GreatHearts
Northern Oaks

Supplemental Packet

May 4 - 8, 2020

4th grade

SUPPLEMENTARY ACTIVITY: Shadow Tracing to Find Negative and Positive Space in Trees

Materials: something hard to draw on (unless you have your sketchbook), pencil, eraser, marker, and sunlight!! (**_optional_: paintbrush, water)

1. Go outside and find a shadow of a tree or a plant on the ground.
2. Place your paper on a good and interesting part of the shadow.
3. Begin tracing lightly with your pencil (only contour lines!!! No shading!).
4. Once you have traced your shadow lightly with pencil, go over your pencil lines with marker.
5. **Optional: Using a paintbrush and water, go over your marker lines and spread them outward, into the NEGATIVE SPACE (away from the shadow).

Food Chains and Food Webs

In any ecosystem, a lot of eating is going on. Do you remember why? Eating is the way animals get the food they need to survive. What is it about food that makes life possible? Food is a source of matter and energy. The matter in food provides the raw materials an organism needs to grow and reproduce. Energy is like fuel that makes things happen.

One way to think about ecosystems is who eats whom. When you know how an organism gets its food, you can put it into a group. Let's look at the groups.

Producers

Some organisms don't eat anything. They don't have to because they make their own food. Organisms that make their own food are called **producers**. In terrestrial ecosystems, the most important producers are plants. Grasses, trees, and bushes are producers. In freshwater and ocean ecosystems, algae are the most important producers.

A type of freshwater algae called *Oedogonium*

Algae are organisms that play an important role in aquatic ecosystems. Many algae are microscopic. Algae produce most of the food in freshwater and ocean ecosystems. They use water (H_2O), carbon dioxide (CO_2), and sunlight to make their own food, just like plants. Algae are the food source for many kinds of crustaceans, insects, fish, and worms. In your goldfish aquarium, you might have seen algae growing. Did the water turn green? Did a green layer form on the sides of the aquarium? If so, then you saw algae.

But wait! If algae are **microorganisms**, how can you see them? When a few algae are in your aquarium, you won't see them because they are so small. But they start to reproduce. And after a week or two, the population of algae will be in the billions! That's what you see. Any one of those microorganisms by itself is much too small to see. You need a microscope to see just one. But huge numbers of them can affect the color and clarity of the water, making it look green and cloudy.

What happens to the algae? In a freshwater lake, insects and fish eat the algae. In the ocean, algae are food for baby clams, barnacles, corals, and thousands of young fish, crabs, and snails.

Producers use the food they make as a source of matter and energy. They don't eat other organisms for matter and energy. Any organism that makes its own food is a producer.

Algae on a pond

A ground squirrel

Caterpillars

A snake

A vulture

Consumers

Organisms that eat other organisms are **consumers**. Consumers can't make their own food. Consumers depend on other organisms to get their matter and energy.

Some consumers eat plants and plant parts. Deer eat grass and leaves. Gophers eat roots. Squirrels eat grass, nuts, and berries. Caterpillars eat leaves. Animals that eat only plants to get their food are called **herbivores**.

Some animals don't eat plants. Snakes don't eat nuts and berries. Hawks don't eat grass. Spiders don't eat leaves. So how do they get their matter and energy? They eat other animals. Snakes and hawks eat gophers and squirrels. Spiders eat insects. Animals that eat other animals are called **carnivores**.

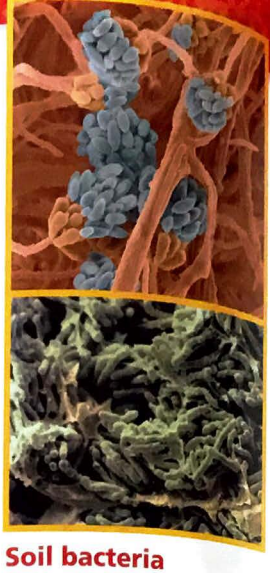
Some consumers, like humans, bears, raccoons, robins, and crayfish, eat both plants and animals. They are called **omnivores**.

