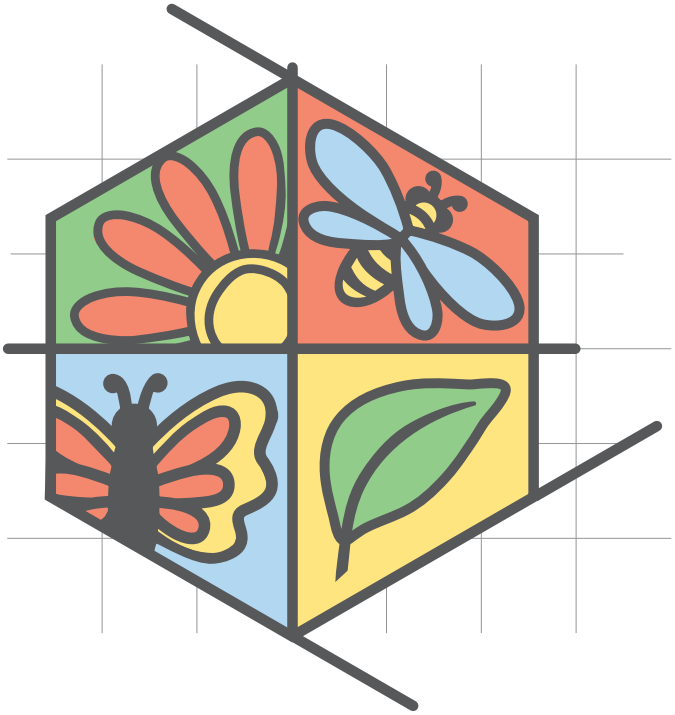

Save Our Turtles

5th Grade STEM Storyline
to support the Living Systems kit

STEM

6.29.20

ABOUT THIS UNIT

We are pleased to present this STEM Storyline Unit to help support educators in our region as we shift towards providing students with NGSS-aligned, phenomenon-based, and project-based learning experiences. Our vision is to provide students with high-quality and equitable learning experiences that empower them to develop fluency in STEM and literacy. This unit strives to engage students in designing solutions to help preserve an endangered species, the western pond turtle.

This unit also contains links to online resources created by other organizations which may use a different license. Please make sure that you understand the terms of use of third-party resources before reusing them. Prior to publishing this unit of study, we have reviewed the content of this unit to ensure that all materials are in accordance with creative commons regulations. If you notice that a part of this unit infringes another's copyright, please contact us.

A digital copy of this document is available on the STEM Materials Center website at:
https://www.stemmaterials.org/saveourturtles

ATTRIBUTION

This unit is a result of a collaborative effort between Educational Service District 112 and educators and specialists from other school districts and agencies.

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STEM
Science
Technology
Engineering
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OSPI

CLIME TIME
CLIMATE SCIENCE LEARNING

UNIT OVERVIEW

The Western Pond Turtle is a species of endangered semi-aquatic sea turtles native to the Pacific Northwest and headed towards extinction. Set your students on a mission to help save the western pond turtles by first studying the ecosystems in which they thrive, and then designing solutions to help this species survive. Once students have developed a deep understanding of the interactions within ecosystems, they will design solutions to some of the human-caused threats to this species and will present their solutions to a public audience. This unit focuses on the NGSS Performance Expectations Bundle for 5th Grade Life Science (5-PS-3-1, 5-LS1-1, 5-LS2-1).

Please note that the sequence of FOSS activities in this storyline unit differs from the way that the FOSS teacher guide presents these investigations. Please also note that ESD 112 K-5 STEM kits no longer include live critters, and these critter-focused investigations have been intentionally omitted in this storyline. For alignment with NGSS and to create an integrated STEM-based learning experience for your students, it is recommended that you use this storyline unit instead of closely following the sequence of the FOSS guide. The outline below can help in your planning. Please note that each session is intended to take a class period of 30-45 minutes.

For your convenience, all resources have been uploaded to this Google drive folder, Save the Turtles (https://bit.ly/savethewpt) for easy access. Since curriculum revision during the school year will be limited, any additional resources and changes will be reflected in the live file folders on the Google drive. You may also make comments for suggested revisions on these documents. In order to modify the Google resources to make changes, click "file" and "make a copy." This will create a copy in your drive that you can edit to fit your needs or to share with your students on the google platform.

LESSON 1: Disappearing turtles *pg. 7*

In this lesson, students will experience an "entry event" where they learn about the predicament of our disappearing western pond turtles. Students will create an initial model of their thoughts on why the turtles are declining in their numbers and how humans might be impacting this species in a negative way.

Session	Materials Needed		Page
1. The western pond turtles need your help!	• Teacher slides • Chart paper	• Post-its (or small slips of colored paper and tape)	8
2. Model of the threat to the turtles	• Plain white paper (large if possible)	• Markers and colored pencils	9
3. Field STEM outdoor observation	• Hard surface or clipboards	• Blank paper, pencil	10
4. What is the western pond turtle (WPT)?	• Teacher slides • Devices with internet access for each team of students to use for research	• Markers and colored pencils (if students are creating posters)	11
5. Western Pond Turtle informational seminars	• Teacher slides • Devices with internet access for each team of students to use for research	• Seminar materials • Teams' initial models of the Western Pond Turtle	12

UNIT OVERVIEW (cont.)

LESSON 2: They need WHAT?! *pg. 14*

In this lesson, students will explore the ecosystem that supports the survival of the Western Pond Turtle. Students will conduct an investigation to see what the producers in an ecosystem need for survival and will explore the interconnectedness of all the living and non-living parts of an ecosystem.

Session	Materials Needed		Page
1. What do the Western Pond Turtles need in order to survive?	• Teacher slides • Students' models of the WPT's habitat	• Student devices with internet access	15
2-3. But what do the producers need? FOSS Investigation 2 Part 2	• Teacher slides • Investigation Plan Template	• Materials for FOSS Investigation 2 Part 2 Plant Nutrition	16-17
4. Do plants need soil? FOSS Investigation 3 Part 1	• Teacher slides • Investigation logs	• FOSS Investigation 3 Part 1 Materials	18
5. Digesting the data and creating an argument	• Teacher slides • Scientific Argument Template	• Investigation logs from previous investigations • At least one student computer device per team	19
6. But what about our turtle?!	• Teacher slides • Data from investigations	• Students' model of western pond turtle in its ecosystem	20
7. Field STEM outdoor observation-food web	• Observation Guide	• Hard surface or clipboards • Pencil	21

LESSON 3: Fighting for food and survival! *pg. 23*

In this lesson, students will expand their understanding of western pond turtle and its role in its ecosystem by learning about the predators that eat the WPT and the impact of invasive species on the western pond turtle's survival.

Session	Materials Needed		Page
1. Predators and competitors	• Teacher slides • Laminated Predator/ Competitor Cards	• Students' model of western pond turtle in its ecosystem	24

UNIT OVERVIEW (cont.)

LESSON 4: Decomposers *pg. 26*

In this lesson, students will expand their understanding of ecosystems by investigating the role of decomposers in the recycling of matter. Students will then apply their understanding of the importance of decomposers to the ecosystem habitat of the Western Pond Turtle.

Session	Materials Needed		Page
1. What are the worms doing?!	• Teacher slides • Blank paper	• Markers and colored pencils	27
2. (with week-long observations) Decay without worms	• Teacher slides • A few clear plastic cups or plastic bags	• Food Decay Experiment Log • Food scraps	28
3. Decomposers and what they do	• Teacher slides • Students' model of western pond turtle in its ecosystem	• Student devices with internet OR print-out of article: National Geographic Entry on Decomposers	29
4. *OPTIONAL* FOSS Investigation 2 Part 1: Yeast Nutrition	• Materials for FOSS Investigation 2 Part 1:Yeast Nutrition		30

LESSON 5: Humans and the turtles *pg. 32*

This is the culminating lesson in our STEM Storyline, where students create a public product that will be shared with their community sharing actionable steps that can be taken to help save the western pond turtle. Because this is a unit created in the framework of Project-Based Learning, there is a lot of opportunity to give students autonomy about how they'd like to present their message. Based on your comfort level with certain options and the time you have available, select an option that fits your needs and the needs of your students. Below are some ideas about how the public product could be produced/shared.

