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NATIONAL WETLAND INVENTORY

NOTES TO USERS

CASCADE MOUNTAIN RANGE

CENTRAL WASHINGTON

1:100,000 Scale Map Covered

CONCRETE NE

MAP PREPARATION

The U. S. Fish and Wildlife Service, Office of Habitat Resources, is conducting an inventory of the wetlands of the United States. The National Wetlands Inventory (NWI) is establishing a wetland data base in both map and computer forms for the entire country. The NWI information will serve to identify the current status of U.S. wetlands and can be used as a reference point from which future changes in wetlands can be evaluated.

The purpose of Notes to Users is to provide general information regarding the production of NWI maps and wetlands found within a relatively uniform geographic area. Notes to Users are not intended to include complete descriptions of all wetlands found in the area or provide complete plant species information.

Specific wetland map delineations and classification are the product of photo-interpretation of high altitude aerial photography, supported by preliminary field reconnaissance and aided by the use of collateral information (County Soil Surveys, USGS quadrangles, etc.). The system for wetlands classification is in accordance with "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin, et. al., 1979).

Most photography used for interpretation was National High Altitude Color infrared at a scale of 1:58,000. Photography was taken on six days during August, 1983. Some of the higher mountain regions were covered by black and white photography at a scale of 1:80,000. This was in a small area of the Wenatchee SE, NE and Concrete SE, NE maps. All black and white photographs were taken on 20 August, 1984

GEOGRAPHY

The mapping area is located in and around the North Cascade Mountain Range in north central Washington State (See attached maps). Falling within this area are portions of the Snoqualmie, Wenatchee, Okanogan, Mt. Baker and Gifford Pinchot National Forests.

Bailey's Ecoregion Classification (1978) identifies two major domains within the study area, the largest portion falling in the Humid Temperate Domain, Marine Division.This ecoregion covers the largest aerial extent of the study area and includes the Cascades Range. The second is the Dry Domain, Steppe Division. This area is to the southeast of the Cascades. It is dryer here because the orographic rain which occurs in the Cascades depletes the precipitation by the time it reaches east.

The Marine Division is further divided into the Pacific Forest Province, Silver-fir-Douglas-fir Forest Section (M2415). The characteristic vegetation of this section is Douglas-fir, western redcedar, western hemlock, grand fir, silver fir and alder. The subalpine forest in the Cascades contains mountain hemlock and subalpine fir. Douglas-fir is most abundant but is not part of the climax vegetation.

The Steppe Division is further divided into the Intermountain Sagebrush Province with two sections in the study area. The Ponderosa Shrub Forest Section; characterized by ponderosa pine, low deciduous shrubs (snowberry and rose) and perennial grasses (wheatgrass and pinegrass), is found in the southern extreme of the study area in and around Conboy Lake. The Sagebrush-Wheatgrass Section occurs in the Kittitas Valley area. This area is characterized by low mountains and sparsely vegetated tablelands and is the edge of the area known as the Columbia Plateau.

The majority of the study area is in the Cascade Mountain Range characterized by steep, high and rugged mountains. Elevations in the range of 8,000 - 9,000 ft. above sea level and rise occasionally to volcanoes of much higher elevation. Mt. Ranier (14,410 ft.) and Mt. Adams (12,276 ft.) are just two such examples

Another area of differing topography is the Willamette-Puget Forest Province (2410). This occurs in the southwestern most part of the study area near and in the Cowlitz River valley and around Enumclaw. Elevations here range from nearly sea level to 1500 feet. The portion of this Province in our study area is a moderately dissected tableland with isolated hills and low mountains.

CLIMATE

The Cascade and Pacific Highlands are among the wettest areas of North America with precipitation up to 150 inches or more with the most occuring in the winter months. The warm moist Pacific air also keeps temperatures fairly moderate (35 - 50° F average excluding the alpine areas). In summer there may be a slight precipitation deficit, but fog and clouds at higher elevations ("drip zone") compensates. Snow and glaciers are found year round at the higher elevations. Lower elevations, especially in the lee of the mountains have somewhat less annual precipitation.

