

Constructing Food Webs

Lesson Topic

Ecology- Food webs and energy transfer

RIEL Biology Element

Affirming Identities

Time Required

Two to Three class periods

Standards Addressed

 SC.912.L.17.9 Food Webs and Energy Transfer-Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Science and Engineering Practices

- Obtaining, evaluating, & communicating information
- Developing and/or using models
- Planning & carrying out investigations
- Analyzing and interpreting data

Lesson Summary

Students will be observing their natural habitat on school campus and identifying the different parts of a food web. They will use the data collected from their observations to construct a food web. They then will analyze their food webs to describe the energy transfers within the school's ecosystem. This will allow students to make connections between the concepts learning in class to the ecosystem and communities found in their school environment/campus.

Students will be put in the role of an ecologist to make observations and evaluate our campus environment and create a food web based on the organisms living on campus. This allows students to collect data in the field and feel just like an ecologist/scientist would. They will practice using observation and inferencing skills to collect data. Remind them that we can make observations with other senses beyond sight – e.g., hearing birds. Explain to students that ecologists do field work, and that means they go into the ecosystem they are studying and use their observation skills to collect data just like the kids are about to.

Give examples of what an ecologist's real job might be such as, overseeing construction at sites to ensure no environmental impacts occur, risk assessment work based on community interactions, wildlife monitoring, and/or planting at a restoration site. You can describe how ecologists perform tasks like restoring habitats, tracking animals, and running predictive models that are based off data collected in the field like what the students are about to collect. This is a great opportunity to share any personal experience stories you may have related to field research with students too.

Students will be making and recording their own observations from the environment and use the data to construct a food chain, food web, and energy pyramid. They will analyze and evaluate their collected data and models to explain the energy transfer within the observed ecosystem. They will also have discussion questions regarding ecosystem values, biodiversity, and human impact.





Materials

- Student worksheets
- Writing utensils
- Clipboards or notebook/folders for writing surface
- Organism signs (described below)

Before the Activity

The school is populated during the day, many organisms will not be visible, and most students are unfamiliar with names of organisms. The school also might not have a land lab available. <u>Inaturalist</u> can be used to find local flora and fauna from the direct area.

Once laminated, write the names of each organism on the back of the photo and tape it to something to be used as a stake in the ground like little signs (plastic knives work well).

The morning of the lab, go to the designated outdoor area and place the organism signs all around (like an ecosystem scavenger hunt), being sure to place the sign next to the actual plant if available. For example, an oak tree sign placed at the base of the tree and a raccoon on a fence picture next to the fence.

Be sure to notify the main office that you will be outside and check the area you want to use is okay. I suggest something on the edge of campus/low traffic area if possible, so other students throughout the day don't disturb the area.

Check the weather forecast ahead of time and remind students to appropriately dress for the weather. (You could theoretically use the signs in the classroom and do an inside scavenger hunt if going outside doesn't work for you).

To maximize time outside (weather permitting), have students meet in class for attendance, review of behavior guidelines, and lab procedures, then take their belongings to the lab area to be dismissed from there.

Content Learning Objectives

- Use a food web to identify and distinguish producers, consumers, and decomposers.
- Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
- Observe ecology concepts.
- Sketch and label ecology concepts using unit vocabulary.
- Identify and record observations.
- Hypothesize food pyramids and energy transfers from the school environment.

Teacher Notes

- Using the iNaturalist site, search by zip code and select several organisms from each trophic level to print and laminate. Search filters set for research grade and verifiable pictures are helpful.
- Print pictures of things students will see so they know the names of organisms, but also include organisms that are known to be in the area but may not be observed during the day on campus.







Lesson Activities

- **1.** In class, students should already have learned basic ecology concepts. This includes energy transfer, community structure, and populations.
- 2. Review safety procedures for the lab, vocabulary terms, and observation and inference skills with the students at the beginning of class.
- **3.** Take students outdoors to locate, identify, and sketch the required components of the worksheet.
- 4. Once all data collection is complete students can work in their lab groups outside or head back to the classroom to utilize the information collected and answer the questions on the worksheet.
- 5. Critical thinking/extension questions can also be used as discussion questions instead of written









Date:___

Ecology Observation Lab

Purpose: Use science skills to connect ecology concepts learned in the classroom to the ecosystem surrounding the school's campus.

Materials: Lab sheet, Pencil, clipboard or other hard writing surface

Pre-Lab Question:

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List 2 safety precautions need to be taken for this type of activity?

 a.

b.

Procedures:

- 1. Explore the designated area on campus and look for examples of organisms that live in each of the following trophic levels in the chart below.
- 2. Fill in the chart with your findings. You will need to find at least 3 organisms at each level.
- 3. Complete the lab questions based on your observations.

PRODUCER	PRIMARY CONSUMER	SECONDARY CONSUMER	TERTIARY CONSUMER	DECOMPOSER DETRITIVORE





Lab Questions:

 Sketch and label 1 food chain you observed. Remember to start the food chain with a producer and it needs to have at least 1 primary consumer and 1 secondary consumer. Include the name of the organism and trophic level from your observations table in your food chain.

2. Record 2 predator/prey relationships you observed.

3. Sketch and label one ecosystem you observed. Remember an ecosystem includes abiotic and biotic features.

4. List all of the parts of the community you sketched in question #3.

5. Identify and list 1 population from the ecosystem in question #4







Lab Questions:

6. Create a food web using the organisms from your observations. You do not need to include decomposers.

7. We are currently in the middle of what is considered our dry season. Pretend it is the middle of the rainy season (June-Sept) and you are observing the same ecosystem from question #3. Describe at least 2 changes you might observe and explain why it would be different. Hint: think about how more rain would affect all aspects of the ecosystem.

a.

b.

8. Describe at least 2 separate niches from the ecosystem you observed today. (Example: Beavers build dams that controls water flow)

a.

b.







Lab Questions:

- 9. Draw a food pyramid. Fill in the pyramid with the appropriate biotic features that would occupy the different trophic levels of the pyramid that would come from the ecosystems surrounding the school.
 - a. In which trophic level would you find the greatest mass of organisms? (remember the biomass pyramid)
 - b. What could the possible implications be for producers and tertiary consumers if the primary consumers numbers were quickly and drastically reduced?







Critical Thinking/Extension Questions:

1. Describe the value of the ecosystem found on your school site from a natural and human perspective. In other words, how do living organisms, the school site, and humans interact in a beneficial way?

- 2. Do you consider your school grounds to be a biologically diverse area? Why or why not?
 - a. What changes could you realistically make to the landscape around the school building and grounds to increase the biological diversity of this ecosystem?
 - b. Why is biodiversity important? Go back and look at the answers you put in questions 1-6 above. How do you think those organisms both cooperate and compete in your school grounds ecosystem?
- 3. Use ecological terms to describe how your school site ecosystem would change or be different from what you see today if the groundskeeper changed the school grounds with these techniques below....
 - a. ...raised the height of the mower?
 - b. ...cut down any large trees and replaced them with landscaping shrubs that take less water?
 - c. ...put bird feeders outside of classroom windows?





