

# Amity University

## Rajasthan

Amity Business School

Environmental Studies

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# Aquatic Ecosystems



- Freshwater
  - Ponds & Lakes
  - Streams & Rivers
  - Wetlands
- Marine
  - Oceans
  - Coral Reefs
  - Estuaries

# Freshwater

- Freshwater is defined as having a low salt concentration—usually less than 1%
- Plants and animals in freshwater regions are adjusted to the low salt content and would not be able to survive in areas of high salt concentration (i.e, ocean)

# Freshwater Ecosystems

- Usually 0.005% salt
  - Some exceptions:
    - Great Salt Lakes- 5-27% salt
    - Dead Sea- 30% salt
- **Moving water-** high elevations; cold; high  $O_2$ ; trout; streamlined plants
- **Standing water-** lower elevations; warmer; less  $O_2$ ; bass, amphibians; cattails, rushes



# Freshwater

- Ponds & Lakes
- Streams & Rivers
- Wetlands

# Lakes and Ponds

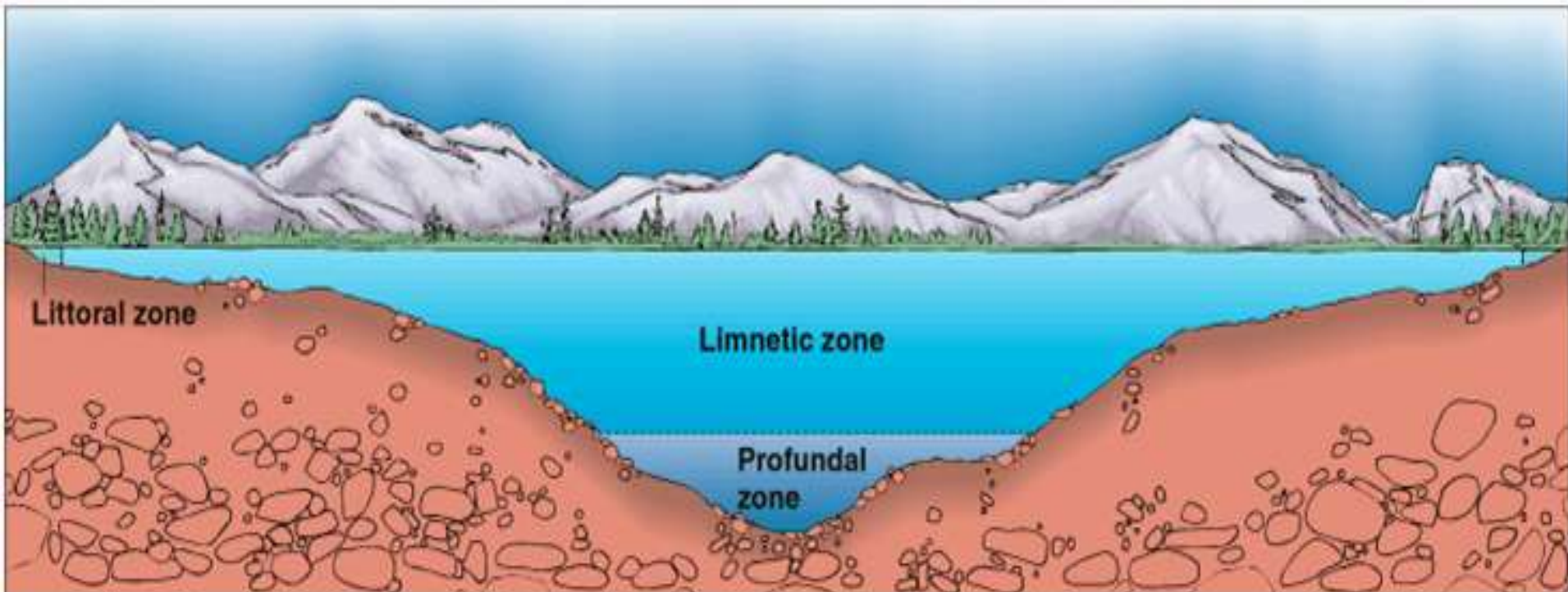
- ④ range in size from just a few square meters to thousands of square kilometers
- ④ ponds may be seasonal, lasting just a couple of months (such as sessile pools)
- ④ lakes may exist for hundreds of years or more
- ④ may have limited species diversity since they are often isolated from one another and from other water sources like rivers and oceans

# Lakes and Ponds

- The food webs in lakes and ponds often are based on a combination of plankton and attached algae and plants.
- **Plankton** is a general term that includes both phytoplankton and zooplankton.
- Water flows in and out of lakes and ponds and circulates between the surface and the benthos, distributing heat, oxygen, and nutrients.

