidal, open water channels of rivers and streams. These channels are subject to tidal flux, but are upstream from the influence of ocean-derived salinity.

R2UBH Permanently flooded, open water channels of lower perennial rivers and streams. The gradient in these rivers is lower than that of upper perennial rivers, and the floodplain is well developed.

R2US/UB Mixture of river flats and bars and open water channels in lower perennial river systems. This code is used when it is difficult to separately delineate the numerous channels and riverine bars.

R3UBH Permanently flooded, open water channels of upper perennial rivers and streams. These channels are characterized by a high gradient and fast water velocity. There is very little floodplain development and the substrate consists of rock, cobbles, or gravel with occasional patches of sand.

R4SBF Semipermanently flooded intermittent streams. These streams do not carry water throughout the year, but do have moving water flow for extended periods each year.

R4SBC Seasonally flooded intermittent streams. These channels are similar to R4SBF channels, although water flow occurs for briefer periods.

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.

PUBH Permanently flooded, small open water bodies (ponds). Vegetation is generally lacking within the open water area, but aquatic beds or persistent emergents may provide sparse cover less than 30 percent along the pond edge.

PUBF Semipermanently flooded, small open water bodies where sparse vegetation may occur, but is less than 30%.

PUBV Permanently flooded, small open water bodies that are influenced by tidal fluctuations.

PUB/EM1H A complex of open water ponds mixed with stands of permanently flooded emergents or semipermanently flooded emergents. Vegetation may be dense in areas and consists primarily of Carex spp., Equisetum fluviatile, Menyanthes trifoliata, Caltha sp. and Eleocharis palustris.

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.

PUS/EM1C Seasonally flooded areas consisting of a mix of persistent emergents and flats (unconsolidated shore) composed of sand and gravel-sized particles. The emergents cover 30-50% of the area (see description for PEM1C).

PUS/SS1C Seasonally flooded areas usually found 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.

PAB3H Rooted vascular aquatic vegetation occurring in permanently flooded ponds. This vegetation generally occurs in sheltered areas where there is little water movement. Typical species include Myriophyllum spp., Utricularia spp., Nuphar polysepalum, Nymphaea tetragona, and Potamogeton spp.

PEM1H Permanently flooded, emergent freshwater marsh. These are marshes that exhibit standing water throughout the year in all years. The dominant vegetation includes Menyanthes trifoliata, Hippuris vulgaris, Eleocharis palustris, Equisetum fluviatile, and numerous sedges (Carex spp.).

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).

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 peripnery of ponds and lakes.

The dominant herbaceous emergent vegetation includes Eriophorum spp., Carex spp., Juncus spp., Triglochin spp., Ranunculus spp., Potentilla palustris, Caltha sp., Eleocharis, and Menyanthes trifoliata. Species included in the PEM1H wetland type may also be found in these semipermanently flooded areas.

Tne 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).

PEM1C Seasonally flooded, persistent emergent marshes. This emergent wetland type frequently 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 at the margins of ponds and lakes and on the floors of large valleys. Species of primary importance include Carex spp., Equisetum sp., Eriophorum spp., Eleocnaris palustris, Rumex crispus, Polemonium acutiflorum, Potentilla palustris, Platanthera spp., and Pedicularis verticillata.

Various shrub species such as Betula nana, Rubus sp., and Ledum decumbens may also occur witnin the PEM1C wetland type. Shrub cover is less than 30%.

PEM1B Saturated, emergent meadows. Soils are usually mineral but may be overlain by a shallow organic layer. PEM1B wetlands occur in high elevations on gentle slopes, and on hillside seep areas. Dominant species include Calamagrostis spp., Descnampsia spp., Carex spp., Equisetum spp., and Eriophorum spp. Other emergent species of importance are Potentilla sp., Epilobium spp., Solidago sp., Parnassia spp., Ranunculus sp., Fauria-crista galli, and Achillea millefolium. Shrub cover is less than 30% and includes species such as Salix spp., Empetrum nigrum, Oxycoccus microcarpus and Betula nana.

PEM1A Temporarily flooded, persistent emergent wetlands. This type generally occurs in depressions and on benches adjacent to streams and small rivers. Calamagrostis canadensis, Epilobium angustifolium, Achillea borealis, and Polemonium spp. are among the common species. Other species include Solidago lepida, Heracleum lanatum, Carex spp., Parnassia spp., Rumex sp., Rubus sp., Sanguisorba stipulata, Thalictrum sparsiflorum, Senecio triangularis, Galium sp. and various ferns.

