



Food Webs

Activity from *The Science of Food Teacher's Guide: From Ecosystems to Nutrition*
and for *The Mysterious Marching Vegetables*

Written by

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BioEdSM

Teacher Resources from the
Center for Educational Outreach at
Baylor College of Medicine

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The activities described in this book are intended for school-age children under direct supervision of adults. The authors and Baylor College of Medicine cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

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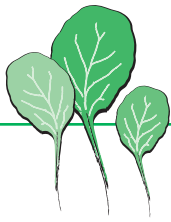
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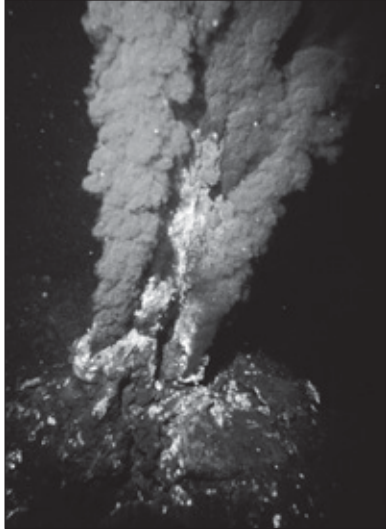
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Food and Energy in Living Things

Life Science Basics



Some specialized bacteria make the molecules they need without sunlight. Bacteria that live in hot deep-sea vents obtain energy through the chemical breakdown of hydrogen sulfide in a process known as chemosynthesis. The bacteria are the primary producers in this environment.

In soil, some bacteria combine nitrogen- or iron-containing compounds with oxygen and capture the energy produced by these reactions.

Photo courtesy of NOAA.

Living things often are classified as producers or consumers, depending on how they obtain energy and nutrients. Producers typically are able to use solar energy to make the molecules they need from relatively few substances present in the air, water and soil. On land, green plants are the primary producers. In water, some plants and many varieties of algae, bacteria and other one- to many-celled organisms (Protists) are producers. All other organisms are consumers, which live directly or indirectly on food provided by producers.

Almost all producers make the molecules they need through photosynthesis. During photosynthesis, producers absorb energy from the sun and use it to combine carbon from carbon dioxide with water to make sugars and other carbohydrates. Thanks to this amazing process, light energy from the sun is converted into chemical energy stored in the bonds between atoms that hold molecules together. Plants use the energy stored in these molecules to build other compounds necessary for life. Likewise, consumers, who cannot trap energy directly from sun, must rely on molecules manufactured by plants for food.

The general sequence of who eats whom in an ecosystem is known as a food chain. Energy is passed from one organism to another at each step in the chain. Along the way, much energy is given off as heat. In fact, about 85–90% of the total usable energy is released as heat at every step in a food chain. Most organisms have more than one source of food. The relationship among all the energy flow interactions that happen in an ecosystem usually are described as a food web.

PRODUCERS AND CONSUMERS

- **HERBIVORES**, such as giraffes and caterpillars, are primary consumers. They feed on plants and other producers.
- **CARNIVORES**, such as anteaters and spiders, are secondary consumers. They feed on primary consumers. Most secondary consumers are animals, but a few are plants, like the pitcher plant.
- **OMNIVORES** eat plants and animals. Humans, pigs, dogs and cockroaches all are omnivores.
- **DECOMPOSERS** live off waste products and dead organisms. Many kinds of bacteria and fungi (molds and mushrooms) are decomposers. The decomposers themselves are important food sources for other organisms in soil, such as worms and insects. Litterfeeders, such as termites and earthworms, feed on partially broken down bits of plant and animal matter.
- **SCAVENGERS** feed on dead organisms that have been killed by another animal or that have died naturally. Vultures, flies and crows are examples of scavengers.

Food Webs

Life Science



Environments, such as oceans, forests, lakes and deserts, are homes to different communities of organisms. Within each distinct environment, plants, animals and other living things must find ways to obtain water, food and other necessary resources. Different kinds of organisms have different needs. As seen in the previous activities, plants need air, water, nutrients

(usually from soil) and light. Animals need air, water and food.

