

## Chapter 7

### Aquatic Ecosystems

#### Section 1: Freshwater Ecosystems

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## Freshwater Ecosystems

- The types of organisms in an aquatic ecosystem are mainly determined by the water's **salinity**.
- As a result, aquatic ecosystems are divided into **freshwater and marine** ecosystems.
- Freshwater ecosystems include ponds, lakes, streams, rivers, and wetlands.
- **Wetlands** are areas of land that are periodically under water or whose soil contains a great deal of moisture.



## 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, nekton, and benthos**.





## Characteristics of Aquatic Ecosystems

- **Plankton** are the mass of mostly microscopic organisms that float or drift freely in the water, and can be microscopic animals called zooplankton or microscopic plants called 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.
- **Decomposers** are also aquatic organisms.

## Lakes and Ponds

- Lakes, ponds, and wetlands can form **naturally** where groundwater reaches the Earth's surface.
- Lakes and ponds can be structured into horizontal and vertical zones.
- The types of organisms present depend on the **amount of sunlight** available.



## Life in a Lake

- The **littoral zone** is a shallow zone in a freshwater habitat where light reaches the bottom and nurtures plants and aquatic life. Life is diverse and abundant.
- Some plants are **rooted in the mud** underwater with their upper leaves and stems above water.
- Other plants have **floating leaves**.
- In open water, plants, algae, and some bacteria capture solar energy to make their own food during photosynthesis.

