

Chapter 7 Notes: Aquatic Ecosystems

Section 1: Freshwater Ecosystems

- The types of organisms in an aquatic environment are mainly determined by the water's _____ – the amount of dissolved salts in water.
- As a result, aquatic ecosystems are divided into _____ and _____ ecosystems.
 - o Fresh water – ponds, lakes, rivers, streams, **wetlands** (areas _____ under water)
- Approximately _____ of Earth's surface is covered by water, but only about _____ of that is freshwater.
- Despite covering only _____, freshwater ecosystems are home to _____ of all fish species worldwide.
- However, freshwater _____ is low down on environmental priorities. Marine and terrestrial ecosystems tend to get far more attention.
- Characteristics of Aquatic Ecosystems
 - o Factors such as _____, sunlight, oxygen, _____, and the nature of the bottom determine which organisms live in which areas of the water
 - Example: Most photosynthetic organisms live on or near the _____

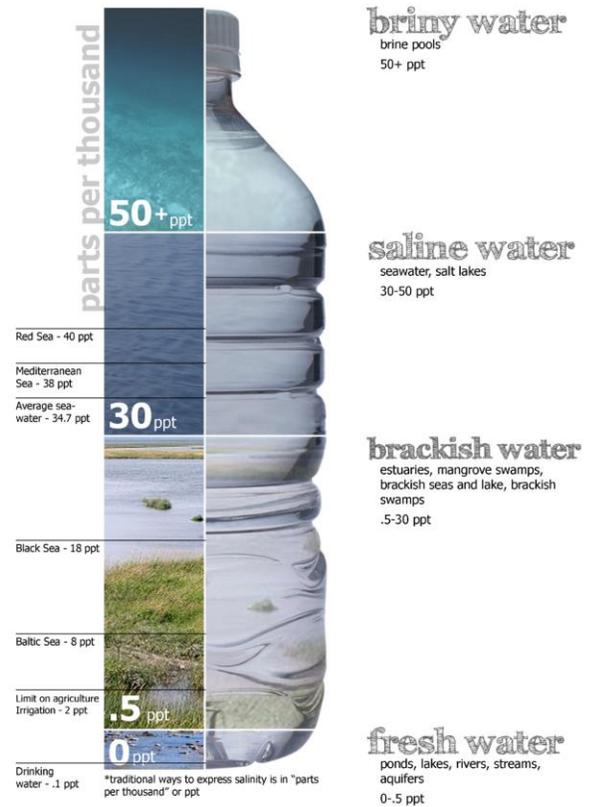
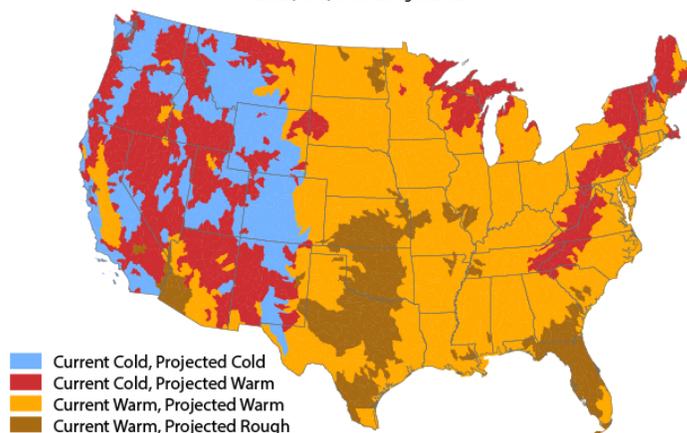


Figure 1. Projected Impact of Unmitigated Climate Change on Potential Freshwater Fish Habitat in 2100