All animals depend on plants and other producers. Some animals eat plants for food. Other animals eat animals that eat the plants, and so on. Some organisms even feed on waste and dead material. The general sequence of whom eats whom in an ecosystem is known as a food chain. Energy is passed from one organism to another at each step in the chain. Most organisms, however, have more than one food source. Thus, a web, which depicts all of the different foods eaten by each animal, is a more accurate

model of interactions within an ecosystem.

This activity lets students construct possible food webs for different ecosystems, as they learn about the roles of different kinds of living organisms.

SETUP

You will need to make copies of the six sets of Ecosystem Cards (pages 23–28) for students in advance. Each group of students will receive one set of the cards. Have students work in teams of 4.

PROCEDURE

1. Remind students of the previous activity in which they explored plants that people eat. Ask, *Do people only eat one kind of food? What kinds of food do people eat?* Explain to students that most other animals also have several food sources, although not all animals are omnivores (eat plants and animals).
2. Discuss with students the different kinds of consumers:
 - Herbivores (primary consumers)** feed on plants and other producers. Cows, camels, caterpillars and aphids are herbivores.
 - Carnivores (secondary consumers)** feed on other animals. Most consumers are animals, but a few are plants that trap and digest insects. There can be several levels of carnivores in a food chain. Lions, owls and lobsters are carnivores.
 - Omnivores** eat plants and animals. Pigs, dogs, humans and cockroaches all are omnivores.

CONCEPTS

- Producers make all the molecules they need from simple substances and energy from the sun.
- All other living things depend on producers for food.
- Living things that must eat other organisms as food are known as consumers.
- Food webs show all of the different interactions among producers and consumers in an ecosystem.

OVERVIEW

Students construct possible food webs for six different ecosystems.

SCIENCE, HEALTH & MATH SKILLS

- Inferring
- Integrating information
- Drawing conclusions

TIME

Preparation: 10 minutes
Class: 30–45 minutes

MATERIALS

Each group will need:

- Set of crayons: one each of blue, green, red and yellow
- Set of Ecosystem Cards representing one ecosystem (see SETUP)
- Sheet of white construction or drawing paper, 9 in. x 12 in.



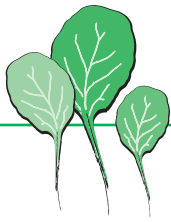
Unit Links

The Mysterious Marching Vegetables

Story, p. 18–21;
Science boxes,
p. 14–15, 19–20

Explorations

Sun Power section,
p. 2–3



OMNIVORE



The American black bear's diet is varied, but mostly vegetarian, including twigs, roots, berries, young plants, and buds. Insects—from beetles to ants to bee larvae eaten with honey—are also important. Small mammals and fish augment the diet, when they are easily caught.

Highly adaptable and with varied food tastes, the American black bear inhabits a wide range of forested habitats in North America.

Sources: Smithsonian National Zoological Park and the U.S. Fish and Wildlife Service (FWS). Photo courtesy of the FWS National Digital Library.

Decomposers and scavengers feed off the dead remains and waste of other organisms at any step along a food chain. Scavengers, such as vultures and flies, feed on remains of animals that have been killed or that die naturally. Decomposers live off waste products and parts of dead organisms. Many kinds of bacteria and fungi (molds and mushrooms) are decomposers. The decomposers themselves are important food sources for other organisms that live in soil, such as worms and insects.

3. Give each group of students a different set of Ecosystem Cards. Each set consists of six cards depicting producers and consumers typically found within a given environment.
4. Have students in each group read the information on the cards.
5. Ask students to identify which organisms are the producers in their ecosystems. Next, have the members of each group identify which cards represent different kinds of consumers (herbivores, carnivores and scavenger/decomposers).
6. Once students have identified the producers and different kinds of consumers in their ecosystems, have them discuss “who might eat whom” among the organisms depicted on their cards. For example, in the Freshwater Pond set of cards, the bluegill fish (carnivore) might eat dragonfly nymphs and snails. The snail (decomposer/scavenger) might eat the green algae, as well as waste or dead body parts from all of the other organisms in the system. Have students consider possible food sources for each of the organisms in their ecosystem.
7. Give each group a sheet of drawing paper. Instruct students to write the names of each of the organisms in their ecosystems around the edges of the sheet. Have them write the names of the producers in green, the herbivores in yellow, the carnivores in blue and the decomposer/scavengers in red.
8. Next, have students draw lines to connect each consumer to all of its food sources. They will find that there are many ways to connect even as few as six organisms within an ecosystem.
9. Encourage students to think about the complex relationships within ecosystems by asking questions such as, *What would happen if there were no producers in your ecosystem? No decomposers? Where would humans fit in your food web? Do humans also depend on many different plants and animals?*