Scavengers are consumers that eat dead organisms. Some scavengers, like vultures, eat only dead animals. Others, like isopods and termites, eat dead leaves and wood. Coyotes, rats, ants, and earthworms will eat just about anything that is dead.

Decomposers

There is a hidden world in every ecosystem. Millions of insects and invisible microorganisms use the last bits of dead plants and animals for food. They can be thought of as the cleanup crew. These organisms are called **decomposers**.

Decompose means "to break into parts." Insects, such as ants and termites, break down dead plants and animals into tiny pieces. Then the decomposers, the **bacteria** and fungi, take over. Bacteria and fungi break down dead plant and animal matter into simple chemicals (nutrients). The simple chemicals are returned to the environment. When decomposers are done with a dead organism, there is no energy to transfer, and there is no longer any food value. The simple chemicals are the raw materials used by producers to make more food. Decomposers are the ecosystem's recyclers of matter.



Soil bacteria

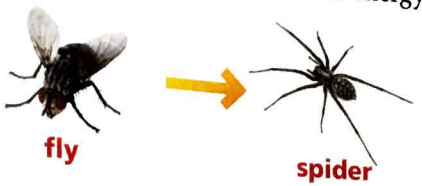
Bacteria are the smallest organisms in the world. They are found in all environments. Bacteria play a very important role in every ecosystem. Bacteria decompose dead matter and waste. After bacteria finish their work, there is no energy to transfer from the matter, and the raw materials are returned to the environment. Some bacteria can cause disease, but most bacteria have important roles in ecosystems.

Fungi are important decomposers, too. They come in different shapes, sizes, and types. We know them as molds, mildew, and mushrooms. Like bacteria, fungi can live everywhere. They can live in both terrestrial and aquatic ecosystems. They are in the soil, in your home, on plants and animals, and even on you. A spoonful of soil might contain 120,000 fungi. Some are harmful to living plants and animals. But most fungi are important in recycling dead matter for raw materials in the environment.

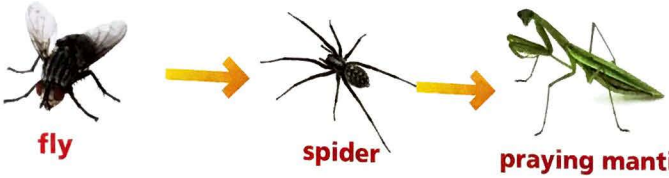
Mushrooms are fungi.

Food Chains

When a spider eats a fly, the matter and energy in the fly go to the spider. This feeding relationship can be shown with an arrow. The arrow always points in the direction that the matter and energy flow.

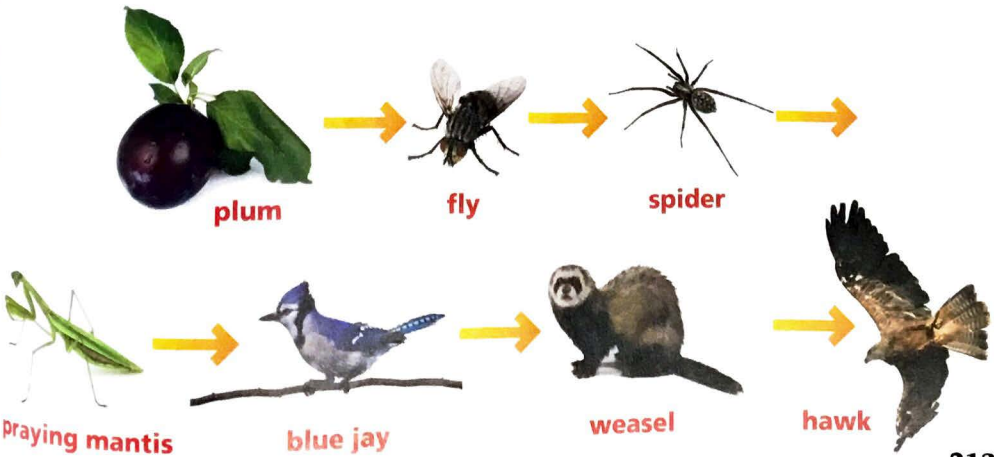


If a praying mantis eats a spider, the matter and energy in the spider go to the praying mantis.



