Assessment and Discussion Questions:

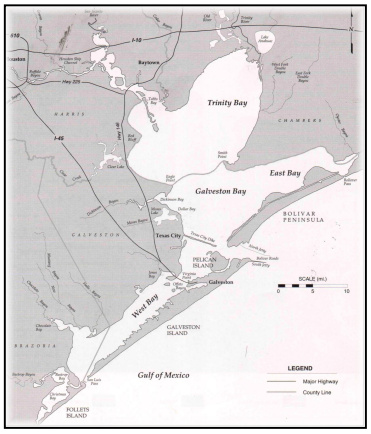
Estuaries and their Ecosystems.

The following student study questions are intended for students from **6th to 8th** grade.

Note to the teacher:
1. These questions are intended to stimulate classroom discussion/debate and as a resource for assessment following lessons and activities.

2. Before attempting these study questions, students should be familiar with the following key words and concepts:

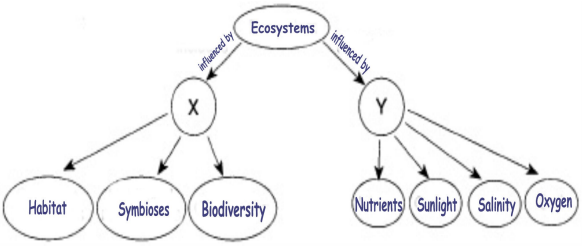
Abiotic
Biodiversity
Biomass
Biotic
Detritus
Dredging
Drought
Ecosystem
Energy Flow
Energy Pyramid
Estuary
Invasive species
Invertebrate
Plankton
Salinity
Tides
Trophic level
Watershed



Source: Galveston Bay Estuary Program

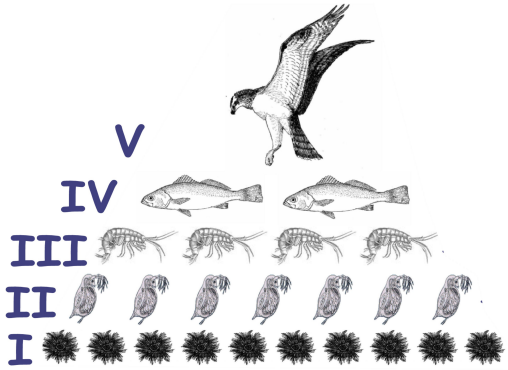
1. Water in the Galveston Bay estuary is *brackish* because of the mixing of fresh water from rivers and saltwater from incoming tides. A drought in the bay watershed would most likely cause the water in the bay to …

   A. increase in salinity.
   B. decrease in salinity.
   C. stay the same.
   D. rise.



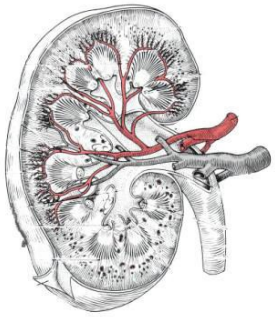
1. In the diagram above, "Y" best represents …

   A. biotic controls within an estuary ecosystem.
   B. abiotic controls within an estuary ecosystem.
   C. human influences on an estuary ecosystem.



3. The illustration above represents energy flow in an estuary. Which of the following statements is the most valid?

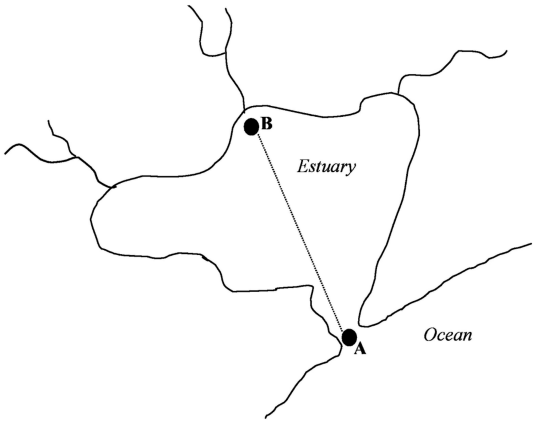
   A. Individuals in tier I have greater energy needs than those in tier V.
   B. Individuals in tier IV produce enough energy to supply the energy needs of tiers I, II, and III.
   C. A lot of energy is lost as heat as it flows from tier I to tier V.
   D. The total biomass of all individuals in tier V is greater than the total biomass of all individuals in tier I.



