WETLAND

A **wetland** is an ecological community that is inundated either year around or seasonally. There are very different properties of freshwater versus saline wetlands. Numerous national, state and provincial agencies have regulatory interests wetlands A chief intent of this article is to provide the reader with special interest in wetland delineation, wetland mitigation and wetland biology with insight to additional sources that will be useful.

Regulatory context

Suisun Marsh wetlands. (Source: California Interagency

The U. S. Army Corps of Engineers and the Environmental Protection Agency (EPA) in the originally published 1987 Corps of Engineers Wetlands Delineation Manual jointly defined wetlands as: “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soilconditions.” They continue to describe specifics of the three core components that constitute whether or not an area is a wetland, i.e., Vegetation, Soil, and Hydrology. Page 2 of the Manual states that “This report should be cited as follows: Environmental Laboratory. 1987. “Corps of Engineers Wetlands Delineation Manual”, Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.” To access an electronic version, see Further Reading.

Ecological Program, Suisun Marsh Program)

The U.S. Federal Highway Administration has interest in the location, form, and function of wetlands due to highway construction and maintenance. Their policy memoranda from 1994 refers and defers to the Soil Conservation Service (SCS), the EPA, and the U.S. Army Corps of Engineers (USACE).

State government agencies often have special considerations regarding wetland delineations. The state of Florida, for example, often has public, state, and federal interests that require careful attention to issues that relate to wetlands. Therefore, special definitions for hydric soils, wetland delineation and hydrophytic vegetation are required for effective regulatory oversight.

Wetland phenomenology

Wetland phenomenology is partially defined by plants and animals in residence, but abiotic factors are also crucial in depicting the entirety of the habitat.. Birds and vegetation, for example, are some of the most recognizable, distinguishable features in a wetland landscape, and many researchers focus on the identification of such birds and plants. The Audubon Society uses the U.S. Fish and Wildlife Service definition in The Audubon Society Nature Guides “Wetlands” by William A. Niering.

The gross elements of wetlands include surface water, as well as shallow aquifers. Surface water must be present for sufficient lengths of time that the area is dominated by hydric soils and organisms that are sustained by and physiologically adapted to such saturated and/or inundated conditions. Therefore, seasonal or vernal pools are also considered wetlands. Hydrology largely determines how the soil develops and the types of plant and animal communities. Wetlands may support species ranging from obligate aquatic to obligate terrestrial.

When the upper part of the soil is saturated with water at growing season temperatures, soil organisms may consume the oxygen in the soil and cause anaerobic conditions unsuitable for most plants. Such conditions also cause the development of soil characteristics (such as color and texture) of so-called *hydric soils*. The plants that grow in such conditions, such as marsh grasses, are called *hydrophytes*. Together, hydric soils and hydrophytes provide clues that a wetland area is present.
The presence of water by ponding, flooding, or soil saturation is not always a good indicator of wetlands. Except for wetlands flooded by ocean tides, the amount of water present in wetlands fluctuates as a result of rainfall patterns, snow melt, dry seasons and longer droughts.

Some of the most well-known wetlands, such as the Everglades and Mississippi bottomland hardwood swamps, may have periods of dryness. In contrast, many upland areas are very wet during and shortly after wet weather. Such natural fluctuations must be considered when identifying areas subject to government regulation. Similarly, the effects of upstream dams, drainage ditches, dikes, irrigation, and other modifications must also be considered.

Types of wetlands

Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Indeed, wetlands are found from the tundra to the tropics and on every continent except Antarctica. Two general categories of wetlands are recognized: coastal or tidal wetlands and inland or non-tidal wetlands.
Tidal (coastal) marshes occur along coastlines and are influenced by tides and often by freshwater from runoff, rivers, or groundwater. Salt marshes are the most prevalent types of tidal marshes and are characterized by salt tolerant plants such as smooth cordgrass, saltgrass, and glasswort. Salt marshes have one of the highest rates of primary productivity associated with wetland ecosystems because of the inflow of nutrients and organics from surface and/or tidal water. Tidal freshwater marshes are located upstream of estuaries. Tides influence water levels. The lack of salt stress allows a greater diversity of plants to thrive. Cattail, wild rice, pickleweed, and arrowhead are common and support a large and diverse range of bird and fish species, among other wildlife.
Inland wetlands are most common on floodplains along rivers and streams (riparian wetlands), in isolated depressions surrounded by dry land (e.g., playas, basins, and "potholes"), along the margins of lakes and ponds, and in other low-lying areas where the groundwater intercepts the soil surface or where precipitation sufficiently saturates the soil (e.g., vernal pools and bogs).