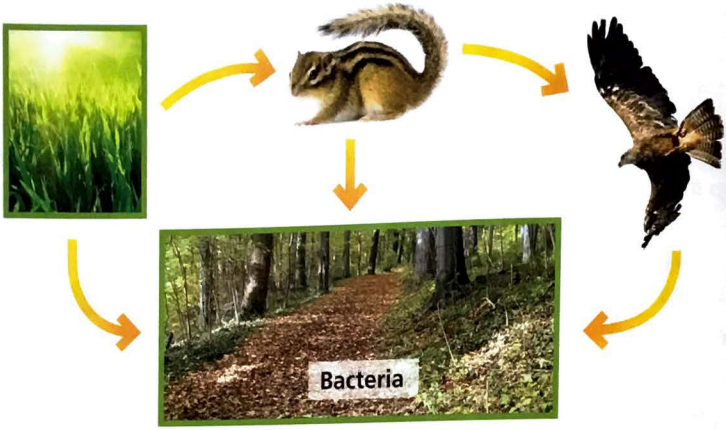
It's possible in a woodland ecosystem for a blue jay to eat the praying mantis, a weasel to eat the blue jay, and a hawk to eat the weasel. Matter and energy pass from one organism to the next when they are eaten. This is called a **food chain**. And at the beginning of the food chain is a producer. Energy for producers comes from the Sun.

In this case, the producer is a fruit from a tree, a plum. You can draw arrows from one organism to the next to describe a food chain. The arrows show the direction of energy flow. They point from the organism that is eaten to the organism that eats it.



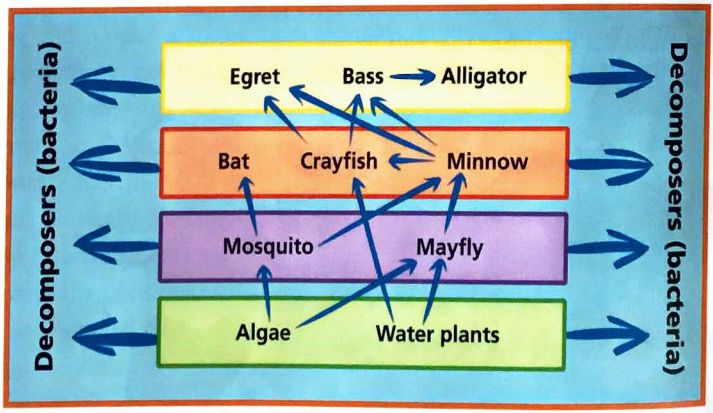
Another example of a food chain might have grass as the producer. A chipmunk eats the grass seed. A hawk eats the chipmunk. Bacteria decompose any dead organisms or uneaten parts. You can always draw arrows from dead organisms to the decomposers.

A simple food chain



Food Webs

There are many feeding relationships in an ecosystem. If you draw *all* the arrows that show who eats whom, you have a **food web**, not a food chain. The food web for a freshwater river might look like this.



This is an example of a food web for a freshwater river. Bacteria decompose all the organisms when they die.

Locate the crayfish in the example of a food web. Crayfish are food for both egrets and bass. If the river has a lot of crayfish, egrets and bass will both have plenty to eat. But if there are few crayfish, the egrets and bass will have to **compete** with each other for food.