The Steppe Division is a transitional belt between the desert areas and the more humid mountain areas. A very low precipitation/evaporation ratio exists with precipitation annually averaging 5-20 inches. The average annual temperatures are 40-55°F with hot dry summers with cool nights and cold dry winters.

SOILS

Soil is a major factor in any plant community. Its properties become a major determining factor in hydric conditions and soils are therefore one of the criteria used to determine and define wetlands. Wetland hydric soils in the study are mostly Mollisols, Entisols, Inceptisols or Histosols.

Representative soil associations include the Oridia-Seattle-Woodinville, the Colville-Okanogan, the Buckley and the Brief-Leavenworth, which while itself is not particularly wet does not have wet inclusions of the Peoh hydric soil.

The Oridia-Seattle-Woodinville association is somewhat poorly drained, nearly level and is found in major stream valleys. Oridia soils are somewhat poorly drained, stratified silt loams, the Seattle soils are very poorly drained deposits of peat and muck, and the Woodinville soils are poorly drained silt loams with layers of peat. The soils of this association are generally the most desirable farming soils in the King County area.

The Colville-Okanogan association is deep, somewhat poorly drained and well drained. This association is subject to spring flooding along flood plains. The Colville soils are somewhat poorly drained while Okanogan soils are well drained. Areas not protected from flooding are used for native hay and pasture or short season crops, such as silage.

The Buckley association is nearly level, poorly drained soils which formed in the Osceola mudflow. The association consists of dominantly nearly level upland[1] plains. This association is used for farming or residential development. Dairy farms are predominant with hay, pasture and small grain the dominant crops. Water ponds for very long periods and drainage is by tile or open ditch.

The Brief-Leavenworth association is dominantly moderately coarse textured, nearly level to strongly sloping soils on bottom lands, low terraces and alluvial fans. The poorly drained Peoh soils only account for ten percent of this association and are found in low-lying areas, mostly in the valley from Wenatchee to Leavenworth and in valleys near Plain and Winton.

Another association which is defined in the Chelan Area soil survey is that of Rock outcrop-Rock land-Terrace escarpment. This association contains alluvial land and riverwash. These two categories account for only ten percent of the association. Alluvial land is on low terraces adjacent to the Wenatchee River and riverwash is found along streams and rivers that flood.

Wetlands can and do occur on other soil associations within the study area, as these are broad associations and not a list of all hydric soils of the area. Other associations not listed here have hydric soils as small inclusions within otherwise well-drained groups of soils.

[1] as defined by U. S. Department of Agriculture, Soil Conservation Service and taken from Pierce County Area, Washington Soil Survey.

USER CAUTION

The map document was prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with "Classification of Wetlands and Deep Water Habitats of the United States" Cowardin, et al, 1977. The aerial photographs typically reflected conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of aerial photographs. Thus a detailed on-the-ground and historical analysis of a single site may result in revision of the wetland boundaries established through photographic interpretation. In addition, some small wetlands and those obscured by dense forest cover may not be included on the map document.

Federal, State, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either design or products of this inventory, to define limits of proprietary jurisdiction of any Federal, State, or local government or to establish the geographical scope of regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State, or local agencies concerning specific agency regulatory programs and proprietary jurisdictions that may affect such activities.

Additional information regarding this map or other National Wetland Inventory activities may be obtained by contacting:

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Aerial photo interpretation was completed by Martel Laboratories, Inc., St. Petersburg, Florida. Maps were prepared by NWI National Team in St. Petersburg, Florida.

Wetland Communities and Deep Water Habitats

Of the five wetland systems, only three, the Riverine, Palustrine and Lacustrine were found in the study area. Rivers and streams with their associated vegetated wetlands are the most frequently encountered wetlands. Virtually all perennial rivers were classified as Riverine, upper perennial (R3OWH). Examples of the medium to large named rivers include the Nisqually, Cowlitz, Mowich, Puyallup, White, Yakima, Wenatchee, Entiat, Methow, Twisp, Pasayten, American and Carbon Rivers. These rivers are fast flowing with a dissolved oxygen content which is very high and for the most part have a steep gradient (with minor aeas of lower gradient). The substrate is generally rubble, cobble-gravel, sand or in some places bedrock.

