

Food Web

Lesson Plan / Instructor Guide

COURSE TITLE: Food Web

INSTRUCTIONAL GOAL: Students will understand what a food web is and how various species fit into this important biological concept, and as some populations increase or decrease how this can impact other species within the web.

INSTRUCTIONAL OBJECTIVES: Upon completion of this block of instruction the participant(s) will be able to:

1. Students will know what a food web is.
2. Students will know what herbivores, omnivores and carnivores are.
3. Students will know what an autotroph and heterotroph is.
4. Students will know how drastic changes in a population of a species can impact the food web.
5. Students will know that toxins accumulated within the food web can possibly affect many more species over time.

INSTRUCTIONAL METHODS: PowerPoint lecture.

HANDOUTS: N/A

COURSE DURATION: Lecture and video approximately 30-40 minutes.

CURRICULUM REFERENCES: N/A

SAFETY CONSIDERATION: Know where exits are in building where presentation is given.

EQUIPMENT, PERSONNEL, AND SUPPLIES NEEDED: Laptop or computer (with presentation uploaded), projector or screen, jump drive with presentation or uploaded to computer, power cords (if needed) and extension cords (if needed).

TARGET AUDIENCE: Middle school and high school aged students, or for individuals wanting to learn more about food webs and biological terms and concepts associated with food webs.

COURSE PREREQUISITES: None.

EVALUATION STRATEGY: Feel free to come up with your own based on need and expected knowledge base learned from the diversity of students and varying grades, who might go over this presentation.

AUTHOR & ORIGINATION DATE: Storm W. Usrey, April 13, 2020.

REVISION / REVIEW DATE(S): N/A.

REVISED / REVIEWED BY: N/A.

CRITERION TEST: N/A

CRITERION TEST ANSWERS: N/A

COURSE OUTLINE:

- I. Introduction
 - A. Give name and title.
- II. Give goals and objectives.
- III. Cover definitions.
- IV. Food webs.
 - A. Are all around us!
 - B. Food chains and food webs are visual representatives of concept.
 - C. Autotrophs and heterotrophs.
 - D. Sun and photosynthesis.
 - E. Examples of how organisms get their own food or energy.

- i. Deer=herbivores, wild turkeys and black bears=omnivores and cougars=carnivores.
- V. Decomposers are important part of food web too.
 - i. Can students name some decomposers? NOTE: Will list some on next slide.
- VI. Hierarchy of a food web.
 - A. Give examples of producers, primary consumers, secondary consumers, tertiary consumers and decomposers.
 - B. Show pyramid and how they fit in concept of food web.
- VII. Energy transfer of a food web. NOTE: Talk about how only 10% of energy is transferred to different trophic levels.
- VIII. How organisms make a living. NOTE: Show where an autotroph and heterotroph fit on a visual pyramid depicting a food web.
- IX. –vore in a Hierarchy. NOTE: Show where saprovore, detritivore, autotroph, herbivore, omnivore and carnivore fit on a visual pyramid depicting a food web.
 - A. Go over definitions for each for clarification.
- X. Examples of species that are part of a food web.
 - A. Discuss and show how each species fits into the web. The next slide will show how species can feed on different organisms.
 - i. Talk about how, if populations of one species drastically change, it can impact a food web as it may be food source for many species.
- XI. Biomagnification or bioaccumulation.
 - A. Talk about DDT use for mosquitoes and how it affected bald eagle populations.
- XII. Thank You!

COURSE CONTENT:

Course Introduction and Overview

Food webs are found all around us in our world today and this concept is important to know how organisms are classified and depend on each other for their energy and life.

Food Web

The goal for this presentation is that students will understand what a food web is and how various species fit into this important biological concept, and as some populations increase or decrease how this can impact other species within the web.

The objectives of this presentation are as follows:

- Students will know what a food web is.
- Students will know what herbivores, omnivores and carnivores are.
- Students will know what an autotroph and heterotroph is.
- Students will know how drastic changes in a population of a species can impact the food web.
- Students will know that toxins accumulated within the food web can possibly affect many more species over time.

Body

Definitions

Throughout this presentation there will be key concepts and definitions that will be covered. It is a good point to have the students read and understand the following definitions off this slide before beginning other slides.

Autotroph – organism capable of synthesizing its own food from inorganic material (e.g. plants photosynthesize their own food).

Bioaccumulation – gradual accumulation of a substance, such as pesticides or other chemicals, in an organism.

Carnivore – organism that eats mainly meat from other animals.

Decomposers – organism that break down dead or decaying organisms or waste.

