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# SABUJEEMA

An International Multidisciplinary e-Magazine

Volume 1| Issue 4 | July, 2021

## WETLANDS: ITS ROLE IN ECOSYSTEM AND PRESERVATION

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Sabujeema Sabujeema
editorsabujeema@gmail.com
sabujeema-international multidisciplinary-e-magazine

# WETLANDS: ITS ROLE IN ECOSYSTEM AND PRESERVATION

[Article ID: SIMM0099]

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## INTRODUCTION:

Wetlands are ecosystems in which water covers the soil and are dominated by anaerobic and aerobic processes. They are found at or near the soil's surface throughout the year or for variable lengths of time. They are separate ecosystem that is inundated by water on a regular or seasonal basis, and where oxygen-free processes predominate. The main feature that distinguishes wetlands from other types of ecosystems is the presence of water. They provide habitat for both aquatic and terrestrial animals. The presence of water over an extended period of time promotes the establishment of specially adapted plants (hydrophytes) and the formation of characteristic wetland (hydric) soils. The economic value of ecosystem services provided to society by intact, naturally functioning wetlands is frequently far greater than the perceived benefits of converting them to more valuable and intensive land use. The profits from unsustainable use often go to a small number of individuals or corporations rather than being shared by society as a whole.

## RAMSAR CONVENTION

According to Ramsar convention (1971), the wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. They include riparian and coastal zones close to the wetlands, as well as islands or bodies of marine water within the wetlands that are deeper than six metres at low tide. They addresses global concerns about the disappearance and deterioration of wetlands. The main goal of the treaty is to identify wetlands of worldwide significance and promote their smart use, with the ultimate goal of preserving the wetlands.

### Functions of wetlands:

Depending partly on a wetland's geographic and topographic location, the functions it performs can support multiple ecosystem services, values and benefits. The United Nations Millennium Ecosystem Assessment and Ramsar Convention described wetlands as a whole to be of biosphere significance and societal importance in the following areas:

1. Water storage (flood control)
2. Water purification
3. Groundwater replenishment
4. Aquaculture
5. Processing of carbon and other nutrients
6. Carbon sinking and reduction in GHGs

7. Shoreline stabilisation and storm protection
8. Wastewater treatment (in constructed wetlands)
9. Reservoirs of biodiversity
10. Pollination
11. Wetland products
12. Cultural values
13. Recreation and tourism
14. Climate change mitigation and adaptation
15. Maintain genetic diversity
16. Slow the spread of minor wildfires
17. Influence local precipitation patterns
18. Extend the period of flow and maintain water temperature in connected downstream waters.
19. Pollination services

## CATEGORIES 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. Wetlands can be found on every continent except Antarctica, from the tundra to the tropics. Wetlands are divided into two types: coastal or tidal wetlands and inland or non-tidal wetlands.

### 1. COASTAL/TIDAL WETLANDS

The Atlantic, Pacific, Alaskan, and Gulf coasts all have coastal/tidal wetlands. They are linked estuaries where seawater and freshwater mingle to create a salinity-varying environment. Most plants find the salt water and varying water levels (due to tidal action) to be a challenging habitat. As a result, many shallow coastal areas are mud flats or sand flats with no vegetation. In tropical climes, mangrove swamps with salt-loving vegetation or trees are abundant. Some tidal freshwater wetlands form beyond the upper edges of tidal salt marshes where the influence of salt water ends.

### INLAND/NON-TIDAL WETLANDS

Inland/non-tidal wetlands are most common in floodplains along rivers and streams (riparian wetlands), isolated depressions surrounded by dry land along the margins of lakes and ponds, and other low-lying areas where groundwater intercepts the soil surface or where precipitation sufficiently saturates the soil (for example, playas, basins, and "potholes") (vernal pools and bogs). It includes herbaceous-dominated marshes and wet meadows, shrub-dominated swamps, and tree-dominated forested swamps. Different types of inland wetlands are found in different parts of the country. . Many of these wetlands are seasonal (dry for one or more seasons each year) and may only be wet on rare occasions, especially in the arid and semiarid West. The functions of a wetland and its role in the environment are partly determined by the amount of water present and the timing of its presence. Even wetlands that appear dry for large portions of the year, such as vernal pools, provide vital habitat for species that have evolved to reproduce exclusively in these regions.