The portions of river substrate exposed during low flows are generally sand or cobble-gravel and occur within the channel or along the edges of the river or stream. These are classified as Riverine, upper perennial unconsolidated shore, temporarily flooded (R3USA) or Riverine, upper perennial, unconsolidated shore, seasonally flooded (R3USC).

The lower perennial subsystem (R2OWH) was restricted to natural creeks in the broader agricultural valleys such as the Kittatas. Here gradients are low enough to be considered lower perennial.

When riverine systems and their adjacent vegetated wetlands were too narrow to be mapped separately at this scale, the vegetation took precedence. Water regime for these communities was determined based on the class of stream on the U.S.G.S. topographic maps. Wetland vegetation occurring along perennial streams was given the seasonally flooded water regime (C) while wetland vegetation along intermittent streams was given the temporarily flooded water regime (A).

Riverine aquatic bed communities were rarely encountered in the field but may occur with somewhat more frequency than is determinable from aerial photography. These communities (R3ABH, R2ABF) are composed of algae, aquatic mosses and or members of the group of plants known as cresses.

Intermittent riverine subsystems were based on the U.S.G.S. quadrangle information. Seasonal intermittents were well defined channels or streambeds (R4SBC) usually bright white and easily followed on the photography or else in well vegetated valleys. Temporary streambeds (R4SBA) were more a gray color and less distinct.

Lacustrine communities occurred as both natural and impounded water bodies. These ranged in size from very large to those which were only just large enough to meet the 20 acre size criteria. Some examples of the larger named natural lakes include Wenatchee, Fish, Chester Morse, Twin Lakes, Waptus, Packwood and Walput Lake. These were classified as L1OWH. Examples of impounded reservoirs are Rimrock Lake, Bumping Lake, Keechelus Lake, Kachess Lake, Cle Elum Lake and Lake Chelan. These were classified as L1OWHh. Substrates will undoubtedley range from silts and muds through bedrock.

Both the natural and impounded lakes had unconsolidated shore (beach bars or draw down) areas. These consisted of sands, muds, silts and cobble-gravel areas which are exposed during annual low water periods. On natural lakes these areas are classified as lacustrine, unconsolidated shore, seasonally flooded, (L2USC) and along dammed rivers or reservoirs the impounded modifier is added (L2USCh).

Lacustrine aquatic bed communities (L1ABH or L2ABH) are rarely encountered. When they do occur they consist of water lily (Nymphaea sp.), spatterdock (Nuphar polysephalum), duckweed (Lemna sp .), pondweed(Potamogeton spp.) and water milfoil (Myriophyllum spp.) in monotypic stands or in mixtures. The Palustrine aquatic bed communities (PABH) are the same.

In the Palustrine system, ponds or palustrine open water areas, were very similar to lakes with the exception of size. Ponds, both permanent and semipermanent (POWH and POWF respectively) range in size from very small (less than one acre) to just smaller than a lake (just less than 20 acres). In lava bed areas, many such small ponds occur with great density. Substrate is probably limited to sand, silt or mud with some undoubtedly existing on bedrock.

The most common Palustrine vegetated wetlands were seasonally flooded types. These were found adjacent to open water areas, as isolated depressions, along river flood plains or in lowland areas. Temporarily flooded wetlands were next in frequency occurring in the same kinds of areas as the seasonally flooded. Semipermantly flooded wetlands occurred with the least frequency and were most often associated with lakes, ponds, or impounded stream channels.

The vegetated river bars range from scrub-shrub to forested and occur either within the river channel or along the banks. Seasonally flooded scrub-shrub bars were comprised of sparse to dense willow (Salix spp.) on sand or mixtures of cobble-gravel and sand. Some bars had varying amounts of red alder (Alnus rubra) also. These wetlands were classified as PSSC. The temporarily flooded areas of these communities are the more built up bars in the channel or areas leading up the banks of the channel. These temporarily flooded scrub-shrub wetlands with a dense cover of willow, alder or a mixture are classified as PSSA. In general the more vegetation on the bar the less often and the shorter the duration of the flooding.