Human Kidney

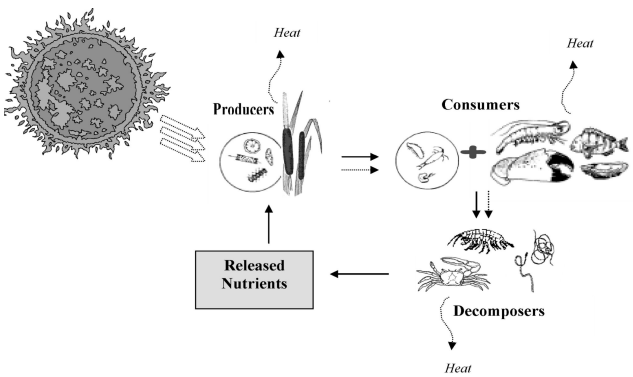
4. Coastal wetlands have been called "nature's kidneys." Which of the following benefits of having wetlands is most like a human kidney?

   A. Wetlands absorb heavy metals and filter out toxins.
   B. Wetlands produce a massive food base that supports aquatic ecosystems.
   C. Wetlands release oxygen into the atmosphere while removing carbon dioxide and other greenhouse gases
   D. Wetlands have the capacity to store large volumes of water.



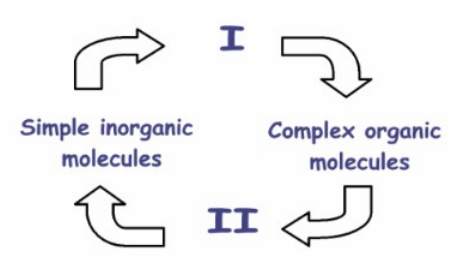
5. A new shipping port is proposed for the shallow estuary (average depth is < 8ft.) illustrated above. To do this, workers will dredge a 40ft deep channel through the estuary from point A to point B. Which of the following is *most likely* to occur in the estuary due to this project?

A. Salinity will increase in the upper reaches of the estuary.
B. Salinity will decrease in the upper reaches of the estuary.
C. There will be no changes in the salinity in the upper reaches of the estuary.
D. The estuary will experience greater flooding during high tide.



6. The illustration above represents heat flow and nutrient cycling in an estuary ecosystem. According to this illustration, which of the following is a key role of decomposers?

A. Recycle nutrients back into the system.
B. Transform simple inorganic molecules into more complex organic molecules.
C. Provide an energy source.
D. Produce biomass to support the food web.

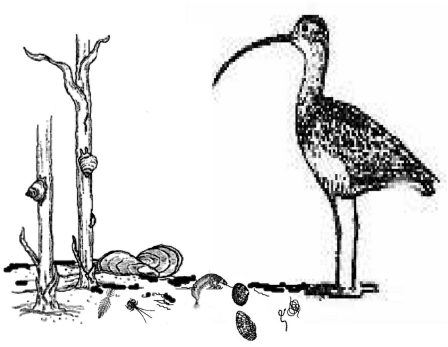


7. The simple diagram above shows how molecules are altered in an ecosystem by members of that system. What do the symbols I and II best represent?

A. I= Producers, II= Decomposers
B. I= Decomposers, II= Producers
C. I= Predators, II=Prey
D. I=Consumers, II=Producers

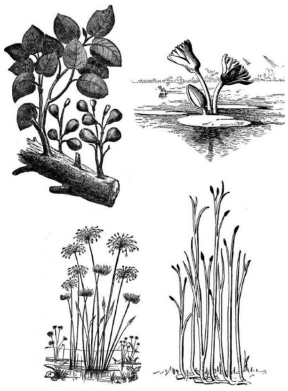
8. The high productivity of estuaries has been attributed to the presence of several primary production units. Which of the following would NOT be considered a primary production unit in an estuary ecosystem?

A. Phytoplankton suspended within the sunlight zone of the water column.
B. Benthic algae, microscopic plants living on the sediment surface wherever sunlight reaches the bottom.
C. Macroflora, such as marsh grasses which are the foundation of many food webs and provide nursery grounds for most coastal shellfish and finfish.
D. Juvenile zooplankton brought to the estuary by tides after hatching offshore.



8. Many shore birds feed on the mud flats of estuaries. When would be the best time for the birds to catch stranded fish and invertebrates?

