

DSE 1 : NATURAL RESOURCE MANAGEMENT

UNIT – 4

**Water**

(Part – 3)

**Wetland water**

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year. The amount of water present in a wetland can vary greatly. Some wetlands are permanently flooded, while others are only seasonally flooded but retain saturated soils throughout much of the unflooded period. **Hydric soils** develop when chemical changes take place in the soil due to the low-oxygen conditions associated with prolonged saturation.

Wetlands may support both aquatic and terrestrial species. Wetland plants are often referred to as **hydrophytes** because they are specially adapted to grow in saturated soils. Many birds, insects, and other wildlife species are completely dependent on wetlands for critical stages in their life cycles, while many other species make use of wetlands for feeding, resting, or other life activities.

**Definition :**

Wetlands are lands of transition between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water.

Wetlands must have one or more of the following three attributes:

- (i) The land supports predominantly **hydrophytes**;
- (ii) The substrate is predominantly un-drained **hydric soil**; and
- (iii) The substrate is **saturated** with water or **covered by shallow water** at some time **during the growing season** of each year.

**Types of wetlands**

There are many different types of wetlands. Type of wetland is determined by its hydrology, water chemistry, soils, and the plant species found there.

Wetlands may be characterized as dominated by trees, shrubs, or herbaceous vegetation. They may be fed by precipitation, runoff, or groundwater.

## 1. Marsh :

**Marshes** are wetlands that are **permanently flooded** or **flooded during high water periods at the edges of rivers, streams, lakes, or ponds**. Marshes may be dominated by **submerged, floating-leaved vegetation**, including **cattails, pondweeds, water lilies**, and various **sedges, grasses**. Marshes can be subcategorized into –

### (i) Emergent marsh :

This type of marsh is found around the shorelines of **shallow water**, and is generally characterized by up to **100% cover** with **emergent plant species**. These species may include **graminoids, forbes**. These marshes are ideal habitat for a wide range of animals, including **mink, muskrat, raccoons, Great Blue Herons**, and a multitude of **dragonflies, butterflies**, and other insects. Emergent marshes also provide critical habitat for **rare amphibians and reptiles** such as the plains **leopard frog** and **Blanding's turtle**.

### (ii) Hemi-marsh

This type of marsh is found in **deeper water** and is characterized by an **open mix of emergent and/or floating-leaved vegetation** and **submerged** plant community. The submerged community may consist of species like **pondweed, coontail, and wild celery**, while the emergent or floating-leaved group can include deeper water species like **broad-leaved cattail, American lotus, white water lily, and common bur reed**. The combination of emergent and floating-leaved species with open water creates ideal food and cover conditions for many aquatic-dependent **birds and amphibians**. The rich vegetation also provides an exceptional nursery for young **fish** and is a great production area for the **zooplankton** and **insects** that are a critical part of the food web.

## 2. Sedge meadows :

Sedge meadows (or wet meadows) are wetlands with **permanently or near-permanently saturated soils**. They may form a transitional zone between marshes and other wetlands. The meadows are wet grasslands often dominated by **sedges and grasses** with relatively few **forbes**. Birds frequenting this habitat include the **King Rail, Sandhill Crane, Northern Harrier, and Sedge Wren**. **Reptiles** such as the **northern water snake** and **amphibians** like the **pickerel frog and cricket frog** are also common.

## 3. Wet prairie :

Wet prairie is an ecosystem that is usually **intermediate in wetness between sedge meadows and mesic prairies**. Wet prairies are **herbaceous wetlands** dominated by a mixture of **graminoids and forbes**. Animals that may be found in wet prairies include **Henslow's Sparrow, Short-eared Owl, eastern hog-nosed snakes, and coyotes**.

#### 4. Fens and seeps :

Fens and seeps are wetlands that are **fed by groundwater** that “seeps” out to the soil’s surface. The type of vegetation found within these wetlands is dependent upon the water chemistry and pH level.

- (i) **Fens** are typically **alkaline from groundwater emerging from calcareous or dolomitic soils or bedrock zones**. Fens are dominated by **herbaceous** vegetation such as **grass, bog lobelia, or beaked spikerush**, but may also include **trees or shrubs** such as shrubby **cinquefoil or willows**.
- (ii) **Seeps** are typically found along the **base of slopes or glacial moraines** where water emerges from saturated soils or a spring. These usually small areas feature plants such as **clearweed, jewelweed, low nutrush, and marsh marigold**.

#### 5. Bogs :

Bogs are basin wetlands for which **precipitation** is the only **source of water**. They are generally dominated by **sphagnum mosses**, which may **form a floating mat** over deeper water that supports specially adapted species. **Sphagnum mosses acidify the water** down to **pH** levels as low as **3**. Bogs also have a **cool micro-climate**, are **nutrient-poor**, and have **very low oxygen levels**. Some of the plants found in these unique, acidic conditions include **carnivorous plants** such as **sundews and pitcher plants**, as well as economically important species such as **blueberry and cranberry**.

#### 6. Swamps :

Swamps are wetlands dominated by **woody vegetation** that typically have standing **water during** at least **certain times of the year**. They are often found in **low-elevation floodplains along rivers** or slow-moving **streams**. Unlike bogs, they are a **nutrient-rich** environment. Their shallow standing water provides important habitat for wildlife like **Wood Duck, river otters, cottonmouth snakes, freshwater shrimp and crayfish**, and more. Forested swamps and shrub swamps are the two major classes of this wetland type.

