# B6. Watersheds and the Chesapeake Bay Ecosystem

The Significance of Watersheds and the Chesapeake Bay Ecosystem

Watersheds

A watershed is a critical concept in understanding how water flows across the Earth's surface. It is an area of land that drains into a particular body of water, such as a river, lake, or ocean. Watersheds consist of both living organisms, known as biotic factors, and non-living elements, known as abiotic factors, all working together to shape the health and dynamics of the watershed.
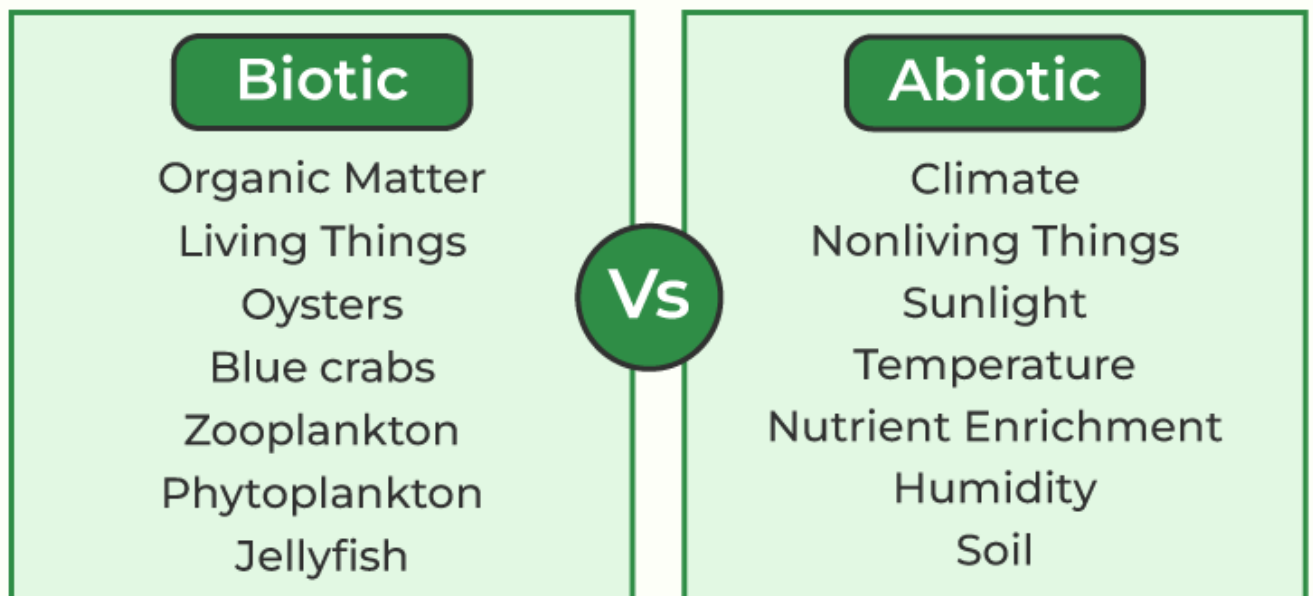
Biotics & Abiotic

1. **Abiotic Factors:**

   Abiotic factors are the non-living components of a watershed. They play essential roles in determining the health and function of the watershed. Abiotic factors include water supply, topography (the shape of the land's surface), landforms, geology (the type and structure of rocks beneath the land's surface), soils, sunlight, and air quality, including the availability of oxygen (O2). These abiotic factors influence the flow of water, nutrient availability, and the overall habitat within the watershed.

2. Biotic Factors:

Biotic factors encompass all living organisms within a watershed, from microscopic bacteria to large mammals. These organisms interact with one another and with their environment, playing vital roles in maintaining the health and balance of the ecosystem. Biotic factors include plants, animals, fungi, bacteria, and algae. They influence the nutrient cycle, the food web, and the overall ecosystem dynamics within the watershed.

a. Plants

Vegetation within the watershed plays a crucial role in stabilizing soil, preventing erosion, and filtering pollutants. Trees and plants also provide habitats and food for various animals.

b. Animals

Animal populations, including insects, fish, amphibians, reptiles, birds, and mammals, contribute to the ecosystem's biodiversity. They play roles as predators, prey, and scavengers, helping to control populations and nutrient cycling.

c. Microorganisms

Microscopic organisms such as bacteria and algae are fundamental in breaking down organic matter, recycling nutrients, and purifying water.

d. Fungi

Fungi contribute to nutrient cycling by decomposing organic matter and forming symbiotic relationships with plant roots.