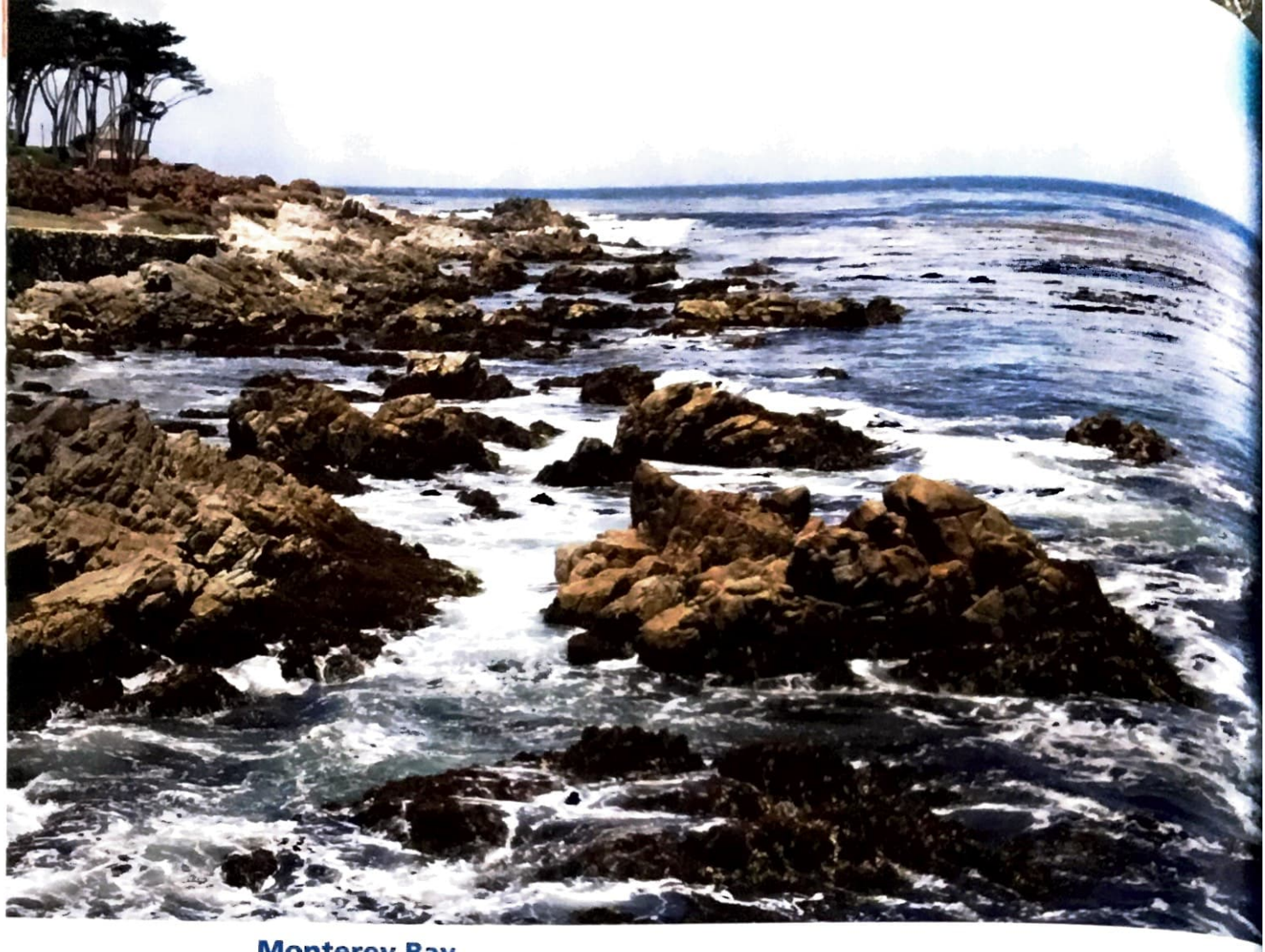
The animal that can get more food is the one that is more likely to survive. In this river ecosystem, egrets and bass compete for crayfish. Are there other competitions for food in the ecosystem?

Organisms in ecosystems depend on one another for the food they need to survive. Herbivores depend on producers to make food. Carnivores depend on consumers for food. Omnivores depend on both producers and consumers for food. Decomposers depend on dead organisms and waste for food. And producers depend on decomposers for raw materials to make food. In a healthy ecosystem, some organisms will be eaten so that other organisms will survive.

Egrets eat crayfish.

Review Questions

1. What is food? Why is it important?
2. What is the role of producers in an ecosystem? What is the role of consumers?
3. What things do most producers need to make their own food?
4. What is a food web? Describe the flow of energy through a food web, beginning with the Sun.
5. Predict how a forest fire might affect the food web in a forest.



