

Factors affecting Aquatic Ecosystems

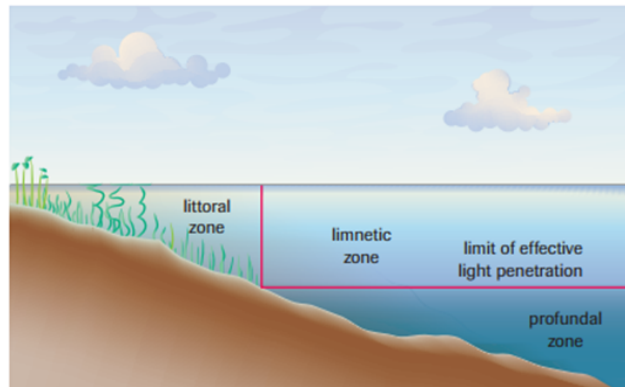
Aquatic ecosystems are found in ponds, rivers, lakes, and oceans.

In Alberta, the major aquatic ecosystems are freshwater ecosystems.

We will focus on lake ecosystems in particular.

- There are three zones in a lake, each with different **abiotic and biotic factors**

- o Littoral zone
- o Limnetic zone
- o Profundal zone



- **littoral** zone is the area extending out from the lakeshore to the point where you can no longer find plants rooted in the bottom of the lake.
 - o most productive part of a lake, the area where algae and plants take advantage of the sunlight to carry out photosynthesis.
 - o Size of zone is determined by the depth and slope of the lake
- **limnetic** zone, the area of the open lake where there is enough light for photosynthesis to occur.
 - o The most common form of organism within the limnetic zone is called plankton.
- **profundal** zone region beneath the limnetic zone, where there is not enough light for photosynthesis to occur.
 - o Nutrients in this zone come from dead material and decomposers
 - o This zone is not usually found in ponds
 - o Decomposing bacteria use oxygen, reducing the amount of oxygen available in the water.

Below are descriptions of some factors that determine type and size of species that can exist in an aquatic ecosystem

Chemical Environment

- freshwater vs. saltwater
 - Organisms that live in freshwater ecosystems can seldom survive in saltwater ecosystems, and vice versa
- Amount of **dissolved oxygen**
 - aquatic organisms require oxygen, but they must get their oxygen from the water
 - depends largely on temperature and decomposition
 - pollutants

Temp and Sunlight

- temperature varies in a body of water (gets colder as you go deeper)
- sunlight can only penetrate so far (no sunlight = no photosynthesis)
- temp affects dissolved oxygen levels

Water Pressure

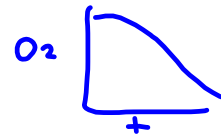
- as you go deeper, the pressure increases
- very few organisms can live on the ocean bottom and at the surface

Seasonal Variation in Lakes

- Throughout the year, **abiotic and biotic factors change** within the lake environment
- As water cools, it becomes more dense, just like other substances
- However, below 4°C, water starts becoming less dense (this is why ice floats)

Winter

- Under the ice the water is arranged in layers, according to its density
 - o Water at, or slightly above, 0°C (least dense) is at the surface below the ice
 - o The densest water, at 4 °C, is found at the bottom
- If the ice is thin enough, some photosynthesis may take place below the ice
- level of dissolved O₂ will drop over winter
 - o some fish may die off if not enough O₂ is available



Spring

- ice melts and wind mixes the water, adding oxygen to it
- the cold surface water warms up and sinks
 - o this pushes up the water at the bottom
 - o spreads oxygen rich water from surface to bottom

Summer

- surface water warms above 4 °C, and will no longer sink because it is less dense than the cooler water below
- layers of water are set up, with the densest water at the bottom
- 3 distinct layers are present in a deep lake
 - o Epilimnion - upper layer of warm water
 - o Thermocline - temperature drops from warm to cold
 - o Hypolimnion - bottom cold layer

} present in summer

Fall

- Air temperature drops and water cools down as well
- Water at surface becomes more dense and sinks
 - o renews oxygen levels at lower levels
 - o breaks up the summer thermal layers

Lesson 2 Review Questions

Read pgs 101-107

1. Explain why a shallow lake tends to be warmer than a deep lake in summer.
2. In your own words, describe the changes that happen in a lake from summer to winter.
3. List some ways in which the amount of organic matter in an ecosystem can increase.
4. Why is it possible that two ecosystems, with identical conditions of temperature and precipitation, could support different plants?
5. Describe what you would expect to happen to oxygen levels in the hypolimnion of a lake over the summer months.
6. Cold water holds more dissolved gas than warm water. Cold water also tends to collect in the lower levels of a lake. However, in summer, oxygen levels in a lake can be highest in the warm surface water of a lake. Explain why.
7. Predict what would happen to a lake that experienced no seasonal changes in temperature. Make a diagram showing the temperature and oxygen levels in the water of the lake over many years of little change in surface air temperatures.
8. (a) Using soda pop, beakers, water, and other materials you choose, design a demonstration (including safety precautions) that shows the relationship between water temperature and the amount of dissolved gas. Have your teacher approve your materials list and design before you begin.

(b) How did you measure the amount of dissolved gas in the soda pop?