VARIATIONS

- Have students (individually or in groups) draw pictures of their ecosystems, including the organisms they used to construct their food webs.
- Have students conduct additional research about the ecosystems and/or organisms that they used for the food webs by consulting resources available at the library, on the Internet or from CD ROM software.

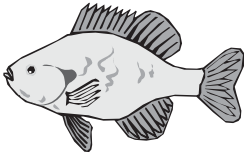
Ecosystem Cards: Freshwater Pond



Tarjetas de Ecosistemas: Estanque de Agua Dulce

BLUEGILL

The bluegill is a silver-blue fish with brown stripes. It likes to lay its eggs in the mud at the bottom of ponds. Bluegills eat insects, snails, tadpoles and even small fish.

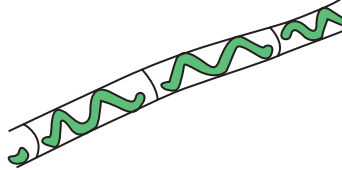


MOJARRA AZUL

Es un pez azul y plateado con franjas de color café. Le gusta poner sus huevos en el lodo que se encuentra al fondo de los estanques. A la mojarra le gusta comer insectos, caracoles, renacuajos y peces pequeños.

GREEN ALGAE

Most ponds have green scum on top. This scum is made of millions of tiny algae. Algae use energy from the sun to make their own food.



ALGA VERDE

La mayoría de los estanques tienen verdín flotando en el agua. El verdín parece espuma verde y está compuesto de millones de algas diminutas. Las algas utilizan la energía solar para hacer su alimento.

HERON

The heron is a large bird with long, slim legs that allow it to wade in the water when looking for food. Herons catch many kinds of small animals with their long beaks.

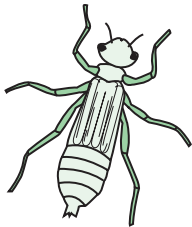


GARZA

La garza es un pájaro grande que tiene patas largas y delgadas porque le gusta caminar por el agua cuando busca animales para comer. Las garzas atrapan muchos animales pequeños con sus picos largos.

NYMPHS

Dragonflies lay their eggs in water. The young insects that hatch are called nymphs. They eat small animals and waste at the bottom of ponds.



NINFAS

Las libélulas ponen sus huevos en el agua. Los insectos jóvenes que nacen de los huevos se llaman ninfas. Las ninfas comen animales pequeños que viven en el fondo de los estanques.

ROTIFER

Rotifers are tiny swimmers. They have fine hairs that help them swim. Rotifers eat algae and other very small organisms in water.

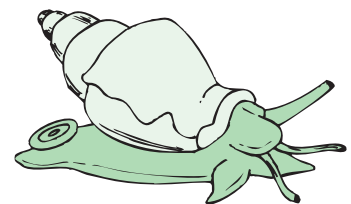


ROTÍFEROS

Los rotíferos son nadadores diminutos. Tienen pelos finos que los ayudan a nadar. Los rotíferos comen algas y otros organismos diminutos que viven en el agua.

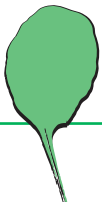
SNAIL

Snails carry their shells on their backs. They eat bits of dead plants and animals and parts of water plants.



CARACOL

Los caracoles cargan sus conchas en sus espaldas. Los caracoles comen pedacitos de plantas y animales muertos y pedazos de plantas acuáticas.



Ecosystem Cards: Temperate Forest

Tarjetas de Ecosistemas: Bosque Templado

BLACK BEAR

Black bears will eat almost anything. They especially like to eat berries, acorns and even insects.



OSO NEGRO

A los osos negros les gusta comer muchas cosas. En particular, les gusta comer bayas, bellotas y también insectos.

