Aquatic Ecosystems

What is an aquatic ecosystem?

- Aquatic ecology is the study of water based ecosystems.
- They are an area of water, in which 'significant' biological activity can occur
- This definition excludes most groundwater systems
- Aquatic ecosystems can involve flowing or still water, and can be fresh or saline

How many types are there?

- Several, depending on how close we look!
  - Freshwater (Limnology)
    - Lakes (lentic)
    - Rivers (lotic)
  - Groundwater
  - Brackish water (inter-tidal)
  - Marine water (Oceanography)
  - Anthropogenic waters (i.e drinking water)

Importance of aquatic ecosystems

- Biodiversity
  - Species richness/trophic structure
- Breeding
  - Breeding grounds for many species
- Buffer systems
  - Physical and chemical
- Sinks
  - Resting places for sediments and chemicals
- Only part of the hydrological cycle
  - What other parts are there?

RESERVOIRS

Table 1.3 The Earth's Water Supply

Reservoir	Approximate Water Volume (km^3)	(mi^3)	Approximate Percent of Total Water
Oceans and sea ice	1,338,500,000	320,600,000	97.24
Ice caps and glaciers	29,289,000	7,000,000	2.14
Groundwater	8,368,000	2,000,000	0.61
Freshwater lakes	125,500	30,000	0.009
Saline lakes and inland seas	105,000	25,000	0.008
Soil moisture	67,000	16,000	0.005
Atmosphere	13,000	3,100	0.001
Rivers	1,250	300	0.0001
Total water volume	1,376,468,750	329,674,400	100

NB water available and suitable for human use, agriculture and industry is limited, literally a "drop in the bucket."

Only 8 ten thousandths of a percent **[*0.0008%*]** of the world's water is available and usable.

Freshwater Ecosystems

- Include:
  - Ponds, Lakes, Streams, Rivers, and Wetlands

- Wetlands– Area of land that are periodically under water or whose soil contains a great deal of moisture
  - Normally on the edge of a pond , lake or river.

Characteristics of Aquatic Ecosystems

- Factors such as temperature, sunlight, oxygen, and nutrients determine which organisms live in which area of the water.
- Three groups of *aquatic organisms* include:
  - **Plankton** - mostly microscopic organisms that float or drift freely in the water, and can be microscopic animals (*zooplankton*) or microscopic plants (*phytoplankton*).
  - **Nekton** - are all organisms that swim actively in open water, independent of currents.
  - **Benthos** - are bottom-dwelling organisms of the sea or ocean and are often attached to hard surfaces.

Lakes and Ponds

- Can form naturally where groundwater reaches the Earth's surface.
- Humans intentionally create artificial lakes by damming flowing rivers and streams to use them for power, irrigation, water storage, and recreation (*reservoir*).
- Structured into horizontal and vertical zones. The types of organisms present depend on the amount of sunlight available.

Ponds and Lakes

- Range in size from just a few square meters to thousands of square kilometers
- Ponds may be seasonal, lasting just a couple of months (such as sessile pools)
- Lakes may exist for hundreds of years or more
- May have limited species diversity since they are often isolated from one another and from other water sources like rivers and oceans

Life in a Lake

- ***Littoral zone*** -shallow zone where light reaches the bottom and nurtures plants, and aquatic life is diverse and abundant.

