

Teacher's Guide

“Advanced Web of Life”

**Grade Level:**

7th

GSE Reference:

S7L4 a,b

Summary:

Students will gain a deeper understanding of how living organisms are inter-related and the fragile balance of food chains within a food web.

Objective:

Students will investigate symbiotic relationships. They will look at energy pyramid dynamics and bioaccumulation in a food chain.

Essential Questions

- 🌀 How does energy transfer between trophic levels?
- 🌀 What happens if part of a food web is lost or changed?
- 🌀 What factors affect energy transfer in food chains and food webs?
- 🌀 Why do organisms engage in symbiotic relationships?
- 🌀 How are commensalism, parasitism, and mutualism the same? How are they different?
- 🌀 How are humans involved in symbiotic relationships?

Vocabulary

- 🌀 *Food Web*—a community of organisms where there are several inter-related food chains
- 🌀 *Energy Pyramid*—graphical representation of the energy amounts that are passed up trophic levels
- 🌀 *Biomass*—organic material made from plants and animals. Biomass contains stored energy from the sun. Plants absorb the sun's energy and then the chemical energy produced in the plants gets passed to animals that eat them. Biomass in ecology refers to the accumulation of living matter and is measured by weight per a given area
- 🌀 *Bioaccumulation*—the accumulation of heavy metals and inorganic chemicals within one trophic level of the food chain
- 🌀 *Biomagnification*—increase in concentration of a pollutant from one link in the food chain to another
- 🌀 *Symbiosis*—a close ecological relationship between the individuals of two or more different species. Sometimes the symbiosis relationship will benefit both species, sometimes one species benefits at the expense of the other, and in other cases neither species benefits.

Pre-Visit Activities

- 📖 **Read** a book from the suggested reading list.
- 📖 **Our Changing Food Webs** Diagram an example of a food web using organisms found in Georgia, and include a threatened or endangered species. Explore what might happen if the endangered organism is eliminated from the food web. (Threatened and endangered species of Georgia: <http://www.fws.gov/athens/endangered.html>)
- 📖 **Citizen Science:** Download the free Bumble Bee Watch app, ID your local pollinators and report your findings. <https://www.bumblebeewatch.org/>

Post-visit activities

- 📖 **Symbiosis Theater** Students will act out a symbiotic relationship for the class while the class figures out the type of relationship being portrayed. Review symbiotic relationships. Divide students into small groups (2-6 per group) and give the group a symbiotic relationship scenario (scenarios are on last page). Students will become “characters” that interact with each other, and their dialogue should help the class decide what type of relationship they have. You may choose to have students tell the audience what organisms are involved, or you can withhold the “characters” identification.
- 📖 **Celebrate Urban birds** by helping Cornell School of Ornithology learn how different environments will influence the location of birds in urban areas. <http://celebrateurbanbirds.org/about/what-is-celebrate-urban-birds/>
- 📖 **Career Critters** (adapted from Project WILD) Students will identify how animals and plants can be used to solve environmental problems. Distribute a set of cards to groups of students (3 ecosystems and 6 critters). Have students solve the issues presented on the ecosystem cards using one or more critters. Not all critters may be used. Discussion points: Explore various symbiotic relationships portrayed in the cards; think of a situation that each of these critters would be helpful; how would using these critters instead of chemicals affect bioaccumulation?
- 📖 **Kahoot!** Go to www.getkahoot.com, sign in, and search for the quiz called Advanced Web of Life created by CNC. This is a fun, interactive way for students to review concepts learned during their visit to CNC using hand-held devices. The direct link is <https://play.kahoot.it/#/?quizId=b3c4a014-dd65-495f-b1ca-31e9f6f3392b>

Suggesting Reading

Environmental Awareness: Water Pollution by Mary Ellen Snodgrass

Polluted Water by Jennifer Stefanow

Horseshoe Crabs and Shorebirds by Victoria Crenson

Watersheds: A Practical Handbook for Healthy Water by Beck and Dobson

Living Together in Nature: How Symbiosis Works by Jane E. Hartman

Endangered Species: Opposing Viewpoints by Cynthia Bily

Introduction to Environmental Issues by Odunayo Ogundipe

Suggested Websites

http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT06/CT06.html

<http://kids.nationalgeographic.com/kids/stories/animalsnature/>

<http://magma.nationalgeographic.com/ngexplorer/0601/articles/mainarticle.html>

Career Critters Cards:

Copy and distribute to small groups of students (3-9 students per group)