A. During tidal ebb.
B. During tidal flow.

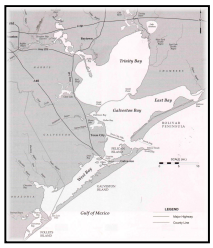


10. Which of the following are advantages to having a diversity of plant life in coastal wetlands?

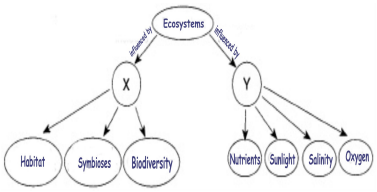
A. There is a greater variety of nutrient sources to provide nutrients to a greater variety of herbivores and other consumers in the food web.
B. There is a greater insurance that if a disease strikes one plant, other plant species will survive and support the ecosystem.
C. Both A and B.

Answer Summaries to:

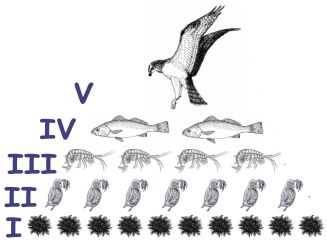
Estuaries and their Ecosystems (Grades 6-8)



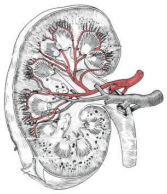
1. (A) Estuaries, by definition, are bodies of water where freshwater from rivers, streams and runoff mix with the salty waters brought in by the tides. Reducing the amount of freshwater brought to an estuary will result in higher salinity levels.



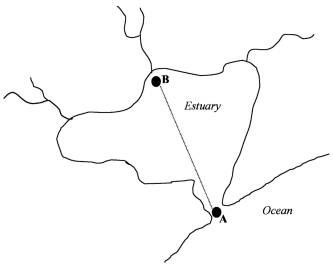
2. (B) Populations and geographical distributions of organisms are controlled by external biotic and abiotic controls. Biotic controls include the interactions of living things. Abiotic controls include the physical or "non-living" characteristics of the environment.



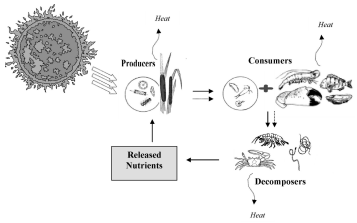
3. (C) Energy pyramids represent energy flow in a food web. Each tier represents an organism's position in the sequence of energy transfers. As energy is transferred from tier I (the producers) to tier V, a lot of energy is lost as heat.



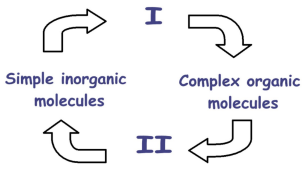
4. (A) Coastal wetlands provide many benefits for estuaries and other coastal waters. Similar to a human kidney, wetlands have the ability to filter out toxic materials and absorb other contaminants such as heavy metals.



5. (A) Since saltwater is more dense than fresh water, the ocean water will most likely form a "saltwater wedge" in the channel starting at the ocean inlet and make its way to the upper reaches of the estuary by "crawling" along the depths of the new channel. The result will most likely be increased salinity in the upper reaches of the estuary.



6. (A) As organisms live their lives and feed, energy lost by the organism producing heat as the animal does work and also by the food that is not completely digested or absorbed. Nutrients are passed along the food web in the form of food and ultimately released back to the environment by the decomposers. We can then say that in an ecosystem, nutrients are recycled but heat is lost.



7. (A) Producers and take the recycled nutrients (inorganic molecules) from the environment and through the process of photosynthesis, they produce complex organic molecules. Decomposers, however, do the opposite, as they break down decomposing material into simple inorganic molecules.

8. (D) Estuaries are known for their high productivity. One of the reasons given is the presence of several primary production units. These include: suspended phytoplankton, benthic algae, and marsh grasses.

9. (B) During tidal ebb, the tide is pulling estuary water back to the sea. During this event, many creatures including shore birds rush to the mudflats to feed on the bounty of stranded fish and retreating invertebrates.

10. (C) The diverse plant communities in coastal wetlands is a key factor in the high productivity an estuary ecosystem. In any environment, biodiversity supports a diverse and healthy ecosystem by: 1. Supporting a greater variety of food chains within a food web, and 2. Providing an iffsurance ãgainst many species-dependent plant diseases.