Forested river bars were encountered infrequently. They were generally covered with red alder or black cottonwood (Populus trichocarpa) and were generally temporarily flooded (PFOA). The seasonally flooded examples were mainly forested with red alder and classified as PFOC.

River flood plain scrub-shrub wetland communities were mixtures of shrub species. These communities had varying densities of shrubs with sedges and other grass-like plants and forbs interspersed in the less dense stands. Seasonally flooded wetlands (PSSC) were comprised of various mixtures of willow, red alder, redosier dogwood (Cornus stolonifera), vine maple (Acer circinatum), rose (Rosa spp.) and spirea (Spirea douglasii). The grass-like plants in these communities included Nebraska sedge (Carex nebraskensis), horse-tail or scouring rush (Equisteum spp.), slough sedge (Carex obnupta), and rushes (Juncus spp.). Temporarily flooded shrub communities (PSSA) were very similar as to species present but composition changes are noticeable. As these areas get drier the willow tends to drop out and there is a noticeable increase of vine maple, rose and spirea. Snowberry (Symphoricarpos sp.) also becomes a component together with viburnum (Viburnum sp.). Semipermanent scrub-shrub wetlands (PSSF) within river flood plains were associated with beaver dams.

Scrub-shrub wetlands also occur along and around lakes. These communities range from very dense growth of shrubs to more open areas of shrubs with an herbaceous layer. The wettest of these areas are the semipermanently flooded communities (PSSF). They are usually monotypic or are predominantly willow or red alder. In these semipermanent shrub wetlands herbaceous vegetation is sparse and is comprised of water sedge (Carex aquatilis), slough sedge, small amounts of horse-tail or scouring rush and small amounts of cattail (Typha latifolia). Seasonally flooded scrub-shrub wetlands (PSSC), the most frequent shrub wetlands, include willows, red alder, redosier dogwood, spirea and cascara (Rhamnus purshiana). Herbaceous species are more prevalent in this community than in the semipermanent areas and include rushes (Juncus spp.), sphagnum moss (Sphagnum sp.), hardstem bulrush (Scirpus acutus), reed canary grass (Phalaris arundinacea) and unidentified ferns, sedges (Carex spp.) and forbs. The highest divesity of species occurs in the temporarily flooded zone (PSSA). Species here include red alder, redosier dogwood, vine maple, rose, spirea, snowberry, viburnum and salmon berry (Rubus spectabilis), with a diverse herbaceous layer of grasses, sedges, forbs and ferns.

Scrub-shrub depressional communities were composed primarily of willow and red alder. As fringe communities of high mountain meadows these seasonally flooded shrub communities were composed of red alder, wild blueberry (Vaccinuim spp.), Labrador tea (Ledum groenlandicum) and bog laurel (Kalmia occidentalis). These shrubs had various mixtures, with alder being near the outside better drained edge and the short blueberry and bog laurel increasing in frequency toward the edge of the emergent meadow. These shrub rings along with the meadows may exhibit saturated conditions.

The forested component of flood plain wetland communities was mainly temporarily flooded (PFOA). These areas were on small benches or terraces slightly raised above the channel but before the banks rose to upland (non-wetlands). Species present here include red alder (both tree and shrub size), black cottonwood, quaking aspen (Populus tremula subsp. tremuloides), Western redcedar (Thuja plicata), lodgepole pine (Pinus contorta), western hemlock (Tsuga heterophylla), bigleaf maple (Acer macrophyllum) and Engelmann spruce (Picea engelmannii). Shrubs included red alder, vine maple, rose, spirea, redosier dogwood, western crabapple, snowberry, blackberry (Rubus spp.) and viburnum. Various grasses, sedges, rushes and ferns occur scattered on the forest floor. As the forested flood plain gets wetter (PFOC) the herbaceous layer changes to a more sedge/rush composition and becomes more scattered. In the shrub layer red alder and spirea increase while most other species decrease in abundance. The tree composition also changes to less of a mixture and more toward monotypic stands of red alder, black cottonwood or western redcedar. Monotypic stands of red alder, black cottonwood or western redcedar may also be temporarily flooded or upland however, so location in respect to the river channel, slope, or elevation must be considered for these communities.

