

APPENDIX E: COWARDIN GLOSSARY OF TERMS

Table E-1 and the quoted descriptions below are provided for Cowardin classes, water regimes and special modifiers identified in the South Deschutes County LWI study area. For further information about Cowardin class, water regime and special modifiers refer to *Classification of Wetlands and Deepwater Habitats of the United States* document (Cowardin et al., 1979).

Table E-1. Cowardin Wetland Habitat Classes and Water Regimes found in the South Deschutes County Local Wetland Inventory

Labeled Feature on Map	Cowardin Class	Water Regime	Special Modifier
PABF	PAB: Palustrine Aquatic Bed	F: Semipermanently Flooded	--
PABFx	PAB: Palustrine Aquatic Bed	F: Semipermanently Flooded	x: excavated
PABH	PAB: Palustrine Aquatic Bed	H: Permanently Flooded	--
PEMA	PEM: Palustrine Emergent	A: Temporarily Flooded	--
PEMB	PEM: Palustrine Emergent	B: Saturated	
PEMC	PEM: Palustrine Emergent	C: Seasonally Flooded	--
PEMCx	PEM: Palustrine Emergent	C: Seasonally Flooded	x: Excavated
PEME	PEM: Palustrine Emergent	E: Seasonally Flooded/Saturated	
PEMF	PEM: Palustrine Emergent	F: Semipermanently Flooded	--
PEMH	PEM: Palustrine Emergent	H: Permanently Flooded	
PEMY	PEM: Palustrine Emergent	Y: Saturated/Semi-permanently/Seasonally Flooded	
PFOA	PFO: Palustrine Forested	A: Temporarily Flooded	--
PFOB	PFO: Palustrine Forested	B: Saturated	--
PFOC	PFO: Palustrine Forested	C: Seasonally Flooded	--
PFOE	PFO: Palustrine Forested	E: Seasonally Flooded/Saturated	

Labeled Feature on Map	Cowardin Class	Water Regime	Special Modifier
PFOY	PFO: Palustrine Forested	Y: Saturated/Semi-permanently/Seasonally Flooded	
PSSA	PSS: Palustrine Scrub-shrub	A: Temporarily Flooded	--
PSSC	PSS: Palustrine Scrub-shrub	C: Seasonally Flooded	--
PSSE	PSS: Palustrine Scrub-shrub	E: Seasonally Flooded/Saturated	--
PSSY	PSS: Palustrine Scrub-shrub	Y: Saturated/Semi-permanently/Seasonally Flooded	--
PUBF	PUB: Palustrine Unconsolidated Bottom	F: Semipermanently Flooded	--
PUBFh	PUB: Palustrine Unconsolidated Bottom	F: Semipermanently Flooded	h: Diked/Impounded
PUBFx	PUB: Palustrine Unconsolidated Bottom	F: Semipermanently Flooded	x: Excavated
PUSHh	PUS: Palustrine Unconsolidated Shore	H: Permanently Flooded	--
PUSCx	PUS: Palustrine Unconsolidated Shore	C: Seasonally Flooded	x: Excavated
R2UBH	R2UB: Riverine Upper Perennial Unconsolidated Bottom	H: Permanently Flooded	
R2UBHx	R2UB: Riverine Lower Perennial Unconsolidated Bottom	H: Permanently Flooded	x: Excavated
R4SBC	R4SB: Riverine Streambed	C: Seasonally Flooded	
R4SBCx	R4SB: Riverine Streambed	C: Seasonally Flooded	x: Excavated

Palustrine System

Definition. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5 percent.

Limits. The Palustrine System is bounded by upland or by any of the other four Systems.

Description. The Palustrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. The erosive forces of wind and water are of minor importance except during severe floods.

The emergent vegetation adjacent to rivers and lakes is often referred to as "the shore zone" or the "zone of emergent vegetation" (Reid and Wood 1976), and is generally considered separately from the river or lake. As an example, Hynes (1970:85) wrote in reference to riverine habitats, "We will not here consider the long list of emergent plants which may occur along the banks out of the current, as they do not belong, strictly speaking, to the running water habitat. " There are often great similarities between wetlands lying adjacent to lakes or rivers and isolated wetlands of the same class in basins without open water.

Subsystems. None.

Classes. Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Unconsolidated Shore, Moss-Lichen Wetland, Emergent Wetland, Scrub-Shrub Wetland, and Forested Wetland.

Unconsolidated Bottom

Definition. The Class Unconsolidated Bottom includes all wetland and deepwater habitats with at least 25 percent cover of particles smaller than stones, and a vegetative cover less than 30 percent. Water regimes are restricted to subtidal, permanently flooded, intermittently exposed, and semipermanently flooded.