## CHARACTERISTICS OF WETLANDS:

Wetlands are distinct from other water bodies or landforms because of their water level and the types of plants that dwell within them. Wetlands are defined as areas where the water table remains at or near the land surface for a long enough length of time each year to support aquatic plants. The wetland community is made up of hydric soil and hydrophytes that exists at the crossroads of true terrestrial and aquatic ecosystems, making them essentially different from one

another while yet being extremely dependent on both. Wetlands are sometimes known as ecotones because they serve as a transition between dry land and aquatic bodies. Due to local and regional changes in terrain, hydrology, vegetation, and other variables, including human participation, wetlands vary greatly. It can be dry during the dry season and excessively dry during the wet season, but under normal environmental conditions, soils in a wetland will be soaked to the surface or inundated to the point that they become anaerobic, and those conditions will last through the wet season.

## ECOLOGY

Flooding is the most essential component in the formation of wetlands. Whether the resulting wetland has aquatic, marsh, or swamp vegetation is determined by the length of inundation or extended soil saturation by groundwater. Fertility, natural disturbance, competition, herbivory, burial, and salinity are all essential contributors. Bogs and fens form as peat accumulates. Bogs get most of their water from the atmosphere, hence the mineral ionic content of their water is usually minimal. The concentration of dissolved nutrients and minerals in groundwater, on the other hand, is higher. Because they get their water from both precipitation and ground water, the water chemistry of fens ranges from low pH and little minerals to alkaline with high calcium and magnesium buildup.

## HYDROLOGY

The geographical and temporal dispersion, flow, and physio-chemical characteristics of surface and ground water in wetlands are all linked. Wetlands are classified as riverine (related with streams), lacustrine (associated with lakes and reservoirs), or palustrine (associated with marshes) (isolated). Sources of hydrological flows into wetlands are predominantly precipitation, surface water, and groundwater. The water flows out of wetlands by evapotranspiration, surface runoff, and subsurface water outflow. By influencing the water balance and water storage inside a wetland, hydrodynamics (the movement of water through and out of a wetland) influences hydro-periods (temporal changes in water levels). Wetland hydrology and hydrochemistry are influenced by terrain factors. The concentrations of $O_2$ and $CO_2$ in water are affected by temperature and air pressure. The pH, salinity, nutrients, conductivity, soil composition, hardness, and water sources all influence the hydrochemistry of wetlands. Wetland water chemistry varies across landscapes and climate zones. With the exception of bogs, they are all minerotrophic.

## ROLE OF SALINITY

Salinity has a strong influence on wetland water chemistry, particularly in wetlands along the coast and in regions with large precipitation deficits. In non-riverine wetlands, natural salinity is regulated by interactions between ground and surface water, which may be influenced by human activity.

## SOIL

Carbon is the most important nutrient cycled in wetlands. The majority of nutrients, such as sulphur, phosphorus, carbon, and nitrogen, are found in wetlands' soil. The nutrient cycling of carbon, hydrogen, oxygen, and nitrogen, as well as the solubility of phosphorus, are influenced by anaerobic and aerobic respiration in the soil, contributing to chemical fluctuations in its

water. Low pH and saline conductivity in wetlands may indicate the presence of acid sulphates, while wetlands with average salinity levels may be influenced strongly by calcium or magnesium. Soils having a low redox potential control biogeochemical activities in wetlands.

**BIOTA**

The flora and fauna of a wetland system are described below as part of the biota. The duration of flooding is the most critical element affecting the biota. Fertility and salinity are two more crucial elements. Species in fens are extremely reliant on water chemistry. The chemistry of water flowing into wetlands is influenced by the source of the water, the geological material through which it passes, and the nutrients released by organic matter in soils and plants at higher elevations in slope wetlands. Seasonal or recent flood regimes can cause biota to change inside a wetland.

**FLORA**

Hydrophytes can be found in wetland systems all around the world in four different groups. In both salty and freshwater environments, submerged wetland vegetation can thrive. Some species have underwater flowers, while others have long stems to allow the flowers to reach the surface. Submerged species provide a food source for native fauna, habitat for invertebrates, and also possess filtration capabilities. Examples include seagrasses and eelgrass and arrow arum.