Session	Materials Needed		Page
1. Threats to our turtles	• Teacher slides • Articles on threats to the Western Pond Turtles	• Model of the Western Pond Turtle • Student devices to research	33
2. Field STEM outdoor observation: human impacts	• Hard surface or clipboards	• Blank paper, pencil	34

LESSON 5 (continued)

Session	Materials Needed	Page
3. Refining our solutions	• Teacher slides • Articles on threats to the Western Pond Turtles • Model of the WPT • Student devices to research • Refining a Solution Template	35
Project building Sessions (several sessions based on your students' needs)	• Teacher slides • Articles on threats to the Western Pond Turtles • Model of the WPT • Student devices to research • Refining a Solution Template • Other materials requested by students (posters, markers, audio recording or video recording device, etc.)	36-37
Launch of Public Campaign! (STEM fair or showcase of student work to community)	• Student's Public Products and other things needed by them for the STEM Fair/Final Showcase	38

LESSON 1: Disappearing turtles

STRATEGY: ENGAGE

In this lesson, students will experience an “entry event” where they learn about the predicament of our disappearing western pond turtles. Students will create an initial model of their thoughts on why the turtles are declining in their numbers and how humans might be impacting this species in a negative way.

STEM

SESSION 1:
The western pond turtles need your help!

Warm-up

Use teacher slides to show students the video of the western pond turtle. Ask students to watch carefully.

Present students with the driving question of the unit: ***How can we, as Washingtonians, help preserve the western pond turtle populations living in Washington State?***

Main activity: Notice, Wonder and Know protocol

If post-its are available, give each student a small stack of post-its and ask them to write down their thoughts about the video they watched by answering the following questions:

- What are some things they notice?
- What are some things they wonder?
- What are some things they know?

Have students write each thought on a different post-it. For instance, if a student has three wonderings (questions), then each question should go on a separate post-it.

Give students a substantial amount of time to record their thoughts. Remind students about the driving question.

Start by asking one student to share something they noticed about the phenomenon that was presented (the western pond turtle). A phenomenon is something that happens in nature and can be observed by us. Thank that student and include their thought on the Notice, Wonder, Know Chart.

After one student has shared their thought, ask if any other students have a similar "noticings." Allow students to continue to share in a chain. Continue to ask if students have thoughts that are similar. Once there is a lull, ask students if there is a noticing that goes along a different line of thinking. At some point, students will start to ask questions, which will be a perfect segue into sharing "wonderings." Continue with the wonderings column. It is important that each student has shared at least once by this point.

Once students have all shared, ask students if they'd like to share something for the "know" column. What is something they know about the problem/phenomenon? It is ok if only some students want to share their knowings. *(Note: there is a difference between something that they "notice" and something that they "know." Noticings relate directly with the phenomenon being explored. Knowings are a piece of information that students already have before walking into the activity that connects with what we are learning.)*

Wrap-up

Thank students for their contributions. Tell students that their ideas will be very important as we move through the unit and come up with solutions to help the western pond turtle population.

In this mini-unit, students will strive to answer the driving question while addressing some of the wonderings that were brought up. Keep students' thoughts available throughout the unit so they can keep track of the wonderings that have been answered and the other thoughts that can help them make-sense of the phenomenon.

Materials Needed

Teacher slides

Chart paper

Post-its (or small slips of colored paper and tape)

SESSION 2:
Model of the threat to the turtles

Warm-up

Use teacher slides to ask students to take another look at the NWK charts that they compiled in the last session. "Can someone recap what we learned about the Western Pond Turtle and how they are doing in the Pacific Northwest?" Before we are able to solve the problem, what are some things that we need to know? Add students' ideas to the "Wonder" chart or create a separate "Need to Know" Chart.

Career Connection: Conservation Ecologist

A conservation ecologist is a person who tries to create programs or systems that protect animals and the environment from harm as people develop or encroach near a natural area.

Materials Needed

Plain white paper (large if possible)

Markers and colored pencils

Main activity

Have students work in teams of 3-4 to create an initial model of what is happening to the pond turtles. A **scientific model** is a diagram that explains or tries to make sense of something that is happening in nature. Ask students to make sure they include its **habitat** and how humans may be affecting the turtle's survival. A habitat includes all the things that an animal needs in order to survive in their surroundings. Take away the pressure students may be feeling, let them know that this is their first version of the model which will continue to get better and better through the course of the unit!

Teacher note: *In this type of project based learning, it is important to be intentional about how you are grouping students and how responsibilities are being distributed. Think through what works well with your group of students and how much structure they need in order to truly work as a team. Students will be working in teams throughout the course of this unit.*

Student models should include:

- A drawing of the western pond turtle
- A drawing of its habitat.
- A drawing of how humans affect the pond turtle's habitat
- Arrows, symbols, or words that help explain your thinking.

Wrap-up

Have students post their models spaced-out throughout the classroom. Facilitate a gallery walk where students are able to take a look at and provide warm feedback about the models (post-it or on a piece of paper taped underneath each model). Bring the group together and have students share what they liked about someone else's model. Remind students about the driving question: How can we, as Washingtonians, help preserve the western pond turtle populations living in Washington State?

SESSION 3:
Field STEM outdoor observation

Warm-up

Find a place in or near campus where students can visit to make some observations. Tell students that today we will be going outdoors to look at what lives in the ecosystem around our school!

Main activity

Tell students that today, their job is to identify the different living and non-living things that they see in their school yard ecosystem. Put students in teams and give them about 15 minutes to make observations of living and non-living things in their ecosystem. Each student should make their own observations on their own piece of paper.

Wrap-up

Bring students back inside and have them share their observations with a group. What living things did they see, what non-living things did they see?

Materials Needed

- Hard surface or clipboards
- Blank paper
- Pencil

SESSION 4:
What is the western pond turtle (WPT)?

Warm-up

Tell students that before we can answer the driving question and figure out how to help the WPTs, we have to learn more about them and what they need in order to survive! In this activity, teams will focus on one aspect of the WPT's lifestyle or needs and will create a 5 minute "mini-seminar" to teach their peers about the WPT. The class will work together to understand this adorable animal.

Career Connection: Teacher or Professor

A teacher or professor is a person who helps someone develop the skills and understanding necessary to be successful in school and in the world. A teacher works hard to plan lessons that will be interesting and helpful for students to understand new ideas.

Preparing for the Seminar (20-30 minutes)

Split the class into 8 groups. Provide each group with a topic to explore (Description, Diet, Behavior, and Habitat). Since there are only 4 topics, each topic will be covered by two groups. Once teams are done, they will be teaching half the class about their topic. Their task is to:

1. read/research their topic
2. collect information that helps them understand their topic
3. present information to their peers in a way that will be helpful (having a slideshow with a lot of text will not be helpful)

If you feel that your students need scaffolding in order to successfully navigate the internet for materials, provide them with some websites as a starting point to begin their research. You may choose to give teams a choice on how to present their materials (poster, google slides, prezi, etc.), or you may select a format that you would like them to present in (poster only). Remember, the presentation should be no more than 5 minutes.

Materials Needed

Teacher slides

Devices with internet access for each team of students to use for research

Markers and colored pencils (if students are creating posters)

SESSION 5:
Western Pond Turtle informational seminars

Warm-up

Give teams some time to get their seminar materials finalized and to make sure that anyone who will speak is prepped and ready to go.

