

Changing Ecosystems and the Flow of Energy

Teacher Facilitation Notes

In General . . .

- Project the slide deck in edit mode—do not show it as a slideshow.
- Hide the speaker notes before projecting. (View/Show Speaker Notes)
- Hide the filmstrip to the left. (View/Hide Filmstrip.)
- Hide the toolbar. (Click on the up arrow at the right end of the tool bar.)
- Call on students to read the various content shown on slides.

Materials Needed:

Part 4: Stable or Unstable?

Organism cards

Other Materials

Student Recording Sheets

Pencils

Student Summative Evaluation

Science notebooks

Part 1: Energy in Ecosystems

- Ask students to look around the room and identify the biotic and abiotic factors they can observe. Ask students how they know which factors are biotic and which are abiotic. Make sure students understand the characteristics of organisms—especially the need for energy to sustain life processes.
- Remind students that organisms live in ecosystems. Read and discuss the opening slide defining an ecosystem.
- Next, ask students, *Where do organisms get the energy they need for living?* Discuss.
- Read and discuss the slide about energy and matter in ecosystems.
- Have students answer the first three questions on their recording sheet after reading about energy in ecosystems and watching the photosynthesis video.
- Read and discuss the remainder of the slides that detail the types of organisms found in ecosystems.
- Have students answer the questions on their recording sheet as they read and discuss the slides.

Part 2: Matter and Energy Flow

- Use part 2 of the slide show to review food chains and food webs as desired.
- Have students complete the data sheets that accompany this section of the lesson.

Changing Ecosystems and the Flow of Energy

Teacher Facilitation Notes, p. 2

Part 3: Changing Ecosystems

- Read and discuss each slide. Call on volunteers to answer each question.
- Ask questions similar to these:
 - What are some ways ecosystems might change?
 - What environmental changes or events could cause an animal population to perish or move?
 - What must an animal do when it is forced to move from its normal ecosystem?
 - Which do you think would cause more changes to an ecosystem—a drought or a flood? Why?
 - How would people be affected if all of the green plants on Earth suddenly died?
- Have students complete the recording sheet for this part of the lesson.

Part 4: Stable or Unstable?

- Duplicate a set of the organism cards. If necessary, duplicate pages more than one time so that each student can have a card. Cut apart.
- Read the first slide in this section. Make sure students understand that a stable ecosystem is one that has the ability to bounce back from changes or disruptions.
- Study the food web on the second slide. Explain the difference between herbivorous and predaceous insects. (Don't hold students responsible for knowing the definitions of these terms. Just make sure they understand how the role of each type of insect differs in the food web.)
- Give each student an organism card. Have them circle the role of the organism in the ecosystem and explain why it fills that role. (For example, grass is a producer because it uses energy from the sun to make its own food.)
- Leave the food web slide displayed as you go through the rest of this activity.
- Call on the students that have cards with producers to stand up. Let the students name their organism and tell why it is a producer.
- Ask the students who have cards with organisms that only eat producers to stand up. Have them name their organisms and tell what its role is in the ecosystem.

Changing Ecosystems and the Flow of Energy

Teacher Facilitation Notes, p. 3

Part 4: Stable or Unstable?, continued

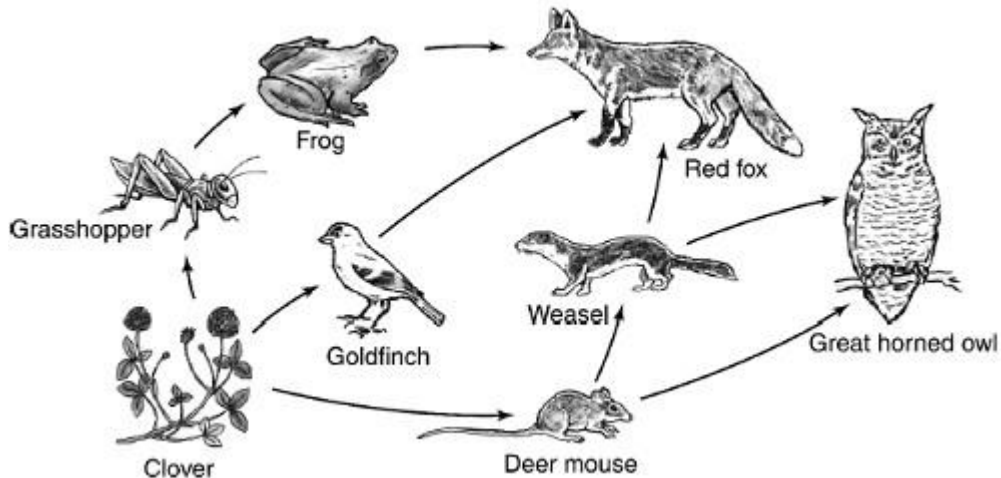
- Have the students who have cards with organisms that eat both plants and other animals stand up. Have them name their organism and its role.
- Call on a set of students to form one of the food chains shown in the food web at the front of the room. For example:
 - Butterfly bush→butterfly→woodpecker→hawk
- Starting with the hawk, have the students explain the flow of energy in the food chain. (Hawk: I get energy by eating the woodpecker, etc.)
- Ask what type of organism is missing (decomposer). Have one decomposer come and stand with the food chain. Present a scenario, such as insects ate all of the butterfly eggs in the ecosystem. How would that affect the other organisms in this food chain?
- Continue in the same manner with other food chains in the food web.
- Have students complete the quiz independently. Discuss as desired.