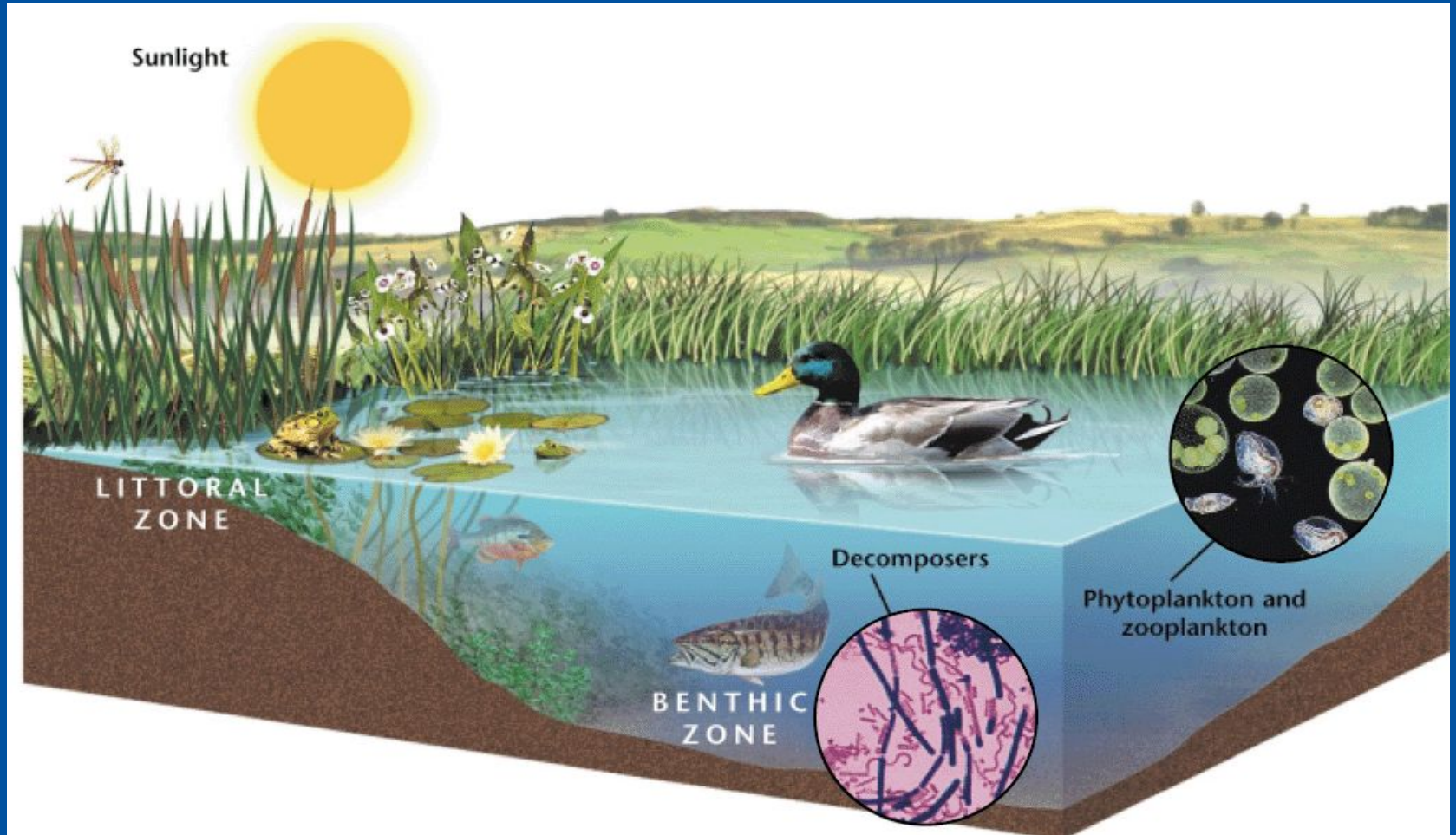




## Life in a Lake

- 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. Fish adapted to cooler, darker water also live there.
- Eventually, dead and decaying organisms reach the benthic zone.
- The **benthic zone** is the region near the bottom of a pond, lake or ocean which is inhabited by decomposers, insect larvae, and clams.

## A Lake Ecosystem



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## How Nutrients Affect Lakes

- **Eutrophication** is an 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.



## Freshwater Wetlands

- Freshwater wetlands are areas of land that are covered with **fresh water** for part of the year.
- The two main types of freshwater wetlands are **marshes and swamps**.
- Marshes contain **nonwoody plants**, while swamps are dominated by **woody plants**.
- Most freshwater wetlands are located in the southeastern United States, with the largest in the **Florida Everglades**.









## Freshwater Wetlands

- Wetlands perform several important environmental functions.
- Wetlands **act like filters or sponges** that absorb and remove pollutants from the water.
- They also **control flooding** by absorbing extra water when rivers overflow.
- These areas **provide a home** for native and migratory wildlife in addition to feeding and spawning for many freshwater game fish.

## Marshes

- Freshwater marshes tend to occur on low, flat lands and have little water movement.
- In shallow waters, plants root themselves in the rich bottom sediments while their leaves stick out about the surface of the water year-round.
- There are several kinds of marshes, each of which is characterized by its **salinity**.