Main activity (20 minutes)

Have each team present to their half of the class. Make sure that teams have their materials available for the rest of the class so that this information can be accessed in the last step of the lesson.

Wrap-up

Have teams return to their initial models that were created in Session 2 of the unit. Have students return to the teams they worked with on these models. *What information did you learn about the western pond turtle that you feel you should add to the model? Is there anything about its diet, habitat, behavior, or traits that you feel are an important addition to the model?* Give teams 10 minutes to improve their models. Students may want to draw, cut and paste onto their model—please encourage this. Let them know that it is completely fine if things are looking sloppy on the model as long as the needed information is still being conveyed.

Materials Needed

Teacher slides

Devices with internet access for each team of students to use for research

Seminar materials

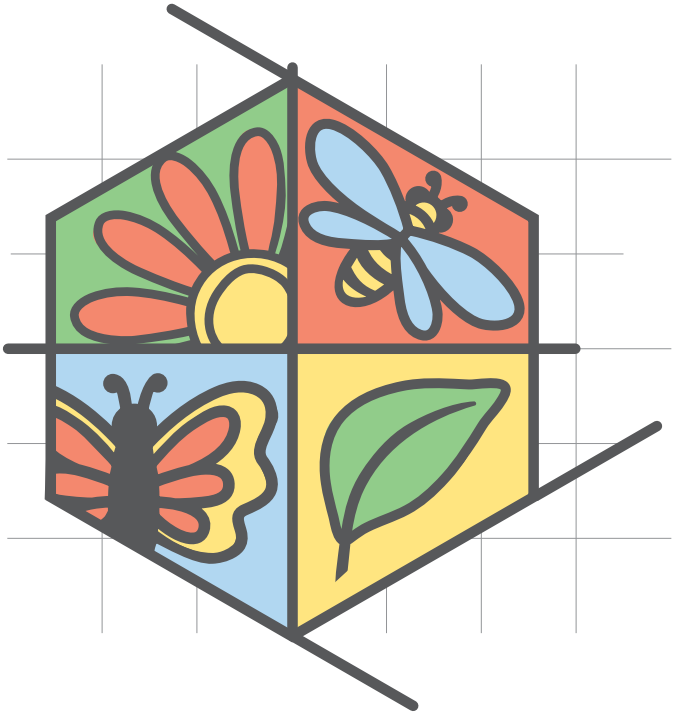
Teams' initial models of the Western Pond Turtle

How Lesson 1 Supports Next Generation Science Standards

5.Matter and Energy in Organisms and Ecosystems

The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

Performance Expectation	**Connections to Classroom Activity,** *Students:*
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. 5-LS2-1 Develop a model to describe the movement of matter among plant, animals, decomposers and the environment.	• Begin to develop a model showing how the western pond turtle survives in its habitat. • Begin to think about what the western pond turtle eats to survive.
SCIENCE & ENGINEERING PRACTICES	
Asking questions and defining problems Developing and using models	• Ask questions about the western pond turtle and its status as an endangered species. • Develop a list of "need to know" questions as they solve the problem and answer the driving question. • Develop an initial model showing the western pond turtle in its natural habitat.
DISCIPLINARY CORE IDEAS	
PS3.D: Energy in Chemical Processes and everyday life LS1:C: Organization for matter and energy flow in organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	• Begin their initial models which show how the western pond turtle survives in its habitat. • Include things that the wpt eats in their model. • Begin to identify the living and non-living components of the wpt's ecosystem. • Begin to think about how humans affecting ecosystems can cause a chain reaction that can impact many organisms.
CROSSCUTTING CONCEPTS	
Systems and Systems Models Energy and matter	• Begin to understand that the western pond turtle's habitat is an ecosystem which has many living and non-living things that interact. • Start to create a model showing where the western pond turtle gets its energy for survival (food).



LESSON 2: They need WHAT?!

STRATEGY: EXPLORE

In this lesson, students will explore the ecosystem that supports the survival of the Western Pond Turtle. Students will conduct an investigation to see what the producers in an ecosystem need for survival and will explore the interconnectedness of all the living and non-living parts of an ecosystem.

STEM

SESSION 1: What do the Western Pond Turtles need in order to survive?

Warm-up

Use teacher slides and have students revisit their models of the western pond turtle and their ecosystem. Does their model show some things they that the WPT needs in order to survive? Have teams talk for a few minutes and then ask teams to share with the whole group. Write students' responses on the board. Students will likely bring up the fact that the WPT needs to eat things in order to survive. Ask students to talk to their teams about this question: Why does the western pond turtle need to eat food? Students may share that animals need to eat so they can have energy to survive. If the word energy is mentioned, write that on the board and give students a "heads-up" that energy will be an important thing to understand if we are to help out the WPT from extinction. Also, students should bring up that food is important to help the body grow, repair itself, move, and stay warm. Write students' ideas on the board.

Career Connection: Ecologist

An ecologist is scientist who studies an ecosystem by studying the interactions between the organisms in an ecosystem. An ecologist will also study how different organisms are interacting with non-living parts of the ecosystem (air, water, sun, etc.).

Main activity

In this part of the session, students will be prompted through a series of thinking-tasks to further refine their models. If students seem to be taking longer than expected to digest and respond to your prompts, split this up into two sessions.

1. Ask students to look at their models. In their models, did students show any animals or plants that the WPT eats? Give students a few minutes to talk. Students should remember that the WPT is omnivorous, which means that it eats both animals and plants. Have teams share their ideas.
2. Have students identify one animal that is eaten by the WPT. What does that animal eat? Give teams a few minutes along with some student devices with internet to research. Have students share their ideas.
3. A food chain is a drawing that shows how one organism eats another in an ecosystem. Use these slides to show students some examples of food chains. What do you think the arrows in the food chain are showing? Why are they pointing in that direction, why not the other way? Wait for students to struggle to explain. Productive struggle is great! Ask students to share their ideas and then, ask them to use the word energy to describe what the arrows are trying to show.
4. Ask students to take another look at their model. Can they use arrows to show how energy is moving from organism to organism in the food chain?

Wrap-up

Students brains are probably quite tired by now. Ask teams to post-up their models and have students circulate to take a look at how other teams have shown the transfer of energy that is in the ecosystem of the WPT. Bravo!

Materials Needed

Teacher slides

Students' models of the WPT's habitat

Student devices with internet access

SESSIONS 2-3: FOSS Investigation 2 (Part 2) But what do the producers need?

Teacher set-up: *In this session, students will investigate what plants need in order to sprout and thrive by engaging in FOSS investigation 2 Part 2: Plant Nutrition. The directions bellow are an abridged and modified version created to fit more seamlessly with this STEM Storyline. Please refer to your FOSS Teacher Guide if you would like more detailed instructions.*

Warm-up

"SO, we have started to develop our amazing models showing what exactly the western pond turtle needs in order to survive. We were able to figure out that a lot of their energy comes either directly from or indirectly from plants. Now, we will be investigating the question: What do the producers, or plants, need in order to produce food that animals can eat? We will investigate this question by growing wheat seeds under different conditions."

Career Connection: Botanist

A botanist is a scientist who studies plants! There are many types of botanists. Some study plants in ecosystems, some study how plants grow in different conditions, and some even try to find new species of plants!

Initial team brainstorm

Based on your preference, work with the whole group to come up with an investigation plan, OR allow teams to work together to come up with a plan on how they'd like to investigate this question.

As a team, think about the following questions:

1. What are some things we think plants need in order to grow?
2. How will we know if a plant is getting or NOT getting what they need?
3. How will we test to see what things they need and what they don't need?

Have teams share their thoughts with the whole group.

