Aquatic Biomes

Nature of Aquatic Systems

- Aquatic biomes cover approximately 70% of Earth's surface.

What vital roles do aquatic systems play ?

- Increase biodiversity
- Effects climate
- Increases biological productivity
- Effects biogeochemical cycles
- Provides fish and shellfish
- Minerals
- Recreation
- Transportation Routes
- Many more goods and services

Aquatic Life Zones

Aquatic life zones are classified into two major types:

- Saltwater/Marine
  - Oceans
  - Estuaries (Actually a mix of freshwater and saltwater – Known as Brackish)
  - Coastal Wetlands
  - Shorelines
  - Coral Reefs
  - Mangrove Forests

- Freshwater – Less than 1% salt concentration
  - Lakes
  - Ponds
  - Rivers
  - Streams
  - Inland Wetlands

- Aquatic biomes are often determined by salinity and depth of the water, as opposed to precipitation and temperature (terrestrial/land biomes).

Salinity

- The salinity of ocean water is 30 parts per thousand, whereas the salinity of freshwater is 0.5 parts per thousand. Water that has a reading in between these #s is called brackish (delta, estuary).

Salinity

- There are several hyper-saline lakes including the Great Salt Lake in Utah and Mono Lake in California. The salinity is measured at 40 parts per thousand.

Sunlight

- Aquatic biomes are also impacted by the amount of sunlight that can penetrate the water.
  - Photic = top layer; light can penetrate (plants, consumers)
  - Aphotic = water below photic zones (consumers)
  - Benthic = bottom of the body of water (scavengers, decomposers)

    - Some bodies of water may not have aphotic zones!

Freshwater Biomes

Type of Standing Water Ecosystem	Abiotic Factors	Biotic Factors
Lake	Deepest; aquifers possible; may have aphotic zone	Floating algae; shoreline plants; complex food webs
Pond	Fed by rainfall; may be seasonal; photic benthic zone	Plants/algae in benthic zone; simpler food web (than lake)
Marsh	Shallow; saturated soil; hypoxic; FW, SW, brackish; tidal	Roots under water, leaves above water; water foul, benthic animals; grasses & cattails
Swamp	Low drainage; hypoxic; saturated soil; flat	Large trees/shrubs; Cyprus, Willow, dogwood
Bog	Acidic soil; decay slow; inland; little water flow; carbon stored in dead plants	Peat, sphagnum moss; 'carnivorous' plants; insects

Wetlands

- Areas of land flooded with water at least part of the year
- Include freshwater marshes (non-woody plants), swamps (woody plants), bogs, and fens

: Rivers and Streams

Bodies of surface water that flow downhill, eventually reaching an ocean or inland sea

Delaware Water Gap

River/Stream Organisms

Pond/Lake Organisms

Adaptations and Change

- Organisms that live in moving freshwater ecosystems have adaptations for survival