Description. Unconsolidated Bottoms are characterized by the lack of large stable surfaces for plant and animal attachment. They are usually found in areas with lower energy than Rock Bottoms, and may be very unstable. Exposure to wave and current action, temperature, salinity, and light penetration determines the composition and distribution of organisms.

Most macroalgae attach to the substrate by means of basal holdfast cells or discs; in sand and mud, however, algae penetrate the substrate and higher plants can successfully root if wave action and currents are not too strong. Most animals in unconsolidated sediments live within the substrate, e.g., *Macoma* and the amphipod *Melita*. Some, such as the polychaete worm *Chaetopterus*, maintain permanent burrows, and others may live on the surface, especially in coarse-grained sediments.

In the Marine and Estuarine Systems, Unconsolidated Bottom communities are relatively stable. They vary from the Arctic to the tropics, depending largely on temperature, and from the open ocean to the upper end of the estuary, depending on salinity. Thorson (1957) summarized and described characteristic types of level-bottom communities in detail.

In the Riverine System, the substrate type is largely determined by current velocity, and plants and animals exhibit a high degree of morphologic and behavioral adaptation to flowing water. Certain species are confined to specific substrates and some are at least more abundant in one type of substrate than in others. According to Hynes (1970:208), "The larger the stones, and hence the more complex the substratum, the more diverse is the invertebrate fauna." In the Lacustrine and Palustrine Systems, there is usually a high correlation, within a given water body, between the nature of the substrate and the number of species and individuals. For example, in the profundal bottom of eutrophic lakes where light is absent, oxygen content is low, and carbon dioxide concentration is high, the sediments are ooze-like organic materials and species diversity is low. Each substrate type typically supports a relatively distinct community of organisms (Reid and Wood 1976:262).

Aquatic Bed

Definition. The Class Aquatic Bed includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Water regimes include subtidal, irregularly exposed, regularly flooded, permanently flooded, intermittently exposed, semipermanently flooded, and seasonally flooded.

Emergent Wetland

Definition. The Emergent Wetland Class is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed.

Description. In areas with relatively stable climatic conditions, Emergent Wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years (Stewart and Kantrud 1972). Emergent Wetlands are found throughout the United States and occur in all Systems except the Marine. Emergent Wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and

slough. Areas that are dominated by pioneer plants which become established during periods of low water are not Emergent Wetlands and should be classified as Vegetated Unconsolidated Shores or Vegetated Streambeds.

Shrub-Scrub Wetland

Definition. The Class Scrub-Shrub Wetland includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes except subtidal are included.

Description. Scrub-Shrub Wetlands may represent a successional stage leading to Forested Wetland, or they may be relatively stable communities. They occur only in the Estuarine and Palustrine Systems, but are one of the most widespread classes in the United States (Shaw and Fredine 1956). Scrub-Shrub Wetlands are known by many names, such as shrub swamp (Shaw and Fredine 1956), shrub carr (Curtis 1959), bog (Heinselman 1970), and pocosin (Kologiski 1977). For practical reasons we have also included forests composed of young trees less than 6 m tall.

Forested Wetland

Definition. The Class Forested Wetland is characterized by woody vegetation (i.e., trees) that is 6 m tall or taller. All water regimes are included except subtidal.

Description. Forested Wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. They occur only in the Palustrine and Estuarine Systems and normally possess an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer. Forested Wetlands in the Estuarine System, which include the mangrove forests of Florida, Puerto Rico, and the Virgin Islands, are known by such names as swamps, hammocks, heads, and bottoms. These names often occur in combination with species names or plant associations such as cedar swamp or bottom.

Streambed

Definition. The Class Streambed includes all wetland contained within the Intermittent Subsystem of the Riverine System and all channels of the Estuarine System or of the Tidal Subsystem of the Riverine System that are completely dewatered at low tide. Water regimes are restricted to irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, and intermittently flooded.

Description. Streambeds vary greatly in substrate and form depending on the gradient of the channel, the velocity of the water, and the sediment load. The substrate material frequently changes abruptly between riffles and pools, and complex patterns of bars may form on the convex side of single channels or be included as islands within the bed of braided streams (Crickmay 1974). In mountainous areas the entire channel may be cut through bedrock. In most cases streambeds are not vegetated because of the scouring

effect of moving water, but, like Unconsolidated Shores, they may be colonized by "pioneering" annuals or perennials during periods of low flow or they may have perennial emergents and shrubs that are too scattered to qualify the area for classification as Emergent Wetland or Scrub-Shrub Wetland.

Unconsolidated Shore

Definition. The Class Unconsolidated Shore includes all wetland habitats having three characteristics: (1) unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock; (2) less than 30 percent areal cover of vegetation other than pioneering plants; and (3) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, or artificially flooded. Intermittent or intertidal channels of the Riverine System and intertidal channels of the Estuarine System are classified as Streambed.