# Ponds and Lakes

- @ divided into three different “zones” determined by depth and distance from the shoreline
  - @ littoral zone
  - @ limnetic zone
  - @ profundal zone





# Littoral Zone

- @ warmest since it is shallow and can absorb more of the Sun's heat
- @ sustains a fairly diverse community, which can include several species of algae (like diatoms), rooted and floating aquatic plants, grazing snails, clams, insects, crustaceans, fishes, and amphibians
- @ the egg and larvae stages of some insects are found in this zone
- @ vegetation and animals living in the littoral zone are food for other creatures such as turtles, snakes, and ducks

# Limnetic Zone

- ④ near-surface open water surrounded by the littoral zone
- ④ well-lighted (like the littoral zone) and is dominated by plankton, both phytoplankton and zooplankton
- ④ plankton are small organisms that play a crucial role in the food chain – most life would not be possible without them
- ④ variety of freshwater fish also occupy this zone

# Profundal Zone

- ④ Plankton have short life spans—when they die, they fall into the deep-water part of the lake/pond
- ④ much colder and denser than the other two
- ④ little light penetrates all the way through the limnetic zone into the profundal zone
- ④ animals are decomposers

# Streams & Rivers

- bodies of flowing water moving in one direction
- found everywhere—they get their start at headwaters, which may be springs, snowmelt or even lakes
- travel all the way to their mouths, usually another water channel or the ocean
- characteristics change during the journey from the source to the mouth
- temperature is cooler at the source than it is at the mouth

# Streams & Rivers

- water is also clearer, has higher oxygen levels, and freshwater fish such as trout and heterotrophs can be found there.
- Towards the middle part of the stream/river, the width increases, as does species diversity—numerous aquatic green plants and algae can be found

# Streams & Rivers

- toward the mouth the water becomes murky from all the sediments that it has picked up upstream
- decreasing the amount of light that can penetrate through the water
- less light
  - less diversity of flora
  - lower oxygen levels
  - fish that require less oxygen, such as catfish and carp, can be found

# Wetlands

- Wetlands are areas of standing water that support aquatic plants
  - Marshes, swamps, and bogs are all considered wetlands
  - highest species diversity of all ecosystems
  - many species of amphibians, reptiles, birds (such as ducks and waders), and furbearers can be found in the wetlands
  - not considered freshwater ecosystems as there are some, such as salt marshes, that have high salt concentrations—these support different species of animals, such as shrimp, shellfish, and various grasses