Changing Ecosystems and the Flow of Energy

Name: **KEY**

Evaluation, page 1

Directions: Use the diagram of the food web to answer questions 1 and 2.



1. How many organisms transfer energy directly to the red fox?
A 1
B 2
C 3
D 4
2. Which of the following is a possible effect of a decrease in the weasel population in this ecosystem? Mark all that apply.
F There would be more clover for the grasshopper and mouse to eat.
G The red fox would eat more frogs and goldfinches.
H The deer mouse population might decrease because the great horned owl would rely on the mice for energy.
J There would be more grasshoppers to transfer energy to the frogs.

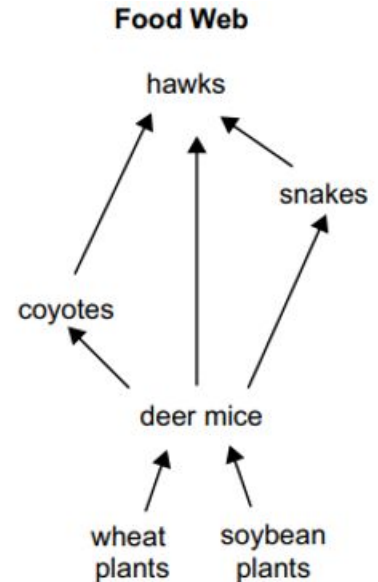
Changing Ecosystems and the Flow of Energy

Name: KEY

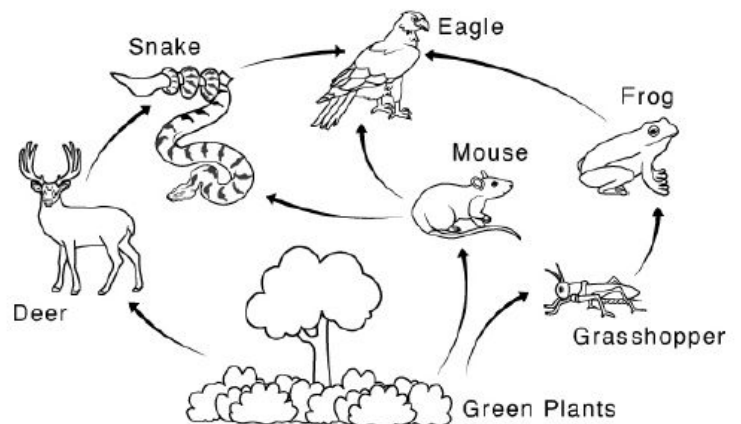
Evaluation, page 2

3. Cold temperatures reduce the snake population in this food web. How will the hawks most likely respond to this change in their environment? The hawks will—

- A eat more deer mice
- B hibernate for the winter
- C get energy from the wheat plants
- D use sunlight to produce their own food



4. One summer, a disease caused most of the grasshopper population in this ecosystem to die. Which of the following explains the animal population that would be most affected by this natural event?



- F The eagle population, because there would be fewer mice in the ecosystem
- G The snake population, because snakes eat grasshoppers every day
- H The mice population, because there would be less grass for them to eat
- J The frog population, because they would have less food to eat