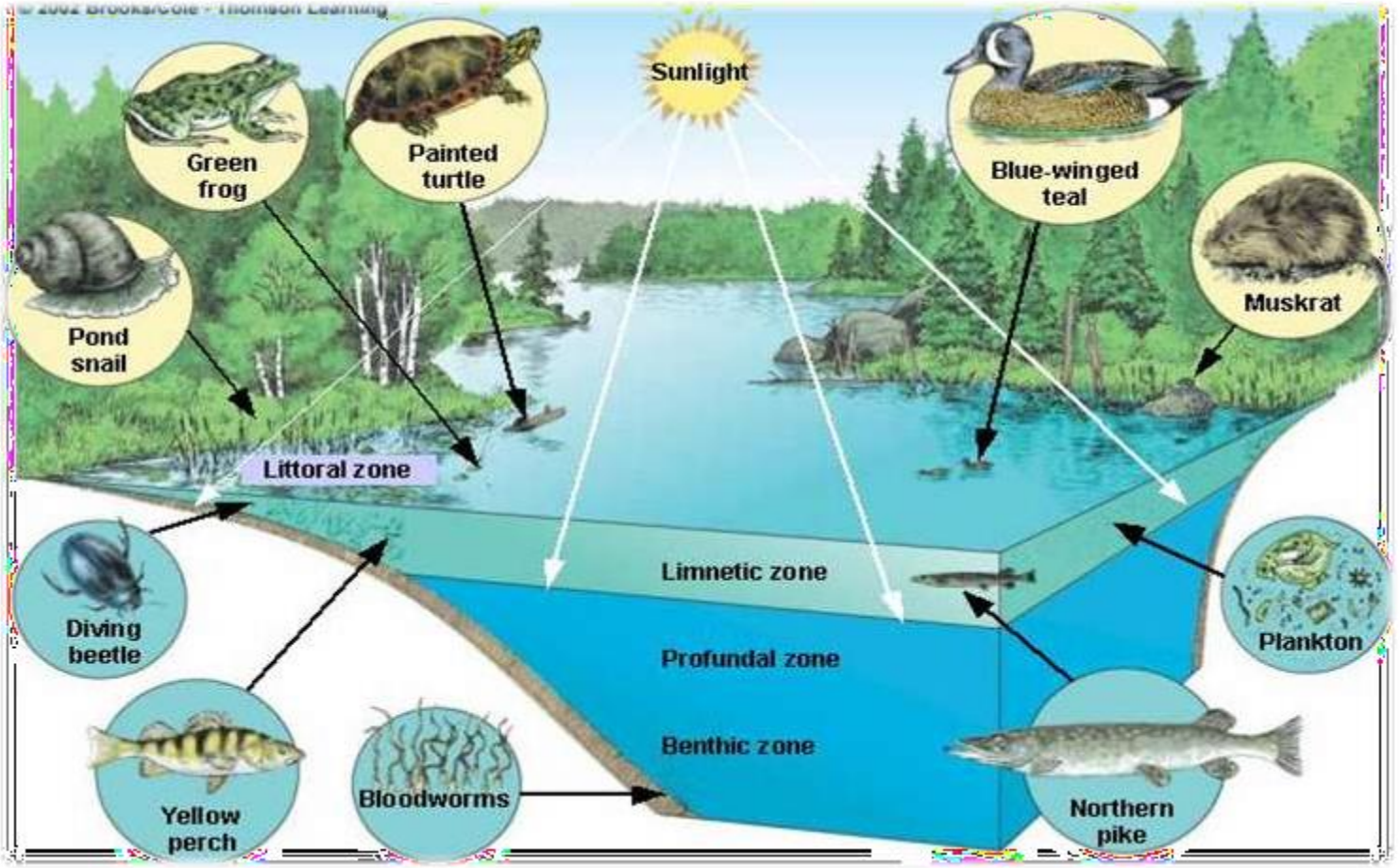
- In open water, plants, algae, and some bacteria capture solar energy to make their own food during photosynthesis.

- ***Benthic zone*** - region near the bottom of a pond, lake or ocean which is inhabited by decomposers, insect larvae, and clams.
  - Some bodies of fresh water have areas so deep that there is too little light for photosynthesis.
  - Bacteria live in the deep areas of freshwater.
  - Eventually, dead and decaying organisms reach the benthic zone.

How Nutrients Affect Lakes

- **Eutrophication** -increase in the amount of nutrients, such as nitrates, in an aquatic ecosystem.
- As the amount of plants and algae grow, the number of bacteria feeding on the decaying organisms also grows.
- These bacteria use the oxygen dissolved in the lake's waters. Eventually the reduced amount of oxygen kills oxygen loving organisms.

Aquatic Ecosystem



RIVER

- A river is usually cold and full of oxygen and runs swiftly through a shallow riverbed.
- As a river flows down a mountain, it may broaden, become warmer, wider, slower, and decrease in oxygen.
- A river changes with the land and the climate through which it flows.