EARTHWORM

The earthworm burrows through soil and eats bits of dead plant material and other waste along the way.



LOMBRIZ

La lombriz excava la tierra y se come los pedacitos de plantas muertas y de otros organismos que encuentra.

GREY SQUIRREL

Squirrels are good climbers and build their nests in trees. They often eat acorns and other kinds of nuts.



ARDILLA GRIS

Las ardillas son hábiles en trepar árboles y es allí donde construyen sus nidos. Éstas frecuentemente comen bellotas y otras nueces.

OAK TREE

There are several kinds of oak trees in the temperate forest. Oak trees are very tall. The nuts of oak trees are called acorns. Many different animals eat acorns.



ROBLE

Existen varios tipos de árboles de roble en el bosque templado. Los robles son muy altos. Las nueces de los robles se llaman bellotas. Diferentes animales comen bellotas.

RASPBERRY

Raspberry bushes grow in clearings and at the edge of the forest. Many animals like to eat the sweet berries.

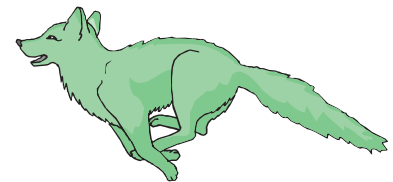


FRAMBUESA

Los arbustos de frambuesa crecen en los claros y las afueras del bosque. A varios animales les gusta comer estas bayas dulces.

RED FOX

Foxes are able to run quickly through the forest. They hunt and eat small animals.



ZORRO COLORADO

Los zorros pueden correr rápidamente por el bosque. Los zorros cazan animales pequeños para comer.

Ecosystem Cards: Desert Grassland



Tarjetas de Ecosistemas: Pastizal Árido

DESERT GRASSES

Many grasses grow in the desert. Some of them grow and make seeds after a good rain.

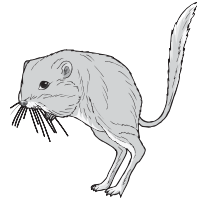


PASTOS DEL DESIERTO

Varios tipos de pasto crecen en el desierto. Algunas de estos pastos crecen y producen semillas después de una buena lluvia.

KANGAROO RAT

This rodent burrows in the ground and is a good jumper. It sleeps during the day and comes out at night, when the air is cooler. It eats seeds and some insects.

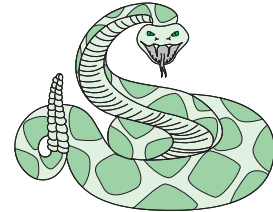


RATA CANGURO

Este roedor se esconde excavando en la tierra y es un buen saltador. Duerme durante el día y sale durante la noche cuando la temperatura ha bajado. Come semillas y algunos insectos.

RATTLESNAKE

Several kinds of rattlesnakes live in the desert. They are able to slide sideways over sand. Rattlesnakes eat rodents and lizards.

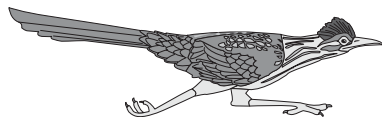


VÍBORA DE CASCABEL

Varios tipos de víbora de cascabel viven en el desierto. Estas serpientes pueden deslizarse de lado a lado sobre la arena. Las víboras de cascabel comen roedores y lagartijas.

ROADRUNNER

This striped bird can run very fast to chase prey and escape predators. It eats other animals, like snakes, insects and lizards.



CORRECAMINOS

Este pájaro puede correr rápidamente para perseguir a sus presas y escaparse de sus depredadores. Se come a otros animales, tales como serpientes, insectos y escorpiones.

TERMITE

Termites are insects that live in large groups, called colonies. They build mounds in the ground in which to live. Termites eat tough dead plant material and other waste.

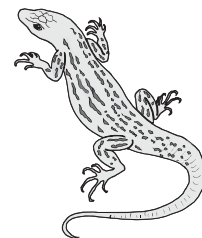


TERMITA

Las termitas son insectos que viven en grupos grandes llamados colonias. Ellas construyen montículos en la tierra que usan como vivienda. Las termitas comen pedazos resistentes de plantas muertas y otros residuos.