Changing Ecosystems and the Flow of Energy

Name: KEY

Evaluation, page 3

5. What happens to the organisms in an ecosystem during a long period of drought?
- A All of the organisms in the ecosystem will die.
 - B All of the organisms in the ecosystem will survive.
 - C Some of the organisms in the ecosystem will survive while others may move to a new place or die.
 - D Most of the organisms in the ecosystem will dig holes and hibernate until the drought is over.
6. A flood can cause much damage to an ecosystem. Many organisms in the ecosystem may die or have to move to a new ecosystem. How can a flood have a positive, or good, effect on an ecosystem?
- F There are no positive effects of floods on ecosystems.
 - G A flood can lead to the death of many organisms in the ecosystem.
 - H Animals will have to rebuild their homes due to flood damage.
 - J Floodwater can create new habitats for some organisms.
7. Wild hogs are an invasive species. (An invasive species is an organism that is not naturally found in an ecosystem.) The wild hogs overpopulate an area, dig up tree roots, and trample grass and young trees. They eat all types of plant parts, including nuts from trees. How would a wild hog population be harmful to the deer population in a forest ecosystem?
- A Wild hogs take over and destroy the deer's habitat.
 - B Wild hogs eat a lot of the same food that a deer eats.
 - C Wild hogs keep new plants from growing.
 - D All of the above

Changing Ecosystems and the Flow of Energy

Name: KEY

Evaluation, page 4

8. Pine beetles dig holes in pine trees to lay eggs. Once the eggs hatch, the larva eat the tree from the inside out. The adult beetles also eat the bark of the pine tree. What changes might occur in a pine forest that has an overpopulation of pine beetles?

F The pine beetles die out from lack of food.

G Pine beetles harm many trees and cause them to die.

H The pine beetles begin to eat other plants and insects.

J The population of trees increases because there are more pine beetles.

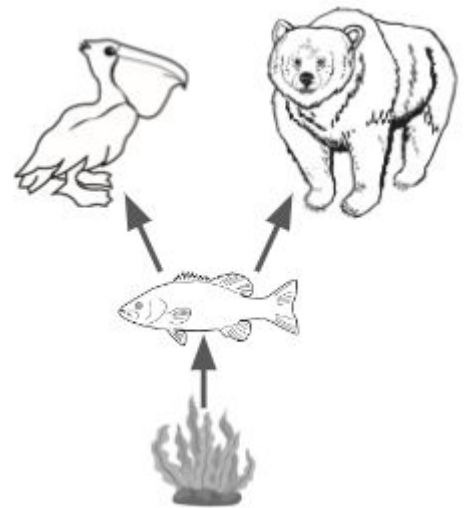
9. Study the food web pictured here. Which change would happen if the fish all died and were removed from this food web?

A The plant population would decrease.

B The pelicans and bears would move away or die.

C The number of water plants would increase.

D Both B and C



10. If all of the dead trees and dead plant material was removed from a forest, which type of organism would be most affected?

A Producers

B Carnivores

C Decomposers

D Omnivores

Changing Ecosystems and the Flow of Energy

Name: _____

Part 1: Energy and Ecosystems

1. What is the source of most of the energy that enters an ecosystem?

2. What three things do plants need from their environment to produce their own food? _____

3. What helpful gas do plants release into the atmosphere as part of photosynthesis? _____

4. The three types of organisms in an ecosystem according to how they get their energy are _____

5. What is a consumer? _____

6. How is a decomposer different from a consumer? _____

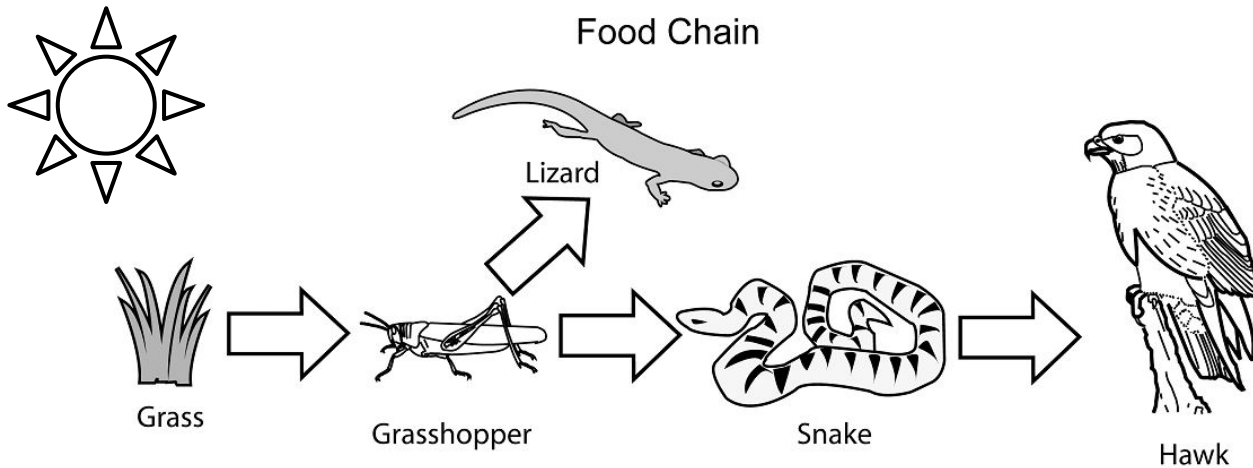
7. Describe the three types of consumers. (Be sure to tell what makes them different from each other.) _____

Changing Ecosystems and the Flow of Energy

Name: _____

Part 2: Matter and Energy Flow

Directions: Study the food chain illustration. Use the illustration and your knowledge of science to complete the questions below.