Investigation plan

Send students back to their teams to fill out their investigation plan. Let them know that they will be using their investigation plan to plant and treat their test subjects. Ask teams to make sure that they have selected a "communications manager" who will be able to share their plan with another team during the team-feedback protocol.

Session 2 Wrap-up

Have student teams pair up to share their investigation plan. Encourage teams to ask each other clarifying questions and give feedback with kindness. **Only kind feedback is welcome.**

Materials Needed

Teacher slides

Investigation Plan Template

Materials for FOSS Investigation 2 Part 2 Plant Nutrition:

Per group:
- 4 containers
- Plastic cup
- Spoon
- Beaker
- Black Plastic bags
- Clear Plastic Bags
- Tape
- 1 container

For the class:
- Wheat seeds
- Add another seed
- Potting soil
- Basins
- Water
- Camera or cell phone
- Sticky notes
- Cardboard box or closet to keep plants in the dark.

SESSIONS 2-3: FOSS Investigation 2 (Part 2) Treating the test subjects

Warm-up

Now that students' investigation plans are ready do go, organize a session where students can plant their seeds and place in the appropriate area (ex. In the sun or in the closet). Ask teams to chose a team name and label their containers so that their test subjects are not mistaken for another team's.

Main activity

Directions from the FOSS Teacher's guide can be used to have students plant their wheat seeds. OR, you can have them follow the simplified instructions below:

1. Fill each ½ L container almost full with soil
2. Sprinkle one 5 mL spoon on wheat seeds over the surface of the soil.
3. Sprinkle more soil over the seeds to cover them up.
4. Pour 100mL of water over the seeds who will get the regular water treatment. Pour no water on the seeds who will not be watered.
5. Label each container with a small piece of paper that says its treatment (ex. Sunlight and no water)
6. Place each container where you want it to get a certain amount of light. Your teacher has black-out bags for the teams who wanted to place their plant in no light.
7. Record the date and your observations
8. Check back on your seeds every few days.

Wrap-up

Clean up! We will check back on our plants and write/draw our observations every few days.

Materials Needed

Teacher slides

Investigation Plan Template

Materials for FOSS Investigation 2 Part 2 Plant Nutrition:

Per group:
- 4 containers
- Plastic cup
- Spoon
- Beaker
- Black Plastic bags
- Clear Plastic Bags
- Tape
- 1 container

For the class:
- Wheat seeds
- Add another seed
- Potting soil
- Basins
- Water
- Camera or cell phone
- Sticky notes
- Cardboard box or closet to keep plants in the dark.

Ongoing observations

Have students check on their seeds every few days to make observations. Continue observations for a few weeks.

Investigation Guide

Investigation question: **What do the producers, or plants need, in order to produce food that animals can eat?**

? What are some things that you think a plant might need in order to survive?

When scientists **investigate**, they often treat different **test subjects** differently. **Test subjects** are animals, plants or people who are being given a certain treatment so scientists can see what happens to them. In this investigation, the wheat seeds will be your test subjects. How would you like to treat them differently to answer the investigation question? Talk to your team and write down some ideas.

You will have 4 containers with seeds. What do you want to do with the 4 containers? (**hint: scientists often have a control group. The control group is going to be the plant group that you treat totally normally and don't do anything different with). In the chart on the next page write and draw how you'd like to treat each plant.

Investigation Plan

Container 1: Control Group. Give this plant plenty of light and some water (since that's what most plants get in nature).	Container 2: _____ _____ _____ _____ _____
What do I predict will happen to this seed?	What do I predict will happen to this seed?
Container 2: _____ _____ _____ _____ _____	Container 2: _____ _____ _____ _____ _____
What do I predict will happen to this seed?	What do I predict will happen to this seed?

Data Collection: What's happening to our seeds?

Use words or small drawings to show what's happening to each seed

Date	Container 1	Container 2	Container 3	Container 4

Data Collection: What's happening to our seeds?

Use words or small drawings to show what's happening to each seed

Date	Container 1	Container 2	Container 3	Container 4

SESSION 4: FOSS Investigation 3 (Part 1) Do plants need soil?

Teacher note: This is a modified version of FOSS investigation 3 Part 1: Plant Vascular Systems. It has been modified to support this STEM Storyline and to NGSS and therefore, the emphasis on vascular systems has been replaced with students investigating if plants need soil in order to thrive. *Unlike the activity presented in FOSS, please do not tell students that the wheat seeds will grow in the straw.*

Warm-up

"While our test subjects are undergoing their treatments, we will also test another idea. Do plants need soil to grow? What are your thoughts?" Ask students to write their ideas down and then share with a partner.

Main activity: Planing wheat seeds in straws

Tell students that they will be planting wheat seeds in straws without any soil. Ask students to make predictions about what will happen in their Investigation Logs. Have each team follow this procedure to plant their seed and have teams label their straws if teams will be combining their straws in the cylinders.

1. Twist a small rectangle of paper towel into a little wick.
2. Insert the wick into one end of the straw. Leave about 1 cm sticking out the end.
3. Orient one single wheat seed with the oval indentation pointing downward (pointy part pointing up) and drop it down into the straw so that it lands on the top of the twisted paper towel. Do this for two more straws.
4. Install seed straws into the graduated cylinder
    a. Put the three straws into the cylinder.
    b. Add a fourth straw that is empty.
    c. Use the syringe to squirt 10 mL of water into the cylinder.
5. Make observations daily in your Observation Log.

Materials Needed

Teacher slides

Investigation logs

FOSS Investigation 3 Part 1 Materials:

Per group:
- Hand lenses
- Zip bag
- 1 graduated cylinder
- Rubber band
- 4 jumbo straws
- 3 pieces of paper towel
- 1 plastic bag
- 1 piece of string
- 1 syringe

For the class:
- Wheat seeds
- Masking tape
- Water

Investigation Guide

Investigation question: Do plants need soil?

Pre-thoughts: Do plants need soil in order to grow and survive? Why or why not? Write and draw you ideas below.

You will be planting wheat seeds in straws using paper towels and without any soil. What do you think will happen?

Procedure:

1. Twist a small rectangle of paper towel into a little wick.
2. Insert the wick into one end of the straw. Leave about 1 cm sticking out the end.
3. Orient one single wheat seed with the oval indentation pointing downward (pointy part pointing up) and drop it down into the straw so that it lands on the top of the twisted paper towel. Do this for two more straws
4. Install seed straws into the graduated cylinder
    a. Put the three straws into the cylinder.
    b. Add a fourth straw that is empty.
    c. Use the syringe to squirt 10 mL of water into the cylinder.
5. Make observations daily in your Observation Log below.

Observation Log

Day	Observations
1	
2	
3	
4	
5	
6	
7	

SESSION 5:
Digesting the data and creating an argument

Warm-up

Now that students have conducted 2 investigations trying to figure out what plants need, its time to look closely at the data that they have collected. Students will use the data to write a claim and answer the question: What do plants need in order to grow? Use teacher slides to facilitate activity below.

Data dive

Ask teams to take a close look at the data they found in both investigations.

1. Which plants did well and which plants did not do well? Which factors seemed to be important in order for the seeds to sprout and grow? What **evidence** do they have from their data to show that? Did plants seem to "use up" soil as they got bigger?

2. What about the second experiment, was soil necessary for plant growth? What did their evidence show?

Evidence are the observations that they made which helped them to answer the question: what do plants need in order to grow?

Constructing the argument

A scientific argument is an answer to a scientific question and is based on evidence. Ask students if they know what the word evidence means. Why is important to back up what you say with evidence? Have students work in teams to fill out their Scientific Argument Template. Circulate and provide support when students struggle. After students have finished their argument template, ask them to condense their ideas into one slide as a team.

Wrap-up

Have teams pair up with another team to share their scientific argument with their peers. Bring the class back together. "SO, what were some commonalities with what you found. Differences?" Celebrate their hard work and let them know that in the next session, they will be using this information to modify their model of the Western Pond Turtle and its surroundings.