Marine Biome

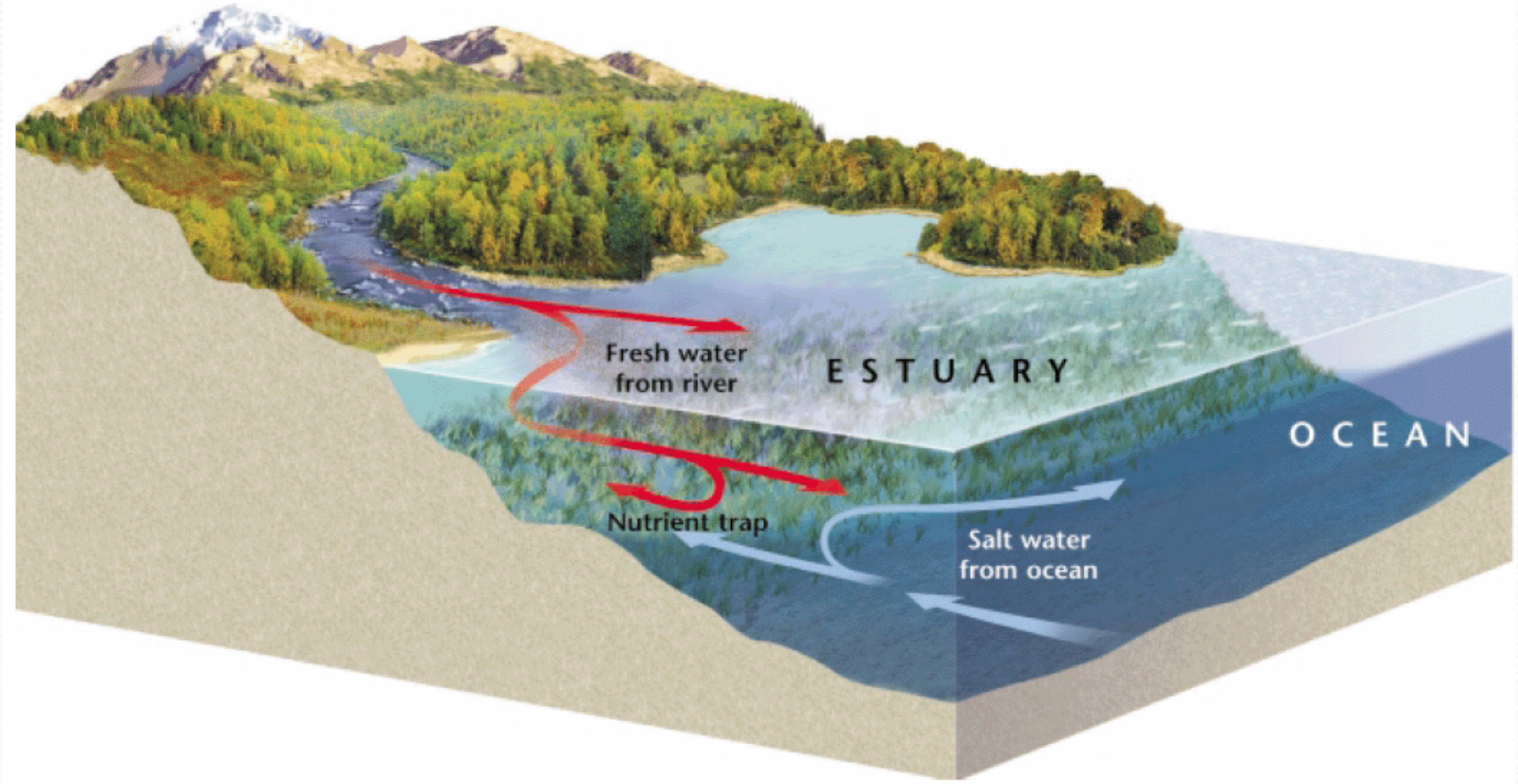
- All of Earth's oceans are connected, but not all of the water is the same (sunlight exposure, temperature, density, salinity, etc.)
- Also characterized by vertical zones (photic [200 m depth], aphotic, and benthic).

- **Estuary**: Where freshwater of a river meets saltwater of the ocean.

Estuaries

- When fresh water meets salt water
  - currents form
  - nutrient-rich mud to falls to the bottom making in available to producers.

- Estuaries are very productive
  - they constantly receive nutrients from the river and ocean
  - surrounding land protects the estuaries from the harsh force of ocean waves


Fresh water
from river
ESTUARY
OCEAN
Nutrient trap
Salt water
from ocean

Plants and Animals of Estuaries

- Estuaries support many marine organisms
  - plenty of light for photosynthesis
  - plenty of nutrients for plants and animals

- Light and nutrients support
  - large populations of rooted plants
  - plankton
  - plankton feed fish
  - fish eaten by larger animals such as dolphins.

- Oysters and clams live anchored to rocks
  - feed by filtering plankton from the water

Coral Reefs

- **Coral reefs** - limestone ridges found in tropical climates and composed of coral fragments that are deposited around organic remains

- Coral reefs among the most diverse ecosystems on Earth
  - thousands of species of plants and animals live in the cracks and crevices of coral reefs

- Corals are predators that use stinging tentacles to capture small animals, such as zooplankton, that float or swim close to the reef

Coral Reefs

- Corals live only in clear, warm salt water where there is enough light for photosynthesis.

Marine – Open Ocean

- There are few plants in the open ocean.
- Animal in the open ocean are streamlines for swimming long distances.
- Pollution and over fishing are major threats

Marine Biome

- Also has horizontal zones (intertidal, neritic, oceanic [500-11,000 m])
  - Neritic: Coastal waters; lots of photosynthesis; majority of ocean life lives here. However, dead zones occur. Why?!
- Reefs can be made of kelp (cold water) or coral (warm water) and are found on continental shelves.
- Intertidal zone experiences a variety of conditions due to tides; the organisms have to have special adaptations for survival!

Open Ocean: Separated into two zones:

- Surface Zone: The first few hundred meters deep of the ocean (where light penetrates).
- Deep Zone: Below the surface zone (totally dark and home to many BIZZARE organisms).

Many polar marine animals are migratory.

They are adapted to cold weather usually by storing blubber.

- Disruption for oil drilling and global warming are major threats.