Description. Unconsolidated Shores are characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms such as beaches, bars, and flats, all of which are included in this Class. Unconsolidated Shores are found adjacent to Unconsolidated Bottoms in all Systems; in the Palustrine and Lacustrine Systems, the Class may occupy the entire basin. As in Unconsolidated Bottoms, the particle size of the substrate and the water regime are the important factors determining the types of plant and animal communities present. Different substrates usually support characteristic invertebrate fauna. Faunal distribution is controlled by waves, currents, interstitial moisture, salinity, and grain size (Hedgpeth 1957; Ranwell 1972; Riedl and McMahan 1974).

Aquatic Bed

Description. Aquatic Beds represent a diverse group of plant communities that requires surface water for optimum growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. The plants are either attached to the substrate or float freely in the water above the bottom or on the surface.

Water Regime Modifiers

Precise description of hydrologic characteristics requires detailed knowledge of the duration and timing of surface inundation, both yearly and long-term, as well as an understanding of groundwater fluctuations. Because such information is seldom available, the water regimes that, in part, determine characteristic wetland and deepwater plant and animal communities are described here in only general terms. Water regimes are grouped under two major headings, Tidal and Nontidal.

Tidal Water Regime Modifiers are used for wetlands and deepwater habitats in the Estuarine and Marine Systems and Nontidal Modifiers are used for all nontidal parts of

the Palustrine, Lacustrine, and Riverine Systems. The Tidal Subsystem of the Riverine System and tidally influenced parts of the Palustrine and Lacustrine Systems require careful selection of Water Regime Modifiers. We designate subtidal and irregularly exposed wetlands and deepwater habitats in the Palustrine, Riverine, and Lacustrine Systems as *permanently flooded-tidal* rather than subtidal, and Palustrine, Riverine, and Lacustrine wetlands regularly flooded by the tide as *regularly flooded*. If Palustrine, Riverine, and Lacustrine wetlands are only irregularly flooded by tides, we designate them by the appropriate nontidal Water Regime Modifier with the word tidal added, as in *seasonally flooded-tidal*.

Though not influenced by oceanic tides, nontidal water regimes may be affected by wind or seiches in lakes. Water regimes are defined in terms of the growing season, which we equate to the frost-free period (see the U.S. Department of Interior National Atlas 1970:110-111 for generalized regional delineation). The rest of the year is defined as the dormant season, a time when even extended periods of flooding may have little influence on the development of plant communities.

Permanently Flooded. Water covers the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes.

Intermittently Exposed. Surface water is present throughout the year except in years of extreme drought.

Semipermanently Flooded. Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

Seasonally Flooded. Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.

Saturated. The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

Temporarily Flooded. Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.

Intermittently Flooded. The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity. Weeks, months, or even years may intervene between periods of inundation. The dominant plant communities under this regime may change as soil moisture conditions change. Some areas exhibiting this regime do not fall within our definition of wetland because they do not have hydric soils or support hydrophytes.

Artificially Flooded. The amount and duration of flooding is controlled by means of pumps or siphons in combination with dikes or dams. The vegetation growing on these

areas cannot be considered a reliable indicator of water regime. Examples of artificially flooded wetlands are some agricultural lands managed under a rice-soybean rotation, and wildlife management areas where forests, crops, or pioneer plants may be flooded or dewatered to attract wetland wildlife. Neither wetlands within or resulting from leakage from man-made impoundments, nor irrigated pasture lands supplied by diversion ditches or artesian wells, are included under this modifier and hardwoods.

Special Modifiers

Many wetlands and deepwater habitats are man-made, and natural ones have been modified to some degree by the activities of man or beavers. Since the nature of these modifications often greatly influences the character of such habitats, special modifying terms have been included here to emphasize their importance. The following Modifiers should be used singly or in combination wherever they apply to wetlands and deepwater habitats.

Excavated

Lies within a basin or channel excavated by man.

Impounded

Created or modified by a barrier or dam which purposefully or unintentionally obstructs the outflow of water. Both man-made dams and beaver dams are included.

Diked

Created or modified by a man-made barrier or dike designed to obstruct the inflow of water.

Partly Drained

The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes.

Farmed

The soil surface has been mechanically or physically altered for production of crops, but hydrophytes will become reestablished if farming is discontinued.

Artificial

Refers to substrates classified as Rock Bottom, Unconsolidated Bottom, Rocky Shore, and Unconsolidated Shore that were emplaced by man, using either natural materials such as dredge spoil or synthetic materials such as discarded automobiles, tires, or concrete. Jetties and breakwaters are examples of Artificial Rocky Shores.