Materials Needed

Teacher slides

Scientific Argument Template

Investigation logs from previous investigations

At least one student computer device per team

My Scientific Argument

Question: What do plants need to live and grow?

Our Scientific Claim:

Plants need_____

_____

_____

Evidence #1: Write and draw how the data you found supports your claim above.

Evidence #2: Write and draw how the data you found supports your claim above.

Evidence #3: Write and draw how the data you found supports your claim above.

Evidence #4: Write and draw how the data you found supports your claim above.

SESSION 6:
But what about our turtle?!

Warm-up

"Let's not forget about the western pond turtle! The whole reason we investigated what plants need in order to survive was so we could understand what fuels our adorable friend, the western pond turtle!"

Main activity

Have teams revisit their WPT habitat models. They should have some plants shown there. Now that they know what the plants need, it is important to show that in the model. Allow students to add the sun and water into their model. Ask students to verbally practice explaining the flow of energy from the sun all the way to the western pond turtle. Congratulate students on putting together such a deep understanding of what this animal needs for survival! This will definitely help us figure out how they are being disrupted and what we can do to help them out!

Materials Needed

Teacher slides

Data from investigations

Students' model of western pond turtle in its ecosystem

SESSION 7: FieldSTEM outdoor observation: food web

Warm-up

Find a place in or near campus where students can visit to make some observations. Tell students that today we will try to create an ecosystem web that represents some living things in our school yard ecosystem.

Main activity

Tell students that today, they will have to identify at least 4 living things and make a food web showing how they are connected through the transfer of energy in the ecosystem. Use the Observation Guide so students have a space to keep track of their thinking.

1. What animals (mammals, reptiles, or insects) do you see?
2. What do you think these animals eat in the ecosystem?
3. What do the plants need?

Ask students to draw their living things and to draw arrows that show how energy and matter flow through the ecosystem.

Wrap-up

Allow students time to share their models with other groups.

Materials Needed

- Observation Guide
- Hard surface or clipboards
- Pencil

Field Observation Guide: Local Food Web

- ❑ What animals (mammals, reptiles, or insects) do you see?
- ❑ What do you think these animals eat in the ecosystem?
- ❑ What do the plants need?

Draw the living and nonliving things you identify and draw arrows to show the transfer of energy through the living things.

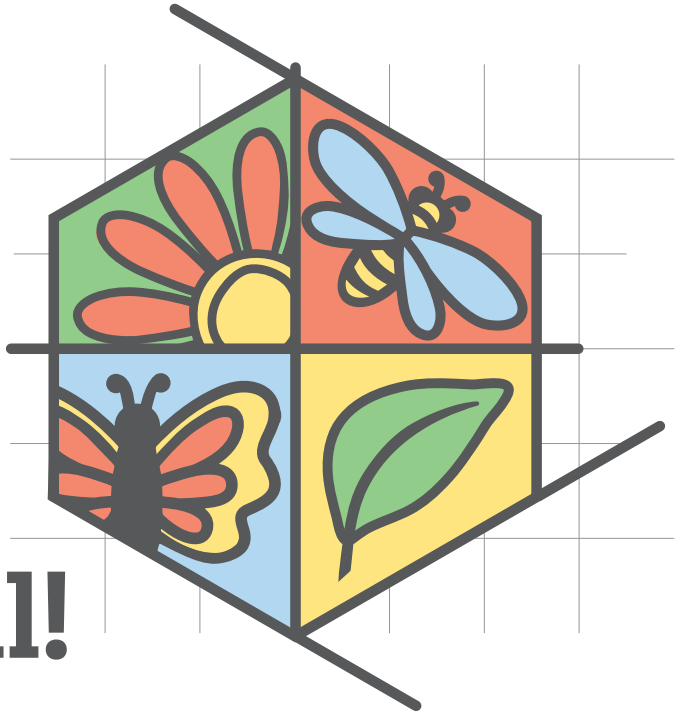
How Lesson 2 Supports Next Generation Science Standards

5.Matter and Energy in Organisms and Ecosystems

The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

Performance Expectation	**Connections to Classroom Activity,** *Students:*
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. 5-LS2-1 Develop a model to describe the movement of matter among plant, animals, decomposers and the environment.	• Investigate what the western pond turtle eats in order to survive. • Continue to develop their model and think about what the producers in an ecosystem need in order to grow and thrive. Students add to their ecosystem model. • Construct an argument based on evidence that plants need air, water and sunlight in order to survive (but not necessarily soil).
SCIENCE & ENGINEERING PRACTICES	
Asking questions and defining problems Developing and using models Planning and carrying out investigations Analyzing and interpreting data Engaging in argument from evidence	• Ask questions about what the WPT and what the producers in its ecosystem need in order to thrive. • Plan and conduct an investigation to figure out what plants need in order to survive. • Analyze and interpret the data they collected about their plant growth. • Construct an argument from evidence about what plants need in order to grow. • Continue to develop their model of the WPT in its habitat and show the chain of movement of mater and energy from the sun and through the ecosystem.
DISCIPLINARY CORE IDEAS	
PS3.D: Energy in Chemical Processes and everyday life LS1:C: Organization for matter and energy flow in organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	• Describe how the WPT uses energy from other consumers and producers in order to support life. • Develop a model to show the interaction of organisms and non-living parts of the ecosystem. • Investigate and model how energy is cycled throughout the ecosystem.
CROSSCUTTING CONCEPTS	
Systems and Systems Models Energy and matter	• Study how different parts of the ecosystem interact with each other to create balance. • Study how matter and energy travel from the sun, air, and water to producers and then to other organisms in an ecosystem.

LESSON 3: Fighting for food and survival!



STRATEGY: EXPLAIN

In this lesson, students will expand their understanding of western pond turtle and its role in its ecosystem by learning about the predators that eat the WPT and the impact of invasive species on the western pond turtle's survival.

STEM

SESSION 1:
Predators and competitors

Warm-up

Use teacher slides and start by having students look at their models. Did they learn about any animals that eat the western pond turtle? Is this something that could cause their population to go down (yes). What about other animals that reduce the western pond turtles' chances for survival?

Main activity

Predator/Competitor Jigsaw: Split class in half and have the teams study one specific predator using the Predator or Competitor Cards. Then, have teams prepare a presentation teaching their half of the class about this predator or competitor. Make sure teams know to share the following crucial information:

1. Is your animal a predator or a Competitor?
2. Where did the predator come from (is it from this area or was it brought by humans)?
3. Why is it a threat to the Western Pond Turtle?
4. What are some thoughts on how to protect the western pond turtle from this predator or competitor?

Wrap-up

Give teams a chance to add some predators or competitors to their developing models. They should also include a caption about where the invasive predator or competitor came from.