Plants and Animals of Oceans

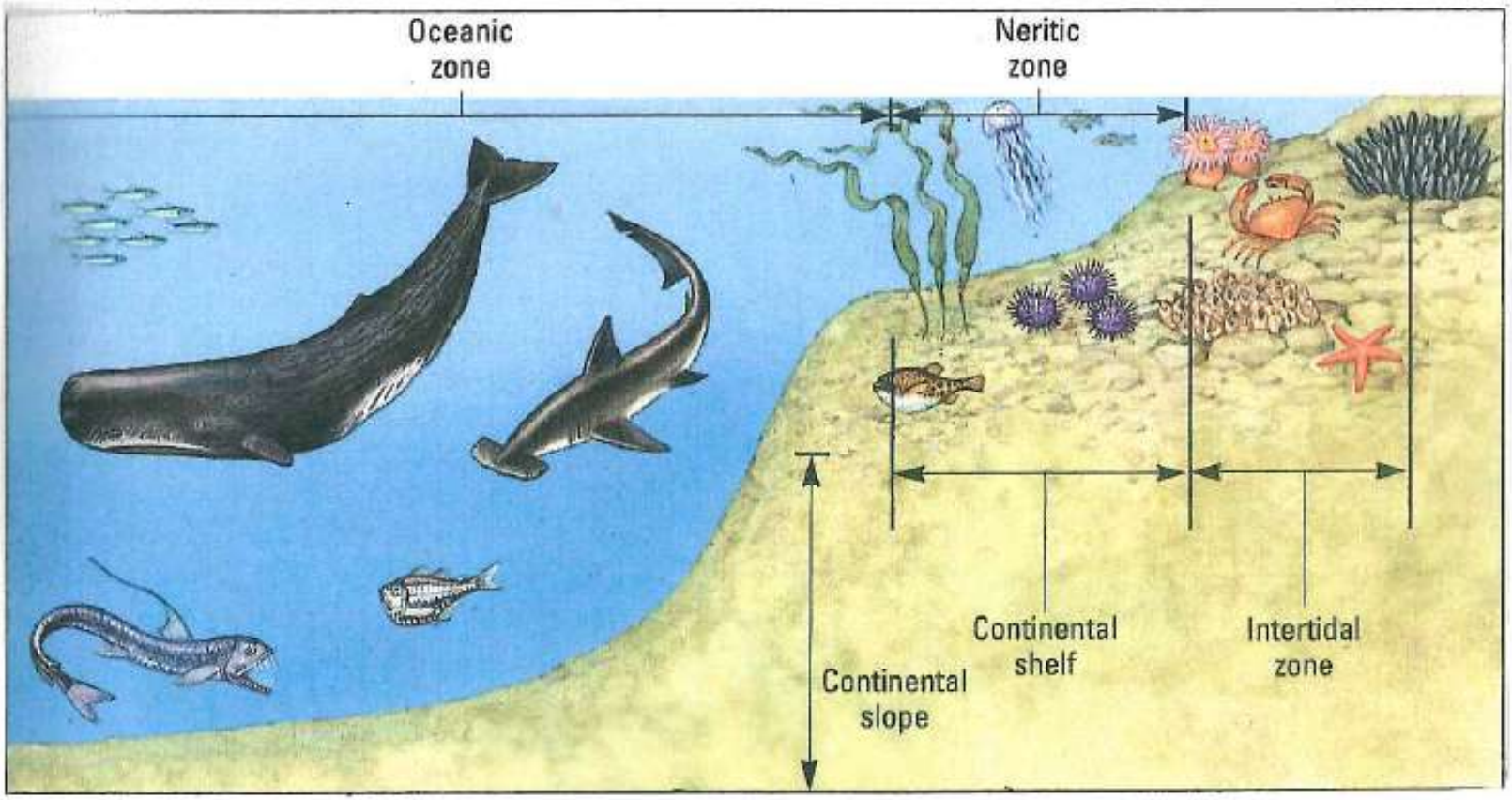
- In the open ocean, phytoplankton grow only in areas where there is enough light & nutrients
  - one of the least productive of all ecosystems

- The sea's smallest herbivores are zooplankton
  - include jellyfish and tiny shrimp
  - live near the surface with the phytoplankton they eat

- Fish and marine mammals (whales) feed on the plankton

Plants and Animals of Oceans

- Deep ocean no sunlight
  - most food at the ocean floor consists of dead organisms that fall from the surface
- Decomposers, filter feeders & the organisms that eat them live in the deep areas of the ocean
- The types of organisms that may be found in the layers of the ocean at various depths is dependent on available sunlight


Oceanic zone
Neritic zone
Continental slope
Continental shelf
Intertidal zone