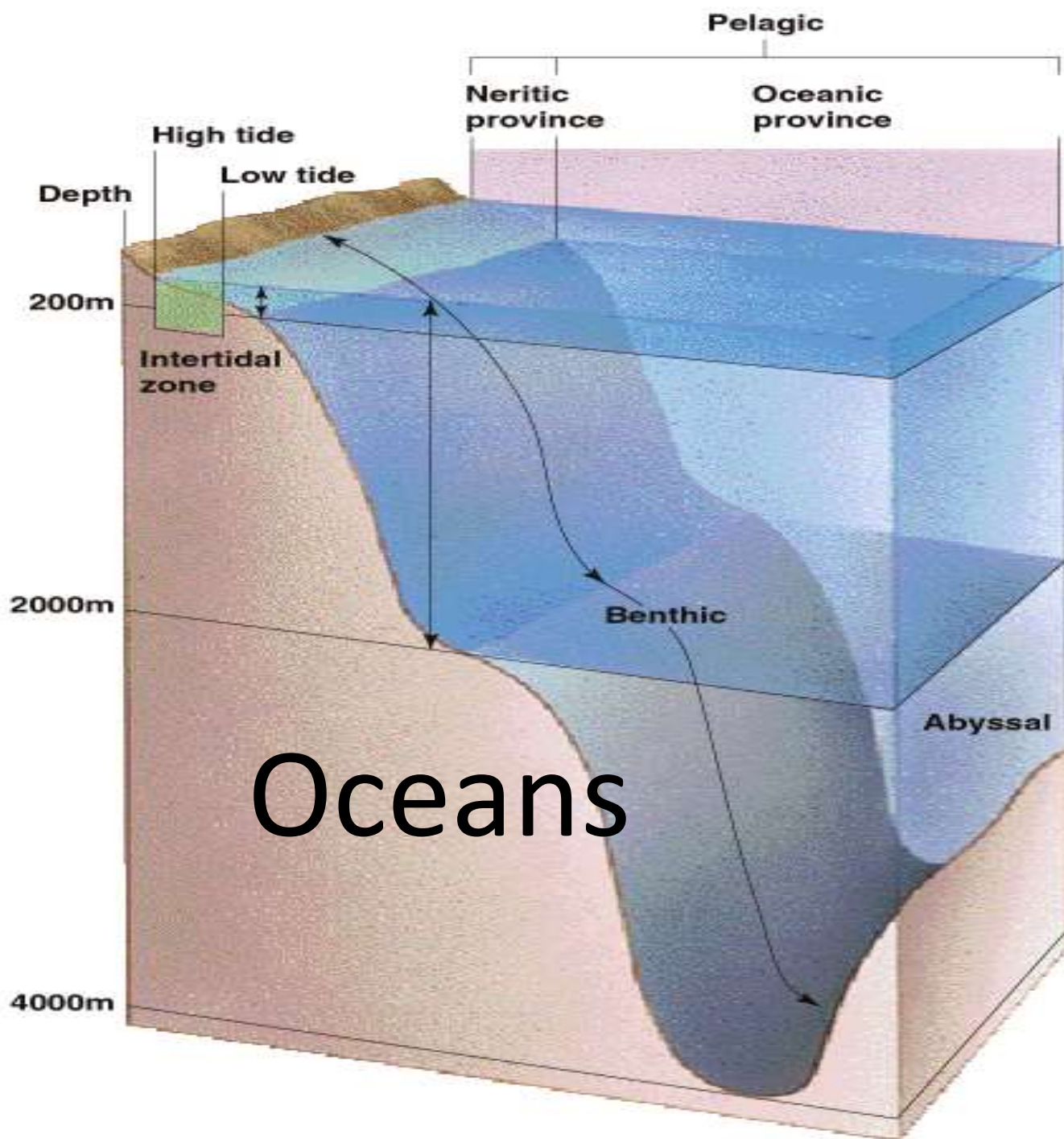
# Marine

- cover about three-fourths of the Earth's surface and include oceans, coral reefs, and estuaries
- algae supply much of the world's oxygen supply and take in a huge amount of atmospheric carbon dioxide
- evaporation of the seawater provides rainwater for the land



# Marine Ecosystem

- Oceans
- largest of all the ecosystems
- dominate the Earth's surface
- separate zones
  - Intertidal
  - Pelagic
  - Abyssal
  - Benthic
- great diversity of species
- richest diversity of species even though it contains fewer species than there are on land



# Intertidal Zone

- where the ocean meets the land
  - sometimes submerged and at other times exposed
  - waves and tides come in and out
- communities are constantly changing
- rocky stones