PEM1R Seasonally flooded, tidal, persistent emergent marshes. These marshes occur on terraces along the banks of freshwater tidal channels (R1UBV). This wetland type is similar to PEM1C wetlands but occurs closer to the mouth of streams entering estuarine waters (see descriptions of PEM1C). Typical plant communities include Carex lyngbyaei, Potentilla egedii and Calamagrostis spp.

PEM1T Semipermanently flooded, tidal, persistent emergent marshes. This wetland type is similar to PEM1F wetlands but occurs closer to the mouth of streams entering estuarine waters (see description for PEM1F wetland).

PEM1/UBH Permanently flooded, emergent freshwater marsh mixed with permanently flooded open water covering 30-50% of the area. The dominant vegetation is composed of those species described for the PUB/EM1H wetland type.

PEM1/UBF Typically a PEM1F wetland type with a 30-50% mix of semipermanently flooded open water (see species description for the PEM1F wetland type).

PEM1/USC A mix of seasonally flooded persistent emergents and flats (unconsolidated shore) composed of sand and gravel-sized particles. The emergents cover 30-50% of the area (see description for PEM1C).

PEM1/SS1C Seasonally flooded wetlands characterized by a mix of persistent emergents and broad-leaved deciduous shrubs. The substrate generally consists of an interspersion of hummocks and basins. This wetland type frequently occurs on river and stream floodplains. Emergent species cover 50-70% of the area and include Juncus spp., Carex spp., Equisetum spp., Potentilla palustris, Eleocharis palustris, Platanthera spp., Polemonium sp., Stellaria sp., and Pedicularis spp. The associated shrubs (30-50% coverage) are Salix spp., Myrica gale and Rubus sp.

PEM1/SS1B Saturated meadows and bog type wetlands consisting of a mix of emergent vegetation and broad-leaved deciduous shrubs. The persistent emergent vegetation covers 50-70% of the area. Common shrub species include Betula nana, Salix spp., Empetrum nigrum, Myrica gale, and Rubus spp. Dominant emergent species are Carex spp., Rumex sp., Castilleja spp., Eleocharis palustris, Festuca sp., Eriophorum spp., Equisetum spp. and Aconitum delphinifolium.

PEM1/SS1A Temporarily flooded, persistent emergents mixed with broad-leaved deciduous shrubs. The emergents cover 50-70% of the area and consist of species described for the PEM1A type. Common shrub species include Salix spp. and Alnus sinuata. These wetland types frequently usually occur on inactive river bars and along stream channels.

PEM1/SS1R Seasonally flooded, tidal areas of persistent emergent vegetation mixed with broad-leaved deciduous shrubs. Emergent species cover 50-70% of the area (see description for PEM1/SS1C wetland type).

PEM1/SS4B Saturated, open canopy, needle-leaved evergreen shrub bog with a persistent emergent ground layer. The shrub canopy consists of stunted Picea sitchensis (see PEM1/SS1B for a description of the emergent species composition. The Sitka spruce covers 30-50% of the area.

PEM1/F04B Saturated, open canopy forest bog with an emergent ground layer. Picea sitchensis covers 30-50% of the area. The persistent emergent ground layer is dominated by species such as Carex spp., Eriophorum spp., Equisetum spp., and Eleocharis spp.

PSS1C Seasonally flooded dense broad-leaved deciduous shrubs often occurring on river bars that have become stable enough to support persistent woody vegetation. This type also occurs in flooded depressions on hummocky terrain. Salix spp., Myrica gale and Betula nana are the most common dominant species. Understory herbaceous species include Carex spp., Juncus spp., and Equisetum spp.

PSS1B Saturated shrub areas with 70% or greater coverage of broad-leaved deciduous shrubs. Typical vegetation includes Salix spp., Betula nana, Vaccinium uliginosum, Vaccinium vitis-idaea, Myrica gale, and Alnus sinuata. Associated emergent vegetation (less than 30% coverage) includes Sanguisorba stipulata, Polemonium sp., Epiolbium sp., and Acnillea sp. This wetland type may occur in level areas and on hillside seeps.

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.

PSS1/4B Saturated deciduous shrub areas mixed with stunted Picea sitchensis covering 30-50% of the area (see PSS1B for a description of typical deciduous shrub species composition).

PSS1/EM1C Seasonally flooded areas on stream floodplains and in wide valleys. These wetlands are characterized by a mixture of broad-leaved deciduous shrubs and persistent emergents. Shrubs cover 50-70% of the area (see PEM1/SS1C for a description of the dominant species).

PSS1/EM1B Saturated shrub meadow and bog-type wetlands dominated by low broad-leaved deciduous shrubs. The remaining portion of the vegetative cover consists of persistent emergents. This is a common wetland type occurring in basin areas, on hillside seeps, and on gently sloping areas in valleys. Common shrub species include Salix spp., Empetrum nigrum, Betula nana, Vaccinium vitis-idaea, Vaccinium uliginosum and Myrica gale. The persistent emergent species include Carex spp., Calamagrostis sp., Equisetum sp., Eriophorum spp., Fauria crista-galli, and Lathyrus palustris.

