

## Introduction to Aquatic Ecosystems



## Aquatic Ecosystem

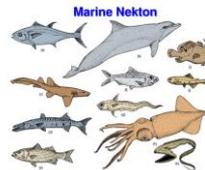
- are groups of interacting organisms dependent on one another and their water environment for nutrients and shelter
- two types: freshwater and marine
- Influenced by both abiotic (non-living) and biotic (living) factors



## Abiotic Factors

- Salinity (the dissolved salt)
- Water temperature
- Amount of sunlight
- Availability of dissolved oxygen
- Nutrients
- Turbidity (the cloudiness of the water)

## Biotic Factors



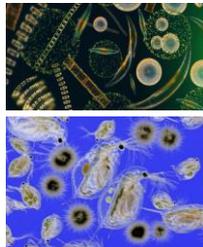
- Life in aquatic ecosystems falls within these types:
- Nekton are strong swimmers and consumers.
    - E.g. Fish, whales, sea turtles

## Biotic Factors

- Plankton, which are free-floating or weakly swimming.

- E.g. Phytoplankton are plant-like and include algae.

- E.g. Zooplankton are animal-like, including organisms like single-celled protozoa or jellyfish.



## Biotic Factors



- Benthos are bottom dwellers.
  - E.g. Starfish, lobsters, mussels
- Decomposers break down dead organisms and waste into nutrients.
  - E.g. Bacteria

## Freshwater Ecosystems

- Characterized by low salinity
- Some freshwater ecosystems are lentic, meaning they contain standing water (lakes, ponds, wetlands)
- Others are lotic, meaning the water is constantly moving (streams, rivers).



## Freshwater Ecosystems



Ponds and Lakes



Wetlands



Rivers and Streams

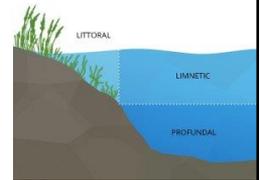
## Lakes and Ponds



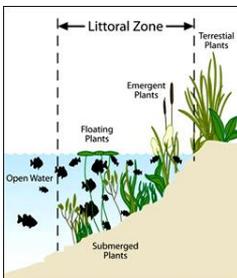
- form in depressions made by glaciers, volcanic activity, or movement of Earth's plates.

## Lakes and Ponds

- Divided into 3 zones based on the amount of sunlight that penetrates the water
1. The littoral zone is near the shore and contains shallow, sunlit waters.



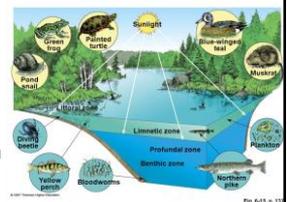
## Lakes and Ponds



- Many producers, such as aquatic plants and algae, live here making this a highly photosynthetic zone
- Consumers like crustaceans, turtles, and frogs

## Lakes and Ponds

2. The limnetic zone is the open water area that is well lit.
- This area is dominated by plankton and the many fish that consume them.



## Lakes and Ponds

- The profundal (or benthic) zone is the deepest area of large lakes.
- It is cold, dark, and less oxygenated, which limits the number of species able to live here.
  - This layer is inhabited mostly by decomposers feeding from detritus from above.

## Lakes and Ponds

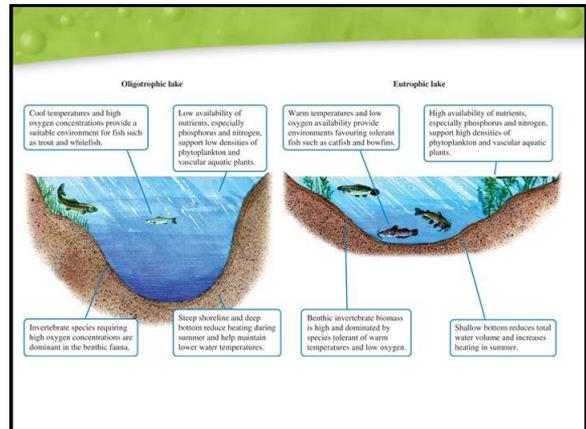
- Ecologists will classify lakes based on their nutrient levels and biological productivity.
- Oligotrophic lakes are very low in nutrients.
  - Populations of plankton and algae are very low.



## Lakes and Ponds



- Eutrophic lakes have higher concentrations of nutrients.
- This removes a growth limiting factor for algae and plankton, often resulting in an algal bloom.



## Wetlands

- Are areas of land that are saturated with water, either permanently or seasonally, and support aquatic plants
- 3 types: marshes, swamps, and bogs



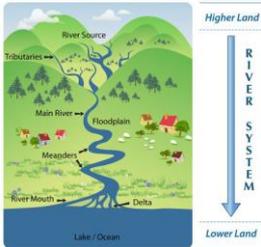
## Wetlands

- Marshes do not have trees, swamps do.
- Bogs are characterized by plants that produce an acidic secretion, slowing down the action of decomposers.



## Rivers and Streams

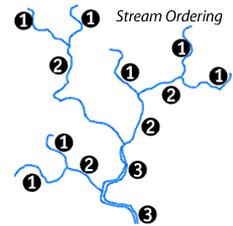
### Features of a River



- Characteristics change from river source to mouth, depending on the stream order
- Stream order is a measure of the relative size of streams.

## Rivers and Streams

- The smallest streams, those with no tributaries, are called first-order streams.
- When two first order streams join, they form a second-order stream (and so on...).



## Rivers and Streams

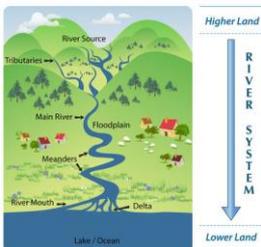
- First- through third-order streams are called headwater streams. Over 80% of the total length of Earth's waterways are headwater streams.
- Fourth- through sixth-order are medium streams. Seventh-order or larger constitutes a river.
- The largest river in the world, the Amazon, is a twelfth-order waterway.

## Rivers and Streams

- Low-order streams are often much cooler than higher-order streams on the same river system.
  1. Originate in hills/mountains
    - > Very fast streams (due to steep slope) which cause turbulence which in turn causes evaporation which in turn cools the stream
  2. Small in size meaning often shaded from the sun by overhanging vegetation
  3. Most of their water starts off cool as it originates in springs, glaciers, or groundwater

## Rivers and Streams

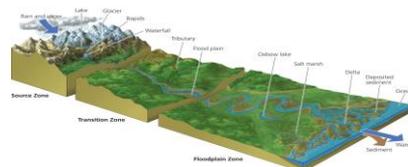
### Features of a River



- Water at the river source is therefore generally cold, high in oxygen, and low in nutrients.

## Rivers and Streams

- As water moves through the transition zone, the rivers widen, become deeper, slow down, and are warmed by the sun.
- Oxygen levels decrease, but nutrient levels rise.



## Rivers and Streams

- Floodplains are low-lying areas that frequently  flood as the river widens and slows
- The water continues to warm, oxygen levels decrease, and nutrients continue to increase.



## Rivers and Streams

- The river eventually ends at a larger body of water (often a sea or ocean). This is called the river mouth.
- Freshwater often mixes with saltwater here, forming brackish water.



## Conclusion

- Freshwater ecosystems are one type of Earth's aquatic ecosystems.
- They include lakes and ponds, wetlands, rivers and streams.
- Plants and animals in freshwater are adjusted to the low salt content.