- (i) **Forested swamps** are dominated by **water-tolerant trees such as bald cypress and tupelo**.
- (ii) **Shrub swamps**, sometimes also known as scrub-shrub wetlands, are dominated by **short, shrubby species like buttonbush and alders**.

## Threats and management strategies of water

Even though our planet is 70% of water, only a small percentage of that is fresh water. The rest is salt water which cannot be used. The 2.5% of fresh water exists mostly as ice or permanent snow cover. **Fresh water is limited and vulnerable.** Supplying of sufficient, clean, fresh water is one of the **most vital issues** facing humanity. Water shortages are becoming a global issue, **due to an increasing population, economic growth and climate change.** A lack of clean, fresh water can hinder the efforts to reduce **poverty** and resulting in **poor health, low productivity, food insecurity and restricted economic development.**

### CAUSES OF WATER DEPLETION

#### Excessive demand of water:

**Due to overpopulation,** the demand of water has increased considerably. More quantities of **water is used and wasted over the time.** The population growth already occurred and will continue at an unpredictable rate.

#### Climate change:

**Due to global warming and change in the climate,** huge amounts of surface water and groundwater are being **evaporated due to excessive heat.** Also, **low rainfall** has reduced considerably over the years. This is mainly **because of large scale deforestation and drastic climatic changes.**

#### Pollution:

Pollution is a major cause of water shortage. There are many sources, for example **pesticides and fertilizers that wash away from human waste or industrial waste and pollute the ground water.** Most of the **industrial wastewater is dumped to clean water sources.** Oil spillage and fecal matter also makes the water contaminated.

#### Deforestation:

This can be considered a major cause for water depletion. **Large scale deforestation considerably lowers the capacity of the soil to retain water** and this affects the water table. Deforestation removes trees that protect watersheds and improve water quality. **Forests play an important role in the water cycle,** by reducing runoff and stabilizing water flows, and helping water return into the atmosphere as clouds.

## **Agriculture:**

Agricultural activities steadily increasing by the day which means more **water is pumped for use**. Agriculture uses 70% of the world's accessible freshwater. It is estimated that about 1 to 3 tons of water is required to grow 1kg of cereal. This way of using water is resulting in **drying out rivers, lakes and underground aquifers**.

## **EFFECTS OF WATER DEPLETION**

### **Hunger :**

As we discussed above that **agriculture requires a huge amount of water** in order to grow crops and to care for livestock animals. So, **water shortage** greatly **affects farming** and in this way it also affecting the **demand for food** as the population is rapidly increasing.

### **Health Problems :**

In many developing nations, water scarcity **forces people to drink low quality of water**. Accordingly, they are infected with **water-borne diseases** such as **cholera, typhoid, and dysentery** that kill people.

### **Habitat Loss and Destruction to Ecosystems :**

When water is scarce, then it means the natural landscapes suffer the most as it contributes to desertification, **lose of plants and death of wildlife and other animals**. As a result, these **ecological catastrophes create habitat loss** that, in turn, **leads to food shortages and poor quality of life**.

### **Disappearance of Wetlands :**

According to WWF, more than half of the planet's **wetlands have lost** since 1990 which is largely due to water scarcity. **Human activities are the main contributors** because of **water overuse, pollution, and interference with the underground aquifers**.

## **SOLUTIONS**

### **Recharging aquifers/groundwater :**

**Groundwater retraction has tripled in the past five decades because of industrial and agricultural uses**. To avoid doing more damage, governments and organizations need to

**take measures to recharge aquifers or groundwater by undertaking projects** aimed at infiltrating or injecting excess surface water into the underground aquifers. This may include aspects such as restoration of watersheds and wetlands and the practice of green infrastructure which aims at reducing impervious surfaces.

### **Water re-use and Effective Water Treatment Technologies :**

Water re-use strategies can restore water scarcity in cities, schools, hospitals, and industries. The main strategies here include **reuse and recycling** and the use of zero-liquid discharge systems. **Zero-liquid discharge** system is whereby the water within a facility is constantly treated, used and reused again and again without being discharged into the sewer or other external water systems. The **non-potable water (grey water) can be used for washing cars, irrigating landscape, industrial processing and flushing the toilets.**

### **Desalination :**

**Desalination is the treatment of salt water.** The treatment process **aims at obtaining fresh drinking water from the salty ocean waters** with high salt concentrations that make them unsuitable for human consumption. However, it is a very expensive process.

### **Water Management :**

**Water management by the use of regulations and policies** can help reduce water scarcity. The regulations and policies can **address the water-related problems** including aspects such as **water reuse, water resource management, water rights, industrial water use, wetland restoration, domestic water supplies, water pollution,** and others.

### **Infrastructure Repair and Maintenance :**

One of the key ways of solving the problem of water scarcity can be through **infrastructure repair and maintenance of water channels. Leaking pipes and sewage systems normally lead to water wastage and contamination** respectively. If these infrastructures are left unattended to over time, the cumulative effects can create water shortages. Millions of liters of water are lost yearly in various regions of the world owing to leakages and sewer contamination, creating water shortages.

### **Water Conservation :**

It is an indirect approach of reducing water demands and it is usually critical in **maintaining the supply-demand balance.** The approaches can easily be implemented as they involve simple ways of saving water. For water conservation to be effective enough, it has to work hand in hand with water management policies.