Materials Needed

Teacher slides

Laminated Predator/ Competitor Cards

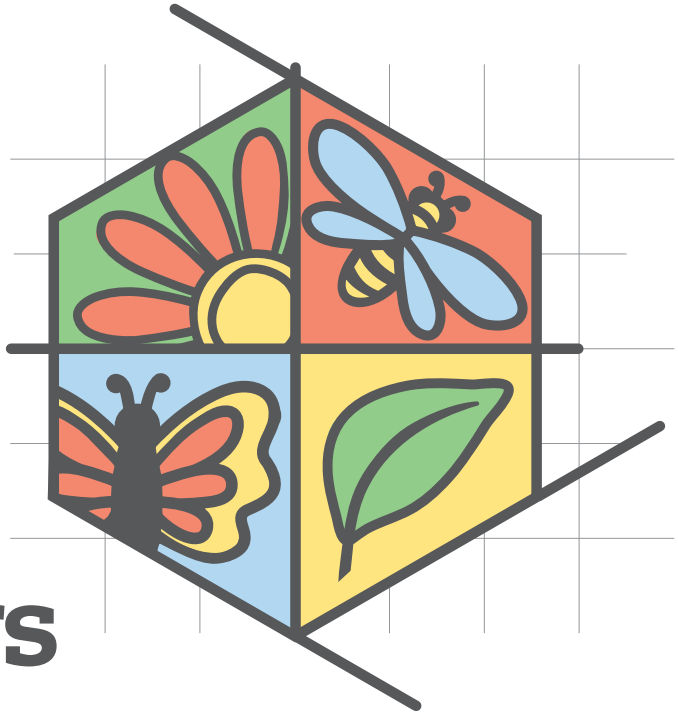
Students' model of western pond turtle in its ecosystem

How Lesson 3 Supports Next Generation Science Standards

5.Matter and Energy in Organisms and Ecosystems

The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

Performance Expectation	**Connections to Classroom Activity,** *Students:*
5-LS2-1 Develop a model to describe the movement of matter among plant, animals, decomposers and the environment.	• Continue to develop their models of the WPT in its ecosystem. • Add invasive competitors and predators to their models.
SCIENCE & ENGINEERING PRACTICES	
Developing and using models Constructing explanations and designing solutions Engaging in argument from evidence Obtaining, evaluating, and communicating information	• Research the way the invasive species have impacted the western pond turtle. • Communicate information about how their competitor or predator threatens the WPT's survival. • Determine whether their animal is a competitor or a predator and present their argument to their peers. • Continue to develop their models and add predators and competitors to their model of the WPT's ecosystem.
DISCIPLINARY CORE IDEAS	
PS3.D: Energy in Chemical Processes and everyday life LS1:C: Organization for matter and energy flow in organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	• Study the impact of different invasive species on the flow of energy and matter needed to help the WPT survive. • Study how competitors threaten the WPT's survival by eating the foods that the WPT counts on for survival. • Study how predators threaten the WPT by using them as a source of food and energy.
CROSSCUTTING CONCEPTS	
Systems and Systems Models Energy and matter	• Study how introduction of new species affects the flow of energy and matter in the ecosystem and consequently impacts the WPT's ability to survive.



LESSON 4: Decomposers

STRATEGY: EXPLAIN

In this lesson, students will expand their understanding of ecosystems by investigating the role of decomposers in the recycling of matter. Students will then apply their understanding of the importance of decomposers to the ecosystem habitat of the Western Pond Turtle.

STEM

SESSION 1:
What are the worms doing?!

Warm-up

Use these slides to show students the video of the worms decomposing the organic matter. After the video is finished, ask students to jot down things that they notice or things that they wonder. Show students the video again if needed.

Main activity

Have students work in teams to develop a model on a piece of blank paper which shows their thoughts about the following question: What are those worms doing? These questions should be addressed in the model, and teams can use words and pictures to share their ideas: What happens to all the food? What are some things you see in the video? How did the worms do that?

Wrap-up

Have teams share their models of the worms, and their thoughts about what the worms are doing. Congratulate students on trying to make-sense of the worm and compost phenomenon and reassure them that we will research this more to better understand what is going on in the next session.

Materials Needed

- Teacher slides
- Blank paper
- Markers and colored pencils

SESSION 2 (with week-long observations): Decay without worms

Teacher set-up: *In a couple of plastic plates, place a scrap of food. Avoid peels, as they usually dry up and don't decay as normal. Find a place to put the food where it will be undisturbed and will not cause a huge disturbance if it gets smelly. Cover with plastic wrap to keep students from touching it.*

Materials Needed

- Teacher slides
- A few clear plastic cups or plastic bags
- Food Decay Experiment Log
- Food scraps

Warm-up

Ask students to remember what they experienced when watching the worms and the compost bin. What would happen to a piece of scrap food when worms aren't around? Ask students to make a prediction in their Food Decay Experiment Log. You can have each group look at a different piece of rotting food to track progress, or you can have the whole class look at each.

Main activity

Over the span of a week, have students observe the food scraps and make observations of what they see.

At the end of the week, have students discuss the following in teams and to come to a consensus about these ideas:

- Did the food scrap change at all?
- How did it change?
- Do you see any living organisms other than worms that may have been involved? If so, what might those living organisms be?
- What do you think it means for something to decay or decompose?
- What do you think a decomposer does?

Circle around share

Have each team share what happened to the piece of food they were observing. Why do they think that this happened to the food scrap?

Food Decay Experiment

What do you think will happen to the scrap of food?

Observations

Draw what your food scrap looks like for several days. Also, use some words to describe what you observe.

Date:_____

Date:_____

Date:_____

Date:_____

Date:_____

Date:_____

Did your food scrap change? How?

SESSION 3:
Decomposers and what they do

Warm-up

Remind students about the worms and the compost. What did their models show about what they think the worms are doing?

ELA activity

Have students work in pairs or small teams to read the National Geographic Entry on Decomposers. Have them talk through the contents in the article and work in teams to verbally answer these questions:

1. What do decomposers do in an ecosystem?
2. Why are decomposers important?

Then, have them look at their model again. What were the worms doing?

Researching the freshwater ecosystem

Tell teams that to start thinking ahead about the Western-Pond turtle and the ecosystem where it lives. What are some decomposers that live in freshwater systems where the western pond turtle lives? Give students time to research this using their student devices. The teacher slides have some examples of websites that can be used to find some information and these can be shared with students if they struggle to locate credible sources on their own.

Refining their model

Then, have students look back at their model of the WPT in its environment. Are decomposers going to be an important part of THIS ecosystem? Give students the time to add the decomposers who generally live in freshwater systems and nearby into this model (Teacher info: they should have found that bacteria and fungi are the main decomposers in the freshwater ecosystem). Ask students to write a caption to describe why the decomposers in this ecosystem are important.

Wrap-Up

Congratulate students on almost completely finishing their models of the western pond turtle in its ecosystem. What great work they've done to understand this creature!

Materials Needed

Teacher slides

Students' model of western pond turtle in its ecosystem

Student devices with internet OR print-out of article: National Geographic Entry on Decomposers

Decomposers

Decomposers play a critical role in the flow of energy through an ecosystem. They break apart dead organisms into simpler inorganic materials, making nutrients available to primary producers.

GRADES

5 - 8
SUBJECTS

Biology, Ecology, Conservation
Saved by 22 educators

IMAGE

Millipede Detritivore

While decomposers break down dead, organic materials, detritivores—like millipedes, earthworms, and termites—eat dead organisms and wastes.

PHOTOGRAPH BY ANKIT SHRIMP/EYEEM

ENCYCLOPEDIC ENTRY VOCABULARY
When you have an empty bottle, do you recycle it so the plastic or glass can be used again? Nature has its own recycling system: a group of organisms called decomposers.

Decomposers feed on dead things: dead plant materials such as leaf litter and wood, animal carcasses, and feces. They perform a valuable service as Earth's cleanup crew. Without decomposers, dead leaves, dead insects, and dead animals would pile up everywhere. Imagine what the world would look like!

More importantly, decomposers make vital nutrients available to an ecosystem's primary producers—usually plants and algae. Decomposers break apart complex organic materials into more elementary substances: water

and carbon dioxide, plus simple compounds containing nitrogen, phosphorus, and calcium. All of these components are substances that plants need to grow.

Some decomposers are specialized and break down only a certain kind of dead organism. Others are generalists that feed on lots of different materials. Thanks to decomposers, nutrients get added back to the soil or water, so the producers can use them to grow and reproduce.

Most decomposers are microscopic organisms, including protozoa and bacteria. Other decomposers are big enough to see without a microscope. They include fungi along with invertebrate organisms sometimes called detritivores, which include earthworms, termites, and millipedes.