Virginia's Watershed Systems

Virginia is home to a diverse range of watershed systems, each with its unique features and characteristics. These systems include streams, lakes, and wetlands, all of which contribute to the overall health and functionality of Virginia's environment.

1. Streams

Streams are critical components of Virginia's watershed systems. They serve as channels for the flow of water, transporting it from higher elevations to lower areas, eventually feeding into larger bodies of water, such as rivers and estuaries. Streams provide habitats for various aquatic species and play a significant role in regulating water flow and nutrient distribution.

2. Lakes

Lakes are another essential feature of Virginia's watershed systems. They act as reservoirs, storing water and serving as recreational areas. Lakes vary in size, depth, and water quality, making them diverse habitats for aquatic life. The health of lakes depends on various factors, including water quality and nutrient levels.

3. Wetlands

Wetlands are unique and valuable ecosystems found in Virginia's watersheds. They function as natural filters, improving water quality by trapping pollutants and excess nutrients. Wetlands also serve as critical breeding grounds for various species of birds, amphibians, and aquatic plants. Preserving wetlands is essential for maintaining the health of watershed systems.

The Chesapeake Bay

The Chesapeake Bay is a renowned estuary located along the East Coast of the United States. Estuaries are transitional zones where freshwater rivers meet and mix with saltwater from the ocean. The Chesapeake Bay plays multiple important functions and faces unique challenges.

Ecosystem Functions

The Chesapeake Bay serves as a critical habitat for numerous species of fish, shellfish, and other aquatic organisms. It also provides breeding grounds and feeding areas for migratory birds. The bay's nutrient-rich waters support a thriving ecosystem and a significant commercial and recreational fishing industry.

Water Quality Monitoring

Monitoring the water quality of the Chesapeake Bay is crucial for assessing its overall health. Parameters such as pH, temperature, salinity, oxygen levels, turbidity (clarity of the water), and the presence of various organisms are regularly monitored. These

measurements help scientists and policymakers understand the bay's condition and the impact of human activities.

Higher Elevations and Watersheds

Higher elevations in the Chesapeake Bay watershed act as natural dividers, separating watersheds that ultimately flow into the bay. This geographical feature influences the types and amounts of pollutants and sediments that reach the bay, making it a critical consideration in managing its health.
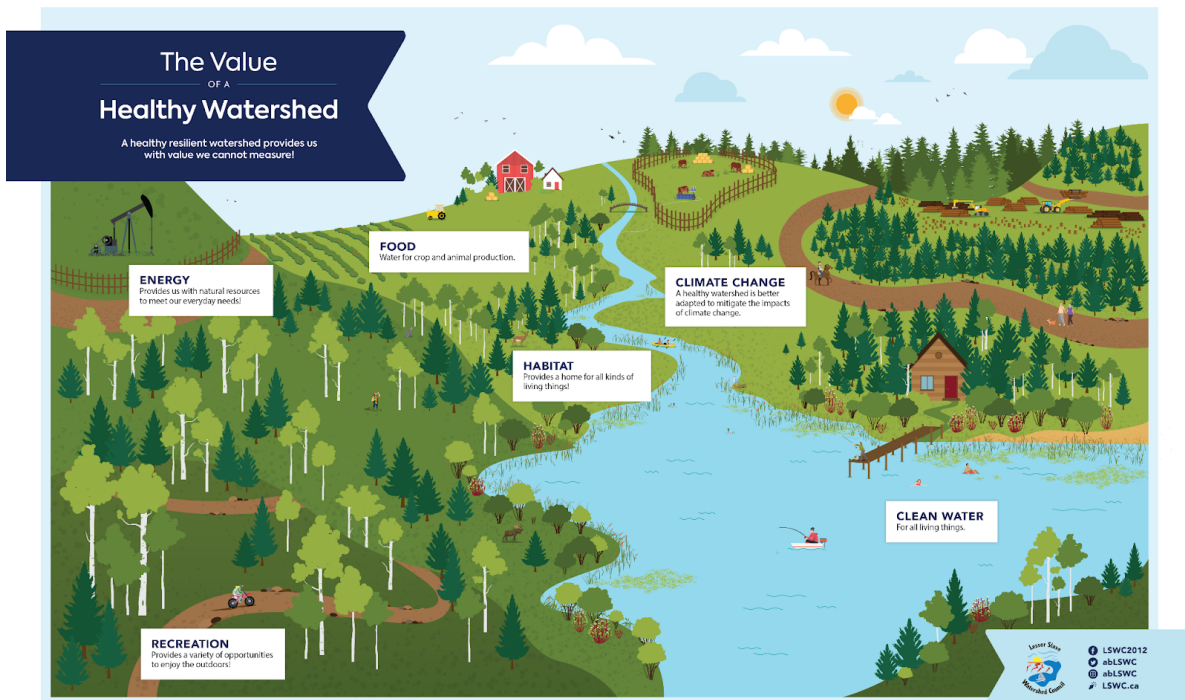
Influences on Watershed Health

The health of a watershed system is influenced by various factors, including natural processes, human activities, and the interaction between biotic and abiotic elements.

