A Salt Marsh Ecosystem

Strand   Biological Communities

Topic   Investigating the impact of physical environment changes on food webs

Primary SOL   LS.8   The student will investigate and understand interactions among populations in a biological community. Key concepts include
  a) the relationships among producers, consumers, and decomposers in food webs.

Related SOL   LS.1   The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
  j) current applications are used to reinforce life science concepts.

LS.5   The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include
  c) photosynthesis as the foundation of virtually all food webs.

LS.7   The student will investigate and understand that interactions exist among members of a population. Key concepts include
  b) influence of behavior on a population.

LS.10   The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic, change over time, and respond to daily, seasonal, and long-term changes in their environment. Key concepts include
  b) factors that increase or decrease population size.

Background Information

A salt marsh is a complicated ecosystem made up of different food chains that overlap to form a food web. Make sure students understand the biotic and abiotic factors of a salt marsh ecosystem. The data on the attached "Salt Marsh Organisms Cards" can be modified to add or substitute examples from your local ecosystem. Teacher should review basic knowledge of food chains and food webs as well as predator/prey relationships. First-, second-, and third-level consumers should be identified.

Materials

- Scissors
- Tape
- Yarn
- Copies of Salt Marsh Organisms Cards

Vocabulary

abiotic, biotic, carnivores, communities, consumers (first-, second-, and third-level), herbivores, omnivores, predator, prey, producers

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Divide the class into groups of three or four students, and give each group a pack of the 15 cards, representing organisms of the salt marsh and sources of energy. Also, display the following questions on the board or chart paper:
    -   What are the producers in this community?
    -   What is the source of their energy?
    -   Which three organisms are strictly herbivores?
    -   Which two organisms are strictly carnivores?
    -   Which three organisms are omnivores?
    -   Which organisms are first-order consumers? Which are second-order? Which are third-order?
    -   How would the predator-prey relationships be described?
    -   How does the size of an animal determine its position in the food web?

2. Have students place the cards representing the producers of this community at the edge of their desk or table. Then, have students place the cards representing the grasshopper, snail, fish, and small crustaceans in a row above the plants and to connect each animal to its food source(s) with a piece of yarn. Have them tape the ends of each piece of yarn to a card. Next, place the hawk and the owl at the top edge of the desk and scatter the remaining organisms in the space between the herbivores and the hawk and owl. Again, have them use the yarn and tape to connect each of the organisms to all the other animals that will eat it, using the food list on each card to help determine the food each organism eats.

3. Ask students to identify the organisms in the food web which are eaten by the rat. Ask students which organisms depend directly on the marsh plants for part or all of their diet. Have students answer the questions listed above in step 1.

4. Have each team member hold one of the producer cards or the heron, hawk, or owl cards and carefully lift the food web off the table. It should be supported by the yarn attached to these five cards. Have students observe the web carefully, noting the connections.

Assessment
-   **Questions**
    -   What do you predict would happen to the food web if insecticides were to enter the salt marsh and kill the grasshoppers and snails?
    -   Which animals would be affected by the loss of these foods?
    -   What might these animals do to replace the lost food sources?
    -   How might this affect their other food sources?
    -   Which organism would be affected if pollution were to reduce the population of fish?
    -   What is the basis of most every food web? Why are these organisms key to the other organisms' survival?
-   **Journal/Writing Prompts**
    -   Predict what might happen to this food web if the salt marsh were filled in to make room for a new housing development.

- **Other**
  - o Have students create a food web from another ecosystem.

Extensions and Connections (for all students)
- Have students research other food chains. They may investigate how toxins travel through the food chain in the salt marsh. Why should all members of the larger watershed be concerned about a salt marsh that is hundreds of miles away. How do salt marshes benefit humans? Have students research other ways to control pests.

Strategies for Differentiation
- Have students construct a simple food web with the following organisms: grass, weeds, worm, grub, beetle, robin, starling, and cat. Have students identify the producers and first-, second-, and third-order consumers.
- Students can expand on the ecosystem food web by creating an energy pyramid that corresponds to the organisms listed.

Salt Marsh Organisms Cards

MOUSE *eats* grasshoppers snails marsh plants	**RAT** *eats* sparrows grasshoppers snails marsh plants	**OWL** *eats* rats sparrows ducks sandpipers
DUCK *eats* crustaceans marsh plants algae grasshoppers snails	**SANDPIPER** *eats* crustaceans algae	**SPARROW** *eats* crustaceans marsh plants grasshoppers snails
SMALL CRUSTACEAN *eats* algae	**FISH** *eats* crustaceans marsh plants algae	**HERON** *eats* fish
SALT WATER ALGAE *energy source:* sunlight CO_2 water	**SALT MARSH PLANTS** *energy source:* sunlight CO_2 water	**SNAIL** *eats* marsh plants algae
HAWK *eats* shrews mice rats	**SHREW** *eats* grasshoppers snails mice	**GRASSHOPPER** *eats* marsh plants