Forested depressions were mostly seasonally flooded (PFOC). When dominated by evergreen species these areas had a more open understory. The species here were lodgepole pine (Pinus contorta) Western redcedar or Engelmann spruce. Under a forest cover of this type there was a more lush growth of ferns and mosses together with sedges.

Deciduous forested wetlands were highly variable communities. Temporarily flooded stands of quaking aspen with very thick understory growth of snowberry were found. Aspen could also be found on upland, however. Red alder stands could be seasonally flooded, temporarily flooded or upland communities. The other forested wetlands occurring in depressions throughout the study area resembled those already discussed.

Emergent wetlands within flood plains were seasonally flooded to temporarily flooded (PEMC, PEMA). Seasonally flooded emergent communities were composed of soft rush (Juncus effusus), spike-rushes (Eleocharis spp.), Nebraska sedge, slough sedge, horse-tails or scouring rushes, and reed canary grass. These wetlands are generally within broad valleys and are often used as pasture; if dry enough at the end of the season they are mowed for hay. Temporarily flooded wetlands are composed of more grasses such as hairgrass (Deschampsia sp.) and bentgrass (Agrostis sp.) together with false hellebore (Veratrum sp.) and other herbs such as aster (Aster spp.). Many of these areas are also grazed or mowed if accessible.

Lake marshes consisted of emergent grasses, sedges, rushes, other grass-like plants and forbs. They occurred around the edges of lakes in the shallow areas which are flooded for varying lengths of time during the growing season. Very few semipermanently flooded areas (PEMF) were encountered. When they do occur they are dominated by cattail and/or hardstem bulrush. The next drier zone is the seasonally flooded shallow marsh (PEMC). The species here include cattails, bulrushes, rushes, sedges and reed canary grass. The temporarily flooded zone (PEMA) between the shallow marsh and the upland is comprised of rushes, sedges, and water tolerant grasses.

Wet meadow emergent communities occurred as high mountain meadows, pasture or grazed areas and mowed meadows. The high mountain meadows were very similar in appearance and species composition. They had a rather distinct edge where shrubs or trees started the transition to drier conditions and uplands. The water table fluctuates from above the soil surface to usually just below it. Species here include slough sedge, water sedge, Nebraska sedge, ladies tresses (Spiranthes romanzoffiana), grasses and grass-like plants and sphagnum moss. These communities were classified as PEMC.

Emergent wetlands which are grazed or mowed occur in the valley areas. These wetlands are often influenced by irrigation of surrounding cropland. These meadows are generally seasonally to temporarily flooded depending on size, soils and man's influence. Seasonally flooded examples (PEMC) contain reed canary grass, phragmites (Phragmites australis), rushes and many species of grasses and grass-like plants. The temporary meadows (PEMA) generally have species of short grasses, spike-rushes and sedges.

Springs occur throughout the study area. They take the form of seepy slopes, "headwaters" of and along rivers and within meadow areas. The seepy slope type is vegetated by many species of sedges and some wetland grasses. The "headwaters" type is generally within scrub-shrub communities. Species here include willow, alder, rose, and near the drier edges and along the drainages, hawthorn (Crataegus sp.). The meadow types, such as at Longmire on Mt. Rainier, are vegetated by grasses, sedges and rushes.

Community descriptions and species listed here are representative of the more commonly occurring conditions within the study area and are not intended to be all inclusive. Wetlands may be encountered which are different, to one degree or another, from those discussed here.