Monterey Bay

Monterey Bay National Marine Sanctuary

Much of the northern California coast is rocks and cliffs. The ocean water is very cold all year. During the winter and spring, huge waves from the Pacific Ocean crash on the rugged shore. Can anything live in this difficult environment?

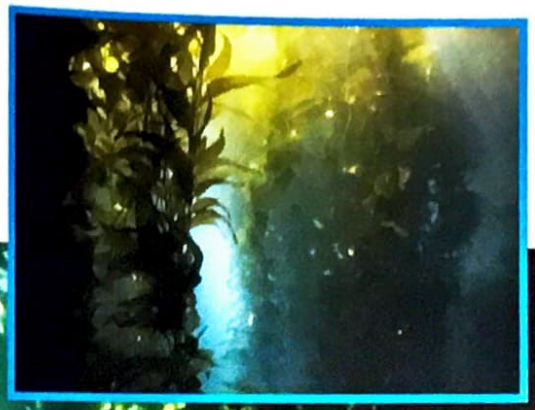
The answer is yes. The northern California coast is one of the most diverse and productive ecosystems on Earth. Thousands of different kinds of organisms live and interact in the cold ocean water. This ecosystem is protected in the Monterey Bay National Marine Sanctuary. *Marine* means "ocean" or "sea." A sanctuary is a protected place. This is one place where scientists can study the interactions between ocean organisms and their environment.

The Kelp Forest

Giant kelp grows in most of the 15,783-square-kilometer (km) sanctuary. Kelp looks like a plant, but it is actually algae. Like plants, algae make their own food.

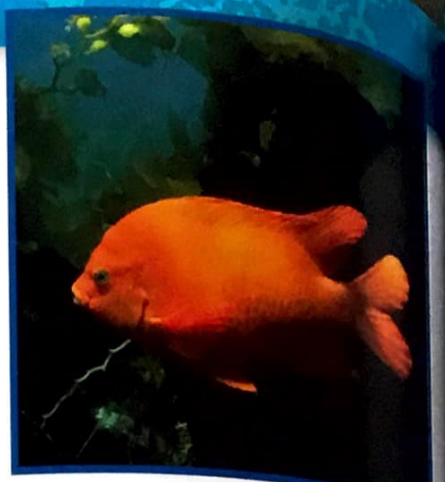
Giant kelp are anchored to the seabed and reach clear to the ocean surface. In some places, the distance is more than 100 meters (m) to the surface. This makes the kelp taller than the tallest trees. For this reason, the California marine ecosystem is often called the kelp forest.

Like the rain forest, the kelp forest has a floor, an understory, and a large canopy. The canopy spreads across the water's surface. But, unlike the rain forest, most of the organisms do not live in the canopy. Most live in the understory and on the floor. Every bit of the rocky bottom has animals clinging to it. These include clams, scallops, mussels, barnacles, limpets, abalones, snails, sponges, sea urchins, sea stars, shrimp, and sea anemones. Every crack and cave shelters a fish, an eel, a crab, or an octopus.



A kelp forest

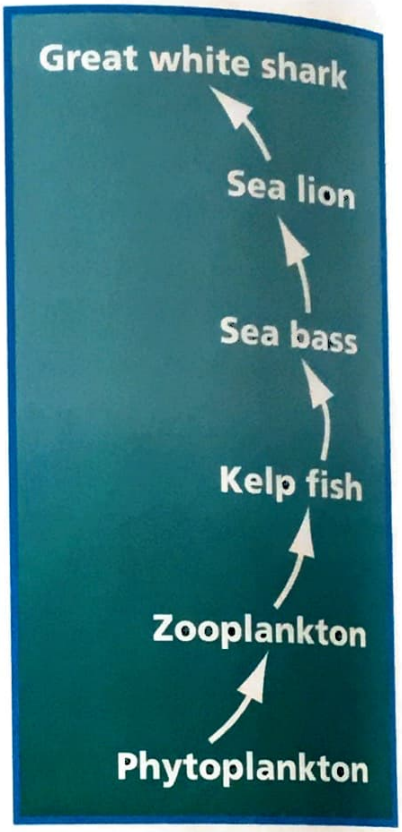
Fish live in the understory. There are small fish such as anchovies and sardines, medium-sized fish such as sea bass, snappers, and perch, and large fish such as groupers and sharks. The California state marine fish is the bright orange garibaldi. It also lives here. Other animals found in the understory are squids, jellyfish, seals, sea lions, and gray whales.



