

Unit Nine: Intertidal Ecology, Estuaries & Salt Marshes

Estuaries

- An estuary is a partially enclosed coastal embayment where fresh water and saltwater meet and mix.
- In most estuaries there is a gradient in _____ from full seawater at the mouth to fresh water at the upper reaches.

Estuary Types

- The most common type of estuary is the coastal plain estuary. These were formed at the end of the last ice age when the rising sea level invaded low-lying coastal river valleys. (ex. _____ Bay)
- In a _____ estuary, the sea reinvades the land due to subsidence of the land. (ex. San Francisco Bay)
- A semienclosed bay, or lagoon, forms when sand bars build up parallel to the coastline and partially cut off the waters from the sea. (ex. North Carolina coast)
- The fjords are glacial valleys that have been invaded by the sea.
- A _____ estuary, or salt wedge estuary, has a strongly stratified water column with its highest salinity at or near the bottom and lowest at or near the surface.
- A neutral estuary, or homogeneous estuary, has complete mixing leading to similar salinities from surface to bottom
- A _____ estuary, or evaporite estuary, results from little freshwater input and high evaporation leading to a hypersaline surface.

Physical Characteristics

- Six major characteristics influence estuaries:
 - Salinity - the dominant feature of the estuarine environment because the pattern of salinity within an estuary vary with the tides and seasons
 - _____ - most estuaries have soft, muddy substrates
 - Temperature - varies greatly vertically but also with salinity
 - Turbidity - effects the penetration of light
 - _____ - usually in ample supply in the water column (due to mixing) but depleted in the substrate (due to high organic and bacterial content)
 - Wave Action and Currents - controls the deposition of sediments development of rooted plants, and the amount of mixing between freshwater and saltwater. The time required for a given mass of freshwater to be discharged from the estuary is the flushing time.

Estuarine Fauna

- Three types of fauna exist in estuaries: marine, freshwater, and estuarine (brackish).
 - The marine fauna is the largest group inhabiting estuaries.
 - _____ animals cannot tolerate salinity changes
 - _____ animals can tolerate salinity changes usually down to 15 ppt

Plant Adaptations

- Plants must have adaptations to live in a saline environment.
 - Aerenchyma are special tissues that supply roots with oxygen in anoxic mud.
 - Some plants have salt glands for releasing excess _____.
 - Succulence is the incorporation of high water content in tissues to reduce loss by osmosis.

Salt Marshes

- Salt marshes are communities of emergent grasses in soils alternately inundated and drained by tidal action. The plants occurring there are halophytes, meaning they grow in soils with high salt content. Some areas called salt _____ have even higher salt content where no vegetation can grow.

Inland Freshwater Wetlands

- Inland wetlands include marshes, swamps and bogs along with seasonal wetlands, which include floodplain wetlands and prairie potholes. These are important for three main reasons:
 - provide food and _____ for fish, migratory waterfowl, and other wildlife
 - filter, dilute, and degrade toxic wastes, excess nutrients, sediments, and other pollutants from runoff
 - reduce flooding and _____ by absorbing overflows of streams and lakes

Adaptations of Intertidal Organisms

- resistance to water loss that occurs due to _____ when exposed during low tide
- maintenance of heat balance
- resistance to mechanical stress of crashing waves
- prevention of salinity stress due to salt crusting or freshwater influx
- respiration, reproduction, and feeding occur mainly at _____ tide

Intertidal Environments: Tidal Pools

- Tidal pools frequently occur along rocky shores, the majority of which are overturned with each tidal cycle. Three major factors influence life in tidal pools:
 - temperature - isolation and exposure to the atmosphere lead to rapid and dramatic temperature changes
 - _____ - the evaporation of water leads to increases in salinity
 - oxygen - as temperature rises and organisms respire, dissolved oxygen decreases

Intertidal Environments: Sandy Shores

- Exposed sand beaches and protected sand flats are common throughout the world. The most important factors influencing these environments are:
 - _____ size - coarse sand allows much more water to drain through, while fine sand holds water and better for burrowing
 - wave action - controls erosion and sand movement
 - _____ - controls the degree of erosion and sand movement (along with wave action)

Beaches

- Beaches are deposits of sand or larger rock fragments along an ocean floor and coastline
- _____ – raised areas of the beach (higher slopes in the winter, shorter in summer)
- Sand Bar – sand carried away from the shore by waves
- Long Shore Current – current runs parallel to the coastline, transporting sand
- _____ Islands are isolated former dunes, long narrow offshore ridges of sand

Barrier Islands

Intertidal Environments: Muddy Shores

- Muddy shores are restricted to intertidal areas completely _____ from open ocean wave activity.
- Muddy shores have a very fine particle size that holds water extremely well. This frequently leads to _____ conditions.

Intertidal Fishes

- In rocky intertidal areas, fish are typically small and elongate in order to navigate the highly _____ environment.
- In mud and sand flats, skates and rays as well as various species of flatfishes are significant predators.

Intertidal Birds

- Birds are very common in all intertidal areas, especially sand and mud flats. Bird predation may be particularly intense during _____ and play an important part in the intertidal community.