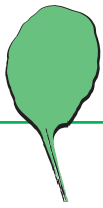
WHIPTAIL LIZARD

This striped lizard blends into the landscape. It moves very quickly as it searches for termites, beetles and insect larvae to eat.



HUICO

Este lagarto rayado puede esconderse en el paisaje. Es muy activo en su búsqueda de termitas, escarabajos y larvas de insectos para comer.

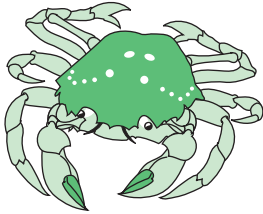


Ecosystem Cards: Coastal Ocean

Tarjetas de Ecosistemas: Océano cerca de la Costa

CRAB

Crabs are animals with hard shells and legs with joints. They use their two claws to hunt small animals for food.

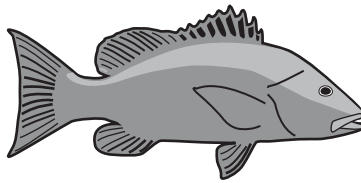


CANGREJO

Los cangrejos son animales que tienen un caparazón duro y patas articuladas. Tienen dos pinzas que usan para cazar animales pequeños para comer.

GRAY SNAPPER

The gray snapper lives near the ocean shore. It eats crabs, shrimp and small fish.

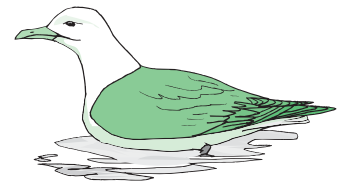


PARGO DE MANGLAR

El pargo de manglar es un pez que vive cerca de la orilla del mar. Come cangrejos, camarones y peces pequeños.

HERRING GULL

This medium-sized white and gray bird has webbed feet that allow it to swim. It eats small fish and small sea animals with shells.

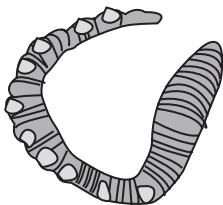


GAVIOTA ARGÉNTEA

Este pájaro blanco y gris es de tamaño mediano y tiene patas palmeadas para nadar. Come peces pequeños y animalitos con caparazones.

LUGWORM

Lugworms are ocean-living worms that feed on the remains of plants and animals. They dig burrows into the sand.

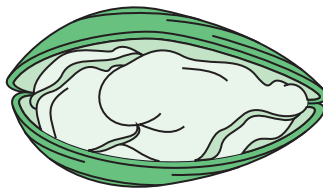


GUSANO MARINO

Los gusanos marinos son gusanos que viven en el océano. Éstos comen los restos de plantas y animales. Hacen túneles en la arena.

MUSSEL

Mussels are animals with two-part shells. They attach themselves to rocks and feed on tiny plants and animals in water.

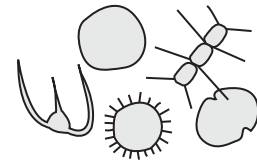


MEJILLÓN

Los mejillones son animales que viven en conchas de dos partes. Se adhieren a las rocas y comen pequeños animales y plantas que viven en el agua.

PLANKTON

Plankton is made up of tiny plants and animals that live in ocean water. Many kinds of plankton are green and are able to use energy from the sun to make their own food.



PLANCTON

El plancton está compuesto de pequeños animales y plantas que viven en el agua del océano. Muchos tipos de plancton son verdes y pueden usar la energía procedente del sol para hacer su propio alimento.

Ecosystem Cards: American Rain Forest



Tarjetas de Ecosistemas: Bosque Lluvioso Americano

ANTEATER

Anteaters are related to possums. They have long noses, no teeth and sharp claws. Anteaters eat ants, termites and grubs.

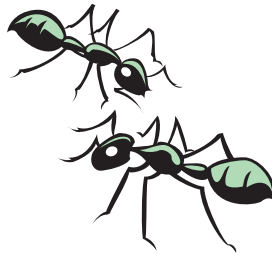


OSO HORMIGUERO

Los osos hormigueros pertenecen a la familia de las zarigüeyas. Tienen narices largas, garras afiladas y no tienen dientes. Comen hormigas, termitas y gusanos.

