

MADE TO EXPLORE

ECOSYSTEM CONNECTIONS

3 Experiential Science Challenges

Food Chains • Camouflage & Natural Selection • Habitat Change

EXPERIENCE → REFLECT → LEARN → TRY AGAIN

Grade 5 | Science + Environmental Responsibility | Low-Prep, Hands-On Learning

EXPERIENCE 1: Who Am I? Food Chains
EXPERIENCE 2: HIDE! Camouflage Challenge
EXPERIENCE 3: Turtle Tribulations

Teacher Overview

Ecosystem Connections is a three-experience mini-unit designed around a simple idea: students understand environmental responsibility more deeply when they can see, feel, and reason through ecological connections themselves.

The sequence begins with food chains and food webs, moves into camouflage and natural selection, and ends with a box turtle habitat simulation in which students experience how development and environmental change can restrict an animal's choices.

Made to Explore Approach

Each lesson follows the same experiential cycle: students are given a challenge, adults create conditions for discovery, students make decisions and observe consequences, and the class reflects on what the experience reveals.

What's Included

3 complete teacher lesson plans

Unit-at-a-glance pacing and learning targets

24 printable food-chain organism cards

Yes/No Question Strategy sheet

Food Chain Builder + food web reflection

Camouflage field simulation and data sheets

Peppered moth background + external simulation guidance

Box turtle habitat board

8 printable turtle team markers

10 habitat change scenario cards

Habitat decision log and final stewardship reflection

Differentiation, extensions

Unit Essential Question

If living things depend on their environments and on one another, what responsibilities do people have when our choices affect those systems?

Unit at a Glance

EXPERIENCE	SCIENCE IDEA	STUDENT CHALLENGE	TIME	REFLECTION
Who Am I? Food Chains	Energy transfer; food chains/webs	Identify organisms using yes/no questions and connect the chain	40-50 min	How are organisms connected?
HIDE!	Camouflage; selection pressure	Hide colored sticks so predators cannot find them	45-55 min	How can environment affect survival?
Turtle Tribulations	Habitat change; fragmentation	Keep a box turtle alive as the landscape changes	45-60 min	How do human choices affect habitat?

Learning Targets

I can model how energy moves through a food chain and explain how chains connect into food webs.

I can use evidence from a camouflage simulation to explain why some traits may provide a survival advantage in a particular environment.

I can predict how habitat changes can affect an animal's ability to survive and move.

I can use evidence from an experience to explain an environmental responsibility.

Vocabulary

producer • consumer • predator • prey • food chain • food web • camouflage • adaptation • natural selection • habitat • development • fragmentation • migration/movement • environmental responsibility

Teacher Note on Scientific Precision

In the camouflage lesson, avoid saying that individual organisms change color because they 'need' to survive. The experience models differential survival: when inherited traits

make some individuals harder for predators to find in a particular environment, those individuals may survive and reproduce more successfully. Over generations, the frequency of traits in a population can change.

EXPERIENCE 1 - Who Am I? Food Chains

Original challenge: students discover each organism in their group using only yes/no questions, then correctly connect the organisms into a food chain.

TIME	40-50 minutes
MATERIALS	Food-chain organism cards; optional animal/plant pictures; one piece of string per student
GROUPING	Groups of 4
BIG IDEA	Organisms are connected through energy relationships.
CHALLENGE	Identify every organism without showing cards, then arrange and connect the food chain.
RESPONSIBILITY LENS	Understanding connections helps us predict how changes to one part of an ecosystem may affect others.

Set the Stage

Ask: "What does it mean to be responsible for an environment?" Do not resolve the question. Tell students they will return to it after several experiences.

Ask someone to define a food chain. Clarify that arrows in a food-chain model show the direction ENERGY moves: grass → rabbit → fox.

Experience It

Give each student one organism card. Students may look at their own card but cannot show it to anyone.

One at a time, group members ask yes/no questions until the group identifies each organism.

Once all identities are known, students lay the cards on the floor or stand in the order they believe represents

the food chain.

Students use string to show the energy connections and explain each connection.

Repeat with a different food-chain set.

Finish with a gallery walk. Ask students to look for chains that could connect.

Don't Tell Them Yet!

Do not immediately correct the chain order. Ask students to justify the direction of energy and use questions to help them notice errors.

The Debrief

What questioning strategy helped you identify organisms efficiently?

Where does the energy in your chain begin?

Which chains in the room could connect?

What do we call many connected food chains?

