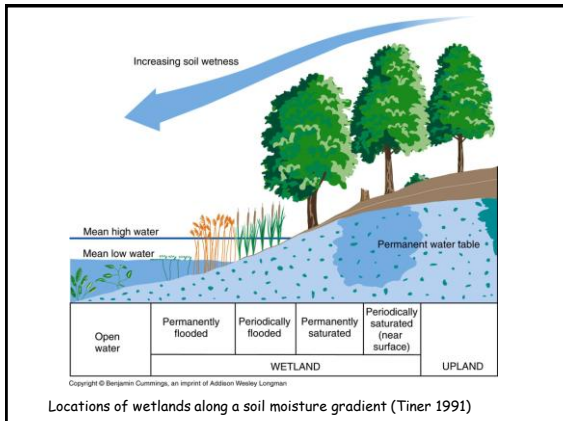




Aquatic Ecosystems II: Freshwater Ecosystems

- **Wetlands**
 - **What is a wetland?**
 - Wasteland?
 - Make up only 5% of land surface of the lower 48 states (12% if AK and HI included)
 - Difficult to define - Where does it start? Where does it end?
 - **Characteristics**
 - 1) the presence of water @ or near the surface
 - 2) soils that differ from those of adjacent upland areas
 - 3) vegetation adapted to wet conditions
- Halfway world btw aquatic and terrestrial ecosystems (transitional)
 - Classification conflicts - (involve more politics than science)
 - Becomes off-limits to development



Aquatic Ecosystems II: Freshwater Ecosystems

- **Types of Wetlands**
 - Three major groups:
 - **Basin wetlands**
 - Developed in shallow basins ranging from upland topographic depressions to shallow filled-in lakes and ponds
 - **Riverine wetlands**
 - Developed along shallow periodically flooded banks of rivers and streams
 - **Fringe wetlands**
 - Occur along coastal areas of larger lakes and oceans (i.e., mangrove communities - tropical marine environments)
 - Generally separated by direction of water flow
 - Vertical (bw), unidirectional (rw), or both (fw)
 - Flow carries nutrients (in-out) and modifies habitat (physical)

Aquatic Ecosystems II: Freshwater Ecosystems

- **Types of Wetlands**
- **Many sub-groups (deep or shallow):**
 - **Marshes** → emergent herbaceous vegetation dominates
 - **Swamps** → woody vegetation dominates
 - **Riparian woodlands** → occasionally or seasonally flooded by river waters (dry most of the year)
 - **Vernal pools** → flooded during winter and spring (dry summer and fall)
 - **Peatlands (mires)** → water retained by partially decayed organic matter accumulations
 - (i.e., fens, bogs, blanket mires or moors)

Aquatic Ecosystems II: Freshwater Ecosystems

- **Wetland Structure**
 - Influenced by hydrology
 - Physical aspect
 - Source (precipitation, surface or subsurface flow), direction, kinetic energy of water, chemistry, etc.
 - Duration and frequency
 - Hydroperiod (including depth and season of flooding)
 - Varies with wetland type
 - Basin wetlands → long hydroperiod
 - Riverine wetlands → short period of flooding (peak stream flow)
 - Fringe wetlands → short and regular hydroperiod (influenced by wind and lake waves)

Aquatic Ecosystems II: Freshwater Ecosystems

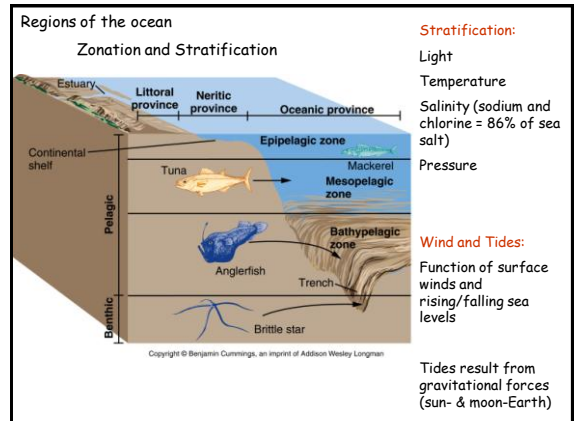
- **Wetland Functions**
 - Habitat
 - Growth of living matter
 - Diversity of wetland plants (vegetation)
 - Hydrologic
 - Water storage (groundwater recharge and discharge)
 - Flow velocity (flood control)
 - Water Quality
 - Transformation of nutrients (trapping of sediment)
 - Influence on biogeochemical processes (pollution control)
 - Value within itself
 - Surrounding ecosystems (ecological & functional values)
 - People (social, aesthetic, & economic values)