1. What is the main source of energy for the food chain? _____

2. Which organism in the food chain receives the most energy directly from the sun? How does this organism use the sun's energy? _____

3. From what organism does the lizard get its energy? _____
4. The grasshopper gets its energy from the _____ and supplies energy to the _____
5. Which organisms in the food chain are carnivores? _____

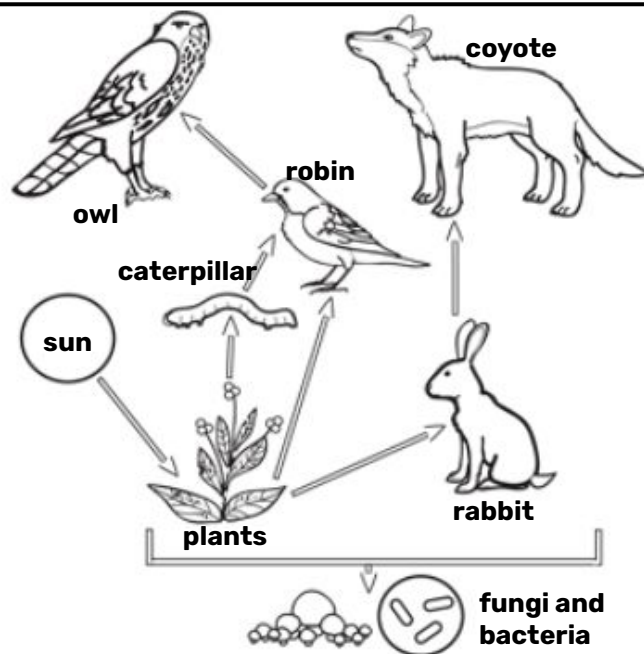
6. What do the arrows in the food chain represent? _____

Changing Ecosystems and the Flow of Energy

Name: _____

Part 2: Matter and Energy Flow, p. 2

Directions: Study the food web illustration. Use the illustration and your knowledge of science to complete the questions below.



7. In this food web, what organism(s) give energy to the robin? _____

8. Which organisms are decomposers?

9. What is the function of decomposers in a food web? _____

Directions: Put the following groups of organisms in order to show food chains from the food web. Make sure to use arrows showing the transfer of energy from one energy source to another.

10. robin, plants, caterpillar, sun

11. sun, rabbit, coyote, plants

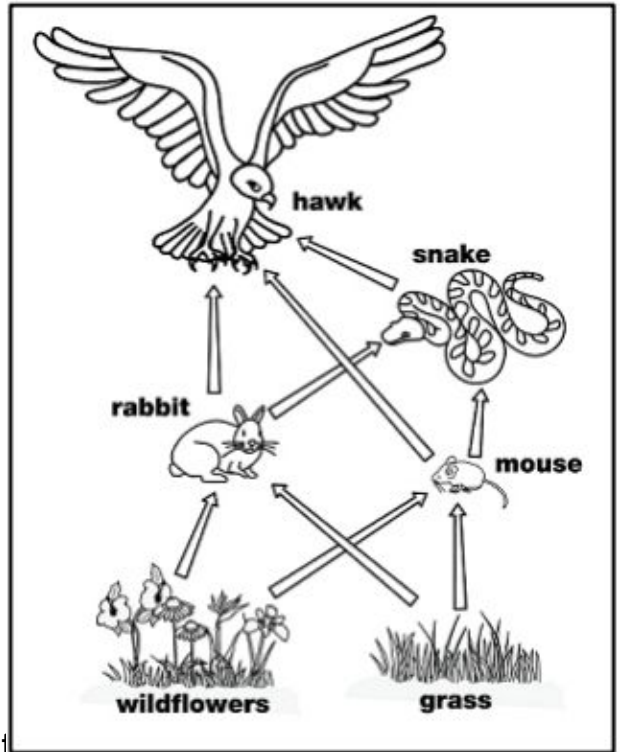
12. caterpillar, sun, owl, green plants, robin

Changing Ecosystems and the Flow of Energy

Name: _____

Part 3: Changing Ecosystems

Directions: Study the food web illustration. Use the illustration and your knowledge of science to complete the questions below.