- Brackish marshes have **slightly salty water**, while salt marshes contain **saltier water**.





## Swamps

- Swamps occur on **flat, poorly drained land**, often near streams and are dominated by woody shrubs or water loving trees.
- Freshwater swamps are the **ideal habitat** for amphibians because of the **continuous moisture**.
- Birds are also attracted to hollow trees near or over the water.
- Reptiles are the predators of the swamp, eating almost any organism that crosses their path.





## Human Impact on Wetlands

- Wetlands were previously considered to be **wastelands** that provide breeding grounds for insects.
- As a result, many have been drained, filled, and cleared for farms or residential and commercial development.
- The importance of wetlands is now recognized, as the law and the federal government protect many wetlands while most states now prohibit the destruction of certain wetlands.



## Rivers

- At its headwaters, 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.



## Rivers in Danger

- Industries use river water in **manufacturing processes and as receptacles** for wastes.
- In addition, 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.



## Ticket Out the Door

1. How are the types of organisms determined in an aquatic ecosystem?
2. What are the two main aquatic ecosystems?
3. List four factors that determine where organisms live in an aquatic ecosystem.
4. Define plankton and nekton.
5. What two factors determine the type of organism that lives in a lake or a pond?
6. Why are freshwater swamps an ideal habitat for amphibians?
7. What factor do scientists use to categorize salt marshes?
8. What is eutrophication?