Detritivore – organism that feeds on waste products or dead organic material (mostly animals).

Food Chain – is a linear network of links in a food web.

Food Web – model depicting the many food chains linked together to show relationship of organisms in the ecosystem.

Herbivore – organism that eats only plants.

Heterotroph – organism that cannot produce its own food.

Omnivore – organism that eats plants and animals.

Primary Consumer – organism that feeds on primary producers. Organisms here are herbivores.

Food Web

Producers – organisms that make their own food.

Saprovore – organisms that feed on dead organic matter (mostly fungi).

Secondary Consumer – organism that feeds on primary consumers. Organisms here can be omnivores or carnivores.

Tertiary Consumer – organism that feeds on primary or secondary consumers. Organisms here are usually carnivores, but can be omnivores. Apex predators can be classified or found here.

Trophic level – position an organism occupies in a food web.

Food Webs

Some important information to give students in regards to food webs:

- Food webs are found all around us in the world and it is very important to understand this key biological concept and how all species interact around us and how energy is transferred between trophic levels.
- Food chains are singular linear relationships that are found within food webs. And both are visual representatives of how organisms acquire their energy.
- The sun gives energy to growing plants. Plants produce their own food through a process known as photosynthesis. Since plants make their own food they are called autotrophs.
- As you move up a pyramid that represents a food web, this is where you will find organisms that depend on other organisms for acquiring their energy. These organisms are called heterotrophs.
- Examples of how organisms acquire their energy from others might include, and are not limited to:
 - Deer browse on leaves. Deer are also herbivores.
 - Wild turkeys eat acorns and insects. Wild turkeys are omnivores.
 - Black bears eat berries and elk. Black bears are omnivores.
 - Cougars eat deer and bighorn sheep. Cougars are carnivores.
- Decomposers are important as they break down dead material that plants can use or obtain nutrients. Thus, the cycle continues! Can students name any decomposers such as maggots, earthworms, fungus, etc.?

Hierarchy of a Food Web

- Examples of producers are trees, brush, flowers and grass. All of these are autotrophs.
- Examples of primary consumers would be elk, deer, grasshoppers and chipmunks. All of these are heterotrophs and all of these are herbivores.
- Examples of secondary consumers would be wild turkeys, lizards, foxes and coyotes. All of these are heterotrophs and all of these are omnivores.

Food Web

- Examples of tertiary consumers would be cougars, black bears and bald eagles. All of these are heterotrophs and eagles and cougars would be considered carnivores. A black bear is an omnivore. Cougars, black bears and bald eagles can all be considered apex predators or top of a food chain.
- Examples of decomposers would be maggots, earth worms and fungus. They are heterotrophs too. They play a vital role in breaking down dead material to be used as nutrients from growing plants. The cycle of life begins again!

Instructor Notes:

Show the slide of how a pyramid can be a visual representation of a food web and how we can plug "terms" of trophic levels into the pyramid.

Energy Transfer in a food web

Let students know that as you go higher up in trophic levels of a food web that only 10% of energy is transferred up to organisms that consume them. About 90% is used at the level by organisms for mechanical and heat energy.

How organisms make a living

Show students where the terms autotroph and heterotroph plug into the visual representation of a food web when looking at a pyramid.

-vore in the hierarchy

Show students where the terms saprovore, detritivore, herbivore, omnivore and carnivore plug into the visual representation of a food web when looking at a pyramid.

Instructor Notes:

It might be a good idea to go over the definitions for these terms again.

Examples of organisms in a Food Web

Look at the pictures of the various species and where they are classified in the pyramid as a visual representation of a food web. NOTE: Next slide will show how they can interact within trophic levels and species.

Species within different trophic levels can depend on more than one species for a food source so this is why we call it a food web and not a food chain. If one species drastic decline occurred it could potentially impact many more species within the food web.

Bioaccumulation (Biomagnification)

When pesticides that had DDT in them were used, the harmful chemicals entered the water system and all species in the system from plankton to fish accumulated DDT in their body tissues.

Food Web

This drastically impacted higher organisms on the food web such as bald eagles and ospreys when they fed on fish that had DDT. Over time, the bald eagles accumulated harmful levels of this in their system. When they would lay their eggs the egg shells were not developing properly and the eggs would not last thus killing the potential chick that could have been hatched. Over time eagle numbers drastically declined until they became endangered. Now, because of laws not allowing the use of DDT eagle numbers have increased and they are no longer endangered.

Conclusion

Thank the students for paying attention! They now know more about food webs than before the presentation started.