Fungi are important decomposers, especially in forests. Some kinds of fungi, such as mushrooms, look like plants. But fungi do not contain chlorophyll, the pigment that green plants use to make their own food with the energy of sunlight. Instead, fungi get all their nutrients from dead materials that they break down with special enzymes.

The next time you see a forest floor carpeted with dead leaves or a dead bird lying under a bush, take a moment to appreciate decomposers for the way they keep nutrients flowing through an ecosystem.

While decomposers break down dead, organic materials, detritivores—like millipedes, earthworms, and termites—eat dead organisms and wastes.

Photograph by Ankit Shrimp/EyeEm

SESSION 4: FOSS Investigation 2 (Part 1) Yeast Nutrition (OPTIONAL)

In your kit, you have materials to implement FOSS Investigation 2 Part 1, which has students investigate what yeast needs in order to activate. This investigation can be used for students to further investigate decomposers, since yeast are a type of fungus, which decompose organic matter and digest sugars. In the investigation, students try to activate yeast using either flour or sugar, and they find that sugar is needed in order for the yeast to activate. Follow the FOSS guide to set up and implement the investigation. Be sure to tie back to the storyline and talk about the importance of decomposers in an ecosystem so that the activity has relevance for your students within the context of the bigger picture.

Materials Needed

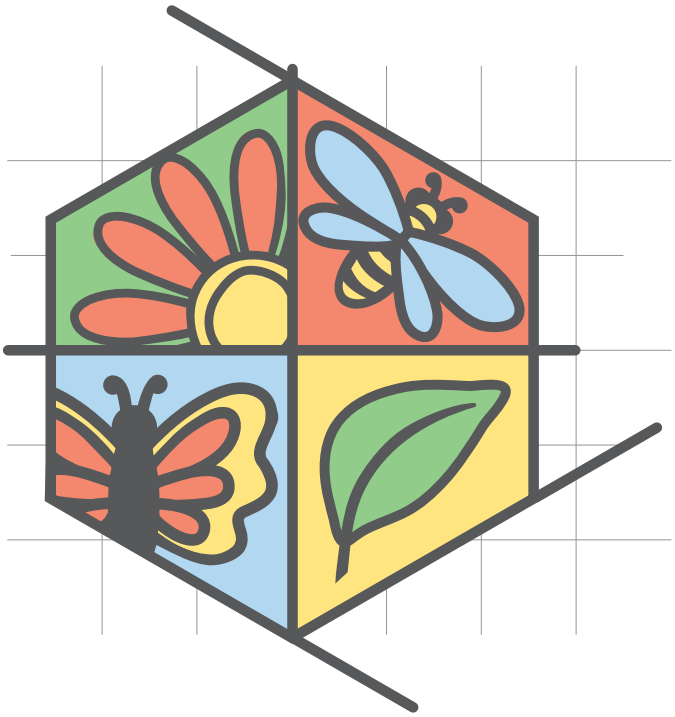
Materials for FOSS Investigation 2 Part 1:Yeast Nutrition

How Lesson 4 Supports Next Generation Science Standards

5.Matter and Energy in Organisms and Ecosystems

The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

Performance Expectation	**Connections to Classroom Activity,** *Students:*
5-LS2-1 Develop a model to describe the movement of matter among plant, animals, decomposers and the environment.	• Continue to develop their model of the WPT's ecosystem and describe the importance of decomposers in the model. • Describe the role that decomposers play in cycling matter and energy.
SCIENCE & ENGINEERING PRACTICES	
Asking questions and defining problems Developing and using models Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations and designing solutions Obtaining, evaluating, and communicating information	• Inquire about the importance of decomposers. • Conduct an investigation to see how decomposers digest decaying material and turn it into something different. • Continue to develop their model and add decomposers to the model of the WPT ecosystem. • Use their data from the investigation to describe what they think decomposers are doing and how there are decomposers other than worms in action. • Research the types of decomposers that live in the WPT's freshwater ecosystem and communicate information about the role they play in that system.
DISCIPLINARY CORE IDEAS	
PS3.D: Energy in Chemical Processes and everyday life LS1:C: Organization for matter and energy flow in organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	• Investigate how the decomposers play a crucial role in any ecosystem. Students then research the freshwater ecosystem and learn about the decomposers that live in that ecosystem. • Add decomposers to their model of the WPT's ecosystem and describe how the role of the decompsers is important in the cycling of matter.
CROSSCUTTING CONCEPTS	
Systems and System Models Energy and Matter	• Study how decomposers cycle matter in an ecosystem. • Study the important role that decomposers play in the ecosystem.



LESSON 5: Humans and the Turtles

STRATEGY: EVALUATE

This is the culminating lesson in our STEM Storyline, where students create a public product that will be shared with their community sharing actionable steps that can be taken to help save the western pond turtle. Because this is a unit created in the framework of Project-Based Learning, there is a lot of opportunity to give students autonomy about how they'd like to present their message. Based on your comfort level with certain options and the time you have available, select an option that fits your needs and the needs of your students. Below are some ideas about how the public product could be produced/shared.

Create a video as a class and upload to Youtube: have students work in expert groups (based on interest) to tackle a threat to the western pond turtle. Have each team create a 1-2 minute segment where they share about that specific threat and solutions (what can we do?!) to help eliminate that threat. Students will have to 1) collect information 2) create a storyboard/script 3) Create visual aids (slides or posters) 4) Practice 5) Film. It would also be great to have one team (or the class) create a quick segment sharing info that the class found about the western pond turtle (i.e. the WPT models that the teams worked so hard presenting), so that viewers have some context.

Create separate public awareness materials: Have students break up into teams based on interest (which threat to the western pond turtle intrigues them the most?) and have each team work together to create a product that will be shared with the public. These products could include posters, videos, podcasts, a website, or other. Arrange a "STEM Seminar night" where families, teachers and community members can come and learn from students as their public products are showcased.

Reaching out to a specific audience who can help with preservation of the WPT: Have students create a presentation/letter with questions for a specific audience who is focusing on preservation efforts. Some examples of authentic audiences: Woodland Park Zoo (they are leading preservation efforts in the state), local agencies that work to preserve spaces for endangered species. Contact ESD 112 STEM and Career Readiness staff at www.esd112.org/stem-initiatives/ccsw if you need help connecting with someone in your community.

SESSION 1:
Threats to our turtles

Warm-up

"Now that we have developed an understanding of the environment where our western pond turtles live, we can really understand how we, humans, are causing problems for the WPT." Present students with the expert group topics. Give students a few minutes to think about which threat interests them the most and what expert team they'd like to work with.

Class & team jigsaw

Split students up in teams based on interest and have them tackle one of the articles available about the threat to the WPT. Each article focuses on one threat to the WPT. Have the teams get this information ready to present to the rest of the class:

1. Describe the threat that you read about.
2. How are humans a part of the problem?
3. What are some solutions you'd like to think about more?

Mini-info sessions: Give each team a chance to share the basic points about the threat that they read about.

Wrap-up

Thank students for their hard work and tell students that during the next (final) part of the project, they will be refining their solution and will create a public product to share with the community to create awareness about the troubles faced by the western pond turtles and to share ways that we can help reduce our negative impact on these creatures.

Materials Needed

Teacher slides

Articles on threats to the Western Pond Turtles

Model of the WPT

Student devices to research

Topic 1

Habitat Loss: Nowhere to live!

A large amount of aquatic and land habitats have been lost since people have been developing structures and procedures to control floods throughout many of the areas where Western Pond Turtles live. Due to the way that humans have developed the areas near or around the western pond turtle habitat, there has been a dramatic loss of wetlands, and especially small streams and oxbow lakes. These large-scale changes to the turtles' habitat poses a serious threat to their survival. The cutting of trees has lead to more sediment flowing from streams into deep pools that used to house the western pond turtle. Loss of these pools and other wetland ecosystems has accelerated as people need more land for agriculture or housing.

