ECO Pyramid Classroom Kit

About the Game

Dear Educator,

EcoPyramid is a card game that was intentionally designed to be educational. Students at McPherson College began with a simple task: design a fun activity that will teach kids about an important environmental concept. Here it is... A dynamic, strategic, and fast-paced game that can be used in the classroom to excite students about environmental sustainability and engage them with science curriculum in a fun way.

The core of the game revolves around the concept of an ecological pyramid. The final structure that students are competing to finish first includes 3 trophic levels: producers, herbivores, and carnivores. Students build this pyramid from the base with lower trophic levels supporting organisms above that feed on them for energy. Concepts of trophic levels, feeding interactions, community stability, and thermodynamics (10% rule) are fundamental in understanding and playing this game.

The boxed game set has 4 different ecosystems that students will have the opportunity to play with. Each ecosystem has different species that students can learn all about by paying attention to the trophic level, scientific name, and the fun facts included on each organism card. In addition to the organism cards, each deck has action cards (catastrophes and protections) that students can use to disrupt other players' pyramids or protect their own. The graphics and effects of each card are intentional to teach students about different threats to each ecosystem and how we can protect these ecosystems from destruction. These cards will be great starting points for class discussion on how humans are harming and/or conserving each ecosystem.

I hope your students enjoy EcoPyramid and find it educational and entertaining. The 5E resources that accompany this game were compiled by our elementary education science methods students with the goal of facilitating a fun learning environment that is easy for you to adopt and incorporate into your classroom. I hope you find the ideas and links compiled here to be helpful for enriching your students' knowledge of ecosystems as well as the role they play in the protection of ecosystems. Thank you for introducing our game to your students!

Sincerely,

Dustin Wilgers
Professor of Biology
McPherson College

Standards

3rd

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

LS4.D Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

LS4.A Some kinds of plants and animals that once lived on Earth are no longer found anywhere.

4th

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

ESS2.E Living things affect the physical characteristics of their regions.

5th

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

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Standards

4th

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5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

6th

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Explanation

What Is an Ecosystem?

An ecosystem is like a neighborhood in nature. It's a place where living and nonliving things work together. Living things include plants, animals, and even tiny organisms too small to see. Nonliving things include sunlight, water, air, and soil.

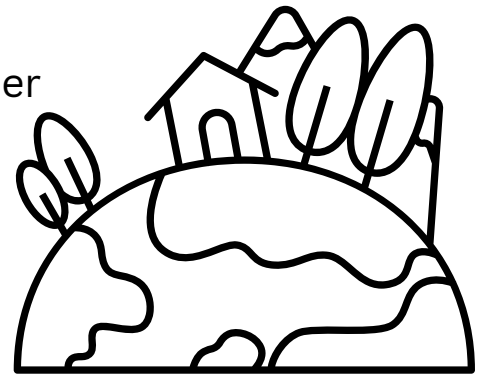
People in a neighborhood have different jobs—some people cook, some clean, some teach, some fix things. Every part of an ecosystem has a job too. Plants use energy from the sun to make their own food through photosynthesis. Animals eat plants or other animals to get their energy. Decomposers, like worms and fungi, break down old or dead things and turn them into nutrients for the soil. Even the nonliving parts have jobs to do. Water keeps plants alive, sunlight gives energy, and soil holds nutrients.

Ecosystems can be any size. A forest, pond, or desert is an ecosystem, but so is the patch of grass outside your school. Even a small area like the area under a rotting log can be its own ecosystem!

Ecosystems change too. If it rains a lot, a field might fill with frogs and insects. If there's a long dry spell, some plants might stop growing. When one part changes, the whole ecosystem feels it—just like how a neighborhood changes when a new family moves in or when a store closes.

You've already seen ecosystems in your everyday life—you just may not have noticed them yet. Maybe you've watched ants carrying food back to their colony, seen birds using trees for shelter, or noticed how plants grow better in sunny spots than shady ones. Those are all examples of living things using the nonliving parts around them to survive.

By learning about ecosystems, you'll start to understand how the natural world works together like a team. You'll be able to look at your backyard, your schoolyard, or a park and say, "I can see how everything in this place is connected." Nature's neighborhoods are all around you!