PSS1/EM1A Temporarily flooded, broad-leaved deciduous shrubs mixed with persistent emergents. The shrubs cover 50-70% of the area and consist primarily of Salix spp. and Alnus spp. See PEM1A for a description of the emergent species composition.

PSS1/EM1R Seasonally flooded, tidal areas of broad-leaved deciduous shrubs mixed with persistent emergent vegetation. Vegetation is periodically inundated by tidally influenced fresh water. See description for the PEM1/SS1C wetland type.

PSS1/EM1S Temporarily flooded, tidally influenced fresh water wetland consisting of broad-leaved deciduous shrubs and persistent emergents. The shrubs cover 50-70% of the area. The shrubs are primarily Salix spp., and the emergent species composition is similar to that described for PEM1A wetlands.

PSS1/FO1S Temporarily flooded, tidally influenced broad-leaved deciduous shrubs mixed with broad-leaved deciduous trees. The forest overstory (30-50% areal coverage) consists of Populus trichocarpa and Populus balsamifera. The shrubs are primarily Salix spp. and Alnus spp. This wetland type occurs on the floodplain of tidally influenced rivers.

PSS4B Saturated, needle-leaved evergreen shrub bog. The dense Picea sitchensis in these wetlands is shrub height (less than 6 meters) and generally exceeds 70% areal coverage.

PSS4/1B Saturated, open canopy needle-leaved evergreen shrub bog. The Picea sitchensis 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 wetland type.

PSS4/EM1B Saturated shrub bog dominated by stunted Picea sitchensis with an emergent ground layer. Most common emergents are Carex spp., Platanthera sp., Swertia perennis, Aster sp., Calamagrostis canadensis and Triglochin sp. Low shrubs including Salix spp., Vaccinium spp., and Rubus spp. also occur beneath the Sitka spruce overstory.

PSS4/EM1A Temporarily flooded areas on floodplains and in drainageways that are a mixture of scrub Picea sitchensis and emergents. Common emergent species are Calamagrostis spp., Epilobium angustifolium, Achillea sp., Carex spp., Sanguisorba sp., Solidago sp., and Galium sp.

PF01A Temporarily flooded, closed broad-leaved deciduous forests occurring on river and stream floodplains. Dominant tree species are Populus trichocarpa and Populus balsamifera.

PF01/EM1A Temporarily flooded, open deciduous forested wetland occurring on river floodplains. Populus trichocarpa and Populus balsamifera are the dominant tree species. Calamagrostis sp., Epilobium angustifolium, Equisetum sp., and Achillea borealis are some of the common emergents.

PF01/SS1A Temporarily flooded areas on river and stream floodplains consisting of a mix of broad-leaved deciduous trees and broad-leaved deciduous shrubs. The tree species are Populus trichocarpa and Populus balsamifera. Salix spp. and Alnus sinuata are the common shrub species.

PF04B Saturated, needle-leaved evergreen forested wetland. This type occurs primarily in the northern portions of the Kodiak Archipelago. Dense Picea sitchensis (greater than 70% coverage) dominates these wetlands. The understory consists of a moss mat, Vaccinium ovalifolium, Salix spp., Alnus spp., Empetrum nigrum, Oplopanax horridus, Parnassia sp., and Epilobium sp.

PF04/EM1B Saturated, open canopy needle-leaved evergreen forested wetland with an emergent ground layer. The forest canopy consists of Picea sitchensis. The common emergent species include Calamagrostis spp., Descnampsia spp., Sanquisorba stipulata, Eriophorum spp., Swertia perennis, Gentian sp., and Equisetum spp. Other species include Empetrum nigrum, Iris setosa, Parnassia spp., and Stellaria spp.

PF04/SS1B Saturated, open canopy, needle-leaved evergreen forest mixed with broad-leaved deciduous shrubs. The sole conifer is Picea sitchensis. Other vegetation includes Salix spp., Vaccinium uliginosum, Veratrum viride, Fauria crista-galli, Sanguisorba stipulata, Empetrum nigrum, Rubus sp., Calamagrostis sp., Carex spp. and a thick mat of moss.

PF04/SS4B Saturated, Picea sitchensis forested wetland. An understory composed of stunted (less than 6 meters) Picea sitchensis also occurs. The ground layer consists of a Sphagnum spp. moss mat and species listed for the PF04/SS1B type. These wetland types occur mainly on Afognak Island, Marmot Island, Spruce Island and the Northeastern portions of Kodiak Island.

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