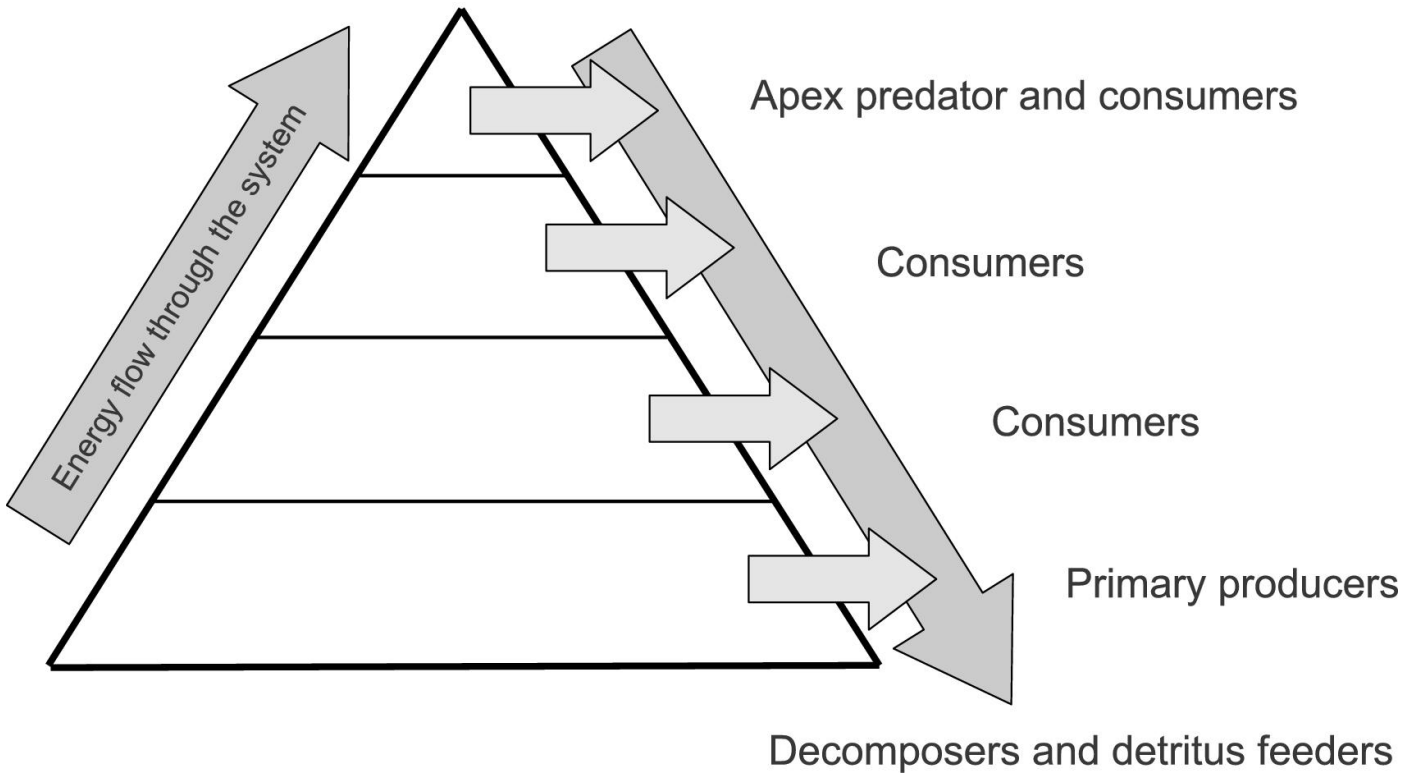


TEACHER MASTER
Food Pyramid

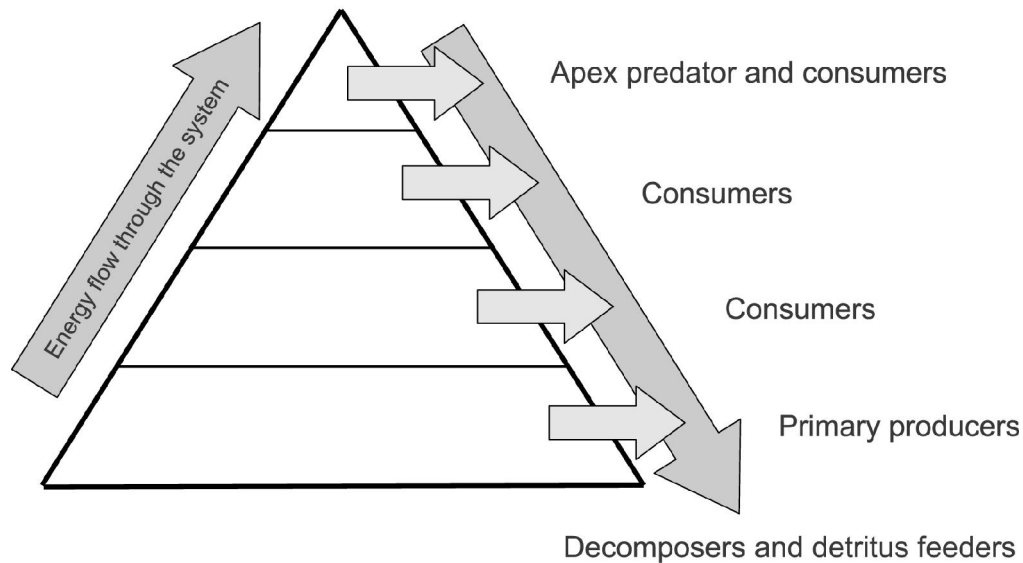


STUDENT MASTER

Estuary Food Pyramid

When animals eat plants or other animals in order to survive, there is a flow of food energy through the ecosystem. What starts out as energy from the sun becomes food energy created by the green plants that use photosynthesis to grow and reproduce. These plants are the producers and the base of food chains and complex food webs.