Vocabulary Glossary

- **Consumer** – An organism that cannot make its own food and must eat other organisms for energy.
- **Carnivore** - An animal that eats meat.
- **Decomposer** – An organism, like fungi or bacteria, that breaks down dead plants and animals and returns nutrients to the soil.
- **Ecosystem** – All the living and nonliving things that interact in a particular environment.
- **Energy** – The power to do work or cause change; in food chains, energy comes from the Sun.
- **Food Chain** – A sequence showing how energy and nutrients flow from one organism to another.
- **Food Web** – A network of connected food chains that shows how energy moves through an ecosystem.
- **Habitat** – The natural home or environment where an organism lives.
- **Herbivore** - An animal that eats plants.
- **Omnivore** - An animal that eats both plants and meat.
- **Predator** – An animal that hunts and eats other animals.
- **Prey** – An animal that is hunted and eaten by a predator.
- **Producer** – An organism (usually a plant) that makes its own food using sunlight.

Matching Vocabulary

Select the meaning of the word from the list. Write the letter of the correct answer in the blank.

1. Ecosystem _____ a. A sequence showing how energy and nutrients flow from one organism to another.
2. Habitat _____ b. An animal that eats meat.
3. Food Chain _____ c. An organism that cannot make its own food and must eat other organisms for energy.
4. Food Web _____ d. All the living and nonliving things that interact in a particular environment.
5. Energy _____ e. An animal that eats plants.
6. Producer _____ f. A network of connected food chains that shows how energy moves through an ecosystem.
7. Consumer _____ g. An organism, like fungi or bacteria, that breaks down dead plants and animals and returns nutrients to the soil.
8. Decomposer _____ h. The power to do work or cause change
9. Predator _____ i. The natural home or environment where an organism lives.
10. Prey _____ j. An organism (usually a plant) that makes its own food using sunlight.
11. Herbivore _____ k. An animal that eats both plants and meat.
12. Carnivore _____ l. An animal that is hunted and eaten by a predator.
13. Omnivore _____ m. An animal that hunts and eats other animals.

Matching Vocabulary ANSWER KEY

1. Ecosystem	_____d_____	a. A sequence showing how energy and nutrients flow from one organism to another.
2. Habitat	_____i_____	b. An animal that eats meat.
3. Food Chain	_____a_____	c. An organism that cannot make its own food and must eat other organisms for energy.
4. Food Web	_____f_____	d. All the living and nonliving things that interact in a particular environment.
5. Energy	_____h_____	e. An animal that eats plants.
6. Producer	_____j____	f. A network of connected food chains that shows how energy moves through an ecosystem.
7. Consumer	_____c____	g. An organism, like fungi or bacteria, that breaks down dead plants and animals and returns nutrients to the soil.
8. Decomposer	_____g____	h. The ability to do work or cause change
9. Predator	_____m____	i. The natural home or environment where an organism lives.
10. Prey	_____l____	j. An organism (usually a plant) that makes its own food using sunlight.
11. Herbivore	_____e____	k. An animal that eats both plants and meat.
12. Carnivore	_____b____	l. An animal that is hunted and eaten by a predator.
13. Omnivore	_____k____	m. An animal that hunts and eats other animals.

Explanation

Helpful Resources to Learn More

- Books
  - *The Great Kapok Tree* by Lynne Cherry
  - *Over & Under the (Pond, Waves, Rainforest)* by Kate Messner
  - *What if There Were No Bees?* by Suzanne Slade
  - *Merry Morpho: A Butterfly's Effect* by Dustin Wilgers

- Informational Sites
  - Kiddle (kids.kiddle.co)
    - Trophic Levels
  - National Geographic (education.nationalgeographic.org)
    - food web
    - food chain
    - energy flow through an ecosystem

- SciShowKids
  - How Living Things Work Together
  - The Layers of the Redwood

- Games
  - https://www.sheppardsoftware.com/science/animals/games/food-chain/?utm_
  - https://sciencetrek.org/topics/food-web/games?utm
  - https://www.cserc.org/sierra-fun/games/build-a-food-chain-game/?utm
  - https://www.educaplay.com/learning-resources/8013440-trophic_levels.htm
  - https://games.legendsoflearning.com/video-lesson/4049?partner=legends-public&slug=WyJnYW1lcyIsNDA0OV0%3D&game_id=4049

Engagement

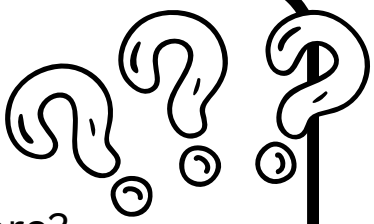
Questions Before Game

- What is an ecosystem?
- What is found in a healthy ecosystem?
- What kind of ecosystem exists where you live?
- What's the biggest ecosystem you can think of?
- How do you think animals and plants interact in ecosystems?
- Have you ever seen changes in nature where you live, like a change in the number of certain animals or plants? What do you think caused it?

