

Thank you for choosing the Oregon Zoo for your field trip destination and helping us make a better future for wildlife. We look forward to seeing you and hope you enjoy your visit.

The activities in this guide explore the concept of food webs. They are designed to help you maximize your students' education experience during and following their zoo field trip. All activities are aligned to core academic standards and address the following Essential and Guiding questions:

- How are plants and animals in an ecosystem connected to one another?
 - Where do plants and animals get their energy?
 - What happens to an ecosystem when one species' population changes or disappears?
 - What can we do to protect healthy food webs?

The Oregon Zoo hopes that as a result of this program, students will be able to:

- Identify the trophic levels in a food web.
- Explain how animals are interconnected through a food web.
- Identify one thing that might happen to an animal if its food web is threatened
- Name two actions they and their families can take to help protect healthy food webs

The program is correlated to the following academic standards:

Next Generation Science Standards:

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

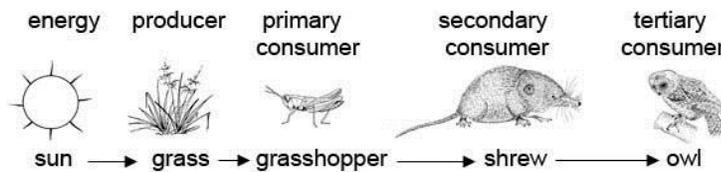
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Oregon Social Science Standards:

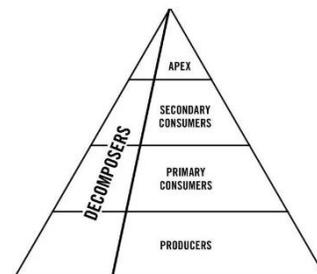
5.11. Describe how technological developments, societal decisions, and personal practices influence sustainability in the United States.

Background for Teachers:

All organisms in an ecosystem are linked together in a food web. A food web is a system of overlaying food chains. A food chain represents a possible path that the energy and nutrients may take as they move through the ecosystem. The diagram below illustrates a simple food chain.



Animals and plants in a food web are grouped into categories called trophic levels. The trophic level of an organism is the position it occupies in the food web. There are three levels – producers, consumers and decomposers. The **first level** is made of the producers. Producers are plants (and other organisms) that make their own food. Consumers make up the **second level**. Primary consumers are herbivores. Herbivores eat plants. Animals that eat herbivores are known as secondary consumers. At the top of the consumers are the apex species. These are the animals that have no known predators. Next to each of the trophic levels are the decomposers. Decomposers feed on and break down dead plant and animal material. Vultures and slugs are examples.



A natural, healthy food web is perfectly balanced. A food web is thrown out of balance when a plant or animal species is lost. Issues contributing to species loss include overhunting, habitat destruction, use of

toxic chemicals, overcrowding, and the introduction of invasive species. While these are big problems, our actions can make a difference. Encourage students to select alternatives to toxic chemicals; participate in an invasive vegetation removal project; plant a wildlife garden on your school grounds; reduce consumption; or implement a school-wide litter patrol.

At the Zoo Activity

(Click on link to download and print the student version of *Eco-Explorers: Food Webs*)

In this activity, students use the map and their observation skills to identify and record the plants and animals found in each of the trophic levels for the ecosystems listed.

African Rainforest

Apex: Leopard

Secondary Consumers: Flamingos; African burrowing frogs; Lungfish; geckos; Swamp monkeys; chameleons; Slender snouted crocodiles

Primary Consumers: Fruit bats; Colobus monkeys

Producers: Fruit trees (e.g. guava)

Decomposer: Monitor lizard

Ocean

Apex: Orca

Secondary Consumers: Sea otters; seals; fish; seastars

Primary Consumers: Sea urchins

Producers: Kelp

Decomposer: Sea cucumbers

Temperate forest

Apex: Cougar

Secondary Consumers: Black bear; salmon; bald eagle; river otters; bobcat

Primary Consumers: Mountain goats; Pocket gophers; beaver

Producers: Lichen; Spreading phlox

Decomposer: California condor

Post-Field Trip Activity

- Review with students the information collected during their field trip.
- Using the information gathered, have students use the template on the last page (consider enlarging to 11x17 when making copies) to construct a three dimensional trophic level pyramid for one of the identified ecosystems. Have students research their ecosystem to fill in any gaps.
- Have students identify a plant or animal in their food chain that has been impacted by people and then research the answers to the following questions:

- In what ways have people impacted this animal?
 - *Ocean - Sea otters were hunted to near extinction for their thick fur.*
 - *Pacific Northwest - Salmon populations have declined in number due to overfishing and logging; condors have been negatively impacted by lead poisoning*
 - *African rainforest –The number of Rodrigues fruit bats has decreased due to deforestation*

- How did this change impact the rest of the food chain?
 - *Ocean*
 - *Sea otters eat sea urchins. Sea urchins eat kelp. When the number of sea otters decreased, the number of sea urchins increased. The sea urchins devour the kelp, destroying a forest of food and protection for coastal fish and other animals.*

 - *Temperate forests in the Pacific Northwest*
 - *Salmon are an important food source for bears. When salmon numbers decline, bear numbers decrease too. Bear scat is a rich fertilizer for the plants growing in the forest. The plants shade the rivers, keeping the water cool for the salmon. Without salmon, none of this is possible.*
 - *When condors and other scavengers feed on the remains of animals shot with lead ammunition, lead can enter their bloodstream, affecting the central nervous system and leading to starvation or predation in their weakened state. Condors play a critical role in ecosystems by recycling nutrients and disposing of dead, disease-ridden animals.*

 - *African rainforests*
 - *Rodrigues fruit bats help to spread the seeds of the fruit they eat. Without them (and other fruit bats) serving in this role, the rainforest ecosystem begins to collapse. Bat guano also provides fertilizer to growing plants.*

- Discuss what can be done to help these animals in the wild.

- Have students summarize their findings in a report and present it to the class.