Streams & Rivers

- **B**odies of flowing water moving in one direction
- **F**ound everywhere—they get their start at headwaters, which may be springs, snowmelt or even lakes
- **T**ravel all the way to their mouths, usually another water channel or the ocean

Life in a River

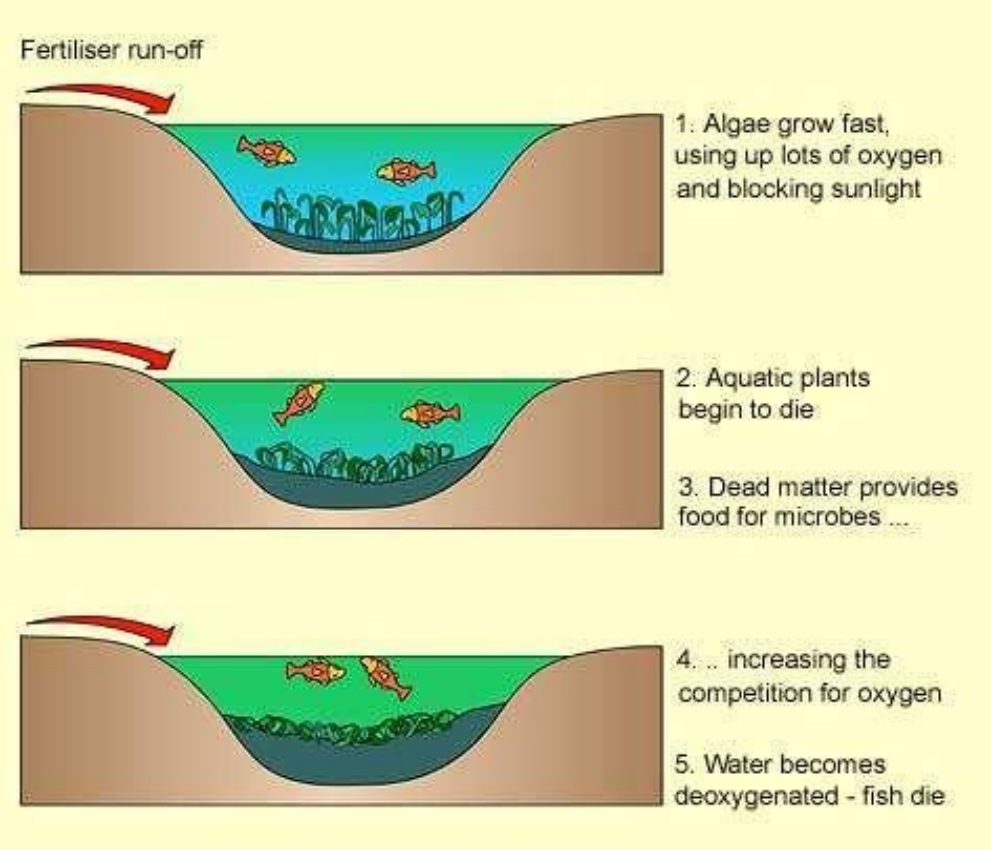
- Mosses anchor themselves to rocks.
- Trout and minnows are adapted to the cold, oxygen rich water.
- Plankton can float in the warmer, calmer waters.
- Plants here can set roots in the river's rich sediment.
- Fish such as catfish and carp also live in these calmer waters.

Rivers in Danger

- Industries use river water in manufacturing processes and as receptacles for wastes.
- People have used rivers to dispose of their sewage and garbage.
- These practices have polluted rivers with toxins, which have killed river organisms and made river fish inedible.
- Today, runoff from the land puts pesticides and other poisons into rivers and coats riverbeds with toxic sediments.

What factors can alter aquatic ecosystems?

- Natural Succession- normal cycle of pond becoming forest
- Artificial Succession- humans add N & P to water via fertilizer & sewage causing succession to happen faster = EUTROPHICATION



What factors can alter aquatic ecosystems?

- Water Pollution
- Exccessive use of Fertilisers
- Industries
- Waste Disposal