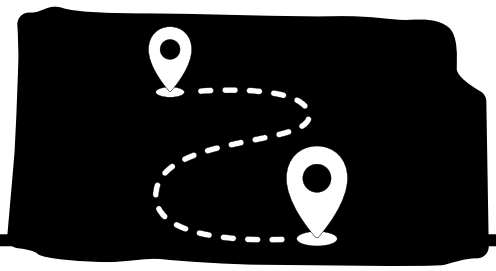
Questions During Game

- What is going well?
- What is making the game difficult?
- What makes each ecosystem unique?
- What might happen if a new organism were introduced into an ecosystem?
- What happens when catastrophe strikes?
- What real life events work like your protection cards?
- What would happen if we removed an organism from the deck?

Questions After Game



- What went well?
- What could you do differently next time?
- Did anything in this game make you want to learn more?
- What are ways that humans harm ecosystems?
- What is one thing you can do to protect the ecosystem around you?
- How can you help protect non-game animals where you live?



Exploration

Kansas Field Trip Ideas

- **Dillon Nature Center** (Hutchinson, KS) - Learn about native species.
  - https://www.hutchrec.com/dillon-nature-center/
- **Kauffman Museum** (North Newton, KS) – Learn about prairie life, early settlers, and Kansas history through hands-on exhibits and scavenger hunts.
  - https://kauffmanmuseum.org/education/field-trips/
- **Exploration Place** (Wichita, KS) – Interactive science museum with exhibits on many scientific themes.
  - https://exploration.org/field-trips/
- **Botanica Wichita** (Wichita, KS) – 20 acres of gardens and outdoor learning with rotating activity stations and art or science-themed scavenger hunts.
  - https://botanica.org/field-trips-at-botanica/
- **Kansas Wetlands Education Center** (Great Bend, KS) – Explore nature, wildlife, and ecosystems through hikes, live animals, and science lessons.
  - https://wetlandscenter.fhsu.edu/education/index.html
- **Kansas Children's Discovery Center** (Topeka, KS) – Hands-on museum with STEM and art exhibits; students can create, build, and experiment.
  - https://kansasdiscovery.org/visit/plan-your-visit/field-trips/
- **Sternberg Museum of Natural History** (Hays, KS) - Travel to the past to see how prehistoric creatures lived.
  - https://sternberg.fhsu.edu/
- **Flint Hills Discovery Center** (Manhattan, KS) - Experience the unique ecosystem of the Flint Hills.
  - https://www.flinthillsdiscovery.org/3458/Exhibits
- **Science City at Union Station** (Kansas City, MO) - Hands on science for all ages.
  - https://sciencecity.unionstation.org/

Exploration

Virtual Field Trip Ideas

Ask A Biologist- Explores a variety of **ecosystems** that comes with pictures with captions, videos, and even games.

- https://askabiologist.asu.edu/sites/default/files/virtual-reality/portal-jump-VR-360-2/index-ns.html

Nature Lab by The Nature Conservancy- Explore different natural environments around the world with a video, teacher guide, and student activity.

- https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/virtual-field-trips/

Smithsonian National Museum of Natural History – Ecosystems Portal to explore exhibits looking at producers, consumers, and decomposers in different **biomes**.