AZTECA ANTS

These ants like to live inside hollow stems. They use nectar and other plant parts as food.



HORMIGAS AZTECAS

A estas hormigas les gusta vivir dentro de tallos de árboles huecos. Les gusta comer néctar y otras partes de plantas.

CECROPIA TREE

The cecropia tree has hollow stems and leaves that look like umbrellas. Each leaf produces nectar. Each cecropia tree produces thousands of fruits.



ÁRBOL CECROPIA

El árbol cecropia tiene tallos huecos y hojas que parecen paraguas. Cada hoja produce néctar. Este árbol produce miles de frutas.

FRUIT BATS

Different kinds of bats look for nectar and pollen to eat from trees whose flowers bloom at night. Some of these bats also eat fruit.



MURCIÉLAGOS FRUTEROS

Diferentes tipos de murciélagos buscan néctar y polen durante la noche para alimentarse. Éstos buscan árboles que florecen en la noche. Algunos también comen frutos.

FUNGUS

Many kinds of fungus break down dead trees and other plants on the damp forest floor.



HONGO

Muchos tipos de hongos descomponen árboles muertos y otras plantas que se encuentran sobre el suelo húmedo del bosque.

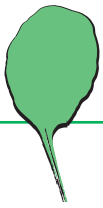
KAPOK TREE

This is a very tall tree that grows on the edges of forests. Its flowers open only at night and produce nectar and pollen.



ÁRBOL CAPOQUERO

Éste es un árbol muy alto que crece en las afueras del bosque. Sus flores abren solamente durante la noche y producen néctar y polen.

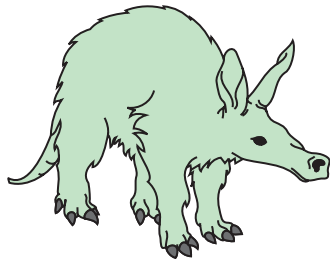


Ecosystem Cards: African Grasslands

Tarjetas de Ecosistemas: Pastizal Africano

AARDVARK

The aardvark is an African anteater. It uses its long tongue to catch termites.

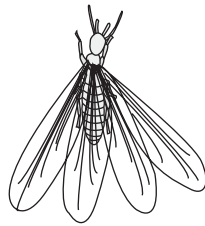


CERDO HORMIGUERO

El cerdo hormiguero es el oso hormiguero africano. Usa su lengua larga para atrapar termitas.

AFRICAN TERMITES

These insects build large houses above the ground. They eat dead plants or use them to grow fungus to eat.



TERMITA

Las termitas africanas son insectos que construyen viviendas enormes sobre la tierra. Las termitas comen plantas muertas o las utilizan para cultivar hongos como alimento.

GRASSES

Many kinds of grasses grow in the rich soils of African grasslands. They are food for many different animals.

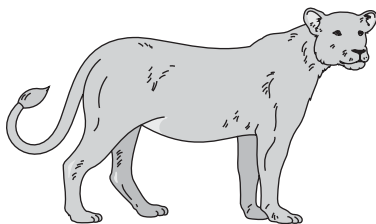


PASTOS

Muchas clases de pasto crecen en los suelos fértiles del África. Estos pastos son el alimento de diferentes variedades de animales.

LIONS

Lions live in groups. Female lions are hunters. They catch other animals for food.

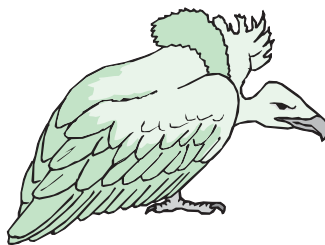


LEÓN

Los leones viven en grupos. Las hembras son cazadoras. Ellas cazan otros animales para alimentarse.

VULTURE

Vultures are large birds with curved beaks. They eat the remains of dead animals.



BUITRE

Los buitres son pájaros grandes que tienen picos curvos. Ellos comen los restos de animales muertos.

WILDEBEEST

A wildebeest is a kind of antelope. It can run quickly and has long, curved horns. Wildebeests eat grass.



ÑU

El ñu es un tipo de antílope. Puede correr rápidamente y tiene cuernos largos y curvos. Estos animales comen hierbas.