



Web of Decay

Cave Food Web Game

Materials: Game cards ● Simplified food webs (enlarged) ● Energy Tokens or string (Optional)

The flow of energy in cave ecosystems is very different from terrestrial ecosystems. However, a review of a “regular” ecosystem will help prepare students for the odd world beneath their feet. So it is recommended that you play the “Food Web Game” several times before moving on to the Cave version. Before you begin either game, discuss the roles that organisms play in their environment and how they all rely upon on another for survival. This includes everything from microscopic bacteria to the largest animal species in that environment.

You may want to review the following terms before you begin:

Decomposers—Derives its energy from eating dead matter and in the process breaks dead materials into “parts” (i.e. nutrients and minerals);

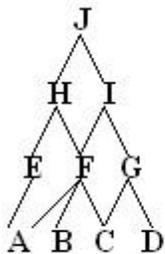
Producers—plants; rely on the sun for their energy (bring energy into the system)

Primary Consumers—Herbivores; rely on producers for their energy

Secondary Consumers—Carnivores; rely on primary consumers for their energy

Sample Web

(Energy flows from A,B,C,D toward J)



E eats A

F eats A, B, & C

G eats C & D

H eats E & F

I eats F & G

J eats H & I

Sample Terrestrial Scenario:

Invasive moth kills C

G eats D only – D #s go down

F eats A&B – they go down

E has more competition for A

& less available – E #s go down

A food chain/web shows how each living plant and animal gets food. Some animals eat plants only (herbivores), some animals eat plants and animals (omnivores), and some animals eat only other animals (carnivores). A total food chain always starts with a plant and ends with an animal. Almost all animals are part of several food chains because they eat more than one type of plant and/or animal in order to survive. These interconnected food chains form a food web.





Basic Food Web Game

1. Divide students into uneven groups (3-4 groups depending on class size).
Group with largest number = plants
Next largest group = herbivores
Then = carnivores
Finally have 1 or 2 top carnivores

2. Arrange by trophic level i.e.:



3. Have them choose their animals and figure out who eats whom.
4. Trace energy through ecosystem. (Poker chips, small pieces of paper, or some other token can be used to represent energy. If you use energy tokens, be sure to “lose” some at each exchange to represent heat loss. Alternatively, string or yarn can be stretched between students to show how each level gets energy from the preceding level.)

What would happen to the ecosystem if one of these levels were to be affected by adverse conditions (drought, pollution, habitat destruction, etc.)? Illustrate this by changing the ecosystem. Use some creativity to “kill” or reduce population of some creatures (or increase them), then track what happens.

Sample Scenarios

1. Reduce a producer’s (plant) population via invasive species (e.g. Dutch elm disease), catastrophe (fire), extinction of animal partner (e.g. seed disperser or pollinator)
2. Reduce a 1° consumer (herbivore) via elimination of food source, or any of the aforementioned.
3. Reduce a 2° consumer (carnivore) via food chain amplification (e.g. DDT) or any of the aforementioned.





Cave Food Web Game

1. Pass out the Web of Decay cards. The basic set is designed for class size of 30 students. The expansion set can be used to increase class size. If there are less than 30 students then use cards A-D (or A-C) from the basic set. Be sure to make sure that there is more detritus (bat guano, leaf litter, and dead animals) than any other level. You may want to remind students that even though detritus is the base of food webs in caves where there is no light that the original source of energy was plant life outside of the cave. All energy floats in, blows in, or is carried in on the wings of bats (or by other animals).
3. Have the students find the other members of their trophic level. You should only have a small number of top carnivores relative to the other groups.
 - Detritus
 - Decomposers (Primary Consumer)
 - Primary Carnivores (Secondary Consumer)
 - Top Carnivores (Tertiary Consumer)
4. Figure out who eats whom or what. (Optional: Enlarge “Simplified Cave Food Web” sheet and challenge students to figure out where they belong.)
5. Trace energy through ecosystem. (Poker chips, small pieces of paper, or some other token can be used to represent energy. If you use energy tokens, be sure to “lose” some at each exchange to represent heat loss. Alternatively, string or yarn can be stretched between students to show how each level gets energy from the preceding level.)
6. What would happen to the ecosystem if one of these levels were to be affected by adverse conditions? Choose from any of the following scenarios or make up your own!

Cave Ecosystem Scenarios

1. Human disturbance raises the temperature of the cave during the winter.
2. A new pesticide decimates a maternity roost.
3. A sinkhole brings new light into a dark zone of the cave.
4. Careless forestry practices reduce the population of Indiana bats.
5. High winds blow large numbers of leaves into the cave in the fall.
6. A flash flood scours the cave one evening, removing all the detritus but not harming the salamanders and bats that were out foraging.
7. An invasive species of carnivorous fish (or spider) moves into the cave.





7. If time allows, pass out the cards from the “Enter into Twilight” edition of the food web game. Play as before. However, make sure that students notice the differences between cave food webs when light and plants are present. Specifically, that both plants and detritus are used as sources of energy in cave entries and the twilight zone. The communities are also made up of different species. Some animals can’t tolerate the bright light and increased competition in these zones and are not present. However, several species that don’t penetrate deep within the cave have been added to the food web. Use the “Enter into Twilight” simplified food web to help guide your students through the effect of sunlight (even meager sunlight) on cave ecosystems.

Summary Points

- The food supply for most animals can be traced back to plants. Therefore, without plants animal life would not exist. Even the energy for cave ecosystems are based on plants that live in the area around the cave.
- Insects and various other organisms depend on dead plant and animal material for food.
- That some source of energy (i.e. sunlight or food) is needed for all organisms to stay alive and grow.
- Nutrients cycle through systems and may be reused, but energy flows and is lost as heat.
- There is no light (and thus no source of energy) deep in the cave, so all the energy that enters a cave ecosystem must come from outside the cave (must either float in, blow in or be carried in by an animal).
- Caves with large bat populations have the most diverse communities.
- Cave communities are larger and more complex near openings or other sources of light.