Inland wetlands include marshes and wet meadows dominated by herbaceous plants, swamps dominated by shrubs, and wooded swamps dominated by trees.
Many of these wetlands are seasonal (they are dry one or more seasons every year), and, particularly in the arid and semiarid western United States, may be wet only periodically. The quantity of water present and the timing of its presence in part determine the functions of a wetland and its role in the environment. Even wetlands that appear dry at times for significant parts of the year—such as vernal pools—often provide critical habitat for wildlife adapted to breeding exclusively in these areas; in fact, biodiversity and occurrence rare and restricted range biota is highly correlated with presence of western USA vernal pools.


Dave Davis

Wetland habitat along this Idaho riparian corridor provides food and shelter for diverse wildlife species.

Wetland categories

Inland wetlands found in the United States fall into five broad categories—marshes, swamps, bogs, vernal pools andfens. Marshes are wetlands dominated by soft-stemmed vegetation, while swamps have mostly woody plants. Bogs are freshwater wetlands, often formed in old glacial lakes, characterized by spongy peat deposits, evergreen trees and shrubs, and a floor covered by a thick carpet of sphagnum moss. Fens are freshwater peat-forming wetlands covered mostly by grasses, sedges, reeds, and wildflowers. Vernal pools are wetlands not subject to permanent inundation and having clearly hydric soils.
More elaborate and detailed classifications may be found in publications from the U.S. Department of Interior Fish and Wildlife Service.

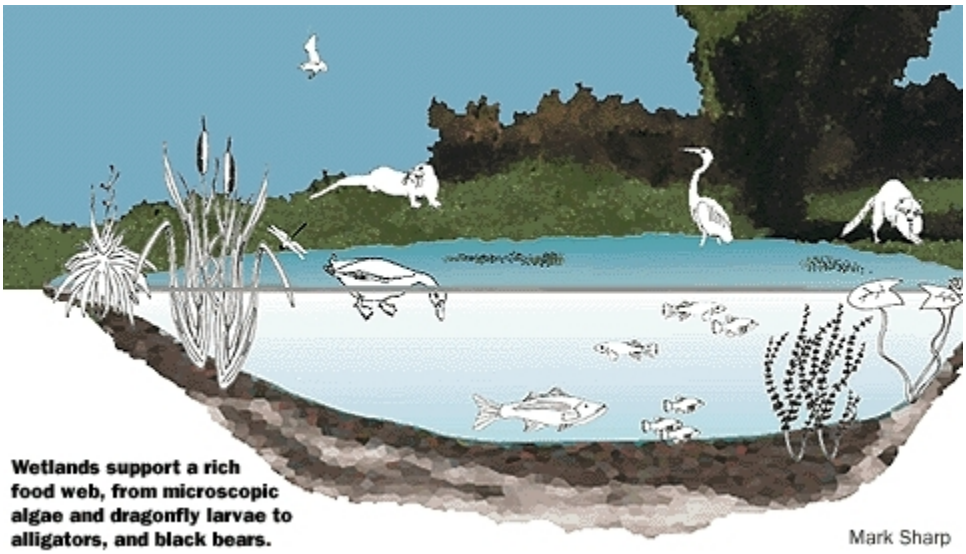
Different wetland types from North America. A. Prairie Marshland (Manitoba, Canada); B. Wetland habitat for aquatic birds (Irrigation canal, Lethbridge, Alberta, Canada); C. Bog (Montana, US). D. Mountain pool (British Columbia, Canada)., E. Dried swamp showing cross section of a typical wetland system (Alberta, Canada); and E. Natural swamp (Saskatchewan, Canada) as viewed from the edge. Source: Saikat Basu own work

Ecological roles of wetlands

Wetlands are among the most productive ecosystems in the world, comparable to rainforests and coral reefs. An immense biodiversity of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals can be part of a wetland ecosystem. Physical and chemical features such as climate, topography, geology, and the movement and abundance of water determine the plants and animals that inhabit each wetland. The complex, dynamic relationships among the organisms inhabiting the wetland environment are referred to as food chains.