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Aquatic Ecosystems

Section 2, Marine Ecosystems

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## Marine Ecosystems

- Marine ecosystems are located mainly in **coastal areas and in the open ocean**.
- Organisms that live in coastal areas adapt to changes in **water level and salinity**.
- Organisms that live in the open ocean adapt to changes in **temperature and the amount of sunlight and nutrients available**.





## Coastal Wetlands

- Coastal land areas that are covered by **salt water** for all or part of the time are known as coastal wetlands.
- Coastal wetlands provide **habitat and nesting areas** for many fish and wildlife.
- They also **absorb excess rain**, which protects them from flooding, they **filter out pollutants** and sediments, and they **provide recreational areas** for boating, fishing, and hunting.



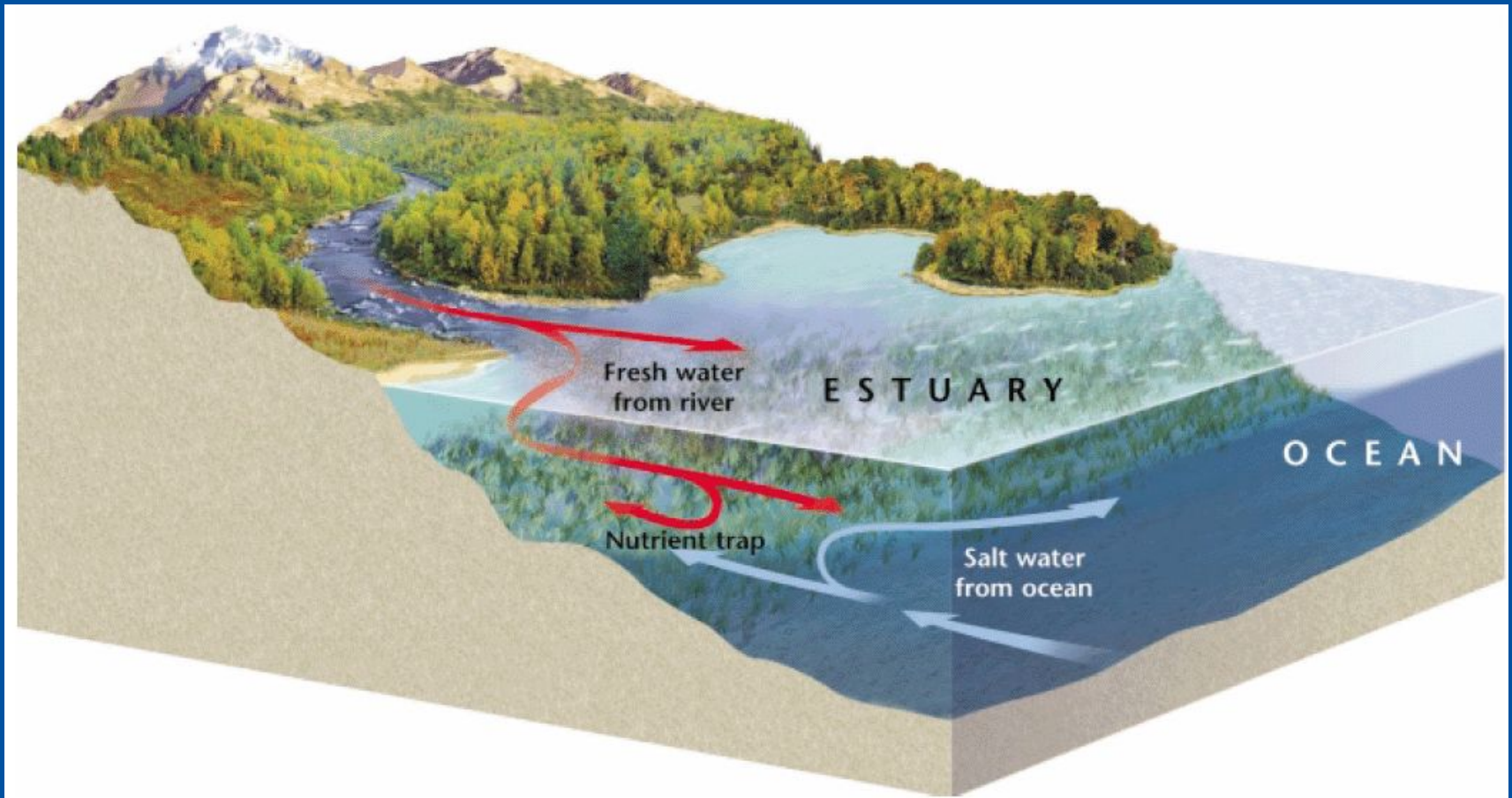
## Estuaries

- An **estuary** is an area where fresh water from rivers mixes with salt water from the ocean.
- As the two bodies meet, currents form and cause mineral rich mud with many nutrients to fall to the bottom making in available to producers.
- Estuaries are very productive because they **constantly receive nutrients from the river and ocean** while the surrounding land protects the estuaries from the harsh force of ocean waves.





# Estuaries





## Salt Marshes

- **Salt marshes** are maritime habitats characterized by grasses, sedges, and other plants that have adapted to continual, periodic flooding and are found primarily throughout the temperate and subarctic regions.
- The salt marsh supports a community of clams, fish, aquatic birds, crabs, and shrimp.
- Salt marshes, like other wetlands, also **absorb pollutants** to help protect inland areas.



## Mangrove Swamps

- **Mangrove swamps** are tropical or subtropical marine swamps that are characterized by the abundance of low to tall mangrove trees.
- The swamps help **protect the coastline from erosion and reduce the damage** from storms.
- They also provide a home for about 2,000 animal species.
- Mangrove swamps have been filled with waste and destroyed in many parts of the world.

## Rocky and Sandy Shores

- Rocky shores have many more plants and animals than sandy shores do because the rocks provide anchorage for seaweed that animals can live on.
- Sandy shores dry out when the tide goes out, and many organisms that live between sand grains eat the plankton left stranded on the sand.
- A **barrier island** is a long ridge of sand or narrow island that lies parallel to the shore and helps protect the mainland.





