Matter and Energy in Ecosystems

ACTIVE LEARNING FOCUS

GRAB-AND-GO LESSON PLANS

SINGLE LESSON – Teacher Facilitation Guide

Science, Biology Grades 9-10

NGSS HS-LS2-4
Ecosystems: Interactions, Energy, and Dynamics

ABOUT THIS RESOURCE

ESSENTIAL QUESTION

How do matter and energy cycle and flow through an ecosystem?

LEARNING GOALS

Students will be able to:

- compare and contrast food chains and food webs.
- create a model of matter and energy cycling and flowing through an ecosystem

LESSON PLAN OVERVIEW

This lesson can be completed individually or with a partner. It introduces students to the basic ideas of how energy and nutrients flow through ecosystems and then invites students to apply these ideas towards creating a model depicting the cycle and flow of energy and nutrients through an ecosystem. This lesson can be adjusted to go more deeply into the topic and/or be more specific and relevant for students in your class. The lesson can also be shortened (by having students complete Activities 2 and 3 only) if you just want to introduce students to food chains, food webs, and trophic levels.

HOW TO PREPARE

1. Make a copy of the ALA: Matter and Energy in Ecosystems Google Slides.
2. Preview the activities, including all resources.
3. Take note of any changes you would like to make and edit as needed to accommodate your students' needs. Consider which activities lend themselves best to teacher facilitation, group **collaboration**, and/or independent practice and edit the slide deck as needed.
4. Review the learning artifact options and make a plan for which choices you will offer.
5. Make a list of must-dos before students begin this unit.
6. The facilitation notes that follow offer suggestions for how to best implement each activity in the slide deck, with active learning in mind.

LEARNING ARTIFACT OPTIONS

1. Written answers to reflection questions
2. Participation in a group discussion in response to reflection questions
3. A visual representation of their answers to the reflection questions

ACTIVITIES

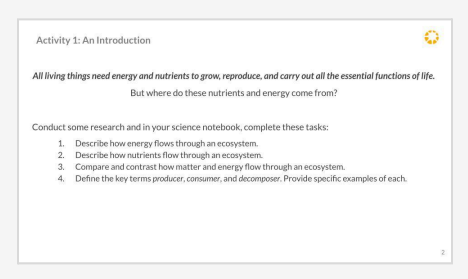
JUMP TO

LESSON FRAMEWORK

ACTIVITY 1: AN INTRODUCTION (SLIDES 2–3)

Learning Goal: Explain how nutrients and energy cycle and flow through an ecosystem.

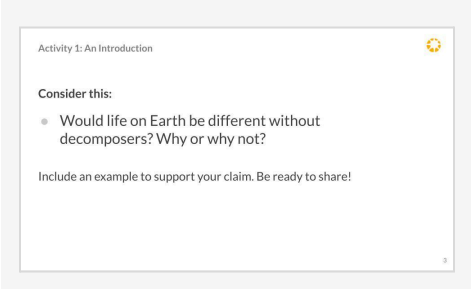
Slide 2



It is okay if students are off the mark here. The important thing is that they begin **establishing meaning** through their research and start to distinguish between the different roles of organisms in an ecosystem.

Students can use this website to **investigate** the Law of Conservation of Mass as it relates to the cycling of matter and the flow of energy in ecosystems.

Slide 3

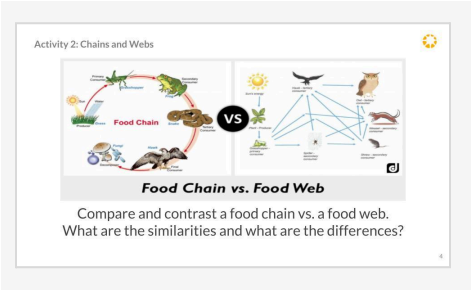


ACTIVE LEARNING

As a way to practice CER (Claim-Evidence-Reasoning) statements, create a shared Google document or other virtual collaborative space. Then, ask students to record their thoughts regarding the role of decomposers in ecosystems (claim), an example (evidence), and a scientific principle/explanation that supports their thinking (reasoning).

