

BSCS Biology An Ecological Approach

Chapter 23 Aquatic Ecosystems

Water, water everywhere nor any drop to drink"

-from Rhyme of the Ancient Mariner by Samuel Taylor Coleridge

Introduction

When we see the earth from afar, it appears bluish in color. This is because over 70% of the earth's surface is covered by water. This **hydrosphere** has a great stabilizing effect on the extremes of heat and cold. Of course, the oceans are the greatest storage reservoir of water on earth. Ultimately, most of the water that falls on land ends up in the ocean. Rivers and streams bring dissolved materials and also harmful human-caused materials to the sea where they remain for centuries. Aquatic ecosystems are also found on land in the form of ponds, streams, rivers, and lakes.

Freshwater Lakes and Ponds

Ponds are generally **shallow** and rich with life. This is because sunlight can reach the bottom of ponds and aquatic growth takes place on all levels. The food webs of ponds are rich in numbers and diversity. Producers, including **phytoplankton**, as well as standing and floating plants are consumed by consumers, some as small as **zooplankton**.

Lakes are larger than ponds and have much deeper areas that are generally cooler and have much less dissolved oxygen in the deep sections. Most food in a lake is produced in the upper layers. The layer that separates the oxygen-rich, warm upper section from the cooler oxygen-poor lower section is the **thermocline**. The thermocline does not remain stable all year. If lakes do not have an outlet, they will gradually turn salty through the process of **salinization**. Lakes also gradually fill up with **sediment**, eventually becoming bogs, marshes, meadows, and forests.

Streams and Rivers

Small flowing bodies of water are known as **brooks**. They combine to form **streams** which combine to form **rivers**. Rivers flow to the sea at the river's **mouth**. Each of the freshwater ecosystems has unique life forms. Brooks and streams are higher in **oxygen** content and are cooler in **temperature**. As we travel from the source to the sea, life in these flowing bodies of water generally becomes more diverse and rich. Stable stream environments fed by high volume springs offer excellent outdoor study areas for biologists to study **productivity**.

The Ocean Ecosystem

This biome is the largest habitat in the world. The ocean's **chemical** composition has remained relatively constant for many millions of years. This is because of the life processes. Although the oceans are great in size, the productivity of the ocean is limited to small areas. Deep water sections of the ocean, except those areas with deep water **vents**, are less productive. **Marine snow** provides the deep water section with nutrients from above. The coastal waters of the ocean are very productive. In some areas, **upwelling** provides nutrients for very productive fishing grounds. The **intertidal** zones are very rich in life, but conditions are harsh. Coastal areas of the ocean are often subject to human degradation due to pollution, habitat destruction, and over fishing.

Wetlands and Human Activity

Wetlands are extremely valuable habitats. They include **marshes, swamps, ponds,** and coastal **estuaries**. Wetlands are flooded with fresh water or salt water all or part of the year. Wetlands are very productive ecosystems. They are the source of many aquatic and freshwater and terrestrial food chains. Unfortunately, many wetland habitats have been altered or destroyed by human activities. **Eutrophication** can happen when wetlands are polluted with sewage, raising the nutrient level of the ecosystem.

Water Pollution

The ocean has been referred to as the ultimate dumping ground because most of all liquid wastes find their way there. Along the way, water pollution can literally kill rivers of most life. The process of eutrophication is accelerated when extra nutrients (such as from farm fertilizers and animal wastes) overwhelm the water source's ability to break down the wastes. As a result, oxygen is used up and the water becomes **anaerobic** and lifeless. Humans can help reduce pollution by installing efficient sewage and wastewater treatment plants, engaging in **biological pest control**, and implementing environmentally friendly crop raising practices such as **contour plowing**.