AP Environmental Systems Ch.8 Notes

**Aquatic Biodiversity**

**Core Case Study: Why Should We Care about Coral Reefs?**

* Biodiversity
* Coral reefs form in clear, warm coastal waters in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas
  + Tiny animals (polyps) and algae have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ relationship
  + Polyps secrete \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ shells, which become coral reefs
* Provide important \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ services
* Vulnerable to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ocean temperatures leading to coral \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_ algae and thus the polyps
  + Increasing ocean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8-1 What Is the General Nature of Aquatic Systems?**

* Saltwater and freshwater aquatic life zones cover almost \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the earth’s surface, with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dominating the planet
* Key factors determining biodiversity in aquatic systems
  + Temperature, dissolved \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ content, availability of \_\_\_\_\_\_\_\_\_\_, and access to \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ necessary for photosynthesis

Most of the Earth Is Covered with Water

* Saltwater – \_\_\_\_\_ of the earth’s surface
* Global ocean divided into four areas
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Freshwater – \_\_\_\_\_ of the earth’s surface
* Aquatic life zones
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ life zones (marine life zones)
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forests
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ life zones
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Inland \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Aquatic Species Drift, Swim, Crawl, and Cling

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – drifting
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Primary producers for most aquatic food webs
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Tiny photosynthetic bacteria
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Secondary consumers
    - Single-celled to large invertebrates like jellyfish
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Strong swimmers – fish, turtles, whales
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Bottom dwellers – oysters, sea stars, clams, lobsters, crabs
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Mostly bacteria
* Key factors in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of organisms
  + Temperature
  + Dissolved oxygen content
  + Availability of food
  + Availability of light and nutrients needed for photosynthesis
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Degree of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in water
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ photosynthesis

**8-2 Why Are Marine Aquatic Systems Important?**

* Saltwater ecosystems
  + Provide major ecosystem and economic services
  + Are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reservoirs of biodiversity

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Provide Vital Ecosystem and Economic Services

* Estimated \_\_\_\_\_ trillion per year in goods and services
* Three major life zones:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Warm, nutrient rich, shallow; shore to edge of continental shelf; usually high NPP from ample sunlight and nutrients
  + \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
  + Ocean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Estuaries and Coastal Wetlands Are Highly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Where rivers meet the sea
* Coastal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Coastal land covered with water all or part of the year
* Seawater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with freshwater
* Very productive ecosystems with high \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ levels
* Examples:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Shores Host Different Types of Organisms

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
  + Area of shore between \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ tides
  + Rocky shore
  + Sandy shore, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ beach
* Organism adaptations necessary to deal with daily \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ changes
* What is the importance of sand dunes in this type of ecosystem?

Coral Reefs Are Amazing Centers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ equivalent of tropical rain forests
* Reefs are being destroyed and damaged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Ocean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Oceans absorb \_\_\_\_\_\_\_\_\_\_
  + CO2 reacts with ocean water to form a weak acid that decreases levels of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ions (CO32-) needed to form coral

The Open Sea and the Ocean Floor Host a Variety of Species

* Three \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zones of the open sea
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Nutrient levels \_\_\_\_\_\_\_\_\_\_
    - Dissolved oxygen levels \_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ brings nutrients from below
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Dimly lit
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and smaller fishes
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Dark and cold
    - High levels of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolved oxygen
    - Deposit feeders
    - Filter feeders
* NPP low in the open sea
  + Except in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas

**8-3 How Have Human Activities Affected Marine Ecosystems?**

* Human activities
  + Threaten aquatic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Disrupt \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ services provided by saltwater systems

Human Activities Are Disrupting and Degrading Marine Systems

* Major threats to marine systems include:
  + Coastal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; use of fishing trawlers
  + Runoff of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ source pollution
  + Point source \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ destruction
  + Introduction of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species
  + Pollution of coastal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Case Study: The Chesapeake Bay – an Estuary in Trouble**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ estuary in the U.S.
  + Polluted since \_\_\_\_\_\_\_\_\_\_
* Large population increase
* Point and nonpoint sources raised \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Phosphate and nitrate levels too \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Excess \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from runoff and decreased vegetation
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a keystone species, greatly reduced
* \_\_\_\_\_\_\_\_\_\_: Chesapeake Bay Program
  + Integrated coastal management with local, state, and federal governments, as well as citizens’ groups
* \_\_\_\_\_\_\_\_\_\_ update:
  + \_\_\_\_\_ years and \_\_\_\_\_ billion
* Program \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to meet goals

**8-4 Why Are Freshwater Ecosystems Important?**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ecosystems
  + Provide major ecosystem and economic services
  + Are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reservoirs of biodiversity

Water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in Some Freshwater Systems and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in Others

* Standing (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) bodies of freshwater
  + Lakes
  + Ponds
  + Inland wetlands
* Flowing (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) systems of freshwater
  + Streams
  + Rivers
* Lakes have four zones based on depth and distance from shore
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Near shore where rooted plants grow; high biodiversity
    - Turtles, frogs, crayfish, some fish
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Open, sunlight area away from shore; main photosynthetic zone
    - Some larger fish
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Deep water too dark for photosynthesis
    - Low oxygen levels
    - Some fish
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Decomposers
    - Detritus feeders
    - Some fish
    - Nourished primarily by dead matter

Some Lakes Have More Nutrients Than Others

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lakes
  + Low levels of nutrients and low NPP
  + Very clear water
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lakes
  + High levels of nutrients and high NPP
  + Murky water with high turbidity
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ eutrophication of lakes from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ input of nutrients

Freshwater Streams and Rivers Carry Large \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of Water

* Surface water
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Downward flow of water from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Three aquatic life zones
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Shallow, cold, clear, swiftly flowing
    - High dissolved oxygen
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Wider, deeper, warmer streams
    - More turbid
    - Less dissolved oxygen
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ zone
    - Wide, deep rivers
    - Broad, flat valleys

**Case Study: River Deltas and Coastal Wetlands**

* Coastal deltas, mangrove forests, and coastal wetlands provide natural \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ against storms
* Dams and levees reduce sediments in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of New Orleans
* Rising sea levels will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ coastal areas

Freshwater Inland Wetlands Are Vital Sponges

* Inland wetlands
  + Lands located away from coasts that are covered with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ all or part of the time
* Include:
  + Marshes, swamps, prairie potholes, floodplains, and arctic tundra
* Provide free ecosystem and economic services
  + Filter and degrade \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ wastes
  + Reduce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and erosion
  + Help to replenish streams and recharge groundwater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Biodiversity
  + Food and timber
  + Recreation areas

**8-5 How Have Human Activities Affected Freshwater Ecosystems?**

* Human activities
  + Threaten and disrupt ecosystem and economic services provided by freshwater lakes, rivers, and wetlands

Human Activities Are Disrupting and Degrading Freshwater Systems

* Dams and canals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the flows of rivers
  + \_\_\_\_\_\_ of the world’s largest rivers
* Flood-control \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ aquatic habitats and alters wetlands
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pollute water
* Many wetlands have been \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for human purposes

Three Big Ideas

* Water dominates the planet
  + Saltwater and freshwater aquatic life zones cover almost three-fourths of the earth’s surface
* The earth’s aquatic systems provide important ecosystem and economic services
* Human activities threaten biodiversity and disrupt ecological and economic services provided by aquatic systems

Tying It All Together: Coral Reefs and Sustainability

* Coral reefs:
  + Thrive on solar energy
  + Participate in nutrient cycling
  + Sustain aquatic biodiversity
* In nature, everything is connected
* How can we can reduce harm to coral reefs?