ACTIVITY 2: CHAINS AND WEBS (SLIDES 4-5)

Slide 4

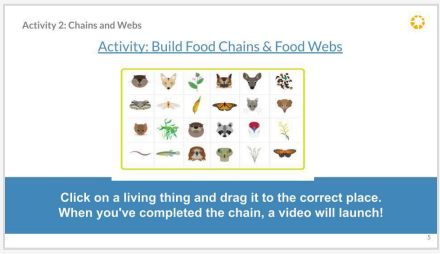


Ask students to examine these models of a food chain vs. a food web, and then, facilitate a discussion of the models using the questions below.

- Can you identify patterns to describe a food chain?
- What are some patterns of a food web?
- How is a food chain similar to a food web?
- What are the differences in the model?

SAY: *Describing the relationships between the organisms in an ecosystem is a bit more complex than "eat or be eaten." Let's take a more in-depth look at food chains and food webs.*

Slide 5



Conduct this activity together as a class, in order to address any misunderstandings students might have.

ACTIVE LEARNING

Students could **collaborate** with a partner or a small group and then report their overall results. Ask students to share if they have seen or experienced any of the living things in their own communities that are shown in the videos.

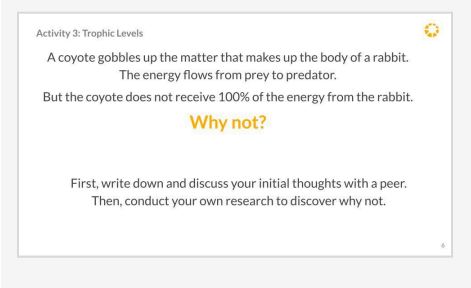
DIFFERENTIATE

Additional Resources for Student Choice:

- This video (5:48) from the Amoeba Sisters can help students who might be struggling with vocabulary.
- For a more advanced example of a food web, this video resource (3:07) illustrates the complexity of the feeding relationships in an ecosystem using the model of the Florida Everglades as an example.

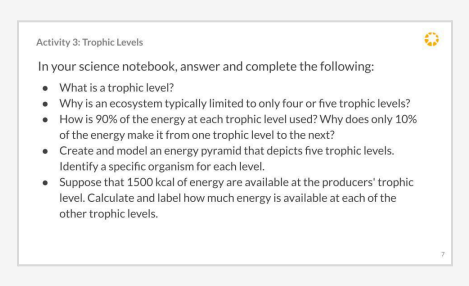
ACTIVITY 3: TROPHIC LEVELS (SLIDES 6–7)

Slide 6



Check in with students here to discuss their research and results.

Slide 7



Check in with students here, too, to discuss and review their responses. Students often struggle with the 10% rule for energy transfer from one trophic level to the next.

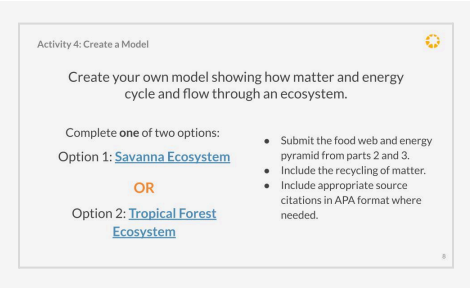
ACTIVE LEARNING

Help ensure students recognize that the 10% rule is what limits the number of trophic levels an ecosystem can support by using this 10% modeling activity.

ACTIVITY 4: CREATE A MODEL (SLIDE 8)

Student Goal: Create a model of matter and energy cycling and flowing through an ecosystem.

Slide 8



This final activity can be tailored or changed entirely to fit the needs of students. Consider allowing students to work with a partner. Note, Part 1 of the HHMI activity is not relevant to what students will be doing in terms of creating a model. However, let your students know if you prefer they submit this part, too.

Present students with the two options on slide 8. For guidance, see the educator materials for Option 1 and Option 2. Note: You will need to print and provide the "cards" for students for this activity (or provide the link). For students completing the savanna ecosystem option, this optional video is available: The Guide: A Biologist in Gorongosa (34:31).

An additional option to offer students is the opportunity to complete an Owl Pellet Dissection Investigation. An overview, teacher notes, and student worksheet are also available in this Owl Pellet Food Webs: A Model of Energy and Mass Transfer resource from Carolina Biological, as are the owl pellets.

DIFFERENTIATE

Include a reflection after students complete the model.

- What was the most interesting thing you learned from completing your artifact?
- What was the most challenging part of completing your food web? Why?
- Predict how ecological forces or disturbances may impact models and justify claims with evidence.