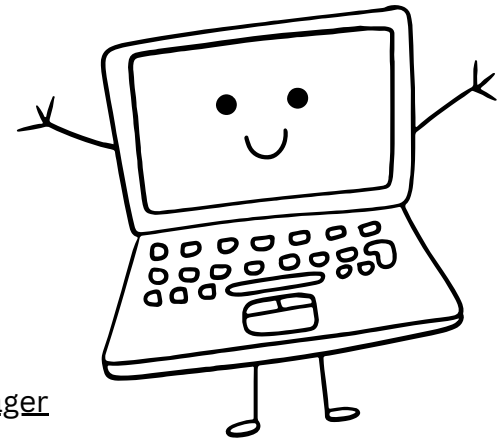
- https://www.naturalhistory.si.edu/initiatives/oceans/ocean-science-center
- https://ocean.si.edu/
- https://naturalhistory.si.edu/visit/virtual-tour

San Diego Zoo Kids – Animal **Diet & Habitat** Virtual Tours
Focus: Herbivores, carnivores, omnivores → primary and secondary consumers

- https://az.pbslearningmedia.org/collection/san-diego-zoo-kids/

BBC Bitesize – Food Chains & Webs Virtual Learning
Focus: **Trophic levels**, energy flow, predator/prey

- https://www.bbc.co.uk/bitesize/articles/zjh4r2p



Exploring Nature – Ecosystem & Food Web Virtual Modules
Focus: Forest, desert, **ocean food webs**

- https://exploringnature.org/#google vignette

Google Earth Voyager – "Ecosystems" Collection
Focus: **Food chains** in rainforests, coral reefs, and grasslands

- https://sites.google.com/tgs.school.nz/geotools/earth/voyager

Ecology Virtual Lab by Glencoe
Focus: Build a **food web**, test energy transfers

- https://glencoe.mheducation.com/sites/0078695104/student_view0/unit1/chapter2/virtual_labs.html#

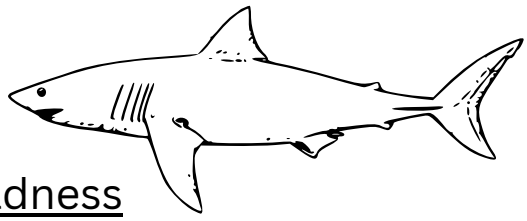
PBS Learning Media – Food Web & Trophic Levels **Interactive**
Focus: Roles in ecosystems, producers → apex predators → decomposers

- https://www.pbslearningmedia.org/subjects/science/life-science/ecology/food-webs/

BioInteractive (HHMI) – Virtual Ecosystem Exploration
Focus: Savanna, tundra, coral reefs—**energy flow** and trophic pyramids

- https://www.biointeractive.org/classroom-resources/creating-chains-and-webs-model-ecological-relationships

Elaboration



March Mammal Madness
https://libguides.asu.edu/MarchMammalMadness

MMM has asked since 2013, “Who Would Win?” This is asked when two animals encounter each other. MMM uses a simulated tournament bracket to help students answer this question.

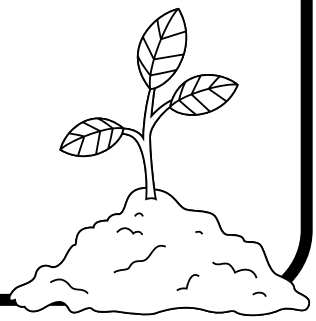
Ecosystem in a Bottle
https://layers-of-learning.com/pop-bottle-ecosystem/

Students can build ecosystems in bottles to better understand how ecosystems work.

Make a Model Chain or Pyramid

Students can use the deck of cards to make a food chain or ecological pyramid that would really exist in nature. Then, they can choose a catastrophe card and/or protection card and explain how they would disrupt or help the chain or pyramid in real life.

Alternatively, stop game play after a pyramid has successfully been built and identify flaws in its design (maybe the animal at the top doesn’t eat what is under it, etc...). Students could then discuss what would make their pyramids more realistic.



Build Your Own Eco Pyramid

Protection

Catastrophe

Carnivores

Herbivores

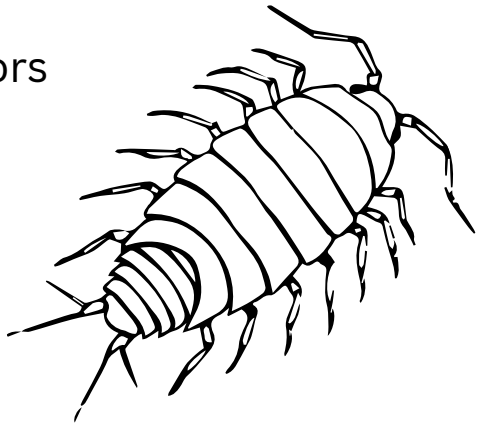
Producers

Elaboration

Demonstration (4th Grade)

Animal Structures & Environmental Impact: Pill Bug Investigation

Materials



- Pill bugs (rolly pollies) collected outdoors
- Two clear plastic containers
- Soil, leaves, small sticks
- Spray bottle
- Notebook

Procedure

- Observe pill bugs outside before collecting to bring inside and draw and label diagrams of their physical attributes:
  - Hard shell → protection
  - Antennae → sensing
  - Many legs → movement
  - Ability to curl → defense
- Record how the pill bug's structure helps it survive.