Wetlands can be thought of as "biological supermarkets." They provide great volumes of food that attract many animal species. These animals use wetlands for part of or all of their life-cycle. Dead plant leaves and stems break down in the water to form small particles of organic material

called *detritus*. This enriched material feeds many aquatic insects, shellfish, and small fish that are food for larger predatory fish, reptiles, amphibians, birds and mammals.
The functions of a wetland and the values of these functions to human society depend on a complex set of relationships between the wetland and the other ecosystems in the watershed. A watershed is a geographic area in which water, sediments, and dissolved materials drain from higher elevations to a common low-lying outlet or basin a point on a larger stream, lake, underlying aquifer, or estuary.



Wetlands support a rich food web, from microscopic algae and dragonfly larvae to alligators, and black bears.

Mark Sharp

Wetlands play an integral role in the ecology of the watershed. The combination of shallow water, high levels of nutrients, and primary productivity is ideal for the development of organisms that form the base of the food web and feed many species of fish, amphibians, shellfish, and insects. Many species of birds and mammals rely on wetlands for food, water, and shelter, especially during migration and breeding.
Wetland microbes, plants, and wildlife are part of global cycles for water, nitrogen, and sulfur. Furthermore, scientists are beginning to realize that atmospheric maintenance may be an additional wetlands function. Wetlands store carbonwithin their plant communities and soil instead of releasing it to the atmosphere as carbon dioxide or methane. Thus wetlands help to moderate global climate conditions, and may provide an important regulating influence to deter climate alteration.

Economic benefits of wetlands

Wetlands perform significant economic benefits to human society, including some ecosystem services that no otherecosystem can provide, including certain types of water

quality improvement, flood protection, shoreline erosion control, opportunities for recreation and aesthetic appreciation, and natural products for our use at no cost. Protecting wetlands in turn can protect our safety and welfare.

Water Quality and Hydrology

Wetlands have important filtering capabilities for intercepting surface water runoff from higher dry land before the runoff reaches open water. As the runoff water passes through, the wetlands retain excess nutrients and some pollutants, and reduce sediment that would clog waterways and affect fish and amphibian egg development. In performing this filtering function, wetlands save us a great deal of money. For example, a 1990 study showed that without the Congaree Bottomland Hardwood Swamp in South Carolina, the area would need a US $5 millionwastewater treatment plant.

In addition to improving water quality through filtering, some wetlands maintain stream flow during dry periods, and many replenish groundwater. Many Americans depend on groundwater for drinking.

Flood protection

Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of flood waters and distribute them more slowly over a floodplain. This combined water storage and braking action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface water runoff from pavement and buildings.

The holding capacity of wetlands helps control floods and prevents water-logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees.

The bottomland hardwood-riparian wetlands along the Mississippi River once stored at least 60 days of floodwater. Now they store only 12 days of such high flow, because most have been filled or drained.

Shoreline erosion

The ability of wetlands to control erosion is so valuable that some states are restoring wetlands in coastal areas to buffer the storm surges from hurricanes and tropical storms. Wetlands at the margins of lakes, rivers, bays, and the ocean protect shorelines and stream banks against erosion. Wetland plants hold the soil in place with their roots, absorb the energy of waves, and break up the flow of stream or river currents.

Fish and wildlife habitat

More than one-third of the United States' threatened and endangered species live only in wetlands, and nearly half use wetlands at some point in their lives. Many other animals and plants depend on wetlands for survival.

The Redwinged blackbird (*Agelaius phoeniceus*), Blue-winged teal (*Anas discors*), and the Mallard (*Anas platyrhynchos*) can all be found in playa lakes at some time of the year.