If one organism became much less common, what might happen elsewhere in the food web?

Food Chain Sets & Printable Organism Cards

Cut apart the cards. The small clue text can remain visible for support or be folded/covered for a more challenging version.

MEADOW

GRASS Producer; makes food using sunlight.	GRASSHOPPER Herbivore; eats plants.	FROG Consumer; eats insects.	HAWK Predator; can eat frogs.
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WOODLAND

OAK LEAVES Part of a producer.	CATERPILLAR Herbivore; eats leaves.	SONGBIRD Consumer; can eat caterpillars.	HAWK Predator; can eat smaller birds.
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POND

ALGAE Producer in water.	TADPOLE Many eat algae.	SMALL FISH Consumer of small aquatic animals.	HERON Wading bird that catches fish.
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OCEAN

PHYTOPLANKTON Tiny producer.	ZOOPLANKTON Tiny consumer.	SMALL FISH Can eat zooplankton.	TUNA Large fish that eats smaller fish.
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DESERT

CACTUS Producer adapted to dry conditions.	GRASSHOPPER Plant-eating consumer.	LIZARD Can eat insects.	HAWK Can prey on lizards.
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ARCTIC OCEAN

ALGAE Producer in cold water.	KRILL Small consumer that feeds on algae.	ARCTIC COD Fish that can eat krill.	SEAL Marine mammal that eats fish.
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WHO AM I? QUESTION STRATEGY

Strong scientists classify before they guess. Start broad, then narrow your possibilities.

ROLE

Am I a producer?

Am I a consumer?

Do I eat plants?

Do I eat other animals?

HABITAT

Do I live mostly on land?

Do I live in water?

Would I be found in this ecosystem?

TRAITS

Am I a plant?

Do I have wings?

Am I an insect?

Am I larger than most organisms in this chain?

CONNECTIONS

Could another organism in our group eat me?

Could I eat another organism in our group?

Am I near the beginning of the chain?

Food Chain Builder

Names: _____ Ecosystem: _____

Write your chain below. Draw arrows in the direction ENERGY moves.

[_____] → [_____] → [_____] → [_____]

Explain One Connection

Energy moves from _____ to _____ because...

From Chain to Web

One other class chain ours could connect to is _____ because...

What If?

What might happen if one organism in your chain became much less common?

EXPERIENCE 2 - HIDE! Camouflage Challenge

Original challenge: students camouflage colored popsicle sticks outdoors, then compare which colors predators find most easily.

TIME	45-55 minutes
MATERIALS	2 colored craft sticks per student; outdoor natural area; optional Peppered Moths simulation
GROUPING	Two large teams, then pairs/small groups for data
BIG IDEA	Camouflage can affect how easily predators detect prey.
CHALLENGE	Hide your sticks within the designated area so the searching team has difficulty finding them.
RESPONSIBILITY LENS	Understanding adaptation and camouflage can help people make more thoughtful choices about wildlife and habitat.

Set the Stage

Introduce the peppered moth as an example of how inherited color differences can affect visibility to predators when environments change. If desired, use Arizona State University's Ask A Biologist Peppered Moths simulation before going outdoors.

Experience It

Play or demonstrate one round in a light forest and one in a dark forest. Record what students notice rather than immediately explaining the pattern.

Take students outside and divide the class into two teams.

While Team 2 looks away, each Team 1 student hides two colored craft sticks inside the designated boundaries. Sticks should remain partially visible and may not be buried.

Give Team 2 two minutes to act as predators and collect as many sticks as possible.

Tally sticks found and sticks that 'survived' by color.

Collect all remaining sticks, switch roles, and repeat.

Return to class and compare the evidence from both rounds.

Added Challenge

Repeat using only brown and green sticks, or choose two colors that match and contrast strongly with your particular outdoor setting.

Peppered Moths: Student Background

Peppered moths occur in light and dark forms. During the Industrial Revolution, pollution darkened many tree surfaces in parts of England. Light moths that had blended well with lighter backgrounds became easier for birds to detect on darker trees, while darker moths had a camouflage advantage in polluted forests. Because color is inherited, differences in survival and reproduction can change how common traits are in a population over generations.

Before You Hunt

Prediction: Which stick color will be easiest to find in our outdoor area? Why?

Camouflage Data

[illegible]

Analyze

Which color had the highest survival rate? _____

What evidence from your data supports that conclusion?

Was the same color best camouflaged everywhere in the search area? Explain.