1. Which consumer(s) would be most affected if all of the grass in the ecosystem died due to drought?

2. From what organisms does the hawk get its energy?

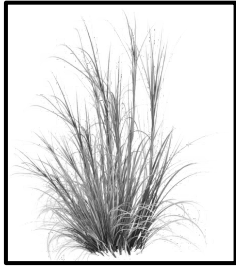
3. How would a decrease in the rabbit population affect the ecosystem?

4. After many days of heavy rain and flooding, the rabbit can no longer get to its nest or its food sources. How would this affect the food web and the ecosystem?

5. What would happen to the wildflower population if the number of rabbits and mice in the ecosystem increased?

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 1



Grass is a type of plant with narrow leaves growing from the base. Grass uses energy from the sun to make its own food. Grass also absorbs water and nutrients from the soil through its roots.

Grass

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



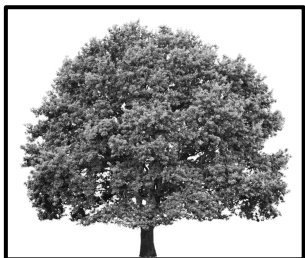
Butterfly bush is fast-growing plant with jagged leaves. The different colored flowers of this plant produce many tiny seeds. Its fragrance attracts a lot of butterflies and other insects seeking nectar.

Butterfly Bush

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Oak trees are tall trees with many branches and many leaves. Acorns are the fruit of an oak tree and contain its seeds. Oak trees lose their leaves in the winter and grow them back in the spring.

Oak Trees

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 2



A squirrel is a small furry animal with a large bushy tail. Most squirrels live in trees. Squirrels eat mostly seeds, nuts, and fruits, but they also eat insects and caterpillars. Squirrels prepare for winter by burying seeds, such as acorns.

Squirrel

I am a (circle all that apply)

Producer

Herbivore

Carnivore

Omnivore

Decomposer

because I _____



Cardinals are sometimes called redbirds because of the male cardinal's bright red feathers. Cardinals eat mostly seeds, insects, spiders, and berries. They find their food hopping on the ground or on tree leaves.

Cardinal

I am a (circle all that apply)

Producer

Herbivore

Carnivore

Omnivore

Decomposer

because I _____



Goldfinches are smallish birds with cone-shaped beaks. In warm months, male goldfinches have bright yellow feathers. Goldfinches get most of their energy from seeds, including sunflower, thistle, and elm seeds.

Goldfinch

I am a (circle all that apply)

Producer

Herbivore

Carnivore

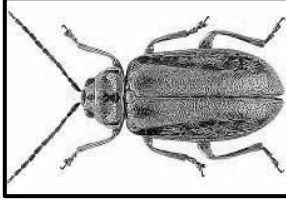
Omnivore

Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 3



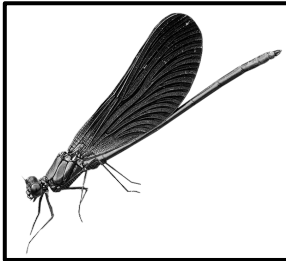
The elm leaf beetle is about 1 cm long and has a green body with black stripes. Like all insects, these beetles have 6 legs and 2 long antennae. Elm leaf beetles eat small, circular holes in the leaves of all kinds of elm trees.

Elm Leaf Beetle

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



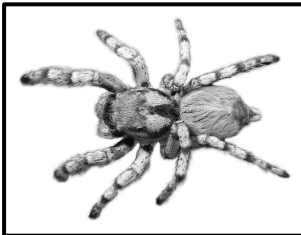
Dragonflies have a long body, transparent wings, and large eyes that can see in different directions. A dragonfly will eat other flying insects, insects that live in the water, worms, and even tadpoles.

Dragonfly

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Tarantulas are large spiders with furry bodies and legs. Some tarantulas are brown and tan while others are black and red. Smaller tarantulas eat mostly grasshoppers, other spiders, and crickets. Larger tarantulas can eat mice, frogs, and small birds.

Tarantula

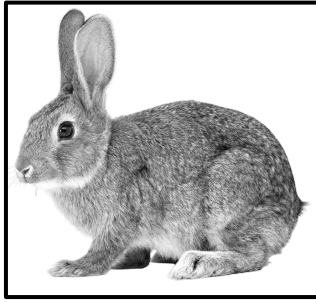
I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 4



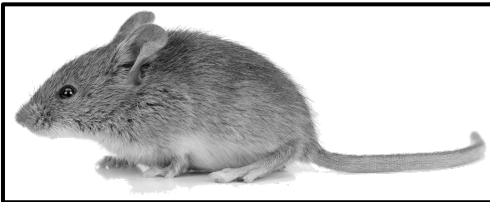
Cottontail rabbits have large hind feet, long ears, and a short fluffy tail. Cottontails survive on a diet of leaves (including lettuce), grass, crops such as beans, tree bark, and twigs.