# Intertidal Zone

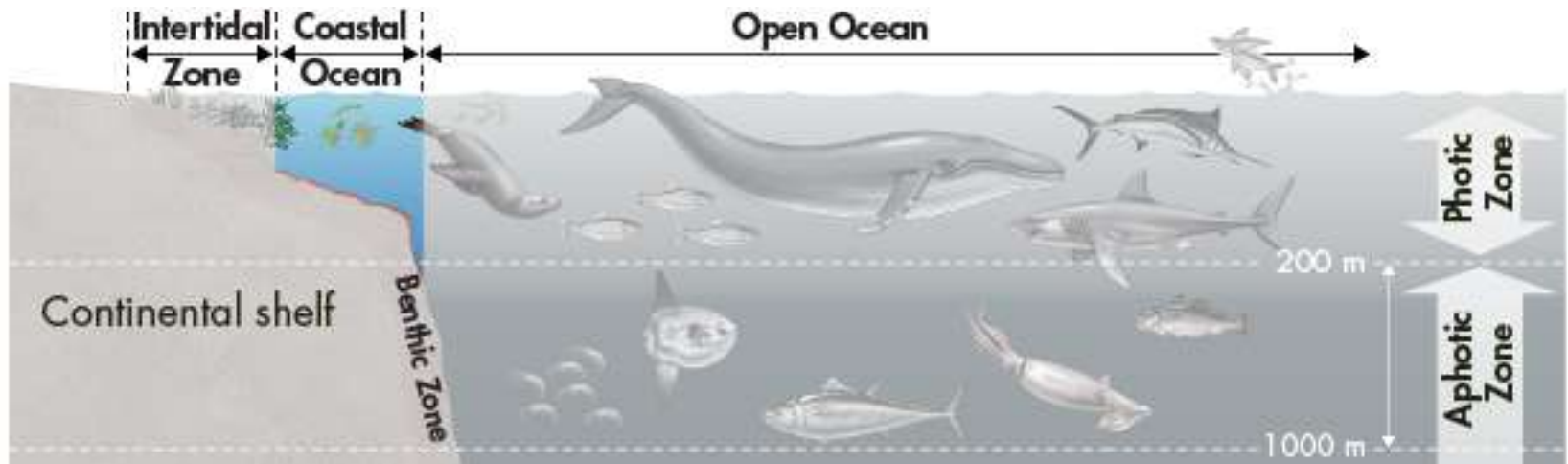
- rocky coasts
- stratified vertically
  - Where only highest tides reach
  - a few species of algae and mollusks
- submerged during high tide
  - more diverse array of algae and small animals, such as herbivorous snails, crabs, sea stars, and small fishes
- bottom of the intertidal zone
  - only exposed during the lowest tides, many invertebrates, fishes, and seaweed can be found

# Intertidal Zone

- sandier shores
  - not as stratified
  - waves keep mud and sand constantly moving
    - very few algae and plants can establish themselves—the fauna include worms, clams, predatory crustaceans, crabs, and shorebirds.

# Coastal Ocean

- Water in the coastal ocean is brightly lit, and is often supplied with nutrients by freshwater runoff from land. As a result, coastal oceans tend to be highly productive.



# Pelagic – Open Ocean

- waters further from the land, basically the open ocean
- generally cold though it is hard to give a general temperature range since, just like ponds and lakes, there is thermal stratification with a constant mixing of warm and cold ocean currents

# Marine Ecosystems

- **SHORELINES**
- Rocky coasts- great density & diversity attached to solid rock surface
- Sandy beaches- burrowing animals
- Threats- due to hotels, restaurants, homes on beach, more plant life destroyed, destabilizing soil, susceptible to wind & water erosion
- Insurance high; danger of hurricanes, erosion
- Build sea walls to protect people but changes & endangers shoreline habitat





# Marine Ecosystems

- **BARRIER ISLANDS**
- Low, narrow offshore islands
- Protect inland shores from storms
- Beauty attracts developers = developers destroy land
- New coastal zoning laws protect future development



# MARINE ECOSYSTEMS

- **CORAL REEFS**
- Clear, warm shallow seas
- Made up of accumulated calcareous (made of calcium) skeletons of coral animals
- Formation depends on light penetration.
- Have a symbiotic relationship with algae
- Very diverse, abundant (rainforests of sea)
- Threats- destructive fishing (cyanide & dynamite to stun fish), pet trade; about 3/4ths have been destroyed