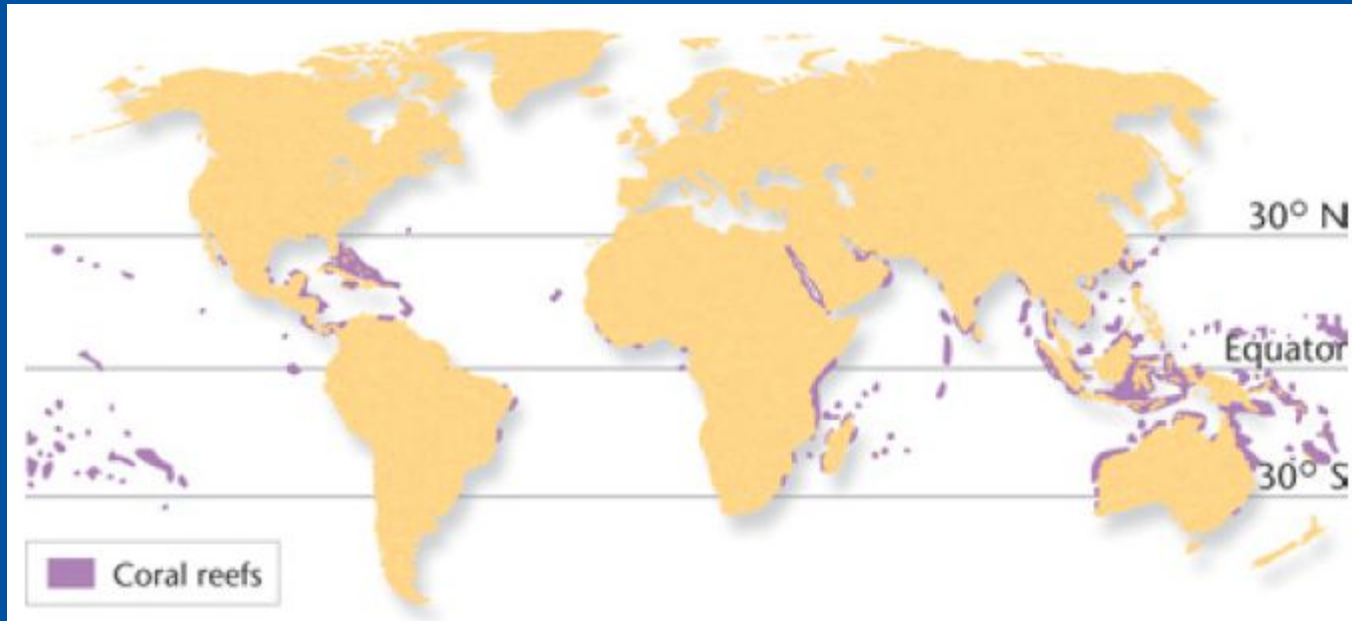
## Coral Reefs

- **Coral reefs** are limestone ridges found in tropical climates and composed of coral fragments that are deposited around organic remains.
- Thousands of species of plants and animals live in the cracks and crevices of coral reefs, which makes coral reefs among the **most diverse** ecosystems on Earth.
- Corals are predators that use stinging tentacles to capture small animals, such as zooplankton, that float or swim close to the reef.



## Coral Reefs

- Corals live only in **clear, warm salt water** where there is enough light for photosynthesis.



## Disappearing Coral Reefs

- Coral reefs are productive ecosystems, but they are also **very fragile**.
- If the water surrounding a reef is too hot or too cold, or if fresh water drains into the water surrounding the coral, the coral may die.
- If the water is too muddy, polluted, or too high in nutrients, the algae that live within the corals will either die or grow out of control. If the algae grows out of control, it may kill the corals.





## Disappearing Coral Reefs

- **Oil spills, sewage, pesticides, and silt runoff** have also been linked to coral-reef destruction.
- **Overfishing** can devastate fish populations, upsetting the balance of the reef's ecosystem
- A coral reef grows very slowly, and it may not be able to repair itself after chunks of coral are destroyed by careless divers, ships dropping anchor, fisheries, shipwrecks, and people breaking off pieces for decorative items or building materials.



## Oceans

- Because water absorbs light, sunlight that is usable by plants for photosynthesis penetrates only about **100 m** into the ocean.
- As a result, much of the ocean's life is concentrated in the **shallow coastal waters** where sunlight penetrates to the bottom and rivers wash nutrients from the land.
- Seaweed and algae grow anchored to rocks, and phytoplankton drift on the surface. Invertebrates and fish then feed on these plants.