Table 1: Wetlands Communities

NWI CODE	NWI DESCRIPTION	COMMON DESCRIPTION	VEGETATION/SUBSTRATE
R3OW	Riverine, upper perennial, open water	River, stream or creek	Unvegetated; sand, cobble-gravel or rubble
R2OW	Riverine, lower perennial, open water	River, stream or creek	Unvegetated sand, cobble-gravel or rubble
R4SB	Riverine, intermittent, stream bed	Stream or creek	Unvegetated; sand, cobble-gravel or rubble
R3US	Riverine, upper perennial, unconsolidated shore	River bars, gravel bars	Unvegetated; sand, cobble-gravel or rubble
L1OW	Lacustrine, limnetic, open water	Lakes (can be dammed river channels)	Unvegetated, sand, mud or cobble-gravel
L2US	Lacustrine, littoral, unconsolidated shore	Lake shores, impoundment draw down zones	Unvegetated; sand, mud, or cobble-gravel
PFO	Palustrine, forested	Wet forest, depressional forest, flood plain forests, river bars	Red alder (Alnus rubra) Black cottonwood (Populus trichocarpa)

Table 1: Wetlands Communities

NWI CODE	NWI DESCRIPTION	COMMON DESCRIPTION	VEGETATION/SUBSTRATE
PFO (cont)			Big leaf (*Acer macrophyllum*) Western hemlock (*Tsuga heterophylla*) Quaking aspen (*Populus tremula*) subsp.*tremuloides*) Lodgepole pine (*Pinus contorta*) Western redcedar (*Thuja plicata*) Engelmann spruce (*Picea engelmannii*)
PSS	Palustrine, scrub-shrub	Shrub swamp, shrub thicket, riparian, flood plain thickets, river bars, alpine heath, alpine tundra	Red alder (*Alnus rubra*) Willow (*Salix* spp.) Vine maple (*Acer circinatum*) Rose (*Rosa* spp.) Spirea (*Spirea douglasii*) Redosier dogwood (*Cornus stolonifera*) Bog laure. (*Kalmia occidentalis*) Salmon berry (*Rubus spectabilis*) Labrador tea (*Ledum groenlandicum*)

Table 1: Wetlands Communities

NWI CODE	NWI DESCRIPTION	COMMON DESCRIPTION	VEGETATION/SUBSTRATE
PSS (cont)			Wild Blueberry (*Vaccinium* spp.) Snowberry (*Symphoricarpos* sp.) Viburnum (*Viburnum* sp.) Azalea (*Rhododendron* spp.) Hawthorne (*Crataegus* sp.)
PEM	Palustrine, emergent	Alpine meadows, wet meadows, wet pasture, depressions, lake edges, pond edges, river banks, marsh, shallow marsh, deep marsh	Bentgrass (*Agrostis* sp.) Sphagnum (*Sphagnum* sp.) Juncus (*Juncus effusus*) Nebraska sedge (*Carex nebraskensis*) Slough sedge (*Carex obnupta*) Reed canary grass (*Phalaris arundinacea*) Horse-tail or Scouring rush (*Equisetum* spp.) Cattails (*Typha latifolia*) Aster (*Aster* spp.) Hairgrass (*Deschampsia* sp.)

Table 1: Wetlands Communities

NWI CODE	NWI DESCRIPTION	COMMON DESCRIPTION	VEGETATION/SUBSTRATE
PEM (cont)			Water sedge (*Carex aquatilis*) Ladies tresses (*Spiranthes romanzoffiana*) Timothy (*Phleum* sp.) False Hellebore (*Veratrum* sp.) Dock (*Rumex* sp.) Wild carrott (*Daucus carota*) Yarrow (*Achillea* sp.) Camas (*Camassia quamash*) Hardstem bulrush (*Scirpus acutus*) Phragmites (*Phragmites australis*) Fescue (*Festuca* sp.) Spike-rushes (*Eleocharis* spp.) Water tolerant forbs Water tolerant grasses

Table 1: Wetlands Communities

NWI CODE	NWI DESCRIPTION	COMMON DESCRIPTION	VEGETATION/SUBSTRATE
POW	Palustrine open water	Pond	Unvegetated, sand, mud, cobble-gravel
PAB	Palustrine, aquatic bed	Pond, shallow pond, deep marsh	Water lily (*Nmphaea odorata*) Water-cress (*Nasturtium officinale*) Duckweed (*Lemna* sp.) Pond weed (*Potamogeton* sp.) Water milfoil (*Myriophyllum* sp.) Spatterdock (*Nuphar polysepalum*)

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