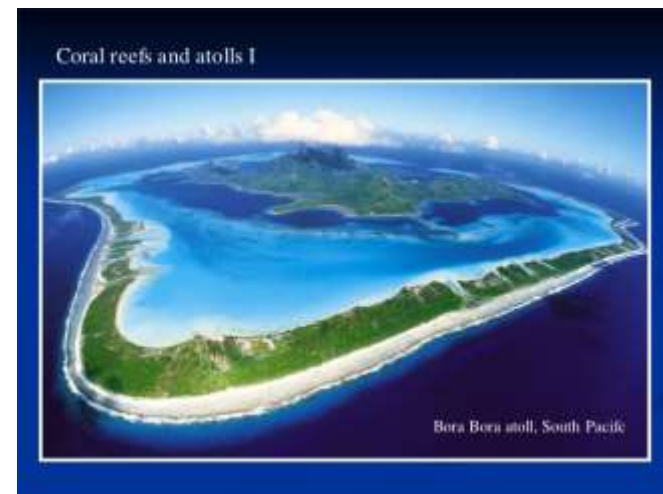
# Estuaries

- An **estuary** is a special kind of wetland, formed where a river meets the sea.
- Estuaries contain a mixture of fresh water and salt water, and are affected by the rise and fall of ocean tides.
- Many are shallow, which means that enough sunlight reaches the benthos to power photosynthesis.
- Estuaries serve as spawning and nursery grounds for many ecologically and commercially important fish and shellfish species including bluefish, striped bass, shrimp, and crabs.

# What Is a Coral Reef?

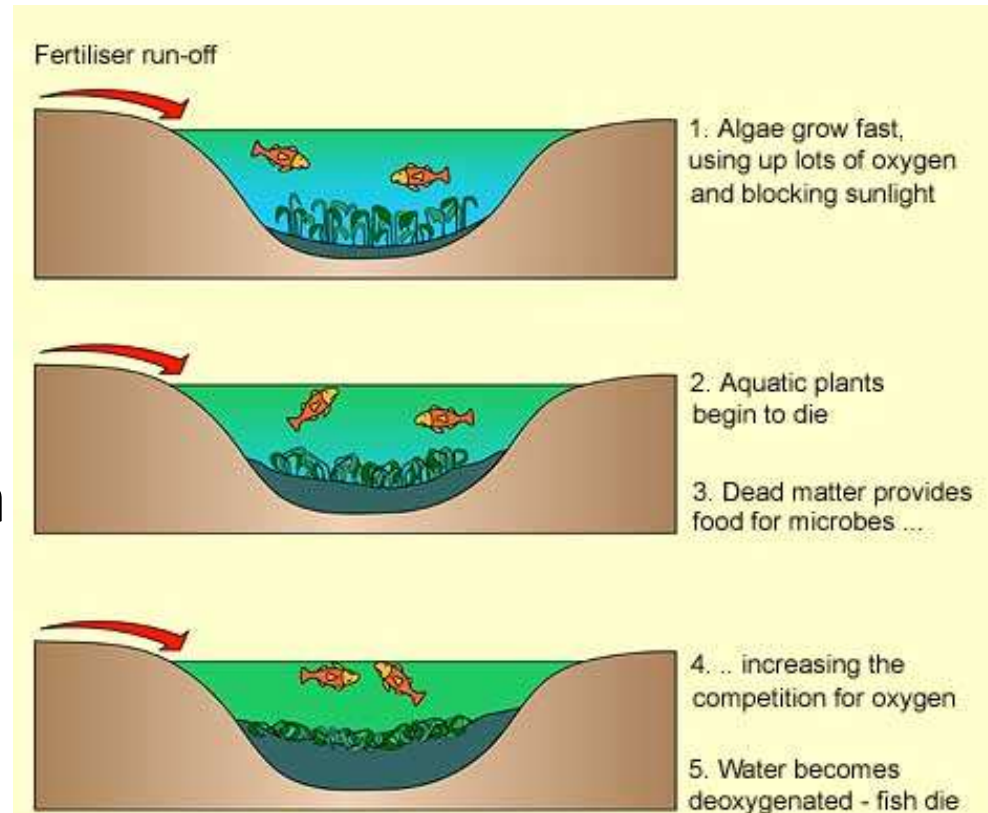


- A structure formed by coral polyps, tiny animals that live in colonies.
- Coral polyps form a hard, stony, branching structure made of limestone.
- New polyps attach to old coral and gradually build the reef.



# What factors can alter aquatic ecosystems?

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



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