Test

- Fill one container with soil + leaves + small sticks
- Fill the second with soil + pill bugs + leaves + small sticks
- Leave for one week, spraying both with water every day
- Compare: soil moisture, amount of decomposed leaves, presence of tunnels or burrows
- *Return the pill bugs back to nature!*

Explain

- Pill bugs help break down dead plants, mix soil, and add nutrients.

Elaboration

Experiment (5th Grade)

Community Compost Investigation

Materials

- Two containers:
  - One for food scraps + yard waste
  - One for landfill trash (dry, clean items like paper)
- Soil
- Water spray
- Worms
- Gloves

Procedure

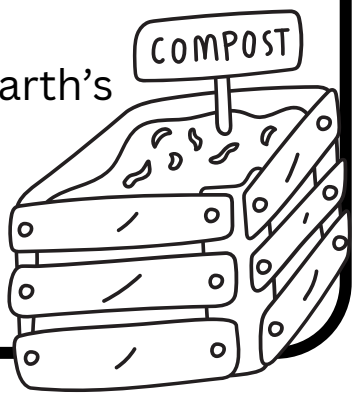
- Start both containers, watering both 2 times/week:
  - Container A: add fruit peels, veggie scraps, leaves, worms, and a handful of soil.
  - Container B: add dry trash (paper, packaging scraps).
- Observe weekly (4-5 weeks minimum):
  - Look for changes (color, smell, decomposition).
  - Track how much material disappears over time.
- *Return worms to nature*

Create a Model

- Show how matter moves through the compost system:
  - Food scraps → decomposers → soil nutrients → plant growth

Make a Claim

- Use data to argue how composting helps protect Earth's resources by:
  - Reducing landfill waste
  - Returning nutrients to soil
  - Supporting plant growth



Elaboration

Research (5th Grade)

Ecosystems: Who Eats What and What Can We Do?

Materials

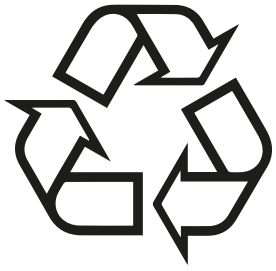
- Poster board
- Markers / colored pencils
- Books and/or internet access for research
- Optional: 3D materials (string, clay, pipe cleaners)

Procedure

- Choose a local ecosystem
- Identify organisms
  - Producers, Herbivores, Carnivores, Scavengers, Decomposers
- Research how each organism gets matter/energy.
- Build a food chain model
  - Use arrows to show movement of matter
  - Add decomposers. Show how they break down dead organisms and return matter to the soil or water.

Community Protection Component

- Research and add information about how the local community protects that ecosystem, such as:
  - Water conservation
  - Recycling
  - Habitat restoration
  - Protected wildlands



Conclusion

- Explain how matter cycles in a specific ecosystem AND how human actions protect those cycles.

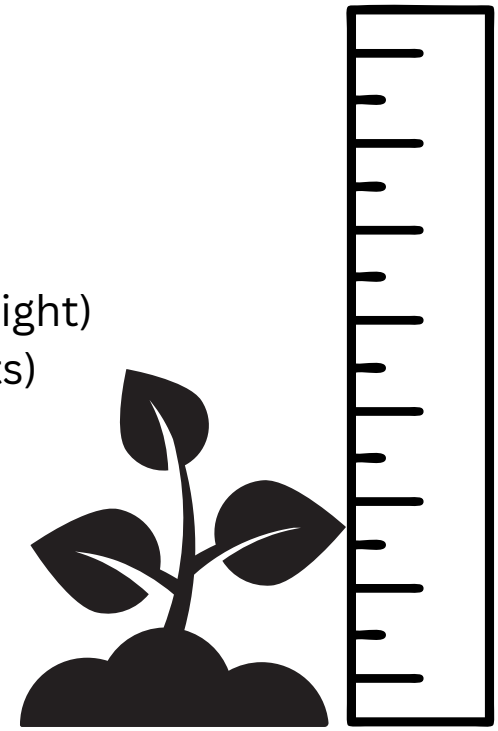
Elaboration

Experiment (6th Grade)

