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WATER QUALITY

Understanding Natural Wetlands

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Marsh, bog, swamp, slough, fen–these are just a few of the names commonly applied to the class of natural habitats called "wetlands." Broadly defined, wetlands are land areas that have a prolonged high water table or at least are covered with shallow water. As a transition habitat between dry land and a deep water environment, they support plants specially adapted to grow in wet conditions.

There are many distinct types of wetlands. Along the edge of some coastal areas, there are salt marsh zones with shallow salt or brackish water flowing over the land in a complex web of creeks. The water level may fluctuate with the tides. At middle and high latitudes, the primary vegetation in salt marshes consists of specially adapted grasses and shrubs that can tolerate daily tidal flooding and salty conditions.

Inland, wetlands occur in different forms: from the cypress swamps of the southeastern United States, to freshwater "prairie potholes" scattered across the northern Midwest, to the great peat bogs that stretch across Siberia, Alaska, Canada, and the northern edges of the lower 48 states. In addition, there are areas along river margins and around lakes, which experience seasonal or periodic flooding and form special wetlands in floodplains.

The sogginess that makes wetlands unpleasant to step in also makes them highly productive ecosystems when they are supplied with abundant sunlight and nutrients.

Wetland productivity

They are a cradle of life, supporting algae, bacteria, plankton, and the eggs and larvae of aquatic organisms, fish, and amphibians. These life forms in turn feed hundreds of species of reptiles, birds, and mammals.

Common wetland plant groups in Oregon include mosses, cattails, grasses, sedges, bulrushes, rushes, and duckweed among others. Their occurrence in a particular wetland depends on characteristics specific to that wetland such as salinity, water depth and water level fluctuation, type of soil, temperatures, local elevation, landscape, and other factors.

In addition, the bird and animal life vary greatly depending on specific wetland conditions. A wide range of birds, including wrens, herons, egrets, ducks, geese, rails, and shorebirds, rely on wetlands for nesting and feeding.

Wetlands improve the quality of surface runoff water that flows through by filtering, absorbing, and settling out soil particles, organic matter, and some nutrients such as phosphorus. These removed materials provide a rich environment for algae and bacteria, which can actively degrade organic waste matter and remove or transform chemicals arriving from upstream natural and human sources.

How wetlands treat water

The biological and chemical processes that take place in wetlands usually transform materials. Plant stems and roots provide surface area that supports the growth of communities of microorganisms.

These communities break down and use some of the nutrients and organic matter carried to the wetland in runoff water. In one example, microbe communities on plant roots and stems convert organic nitrogen into ammonium nitrogen.

Other biological treatment occurs through uptake by plants of nutrients such as nitrogen, phosphorus, and potassium compounds.

Chemical treatment occurs when incoming compounds react with oxygen, soil minerals, and other compounds in the wetland. One easy-to-see example of chemical treatment involves iron and sulfur compounds. When wetland soil has high concentrations of ferrous iron, it appears greenish-gray.

A chemical transformation can occur between the iron and incoming sulfides that forms insoluble ferrous sulfide, which is trapped in the soil and turns it black. If oxygen is introduced into iron-rich wetland soil by plant roots, the soil can turn red around the roots.

The speed and efficiency of these processes vary considerably from wetland to wetland. The rate of treatment depends on such factors as wetland size, water flow, temperature, and amount and form of nutrients and compounds in the water. All of the treatment processes work simultaneously. By the

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time water flows out of a wetland, sediment, nutrient, and bacterial content in the water are lower.

As plants complete their life cycles, they die. Over time, the resulting dead material can turn into an organic soil known as peat. Settled materials and peat are later covered by successive layers of material. In the ensuing decades to thousands of years, wetlands naturally fill up this way, changing into drier more fertile upland areas as they age. They can also keep their wetland characteristics, depending on water flow patterns, geography, and other conditions.

Wetlands as protective buffers

Wetlands frequently serve as critical buffer zones that reduce flooding downstream. This happens because wetlands can soak up and dampen or delay floods by diverting flood waters across a relatively large, flat land surface. Wetlands only store this runoff water temporarily, releasing it slowly over a longer period. Furthermore, shoreline wetlands can act as a physical barrier during ocean storms. They absorb the storm's first fury and shelter inland developed areas while usually sustaining little or no damage themselves.

As people have come to understand these natural wetland processes, their interest has turned to the possibility of constructing artificial wetlands to treat wastewater. In the past 40 years, a number of wetlands have been built specifically to treat municipal sewage, urban storm water runoff, mining spoils, and other wastewater. In addition to their treatment function, these facilities can have other benefits such as aesthetic and recreational value.

Unfortunately, the value of natural wetlands as wildlife habitats, and for natural water treatment and flood and storm protection, has too often been discovered after they were drained and filled to make room for farms and housing developments.

Historically, people thought swamps, bogs, and marshes were mucky, unproductive, and inconvenient. Wetlands were seen as wasted land without a purpose or as obstacles in the way of progress. This attitude led to the elimination of 50 percent of the original wetlands in the lower 48 states. Altering these areas may have caused the extinction of some wetland plant and animal species, and it exposes nearby human development to flooding and higher water tables, which are costly and can endanger human lives.

Wetlands management today

While in the past wetland "management" historically meant planned elimination of these environments, today society is more concerned with preserving and restoring wetlands. People are starting to recognize the importance of natural wetland ecosystems, and, as a result, are initiating programs to protect them.

In the 1970s, federal and state policies began to focus on protecting existing wetlands, and those efforts have recently increased. Despite such conservation efforts, the destruction of wetlands continues, and, though they provide people with many benefits, the threat against wetlands continues.

For more information

OSU Extension publication

EC 1408, *Using Constructed Wetlands to Improve Water Quality*.

Many OSU Extension Service publications may be viewed or downloaded from the Web. Visit the online Publications and Videos catalog at http://extension.oregonstate.edu/catalog/

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Other publications

Mitsch, William J. and James G. Gosselink. *Wetlands* (New York: Van Nostrand Reinhold, 1986).

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