Cottontail Rabbit

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Mice have a slender body, rounded ears that stick up, long tails, and sharp, small claws. Mice can live in buildings or survive in grasslands and forests. Mice eat seeds, berries, small insects, and worms.

Mouse

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



A toad is a common type of frog with dry, rough skin; short legs; and large bumps behind its eyes. Toads eat insects and bugs, such as flies, crickets, grasshoppers, spiders, and beetles.

Toad

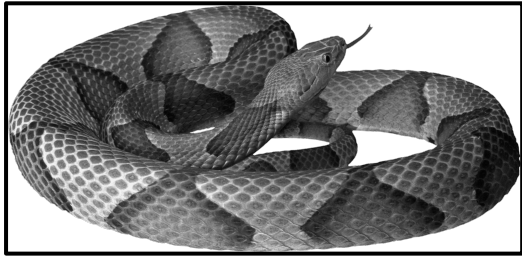
I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 5



Copperhead snakes are poisonous snakes with thick bodies and scaly skin. They have a copper-colored head and a reddish body with brown bands. Copperheads survive by eating mice, birds, insects, toads, frogs, and other snakes.

Copperhead Snake

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



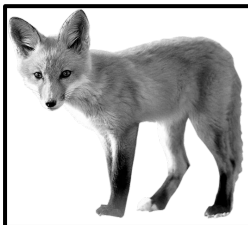
A hawk is a strong, powerful bird with strong talons and hooked beaks for catching and tearing apart prey. Hawks eat snakes, fish, rabbits, mice, squirrels, birds, and any other small animals.

Hawk

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



A fox looks much like a dog. Foxes have bushy tails, long fur, pointed ears, and a pointed snout, or nose. A fox gets its energy by eating rabbits, squirrels, mice, birds, frogs, and earthworms. A fox will also feed on dead animals that it finds in the forest.

Fox

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 6



An earthworm has a smooth, tube-like body made up of many segments, or parts. Earthworms survive by eating dead plant parts and animal manure, or wastes. They also feed on dead animals.

Earthworm

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



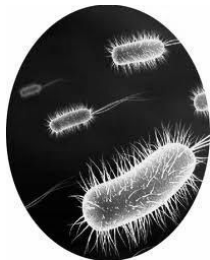
Roaches are insects with an oval, flat body. They also have long antennae and long back legs. Roaches get their energy by eating the remains or wastes of any organism. They especially like rotten meat, moldy bread, and anything sweet.

Roach

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Bacteria are very tiny organisms that usually cannot be seen without a microscope. Bacteria break down dead or decaying organisms. Bacteria in the human body helps a person digest the food they eat.

Bacteria

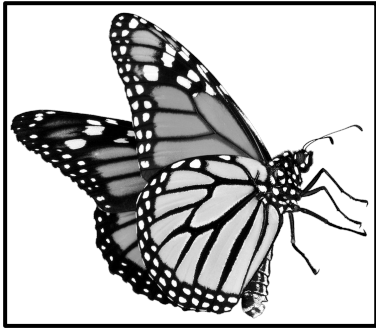
I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 7



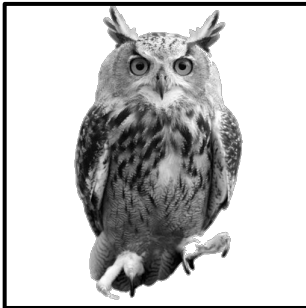
Butterflies are insects that have large wings, six legs, and long antennae. Butterflies survive by eating nectar from the flowers of green plants.

Butterfly

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Owls have eyes that face forward, soft feathers, and huge heads. Owls eat many different small animals, including mice, frogs, birds, squirrels, snakes, fish, and lizards.

Owl

I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____



Fungi are organisms such as yeast, mold, and mushrooms. Fungi are consumers—they get their energy by eating decaying trees, leaves, fruits, vegetables, and animals.

Fungi

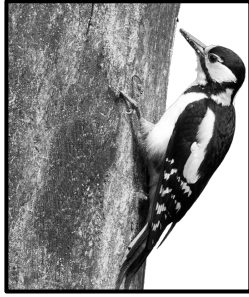
I am a (circle all that apply)

- Producer
- Herbivore
- Carnivore
- Omnivore
- Decomposer

because I _____

Changing Ecosystems and the Flow of Energy

Organism Cards, p. 8



Woodpeckers have tough, pointed beaks which they use to chip the bark off trees to find insects. Woodpeckers mainly eat insect larvae, mealworms, nuts, and seeds.