Science Connection

The sticks did not adapt during the game. Instead, the simulation models how an existing trait can make some individuals easier or harder for predators to find in a particular environment.

HIDE! REFLECT & CONNECT

What Happened?

What colors were easiest to find? What colors were hardest to find?

Why?

What features of the environment made some colors more or less visible?

Natural Selection Connection

Imagine the sticks were moths and being found meant being eaten before reproducing. Over many generations, how might the population change if the environment stayed the same?

What If the Environment Changes?

Predict what might happen if the background changed because of fire, pollution, loss of vegetation, a new season, or another disturbance.

Responsibility

Why is it useful for humans to understand camouflage and adaptation when making choices about habitats and wildlife?

EXPERIENCE 3 - Turtle Tribulations

Original challenge: groups try to keep a box turtle alive as land development and environmental changes are added to a shared habitat grid.

TIME	45-60 minutes
MATERIALS	Habitat grid, 8 turtle markers, optional dry-erase markers or sticky notes
GROUPING	8 groups of approximately 3 students
BIG IDEA	Animals need connected habitat and may have limited options when landscapes change.
CHALLENGE	Keep your box turtle in viable habitat as new changes appear on the landscape.
RESPONSIBILITY LENS	Human land-use decisions can change the amount, quality, and connectedness of wildlife habitat.

Set Up

Display the habitat grid. Assign students a turtle color and have each group decide where their turtle should start. After every scenario, they may decide whether to stay or move.

Movement Rules

A turtle may move no more than 2 squares during one turn.

Turtles may not move through a newly blocked/developed square.

No more than 2 turtles may occupy one square.

Groups must explain their reasoning before the teacher moves the turtle.

If a turtle has no legal route to suitable habitat, mark it as STRANDED rather than simply removing it. The goal

is to analyze why.