1. **Dry and Wet Lands**

   The balance between dry upland areas and wetlands is essential for regulating water flow and nutrient cycling within a watershed. Alterations to these landscapes, such as urbanization or deforestation, can disrupt the natural functioning of the watershed.

2. **Runoff and Pollutants**

   Urban development, agriculture, and construction activities can contribute to increased runoff of rainwater and the transport of pollutants, such as fertilizers and pesticides, into water bodies. This can degrade water quality and harm aquatic life.

3. **Freshwater and Saltwater - Chesapeake Bay**
   The mixing of freshwater from rivers and saltwater from the ocean in the Chesapeake Bay creates a unique ecosystem. Changes in salinity levels can impact the bay's ecological balance, and rising sea levels due to climate change can affect the bay's shoreline and habitats.

Human Activities and Decline

Human activities, including urbanization, deforestation, industrial pollution, and agriculture, have led to the decline of many watershed systems. Pollution, habitat destruction, altered water flow patterns, and invasive species can disrupt the natural balance of these ecosystems. Conservation efforts and sustainable land use practices are essential for restoring and preserving the health of our watersheds.

1. What is a watershed primarily composed of?
   a) Biotic factors only
   b) Abiotic factors only
   c) Both biotic and abiotic factors
   d) Inorganic matter only

2. Which of the following is an abiotic factor in a watershed?
   a) Fish
   b) Soil
   c) Trees
   d) Algae

3. What is the primary role of streams in a watershed system?
   a) Providing habitats for terrestrial animals
   b) Transporting water from higher elevations
   c) Storing excess water during heavy rains
   d) Filtering pollutants from the water

4. Which of the following is NOT a feature of Virginia's watershed systems?
   a) Streams
   b) Lakes
   c) Mountains
   d) Wetlands

5. What is the Chesapeake Bay primarily known for?

 a) Serving as a transportation route

 b) Being a source of drinking water for nearby cities

 c) Its ecological significance as an estuary

 d) Hosting large industrial ports

6. Which of the following is NOT a parameter monitored for the Chesapeake Bay's water quality?

 a) pH

 b) Oxygen levels

 c) Elevation

 d) Turbidity

7. What separates different watersheds that drain into the Chesapeake Bay?

 a) Geographical location

 b) Underground tunnels

 c) Higher elevations

 d) Man-made barriers

8. What is the function of wetlands within watershed systems?

 a) Filtering pollutants

 b) Transporting water

 c) Generating electricity

 d) Storing excess nutrients

9. What type of human activity can contribute to water pollution in watersheds?

 a) Planting trees

 b) Constructing wetlands

 c) Implementing sustainable agriculture practices

 d) Runoff from urban areas

10. Why is it crucial to protect and preserve watersheds?

 a) To increase urbanization

 b) To maintain water scarcity

 c) To safeguard ecosystems and water quality

 d) To promote industrial pollution

ANSWERS & EXPLANATIONS

1. c) Both biotic and abiotic factors
   - A watershed is primarily composed of both living (biotic) and non-living (abiotic) factors.

2. b) Soil
   - Soil is an example of an abiotic factor in a watershed.

3. b) Transporting water from higher elevations
   - Streams primarily transport water from higher elevations to lower areas in a watershed.

4. c) Mountains
   - Mountains are not listed as features of Virginia's watershed systems.

5. c) Its ecological significance as an estuary
   - The Chesapeake Bay is primarily known for its ecological significance as an estuary.

6. c) Elevation
   - Elevation is not a parameter monitored for the Chesapeake Bay's water quality.

7. c) Higher elevations
   - Higher elevations naturally separate different watersheds that drain into the Chesapeake Bay.

8. a) Filtering pollutants
   - Wetlands act as natural filters, improving water quality by trapping pollutants.

9. d) Runoff from urban areas
   - Runoff from urban areas can contribute to water pollution in watersheds.

10. c) To safeguard ecosystems and water quality
   - Protecting and preserving watersheds is crucial to safeguard ecosystems and maintain water quality.