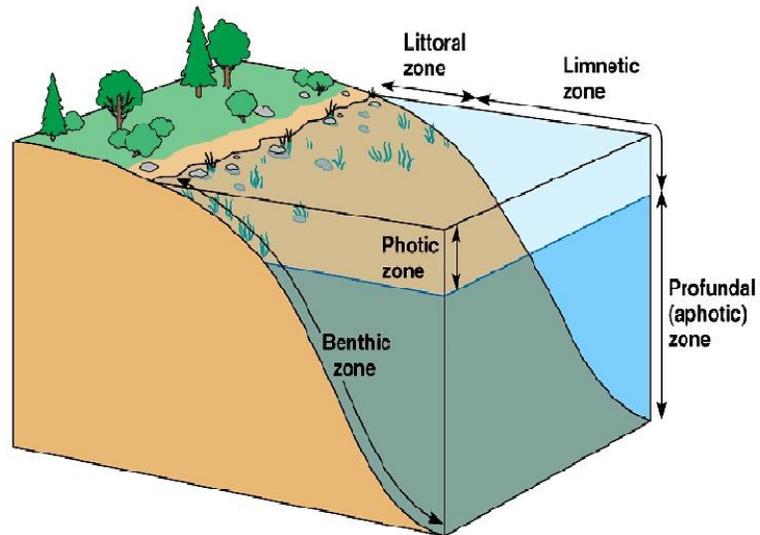
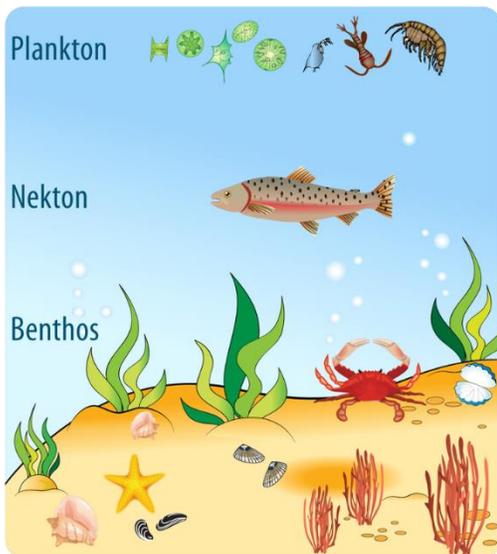
Change in distribution of areas where stream temperature supports different fisheries under the Reference scenario using the IGSM-CAM climate model. Results are presented for the 8-digit hydrologic unit codes (HUCs) of the contiguous U.S.



For more information, visit EPA's "Climate Change in the United States: Benefits of Global Action" at www.epa.gov/cira.

Example: Temperature changes in freshwater ecosystems in the US

- Aquatic organisms are grouped by _____ and by their adaptations.
 - **plankton** – mostly microscopic organisms that cannot swim against currents (“_____”)
 - Example: Drifting algae (aka “_____”) are the food _____ for most aquatic ecosystems
 - Drifting animals (microscopic or as large as jellyfish) are called “_____”
 - **nekton** – free - _____ organisms
 - Examples: fish, whales, dolphins, sharks
 - **benthos** – _____-dwellers
 - Examples: _____, worms, and barnacles
 - Many live attached to hard surfaces or _____ into softer sediments
 - These bottom-dwellers also include _____, like bacteria and water _____.



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- Lakes and Ponds

- Lakes, ponds, and wetlands can form naturally where _____ reaches the Earth’s surface
- Artificial ponds/lakes can be created by humans and some animal species (like _____)
 - Dams and reservoirs are used by humans for _____, irrigation, water storage, and _____
- Life in a Lake
 - **Littoral Zone** – nutrient-rich area near the _____ where aquatic life is diverse and abundant
 - Examples: Plants like cattails, _____, water lilies are rooted here
 - **Limnetic Zone** – open water, no _____ plants
 - Here phytoplankton make their own _____ by photosynthesis
 - **Benthic Zone** – the _____ of a pond or lake, which is inhabited by decomposers, insect larvae and _____.

- Examples of Organism Adaptations in Lakes and Ponds:
 - _____ use the hairs under their bodies to trap surface air so they can breathe during their dives for food
 - Barbels help _____ sense food as they swim over dark lake bottoms
 - In regions where lakes partially freeze in winter, amphibians _____ partway into the mud to hibernate.
 - _____
- How Nutrients Affect Lakes:
 - Nutrients in aquatic ecosystems determine the _____ of plant and algal growth.
 - **eutrophication** is an _____ in the amount of nutrients.
 - Lakes with large amounts of _____ and plant growth from excessive nutrients are *eutrophic lakes*.
 - As the plants and algae multiply, the number of _____ feeding on the decaying organisms also grows. These bacteria use the _____ dissolved in the lake water. Eventually, the reduced amount of oxygen _____ organisms.
 - While lakes naturally become eutrophic over time, this process can be _____ by **runoff** – precipitation that can carry pollutants like fertilizers from land into bodies of water.