Woodpecker

I am a (circle all that apply)

Producer

Herbivore

Carnivore

Omnivore

Decomposer

because I _____



Ladybugs are small beetles with a domed back. Its body is usually red or yellow with black spots. Ladybugs get their energy by eating tiny insects and insect eggs.

Ladybug

I am a (circle all that apply)

Producer

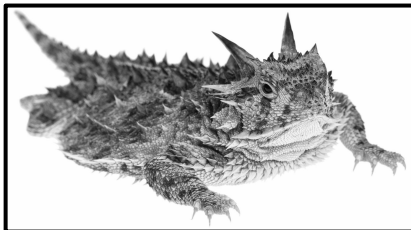
Herbivore

Carnivore

Omnivore

Decomposer

because I _____



A Texas horned toad is really a lizard, not a toad or a frog. It has many horns and spikes all over its head and back. These horned toads eat mostly termites, beetles, and grasshoppers.

Texas horned toad

I am a (circle all that apply)

Producer

Herbivore

Carnivore

Omnivore

Decomposer

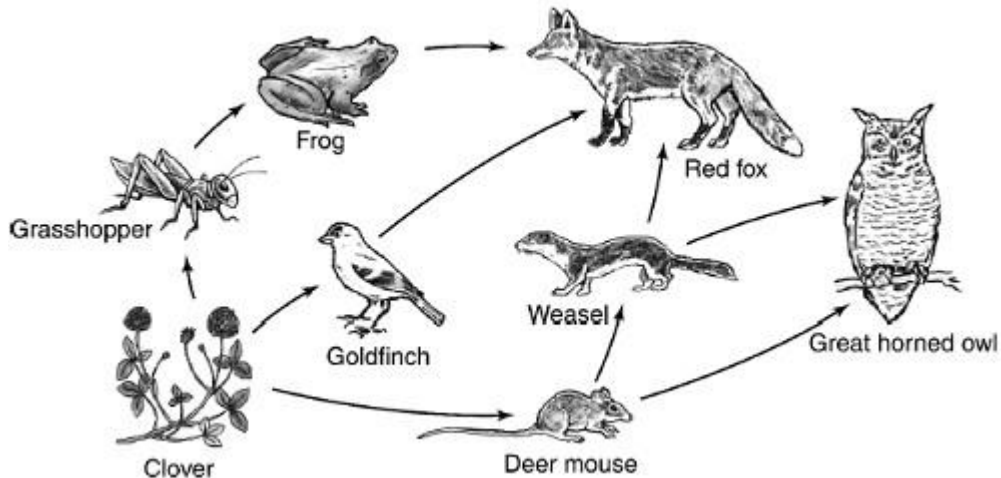
because I _____

Changing Ecosystems and the Flow of Energy

Name: _____

Evaluation, page 1

Directions: Use the diagram of the food web to answer questions 1 and 2.



1. How many organisms transfer energy directly to the red fox?
A 1
B 2
C 3
D 4
2. Which of the following is a possible effect of a decrease in the weasel population in this ecosystem? Mark all that apply.
F There would be more clover for the grasshopper and mouse to eat.
G The red fox would eat more frogs and goldfinches.
H The deer mouse population might decrease because the great horned owl would rely on the mice for energy.
J There would be more grasshoppers to transfer energy to the frogs.

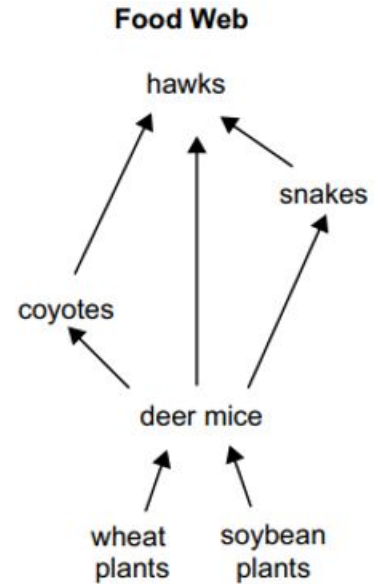
Changing Ecosystems and the Flow of Energy