Estuarine and marine fish and shellfish, various birds, and certain mammals must have coastal wetlands to survive. Most commercial and game fish breed and raise their young in coastal marshes and estuaries. Menhaden, flounder, sea trout, spot, croaker, and striped bass are among the more familiar fish that depend on coastal wetlands. Shrimp, oysters, clams, and blue and Dungeness crabs likewise need these wetlands for food, shelter, and breeding grounds.

For many animals and plants, such as wood ducks, muskrat, cattails, and swamp rose, inland wetlands are the only places they can live. Beaver may actually create their own wetlands. For others, such as striped bass, peregrine falcon, otter, black bear, raccoon, and deer, wetlands provide important food, water, or shelter. Many of the U.S. breeding bird populations—including ducks, geese, woodpeckers, hawks, wading birds, and many song-birds—feed, nest, and raise their young in wetlands. Migratory waterfowl use coastal and inland wetlands as resting, feeding, breeding, or nesting grounds for at least part of the year. Indeed, an international agreement to protect wetlands of international importance was developed because some species of migratory birds are completely dependent on certain wetlands and would become extinct if those wetlands were destroyed.

Natural products of economic value

We use a wealth of natural products from wetlands, including fish and shellfish, blueberries, cranberries, timber, and wild rice, as well as medicines that are derived from wetland soils and plants. Many of the nation's fishing and shellfishing industries harvest wetland-dependent species; the catch is valued at US$15 billion a year. In the Southeast, for example, nearly all the commercial catch and over half of the recreational harvest are fish and shellfish that depend on the estuary-coastal wetland system. Louisiana's coastal marshes produce an annual commercial

fish and shellfish harvest that amounted to 1.2 billion pounds worth US$244 million in 1991. Wetlands are habitats for fur-bearers like muskrat, beaver, and mink as well as reptiles such as alligators. The nation's harvest of muskrat pelts alone is worth over US$70 million annually.

Recreation and aesthetics

Wetlands have recreational, historical, scientific, and cultural value. More than half of all U.S. adults (98 million) hunt, fish, birdwatch or photograph wildlife. They spend a total of US $59.5 billion annually on activities that are pursued in wetlands and other natural areas. Painters and writers capture the beauty of wetlands on canvas and paper, or through cameras, and video and sound recorders. Others appreciate these wonderlands through hiking, boating, and other recreational activities. Almost everyone likes being near the water; part of the enjoyment is the varied, fascinating lifeforms.

Human impacts on wetlands

Seasonal Wetland in Summer

Human activities cause wetland degradation and loss by changing water quality, quantity, and flow rates; increasing pollutant inputs; and changing species composition as a result of disturbance and the introduction of nonnative species.

Hydrologic alterations

A wetland's characteristics evolve when hydrologic conditions cause the water table to saturate or inundate the soilfor a certain amount of time each year. Any change in hydrology can significantly alter the soil chemistry and plant and animal communities. Common hydrologic alterations in wetland areas include:

- Deposition of fill material for development;
- Drainage for development, farming, and mosquito control;
- Dredging and stream channelization for navigation, development, and flood control;
- Diking and damming to form ponds and lakes;
- Diversion of flow to or from wetlands; and
- Addition of impervious surfaces in the watershed, thereby increasing water and pollutant runoff into wetlands.

Pollution inputs

Although wetlands are capable of absorbing pollutants from the surface water, there is a limit to their capacity to do so. The primary pollutants causing wetland degradation are sediment, fertilizer, human sewage, animal waste, road salts, pesticides, heavy metals, and selenium. Pollutants can originate from many sources, including:

- Runoff from urban, agricultural, silvicultural, and mining areas;
- Air pollution from cars, factories, and power plants;
- Old landfills and dumps that leak toxic substances; and
- Marinas, where boats increase turbidity and release pollutants.

Vegetation damage

Wetland plants are susceptible to degradation if subjected to hydrological changes and pollution inputs. Other activities that can impair wetland vegetation include:

- Grazing by domestic animals;
- Introduction of nonnative plants that compete with natives; and
- Removal of vegetation for peat mining.

Source : http://www.eoearth.org/view/article/51cbef3a7896bb431f69d3d0/?topic=51cbfc7ef702fc2ba812ad27