- Freshwater Wetlands

- *Freshwater wetlands* are areas of land, with special soils and plants, that are covered with fresh water for at least part of the year.
- Two main types: marshes and swamps
 - *Marshes* contain nonwoody plants, like cattails
 - *Swamps* contain woody plants, like flood-tolerant trees and shrubs
- Wetlands perform several important environmental functions:
 - Acts as filters or sponges because they absorb and remove pollutants from the water that flows through them → improving water quality
 - Controls flooding by absorbing extra water when rivers overflow → protecting farms and urban/residential areas from damage
 - Buffers shorelines against erosion
 - Provides spawning grounds and habitat for commercially important fish and shellfish
 - Provides a home for native and migratory wildlife, including ducks and blue herons
 - Its vegetation traps carbon that would otherwise be released as carbon dioxide and contribute to global temperature rises
 - Provides recreational areas for fishing, birdwatching, hiking, canoeing, photography, and painting
- Map of Wetlands
- Marshes
 - Most freshwater wetlands in the US are located in the Southeast.
 - The Florida Everglades is the largest freshwater wetland in the United States.
 - Freshwater marshes occur on low, flat lands and have few, if any, woody trees or plants.
 - Plants in marshes consist of reeds, rushes, and cattails in shallow waters that are rooted to the nutrient-dense bottom sediments.
 - The benthic zones of marshes are nutrient-rich and contain plants, algae, many types of decomposers, and scavengers.
 - Waterfowl, such as grebes and ducks, have flat beaks adapted for sifting through the water for fish and insects.
 - Water birds have spear-like beaks that they use to grasp small fish and to probe for frogs buried in the mud.
 - Marshes are also home to migratory birds from temperate and tropical habitats.
 - Salinity of marshes varies. Some have freshwater, some have slightly salty (brackish water). Salt marshes have water that is as salty as ocean water.
- Swamps
 - Swamps occur on flat, poorly drained, wooded land, often near streams.
 - The species of trees and shrubs in a swamp depend on the salinity of the water and the climate of the area.

- Freshwater swamps include acidic *bogs*, filled with sphagnum or peat moss, which are found in colder climates and cypress swamps, which are found in warmer areas.
 - These, along with alkaline *fens*, are the ideal habitat for many amphibians, such as frogs because of the continuously moist environment..
 - Swamps also attract birds, like wood ducks that nest in hollow trees near or over the water.
 - Reptiles, like the American alligator are the major predators of swamps and will eat almost any organism that crosses their path.
 - Human Impact on Wetlands
 - Wetlands were previously considered to be wastelands that provided breeding grounds for disease-carrying insects
 - Many have been drained, filled, and cleared for farms, residential and commercial development
 - For example, the Florida Everglades once covered 8 million acres of south Florida, but now covers less than 2 million acres.
 - Now, many wetlands are federally and internationally protected and most US states now prohibit the destruction of certain wetlands.
- Rivers
 - Rivers can originate from underground springs, snow melt in the mountains, or where smaller streams merge together.
 - At its headwaters, a river is usually cold and full of oxygen and runs swiftly through a shallow riverbed.
 - Further along, it becomes warmer, wider, slower, and contains more vegetation and less oxygen.
 - Life in a River
 - Near the headwaters, mosses anchor themselves to rocks by using rootlike *rhizoids*.
 - Trout and minnows are also adapted to the cold, oxygen-rich waters
 - Trout are powerful swimmers and have streamlined bodies that present little resistance to the strong current.
 - Downstream, in the calmer waters, plants such as the crowfoot set roots in the river's rich sediment.
 - Fish such as catfish and carp thrive where the water slows and deepens.
 - Rivers in Danger
 - People draw water from rivers to use in homes and manufacturing.
 - People also use rivers to dispose of their sewage and garbage.
 - Runoff from the land deposits pesticides and other poisons into rivers and coats riverbeds with toxic sediments
 - Dams alter the ecosystems in and around rivers.