Name: _____

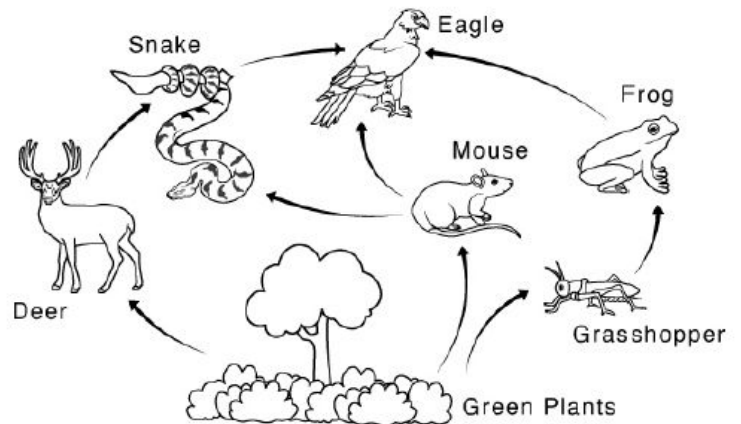
Evaluation, page 2

3. Cold temperatures reduced the snake population in this food web. How will the hawks most likely respond to this change in their environment? The hawks will—

- A** eat more deer mice
- B** hibernate for the winter
- C** get energy from the wheat plants
- D** use sunlight to produce their own food



4. One summer, a disease caused most of the grasshopper population in this ecosystem to die. Which of the following explains the animal population that would be most affected by this natural event?



- F** The eagle population, because there would be fewer mice in the ecosystem
- G** The snake population, because snakes eat grasshoppers every day
- H** The mice population, because there would be less grass for them to eat
- J** The frog population, because they would have less food to eat

Changing Ecosystems and the Flow of Energy

Name: _____

Evaluation, page 3

5. What happens to the organisms in an ecosystem during a long period of drought?
- A** All of the organisms in the ecosystem will die.
 - B** All of the organisms in the ecosystem will survive.
 - C** Some of the organisms in the ecosystem will survive while others may move to a new place or die.
 - D** Most of the organisms in the ecosystem will dig holes and hibernate until the drought is over.
6. A flood can cause much damage to an ecosystem. Many organisms in the ecosystem may die or have to move to a new ecosystem. How can a flood have a positive, or good, effect on an ecosystem?
- F** There are no positive effects of floods on ecosystems.
 - G** A flood can lead to the death of many organisms in the ecosystem.
 - H** Animals will have to rebuild their homes due to flood damage.
 - J** Floodwater can create new habitats for some organisms.
7. Wild hogs are an invasive species. (An invasive species is an organism that is not naturally found in an ecosystem.) The wild hogs overpopulate an area, dig up tree roots, and trample grass and young trees. They eat all types of plant parts, including nuts from trees. How would a wild hog population be harmful to the deer population in a forest ecosystem?
- A** Wild hogs take over and destroy the deer's habitat.
 - B** Wild hogs eat a lot of the same food that a deer eats.
 - C** Wild hogs keep new plants from growing.
 - D** All of the above

Changing Ecosystems and the Flow of Energy

Name: _____

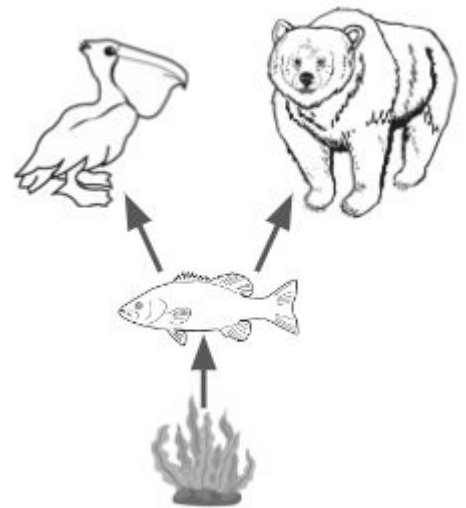
Evaluation, page 4

8. Pine beetles dig holes in pine trees to lay eggs. Once the eggs hatch, the larva eat the tree from the inside out. The adult beetles also eat the bark of the pine tree. What changes might occur in a pine forest that has an overpopulation of pine beetles?

- F** The pine beetles die out from lack of food.
- G** Pine beetles harm many trees and cause them to die.
- H** The pine beetles begin to eat other plants and insects.
- J** The population of trees increases because there are more pine beetles.

9. Study the food web pictured here. Which change would happen if the fish all died and were removed from this food web?

- A** The plant population would decrease.
- B** The pelicans and bears would move away or die.
- C** The number of water plants would increase.
- D** Both B and C



10. If all of the dead trees and dead plant material was removed from a forest, which type of organism would be most affected?

- A** Producers
- B** Carnivores
- C** Decomposers
- D** Omnivores