**FAUNA**

Many frog species reside in wetlands, while others come to lay eggs every year. Wetlands are home to a variety of turtles, including snapping turtles. Wetland ecosystems are more important to fish than any other sort of habitat. Since of their thin skin, frogs are employed as an indication of ecosystem health because they absorb both nutrients and poisons from their surroundings, resulting in an above-average extinction rate in unfavourable and polluted environments. In some areas, reptiles such as alligators and crocodiles can be found in the marshes. Freshwater alligators, like freshwater crocodiles, can be found in bodies of water. The voles, bats, and platypus are examples of small and medium-sized mammals, as well as huge herbivorous and apex mammals such the beaver, coypu, swamp rabbit, florida panther, and moose. Due to numerous seeds, berries, and other vegetative components, as well as abundant populations of prey such as insects, tiny reptiles, and amphibians, wetlands attract many mammals. More than half of the 100,000 known animal species in wetlands are insects and invertebrates. Insects and invertebrates can be found submerged in water or soil, as well as on the surface and in the air. At various phases of their lives, many insects can be found in the water, soil, and atmosphere.

**ALGAE**

Algae are diverse plant-like organisms that can vary in size, color, and shape. Algae occur naturally in habitats such as inland lakes, inter-tidal zones, and damp soil and provide a dedicated food source for many animals, including some invertebrates, fish, turtles, and frogs.

**Other mangrove-derived products:**

1. Fuelwood
2. Salt (produced by evaporating seawater)
3. Animal fodder

4. Traditional medicines (e.g. from mangrove bark)
5. Fibers for textiles

## WATER CHEMISTRY

Anthropogenic nitrogen inputs to aquatic systems have drastically effected the dissolved nitrogen content of wetlands, introducing higher nutrient availability which leads to eutrophication. Due to the low dissolved oxygen (DO) content, and relatively low nutrient balance of wetland environments, they are very susceptible to alterations in water chemistry.

## MONITORING AND MAPPING

A wetland needs to be monitored over time to assess whether it is functioning at an ecologically sustainable level or whether it is becoming degraded. The degraded wetlands suffer a loss in water quality, loss of sensitive species, and aberrant functioning of soil geochemical processes. Many natural wetlands are difficult to monitor from the ground because they are sometimes difficult to reach and may expose visitors to harmful plants and animals, as well as diseases spread by insects or other invertebrates. As a result, aerial imagery mapping is a useful technique for monitoring a wetland, particularly a large wetland, and can also be used to track the state of multiple wetlands within a watershed or region. The wetlands can be mapped using a variety of remote sensing techniques. Remote sensing technology makes it possible to collect timely digital data on a regular basis. Wetlands, as well as neighbouring land-cover and land-use types, can be studied using this method. This repeat coverage allows wetlands, as well as the adjacent land-cover and land-use types, to be monitored seasonally and/or annually.

## REPAIR AND RESTORATION

By assisting directly with the ecosystem's natural processes, ecologists hope to restore wetlands to their native state. These direct methods range in terms of the degree to which the natural environment is physically manipulated, and each is connected with varying levels of restoration. It is required once a wetland has been disturbed or perturbed. Exogenous forces such as flooding or drought are examples of disturbances. Anthropogenic disturbance caused by clear-cut tree harvesting, oil and gas exploitation, poorly planned infrastructure installation, overgrazing of cattle, ill-considered leisure activities, and change of wetland ecosystems are examples of external harm. Disturbance puts different levels of stress on an environment depending on the type and duration of disturbance. There is no one way to restore a wetland and the level of restoration required will be based on the level of disturbance although, each method of restoration does require preparation and administration.

## REFERNCES:

Brinson, M. M. (1993). A hydrogeomorphic clasification for wetlands.

Kent, D. M. (Ed.). (2000). *Applied wetlands science and technology*. CRC Press.

Mitsch, W. J., Bernal, B., Nahlik, A. M., Mander, Ü., Zhang, L., Anderson, C. J., ... & Brix, H. (2013). Wetlands, carbon, and climate change. *Landscape Ecology*, *28*(4), 583-597.

Mitsch, W. J., & Gosselink, J. G. (2000). The value of wetlands: importance of scale and landscape setting. *Ecological economics*, *35*(1), 25-33.