<u>Pine Forest Ecosystem</u>	<u>Garden Ecosystem</u>	<u>Farm Ecosystem</u>
<p>In your pine forest ecosystem, many of the trees are being damaged by bark beetles. Bark beetles bore through the bark and eat the layers of wood inside. Your forest is infested with too many beetles, and a large number of trees have been infected. As a manager, your job is to maintain a healthy forest so that a variety of animals live there. You need to reduce the number of beetles. What animal(s) in the cards could help solve this problem?</p>	<p>Your town has a garden where townspeople plant vegetables. However, this year, small insects called aphids are eating the vegetables. People want vegetables to eat. You could spray insecticides to kill the aphids, but some people don't want to use insecticides. They are concerned about possible health effects. The community garden has another problem: the soil is too hard and packed so the roots have a hard time growing. What animal(s) in the cards could help solve this problem?</p>	<p>You are a farmer. Your crops are turning into a field of dreams for insect pests like grasshoppers. They are eating your crops. You could spray with insecticides to kill the grasshoppers, but they are expensive. Your field is also too close to homes. The homeowners do not want the spray to drift over into their yards. What animal(s) in the cards could help solve this problem?</p>
<p><u>Woodpeckers</u> We live in forests. We peck out the insects that live under the bark of sick or dead trees. We also use our beaks to chip deep holes into trees where we build our nests. Sometimes these holes are used by other birds, such as bluebirds and nuthatches, for their nests. Our holes help to bring new varieties of birds into the forest.</p>	<p><u>Ladybugs</u> We are very small and eat other small tasty bugs such as aphids and scale bugs.</p>	<p><u>Bats</u> We are experts at eating flying insects. We swoop around and can eat thousands of flying insects in one night! Some people are scared of us, but we aren't really bad. Besides, we are active at night when most people are asleep.</p>
<p><u>Squirrels</u> In the autumn, we collect acorns from oak trees and store them to eat during the winter. Sometimes we hide our acorns underground. The only problem is that we collect so many acorns, we sometimes forget where we have buried them! Some of these acorns sprout and grown into tall trees.</p>	<p><u>Peregrine Falcons</u> We are hawk-like birds that live and nest near high cliffs, canyon walls, and even skyscrapers. We catch smaller birds to eat. Ecosystems with steep walls and plenty of birds can be good places for us.</p>	<p><u>Meadowlarks</u> We are robin-sized birds that live in fields and on farms. We are known for our beautiful song and the black "V" on our chests. Many people do not know that we like to eat many insects!</p>

Symbiosis Theater Scenarios:

Distribute one scenario per group, small groups of students (3-5 students per group)

Commensalistic Relationships

Remoras / Shark: *Characters: Remoras, Shark, Shark prey*

Remoras are a type of fish that attach themselves to a shark's body. Then they travel with the shark and feed on the leftover food scraps from the shark's meal. This relationship neither harms nor benefits the shark.

Cowbird / Bison: *Characters: Cowbirds, Bison, Insects*

As bison walk through grass, insects become active and are seen and eaten by cowbirds. Cowbirds are medium-sized songbirds. This relationship neither harms nor benefits the bison.

Burdock / Mammal: *Characters: Burdocks, Mammals*

Burdocks are common weeds found along roadsides and in empty lots and fields. Their seeds are too heavy to move by wind, so instead the seed heads (burs) of burdocks have long spines with hooked tips. The hooked tips catch onto the hair of passing mammals (cows, deer, dogs, humans) and the burs are carried elsewhere until they finally drop off or are pulled off by the carriers. The mammals are unaffected by the burdocks.

Mutualistic Relationships

Bee / Flower: *Characters: Bees, Flower*

The bee pollinates the flower and the flower provides food for the bee.

Honey Pot Ant / Aphids: *Characters: Honey Pot Ants, Aphids*

Honey pot ants protect aphids and the aphids provide the ants with a sweet liquid that the ants eat. The ants will aggressively protect their aphids and may even move them when they are in danger, transferring them into temporary shelters or new nests.

Honey Guide Bird / Badger: *Characters: Honey Guide Birds, Badger, Bee Hive*

Honey Guide Birds alert and direct badgers to bee hives. The badgers then expose the hives and feed on the honey first. Next the Honey Guide Birds eat. Both species benefit.

Parasitic Relationships

Tick / Mammal: *Characters: Tick, Mammal*

Ticks feed off of the blood of warm-blooded animals. The tick's bite is painful to the host animal and causes severe itching.

Mistletoe / Tree: *Characters: Mistletoe plants, Tree*

Mistletoe is dependent on its host tree for all water and dissolved minerals. It grows on the branches or trunk of a tree and actually sends out roots that penetrate into the tree and take up water and nutrients. Lots of mistletoe on a tree will rob the tree of water, minerals and nutrients.

Further Investigations!



Survey your neighborhood or school neighborhood for local environmental problems. Examples could include erosion, invasive weeds, insect predation, soil quality, shade/sun issues, and more. Could animals or plants manage the problem? Make a map of the area, highlight the problems, and insert possible animals and / or plants that could provide a solution.

Environmental Problem:

Potential Solution(s):

Map of _____