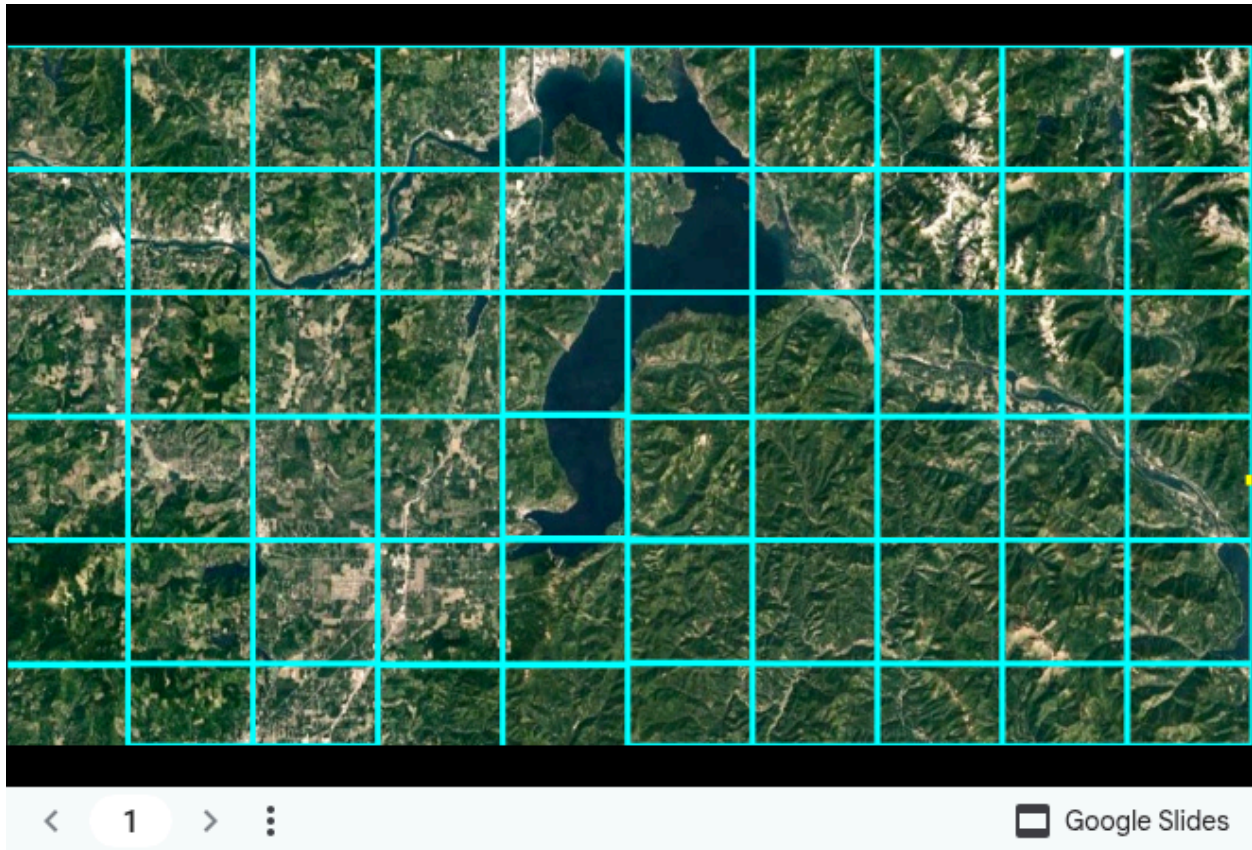
Added Challenge

Allow only one turtle per habitat square. This increases competition for remaining habitat and makes fragmentation more visible.

Teacher Facilitation

After each scenario, pause before groups move. Ask: What changed? Who is affected immediately? What routes are still available? What information are you using to decide? Do not steer every group toward the 'best' square; the value of the simulation comes from comparing choices and consequences.

BOX TURTLE HABITAT BOARD



Link:

https://docs.google.com/presentation/d/1m2PBzrXZla4jNq2jPFzdk3xslibhJuYscrH588BTHY/edit?usp=drive_link

Habitat Change Scenario

Images representing impacts are to the right of the slide and can be moved into place in any order the teacher would like. They can be enlarged or decreased in size to make stronger impacts as desired.

Impacts include:

Lightning Strike

Usually leads to wildfire

Wildfire

Can be expanded over turns

Oil Spill

Red Blob fits the top part of the lake

Housing development

House picture

Road

Yellow squiggly line

Shopping Centers

Mall picture

Damn

Damn picture

BOX TURTLE DECISION LOG

Team: _____ Turtle: _____

ROUND	WHAT CHANGED?	STAY OR MOVE?	NEW SQUARE	WHY?
1				
2				
3				
4				
5				
6				
7				
8				

After the Simulation

Did your turtle ever become crowded, blocked, or stranded? Describe what happened.

Which landscape change had the biggest effect on your turtle? Why?

HABITAT: REFLECT & REDESIGN

Notice

What patterns did you notice in where turtles moved as the available habitat changed?

Explain

Why can a small patch of habitat be less useful if it is cut off from other habitat?

Responsibility

Why is it important for people to understand how animals may be affected by our land-use choices?

What Can People Do?

List or sketch two ways people could help maintain or reconnect habitat.

1. _____
2. _____

Redesign Challenge

Choose one development from the simulation. How could you redesign it so people can still meet their needs while reducing the impact on box turtle habitat?

ECOSYSTEM CONNECTIONS - FINAL REFLECTION

Across all three experiences, you investigated different kinds of connections: who eats whom, how traits interact with environments, and how animals depend on usable habitat.

Experience 1: Food Chains

One connection I understand better now is...

Experience 2: Camouflage

One way the environment can affect survival is...

Experience 3: Habitat

One way human choices can affect wildlife is...

Return to the Essential Question

If living things depend on their environments and on one another, what responsibilities do people have when our choices affect those systems?

Experience → Reflect → Learn → Try Again

One action, design choice, or question I would carry forward from this unit is...

Differentiation & Extensions

More Support

Food Chains: leave clue text visible and provide producer/consumer vocabulary cards.

Camouflage: limit the number of stick colors and graph class totals together.

Habitat: allow groups to trace possible movement routes with a finger before committing.

Use sentence stems on reflection pages and allow oral responses.

Assign collaborative roles: Observer, Recorder, Evidence Checker, Speaker.

Increase the Challenge

Food Chains: add omnivores and decomposers and require students to build a web rather than a single chain.

Camouflage: calculate survival percentages by color and compare microhabitats.

Habitat: assign different habitat needs or movement limits to different turtle teams.

Ask students to identify direct versus indirect ecosystem effects.

Have students design a fourth experiential challenge that demonstrates another human-wildlife connection.

Cross-Curricular Extensions

Math: graph camouflage survival data • ELA: evidence-based environmental reflection • Design/Engineering: redesign a development to preserve connectivity • Civics/Leadership: weigh human needs and wildlife needs • Art: create scientifically accurate organism or habitat cards