As one thing eats another, the layers of the food pyramid narrow. These layers, called trophic levels, represent available energy. Animals at each trophic level depend on animals living in the levels below them for food energy. The largest amount of available food energy is found on the first trophic level, the base of the pyramid. Less than 10% of the amount of food energy that is available in one level is available to the animals in the trophic level just above. That means each higher level can support fewer and fewer organisms.



Procedure

1. Your teacher will assign you one of the organisms found on the Student Master: Estuary Food Pyramid Organisms. Read the description of your assigned organism.
2. Draw a picture of your assigned organism on the food pyramid at the trophic level where you think it exists and/or feeds. Write your organism's name beneath your drawing.
3. Now read the descriptions of the other four organisms on the Student Master: Estuary Food Pyramid Organisms. Based on the descriptions, draw and label an organism that exists on the trophic level just above your assigned organism and an organism that exists on the trophic level just below your assigned organism. (Of course, this is no level above if your assigned organism is an apex predator. And there's no level below if the organism is the producer, except the decomposers and detritus feeders!)
4. Next, use the computer to use the Interactive Food Pyramid simulation. You will find it in on the web page for this activity in the Middle School Curriculum section of the Estuary Education website at estuaries.noaa.gov. Duplicate your food pyramid from this Student Master by dragging the onscreen image of your assigned organism to its proper trophic level. Drag to add the organisms you have selected for the adjacent trophic levels. Now fill in other trophic levels with other available organisms in the simulation. Click the Check button to check your work as you add organisms to see the food web.
5. Answer the questions on the next page.

Questions

Q1. Is your assigned organism a producer or a consumer? Explain.

Q2. Where does your organism get its energy?

Q3. Do you think there are many or few organisms located in your assigned organism's trophic level?
Why or why not?

Q4. Write a paragraph describing the roles different organisms play in the estuary food pyramid.

STUDENT MASTER**Estuary Food Pyramid Organisms**

Use the following information to help place your assigned organism in its proper position on the estuary food pyramid.

Oyster

Oysters and other bivalves are filter feeders. As they filter water over their gills, the oysters take in and eat algae, a kind of phytoplankton. The oyster spat or larvae are eaten by a wide variety of fish and invertebrates. Larger, mature oysters may be eaten by crabs, fish, starfish, worms, or birds.

Bull shark

Immature sharks may be prey to larger fish. However, adult sharks almost always find themselves at the top of the food web and the food pyramid. In an estuary, the shark is the apex (top) predator. Some sharks, such as leopard sharks, may feed on worms, clams, and crabs. Other sharks, such as the bull shark, may hunt for other sharks, turtles, and birds, among other prey.

Phytoplankton

Plankton are floating or drifting plants and animals and are found in bodies of water ranging from fresh to salty. Phytoplankton, the plant plankton that use the sun's energy to make food, are the base of the estuary food web and food pyramid. Plankton are critical in maintaining the health and productivity of the estuary ecosystem.

Horseshoe crab

Horseshoe crabs are bottom dwellers. Their diet usually consists of mollusks (various species of clams), gastropods (snails), and marine worms which are abundant on the bottom of estuaries. Horseshoe crab eggs and larvae are also a great food source for other animals, including birds such as the red knot sandpiper. Although juvenile and mature horseshoe crabs have a hard shell for protection, even they can be eaten. Mature horseshoe crabs are a food source for sea turtles and larger marine animals.

American Oystercatcher

The American Oystercatcher is a dark-colored, wading shorebird. Oystercatchers have long, large, heavy beaks that they use for smashing or prying open mollusks, including bivalves such as oysters, as well as mussels, barnacles, etc. Like other shorebirds, the main predatory threat to the oystercatcher occurs when their eggs are still in the nest, where the eggs can be eaten by other birds or small mammals or even some types of crabs.

CLIMATE EXTENSION

Estuary Food Webs and Climate Change

In this activity extension you will consider ways that the estuary food web could be impacted by climate change.

Procedure

1. Add the following organisms at the correct trophic level on your Estuary Food Pyramid: clam worm, raccoon, mussel, Bald Eagle, striped bass, blue crab, shrimp, and diamondback terrapin.
2. Create a food web with the organisms on your Estuary Food Pyramid by drawing arrows that start at the an organism being eaten to the organism that is doing the eating. Next use your completed estuary food web answer the following question:
 - Q5. How many organisms in your estuary food web rely directly on phytoplankton as a food source?
 - Q6. How many organisms in your estuary food web rely indirectly on phytoplankton?
3. Read the document titled “Marine Plankton Food Webs and Climate Change” and answer the following questions:
 - Q7. List three environmental variables, associated with climate change, that are expected to have impacts on plankton.
 - Q8. How could climate change cause an increase in some jellyfish populations and what impact would the increase have on other organisms in a coastal food web?
 - Q9. Why is it important for scientists to continue to study the impacts of climate change on estuarine and coastal plankton?