Aquatic Ecosystems III: Saltwater Ecosystems



Aquatic Ecosystems III: Saltwater Ecosystems

- **Stratification (2 main layers)**
 - **Pelagic region** → whole body of water
 - Vertical layers
 - Photic (up to 200m) - sharp gradients of light
 - Mesopelagic (up to 1000m) - little light penetration
 - Bathypelagic (2000-4000m or 100-700m) - darkness
 - Horizontal layers
 - Neritic province (water that overlies continental shelf)
 - Oceanic province
 - » Abyssal pelagic or bathypelagic province
 - » Hadalpelagic
 - **Benthic region** → sea bottom
 - Bathyal (up to 4000m), Abyssal (up to 6000m), and Hadal (up to 10,000) Zones



Aquatic Ecosystems III: Saltwater Ecosystems

- **The Open Sea**
 - 70% of the Earth's surface
 - Interconnected (currents, tides, waves, salinity)
 - Only a small portion (volume) receives light
 - Deep waters (up to 7 km in some areas)
 - Darkness and dilute solution = low nutrients
 - Limited production
 - Nutrient reserves in upper layers of water are limited
 - Limited circulation of deep water to upper layer
 - Most productive → shallow coastal waters and areas of upwelling (mixing)
 - Copepods are major herbivores and become the link between trophic levels (energy flow)
 - Bacteria and protists (heterotrophic and photosynthetic) make up half of the biomass → important role in energy flow in pelagic system

Aquatic Ecosystems III: Saltwater Ecosystems

- **Rocky Shores**
 - Places where the sea meets the land
 - Marked by zone of black algal growth (upper & lower)
 - Black zone marks the littoral (submerged daily)
 - Barnacles, periwinkles, mussels, algae
 - Sublittoral (only uncovered during spring tides)
 - Seaweeds, Irish moss, starfish
 - Zonation of life results from alternate exposure and submergence of the shore by the tides
 - Distribution and diversity is influenced by disturbance, from wave action, competition, herbivory and predation

Aquatic Ecosystems III: Saltwater Ecosystems

- Sandy Shorelines and Mudflats
 - Appear lifeless at low tide, but conditions beneath sand and mud are more amenable to life than rocky shores
- Zonation hidden beneath the surface
- Energy base is organic matter (bacterial decomposition)
- Important sites for biogeochemical cycling, supplying nutrients to offshore waters
 - Bacteria are basic consumers (also become a major food source for filter-feeding and deposit-feeding organisms (collectors))
- Part of larger coastal ecosystems: marsh, estuary, and coastal waters

Aquatic Ecosystems III: Saltwater Ecosystems

- Coral Reefs
 - Nutrient rich oases in nutrient poor tropical seas
- Complex ecosystems
 - Anthozoan corals
 - Endozoic dinoflagellate algae (symbiotic)
 - Coralline algae
- Nutrients recycled within the system
 - Function as nutrient sinks
- Among the most productive systems in the world
 - High diversity of colorful invertebrates & vertebrates

Aquatic Ecosystems III: Saltwater Ecosystems

- Estuaries
 - Where fresh water meets the sea (marshes and swamps)
- Nature and distribution of biota determined by salinity
 - Salinity declines from the mouth up to the river to the headwaters
 - Marine species will also decline and give way to FW species
- Serves as a nursery for marine organisms
 - Young can develop protected from predators and competitors
 - Vertical mixing between saltwater and freshwater allows for re-circulating of nutrients btw organisms and bottom sediments

Aquatic Ecosystems III: Saltwater Ecosystems

- Coastal Wetlands
 - Tidal Marshes
 - Dominated by salt-tolerant grasses
 - Flooded daily by tides (nutrient supply & waste removal)
 - Distinctive zonation from high marsh to low marsh
 - Mangrove Swamps
 - Tidal marshes in tropical regions
 - Shallow widely-spreading roots
 - Pronounced zonation from seaward fringe to level of high spring tides