Plant Growth Under Different Conditions

Materials

- Fast-growing seeds (radish, bean, or lettuce)
- 3–4 identical containers
- Soil
- Water
- Ruler
- Light sources/shade materials
- Notebook



Procedure

- Choose one resource to manipulate:
  - Light (full sun, partial shade, low light)
  - Water (high, medium, low amounts)
  - Nutrients (fertilizer vs none)
- Plant seeds in identical containers.
- Measure & record over 4-5 weeks
  - Plant height
  - Number of leaves
  - Survival rate
  - General appearance (color, wilting)

Answer Question

- How does the availability of a key resource (light, water, or nutrients) affect plant growth and the overall population size?

Apply to Populations

- Explain how these results predict outcomes in a real ecosystem:
  - Drought → reduced plant population → affects herbivores

Elaboration

Simulation (6th Grade)

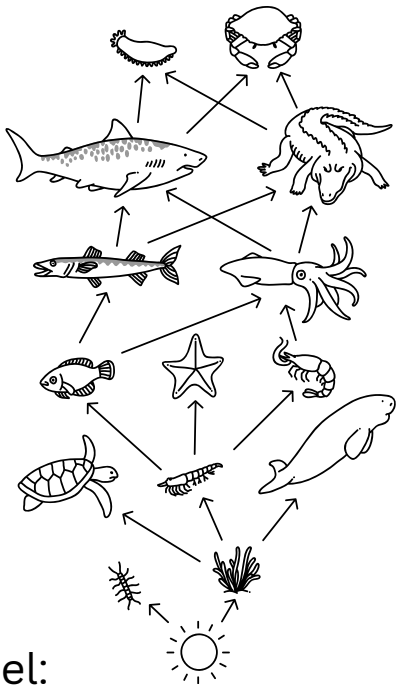
Food Web Simulation: What Happens When One Species Declines?

Materials

- Poster board
- Books and/or internet to research ecosystems
- Colored string/arrows for food web connections

Procedure

- Select 2 ecosystems to compare (ocean vs desert).
- Identify organisms in each ecosystem:
  - Producers
  - Primary consumers
  - Secondary consumers
  - Apex predators
  - Decomposers
- Build food webs for each ecosystem.
- Analyze patterns:
  - Producers at the base
  - Apex predators affecting lower levels
  - Decomposers recycling matter
- Introduce a change into each ecosystem model:
  - Remove a predator (wolves, sharks)
  - Decrease producers (drought, wildfire)
  - Introduce invasive species
- Predict outcomes and construct an explanation using evidence:
  - Prey increase → overgrazing → producer decrease
  - Fewer producers → consumer population declines



Evaluation 4th

UDL Project Question:

How does changing one part of a food chain affect the whole ecosystem?

Build before and after ecosystems!

Create two models of an ecosystem before and after a twist of events. Can you show what happened within your models?

Make an ecosystem news report!

Write a news story about a change in the ecosystem.
Voice record or video your news story.

Design a model for cause and effect!

Create a cause such as removing a species from an eco pyramid. Show at least 6 effects of the cause.

Create your own project!

Pitch your idea to your teacher to get it approved.

Evaluation 5th

UDL Project Question:

How can we teach our school community to protect local ecosystems?

Interview an organism!
Create an interview script of questions you could ask an organism in an ecosystem.
Record your pretend interview.

What if story!
Write a story about how to protect our ecosystems.
Give at least 4 examples of how we can protect local ecosystems.

Make a digital slide show!
Make it interactive, and include at least 4 examples of how to protect local ecosystems.

Create your own project!
Pitch your idea to your teacher to get it approved.

Evaluation 6th

UDL Project Question:

How can we show the importance of non-game wildlife to the stability of the entire food web?

Write a non-game impact report!
Choose a non-game species and do research on it within an ecosystem.
What is its role?

Create an ecosystem pyramid using only non-game wildlife.
Show at least one food chain within an ecosystem. Connect it within a larger food web.

Make an ecosystem podcast!
Talk about an at risk non-game species.
What can we do to help?

Create your own project!
Pitch your idea to your teacher to get it approved.

Works Cited

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