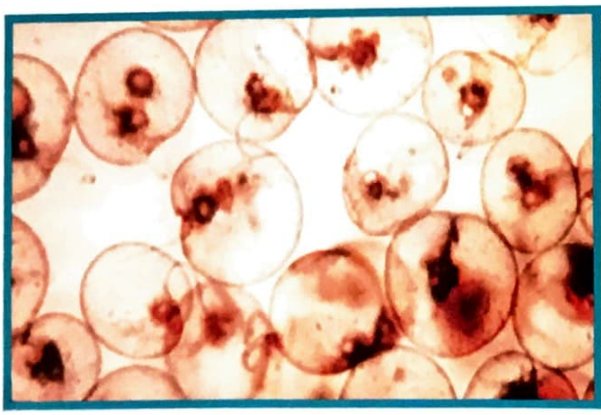
An orange garibaldi

The canopy provides shelter for a number of small animals that live on and around the kelp. These include snails, crabs, barnacles, and kelp fish. The canopy is a resting and hunting place for sea otters, seabirds, gulls, terns, ospreys, and ducks.

Where do all these animals get the food they need to survive? Like all ecosystems, the kelp forest depends on producers. The giant algae provide matter and energy to the ecosystem, but only a small amount. Microscopic phytoplankton are the most important producers in this ecosystem. These tiny producers (the grass of the sea) are eaten by zooplankton. Zooplankton are eaten by baby fish (kelp fish), clams, crabs, and thousands of other organisms. Small fish and crabs are eaten by larger fish (sea bass). The food produced by the phytoplankton eventually feeds the sea lions and sharks at the top of the food web. Marine bacteria decompose all the dead organisms in the ocean ecosystem.



Monterey Bay food chain



Phytoplankton

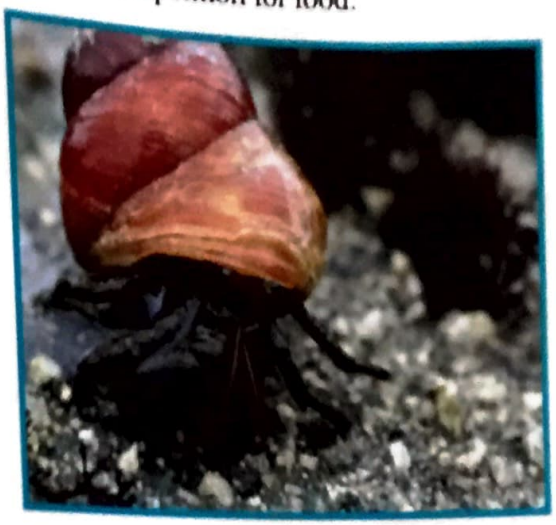
Zooplankton

Competition for Resources

There is a lot of competition for phytoplankton in the marine ecosystem. The zooplankton that have the best structures for catching phytoplankton will be most successful. This is one example of competition for food.

There is also competition for space. Waves and currents are very strong in the coastal environment. Many organisms must attach firmly to a solid surface or be washed away. The rocky bottom of the ocean is completely covered with organisms.

Kelp forest organisms compete for shelter. Caves, cracks, and old shells are used as hiding places. There is life-or-death competition for places to attach and hide.



This is a hermit crab. Hermit crabs live in empty snail shells. What kind of competition do you think they have in the ecosystem?

Review Questions

1. What do you think happens to waste and dead animals in marine ecosystems?
2. What is the most important producer in both freshwater and marine ecosystems? Why?
3. Identify three ways organisms compete in marine ecosystems.