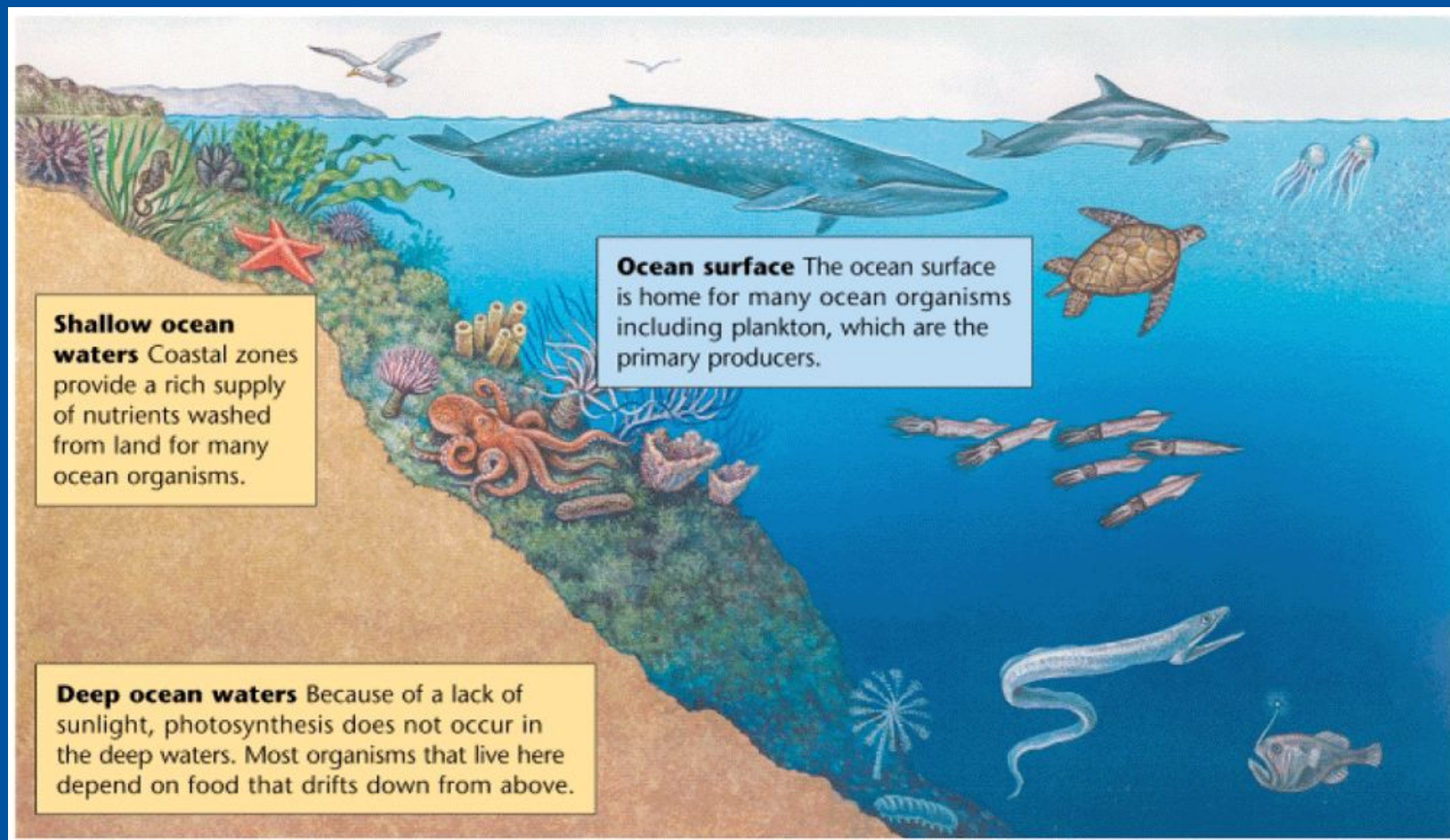
## Plants and Animals of Oceans

- In the open ocean, phytoplankton grow only in areas where there is enough light and nutrients, resulting in one of the least productive of all ecosystems.
- The sea's smallest herbivores are **zooplankton**, including jellyfish and tiny shrimp, which live near the surface with the phytoplankton they eat.
- Fish feed on the plankton as do marine mammals such as whales.





## Plants and Animals of Oceans

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## Threats to the Oceans

- The oceans are steadily becoming more polluted.
- **Runoff** from fertilized fields and **industrial waste** and **sewage** being discharged into rivers are major sources of ocean pollution.
- Overfishing and certain fishing methods are also destroying some fish populations. Marine mammals can get caught and drown in the nets.
- Although it is illegal, some ships discard fishing lines into the ocean where they can strangle and kill fish and seals.



## Arctic and Antarctic Ecosystems

- The Arctic Ocean is rich in nutrients from the surrounding landmasses and supports large populations of plankton, which feed a diversity of fish in the open water and under the ice.
- These fish are food for ocean birds, whales, and seals. Fish and seals then provide food for polar bears and people on land.
- The arctic ecosystems at the North and South Poles depend on marine ecosystems because nearly all the food comes from the ocean.



## Arctic and Antarctic Ecosystems

- The Antarctic is the only continent never colonized by humans.
- It is governed by an international commission and is used mainly for research.
- Even during the summer, only a few plants grow at the edges of the continent.
- So, as in the Arctic, plankton form the basis of the Antarctic food web, nourishing large numbers of fish, whales, and birds such as penguins.

## Ticket Out the Door

1. What two locations are marine ecosystems usually located?
2. What are coastal wetlands?
3. What is an estuary?
4. How do mangrove swamps provide protection?
5. What type of water do coral reefs prefer?
6. What function do salt marshes have to protect inland areas?