Coastal ecosystems Eutrophication	**Coastal ecosystems are highly productive ecosystems for** **several reasons:** ➢ 1. Benefit from ➢ 2. Being shallow, the benthic organisms in these ecosystems live in ➢ 3.. ➢ 4. A combination of nutrients, ample light, and shelter make coastal ecosystems diverse and rich. **Human impacts:** _____ is an overabundance of nutrients that causes an ecological imbalance. It is a stimulus to some species and a detriment to others. Red tides are caused by eutrophication.
Estuaries	**Factors that limit productivity are**: ➢ Organisms in the ecosystem must tolerate wide _____ ranges. ➢ _____ caused by tides mixing with fresh water is fatal to many organisms. ➢ The tendency of decomposition to deplete the _____ level. Estuaries serve as nurseries for **Estuaries contribute to the productivity of adjacent marine ecosystems**: ➢ 1. ➢ 2.
Salt Marshes	Salt marshes exist in estuaries and along _____. The **upper marsh** includes the areas only _____ The **lower marsh** includes areas _____ _____ are plants that have adaptations that allow them to survive in salt water. **Adaptations include**: ➢ _____ in the leaves through which it breathes. ➢ Concentrates salts in _____. ➢ Salt glands on leaves and _____. Sacrificial leaves.

Mangrove swamp	_____ grow on stilt-like roots allowing oxygen to get to the roots. _____ have roots that grow with snorkel-like tubes that carry air from above to the roots. **White mangroves** lack special root adaptations. They are very saltwater tolerant, but thrive high on the tideline. **All species of mangroves share two important characteristics** that make them the basis of mangrove ecosystems. 1. provide habitats for _____. This provides a nursery for nearby marine ecosystems, particularly coral reefs. 2. due to size they hold the _____well, protecting the habitat and coast from erosion from storm surges, _____, and weather
Seagrasses	**Seagrasses differ from other halophytes in several ways**: ➢ They are the only plants, living entirely _____ ➢ They have no means of extracting fresh water from _____. ➢ They extract _____ from the seawater and have internal air canals. ➢ They do not need to have a _____ because they have an internal salinity the same as seawater. ➢ They reproduce by releasing _____into the water. ➢ provide food for _____
Intertidal Zones	May be above or below water. The **_____** is the area only submerged during the highest tides. ➢ Challenges: **drying out**, **thermal stress**, **and water motion**. ➢ **High salt levels _____** The **_____** is the area between high and low tide. ➢ Challenges:**drying out, thermal stress**, **and water motion**. ➢ With ample water nutrients, and sunlight, this is a highly productive region. One challenge to life here, therefore is **_____**.

Beaches	The first way beaches affect the ecosystem is **_____ the coastline by reducing _____ caused by coastal erosion**. The second way beaches affect other marine ecosystems is the _____ The _____– benthic organisms – live in the spaces between sand grains. The physical and organic process in the beach ecosystem break down organic and inorganic materials making the beach a giant _____ that processes compounds from runoff to the sea or washed up from the sea.
Coral Reefs	**Coral reefs** are the _____ on Earth. While diverse, they are also fragile. n The conditions coral requires for life are narrow and specific: ➢ Clear water; dinoflagellates coexisting in the polyps need light for photosynthesis. ➢ Water that's in moderate motion as _____ _____ ___ ➢ Water that is relatively free of nutrients. Lack of nutrients actually protect coral from other organisms. With too many nutrients, algae grows displacing coral and plankton grows reducing water clarity and the amount of sunlight. When a body of water is choked by plant life it is _____. n _____ **to coral reefs include**: ➢ Eutrophication levels have been rising over the last several decades. ➢ Thermal stress also threatens coral reef ecosystems. ➢ Coastal dredging and construction cause sediment to accumulate on the polyps faster than water motion can remove it. Coral diseases are more common

The Arctic	For the following reasons life is relatively scarce under the ice cap. ➢ Marine ecosystems in the _____ face the challenges of **reduced _____ under the ice and water that's barely above freezing**. ➢ Much of this sea is a _____ **on top** of the Earth. n **At the edge of the _____**, life intensifies during the warmer months. As the sun melts ice in the _____ water flows off the ice, sinking into deep water. Warm currents from the south interact with the cold water and that churns up nutrients from the shelf bottom. n **Extremely _____ occurs along an arc in the North Pacific and across the North Atlantic from April to August**. Massive fisheries, marine mammals and other organisms take advantage of the nutrients.
Antarctica	**Antarctica** is a _____, not a frozen sea, and it has it's own _____. ➢ Antarctic winters have widespread freezing and the continent almost doubles in size as the ice sheet expands. ➢ When summer comes, **the _____of this sheet sets off an explosion of _____**. ➢ Cold melt water _____. This downwelling results in an upwelling from the deep ocean. **The nutrient-rich water reaches the surface at the Antarctic Divergence, located at 65° to 70° south latitude. This area extends northward to an area called the Antarctic Convergence located at about 50° to 60° south latitude**. This is the largest nutrient-rich area on Earth. ➢ There are massive phytoplankton blooms from November through the southern summer. The copepod and krill populations are larger than any other species population found in any other ecosystem. The krill swarms have been estimated as exceeding 100 million tons!

The Deep	The abyssal zone covers about _____ of the Earth's surface. **Without _____ there's no _____**; consequently, there's no primary productivity in most of the deep ocean. **_____** makes the deep ocean rich in nutrients. ➢ _____ is the constant fall of sediment, dead organisms, fecal pellets, and other nutrients from the productive shallow water above. Without primary productivity the _____ lacks dense life concentrations. However, there is a vast species diversity. • Without photosynthesis there are not many multicellular organisms. Those that do survive are primarily echinoderms, such as _____, **sea lilies**, **and _____**. Submersibles have seen **rattails, deep-sea dogfishes**, **catsharks**, **crustaceans**, **mollusks and many species of deep-ocean fish**. **The diversity is found in the _____**. Representatives from almost all the animal phyla can be found living in the deep-ocean mud or sediment.
Whale fall	**A whale fall** is exactly what the name says – a place where a dead whale comes to rest on the _____. Stages of whale fall ecosystems are: 1. During the first stage the scavengers arrive. They consume the whale's _____ in a few months. Hagfish, grenadiers, deep-sea spider crabs and sleeper sharks are associated with this stage. 2. Stage two lasts about a year. Worms, small crustaceans, and other small organisms feed on the remaining soft tissue and the tissue dispersed around the whale as _____. 3. The final stage involves the decay of the _____. This can last several years or even decades. The bones provide a steady supply of sulfide as they're broken down. Chemosynthetic bacteria live on this sulfide and in turn create a food source. These _____ appear to be the same as those associated with hydrothermal vents.

Hydrothermal vents	**Hydrothermal vents** are sources of _____. Chemosynthesizing bacteria consume _____ dissolved in the heated water emerging from the vents. These bacteria act as the base of a trophic pyramid for a diverse community living in these deep-ocean ecosystems. **Cold seeps** are areas where _____s and sulfide-rich fluid seep from the underlying rock in the ocean floor. Heated by _____ energy from inside the Earth. They are called "cold" seeps because they're cool compared to hydrothermal vents.
Trenches	n Scientists know little about the **hadal zone** ecosystems primarily because of **the limits of technology**. Depth and pressure make it expensive and difficult. n Depths range from 5,000 to 6,000 meters (16,404 to 19,685 feet). Some spots are as deep as 11,000 meters (36,089 feet). Few submersibles exist that can go to these depths.