Due to loss of wetlands caused by humans, there is less area that is suitable for the western pond turtles to create their nests. Since humans have been trying to stop areas near aquatic environments from flooding, the areas that normally got a lot of water are now drying up and are not a suitable place for the western pond turtle to survive. Another and more manageable threat is loss of nest habitat due to invasive plants that form dense mats or shade such as Himalayan blackberry (Rubus armeniacus or R. discolor) and reed canary grass (Phalaris arundinacea). Additional loss of nesting habitat may occur through efforts to restore some areas; if trees are planted to prevent areas from eroding without leaving exposed areas for nesting turtles, then this is a threat to the turtles.

Terrestrial habitats, or habitats on land, are also being lost due to land use by humans. Although regulations often protect aquatic habitats, the habitats that are land are often used to build homes or farm for food. This is specifically a problem in the Willamette Basin.

Not having an abundance of aquatic space is a problem for hatchlings who rely on this environment to find food and grow. Not having an abundance of land space is a problem for nesting and survival.

What are some things that our community can do to reduce the destruction of water and land habitats for the western pond turtle?

Information from these articles is from this report:U.S.D.I. Bureau of Land Management and Fish and Wildlife Service, U.S.D.A. Forest Service Region 6, Oregon Department of Fish and Wildlife, City of Portland, Nov. 2009. https://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/ca-hr-actinemys-marmorata-2009-11.pdf.

Topic 2

Too Many Predators: Survival of the Babies!

One of the main reasons that the western pond turtles have been threatened and have been decreasing in numbers is because of their increases in the amount of predators hunting eggs while they are in the nest and the hatchlings (babies) after they are born. When the young animals in a population are killed when they are still small, it is hard for the population to grow, and instead, the population begins to decline (get smaller).

Fish and bullfrogs are often considered major culprits in preying on the eggs and the hatchlings although evidence is lacking to support this. Predation on nests is believed to have increased in developed areas because there are more raccoons and skunks than there normally used to be before people lived there. Racoons and skunks tend to look for food in places where people live (ex. Garbage cans). There is some evidence that they are the most common nest predators of the western pond turtle.

Reducing nest predation has been a major focus of management activities for western pond turtles in Oregon. Some people have tried to protect nests by building exclosures. Until our understanding of nest and hatchling predation is improved, elevated rates remain a potential threat to western pond turtles.

What are some things you can do (or create) to help reduce the amount of predators eating the baby western pond turtles?

Information from these articles is from this report:U.S.D.I. Bureau of Land Management and Fish and Wildlife Service, U.S.D.A. Forest Service Region 6, Oregon Department of Fish and Wildlife, City of Portland, Nov. 2009. https://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/ca-hr-actinemys-marmorata-2009-11.pdf.

Topic 3

Road Mortality: Getting Squashed!

Roads affect turtle populations in two main ways: they kill grown-ups due to fast moving traffic, and they prevent different groups from traveling between water and land habitats. Road mortality has been cited as a cause of decline of populations of freshwater turtles, and is considered to be a major cause of death of adult western pond turtles. Adult females are particularly affected because of their seasonal movements to nest.

Like most semi-aquatic turtles, females need to move more on land than males because of the time and distance needed to find good nest sites. A scientist named Holland speculated that the annual loss due to automobiles may reach 3-5% of the population in the Willamette Valley. Although there is not a lot of data about exactly how many western pond turtles are killed by traffic on roads, it is clear that this is common cause that kills adult turtles.

Although there has not been a lot of data collected about the numbers of total turtles found dead or injured on the roads, there have been countless sightings of crushed turtles on the roads in the Pacific Northwest. Crushed turtles have been found. The negative impact of roads has been a bigger problem where there are lots of roads in an area that is close to a dense turtle population. Often times, people have built roads that cut through a nesting habitat near streams, which focus mother turtles to cross the road to reach their nesting habitat. Other times, when roads are surrounding a wetland area that is used by the western pond turtle, this can lead to many deaths of adults.We expect the human population to grow rapidly in the Willamette Valley and other regions of the Pacific Northwest where the western pond turtles. As a result, it is likely that road mortality (deaths of turtles on the road) and reduced connections between water and land habitats and among populations is likely to increase as a threat to the survival of our western pond turtle.

What are some ways that we can reduce the number of adult western pond turtles that are killed on roads that exist now and roads that may be built in the future?

Information from these articles is from this report:U.S.D.I. Bureau of Land Management and Fish and Wildlife Service, U.S.D.A. Forest Service Region 6, Oregon Department of Fish and Wildlife, City of Portland, Nov. 2009. https://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/ca-hr-actinemys-marmorata-2009-11.pdf.

Topic 4

Invasion of the Pet Turtles!

Pet trade is something that threatens the western pond turtle, since people often release their non-native pets into natural areas. Non-native animals are animals that don't normally live in an ecosystem. When non-native species are released into the wild, they tend to compete with native species for resources such as food and shelter. They can also introduce new diseases to the native turtles. Since cities have been growing and there are more people around the areas where the western pond turtles normally live, there have been more people releasing other species of turtles into the wild. There are at least 15 species known to have been introduced into the range of the western pond turtle (Bury 2008). The red-eared slider and common snapper are the most common introduced turtle species in Oregon and Washington. They are known to successfully reproduce in Pacific Northwestern waterways and have become invasive in many aquatic habitats.

Common snapping turtle The common snapping turtle is not native to Oregon and is considered an invasive species because it can easily survive and reproduce in habitats in the Pacific Northwest. Snapping turtles were classified by Oregon Administrative Rules (OAR 635-056) as a Nonnative Prohibited wildlife species in 1996, which prohibits the import, possession, transport, buying, selling and bartering of live snapping turtles. How snapping turtles reached most localities remains unknown but pet releases are the most likely cause (Bury and Luckenbach 1976, Beebee and Griffiths 2000). Reports of common snapping turtles in Oregon have recently increased (Barnes 2009), probably due in part to an increase in public education efforts, including the development of a turtle sighting reporting system by ODFW and the Oregon Zoo. In Oregon, they have been collected in the following areas: Eugene / Springfield, Lebanon, and Corvallis (Willamette River); Troutdale (Sandy River), North Fork Reservoir fish ladder on the Clackamas River, Beaverton / Hillsboro (Tualatin River and tributaries), Milwaukie (Willamette River / Kellogg Lake), Lake Oswego (Lake Oswego), and Portland (Columbia River, Johnson Creek). Snapping turtles have also been collected in coastal Oregon (Coos Bay) and sighted in a pond near Roseburg (Brown et al. 1995). ODFW and partners are trying hard to trap snapping turtles at a specific pond within the City of Beaverton to learn more about snapping turtles in Oregon. Between 2004 and

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2009, 66 snapping turtles have been captured and removed from the pond and multiple nests with eggs have been dug up and removed (S. Barnes, unpublished data).

Red-eared sliders Red-eared sliders are probably the most common freshwater turtle around the world due to the fact that they are the most common type of turtle that people keep as pets. This species is also not native to the Pacific Northwest and is considered an invasive species. In the Pacific Northwest, red-eared sliders are much more common than common snapping turtles. Currently, sliders live throughout the Willamette Basin particularly in or near cities and towns. Pet stores and people began mass "dumping" of sliders after the Oregon government banned them due to the damage they were doing to the natural ecosystem when released. Red-eared sliders are still legal to sell and own in Washington. Where sliders live with western pond turtles in the same ecosystem, they are often far outnumber the western pond turtles (C. Yee, pers. obs.). Reports of sightings of red-eared sliders have increased, most likely due to increased educational efforts.

What can be done to protect the western pond turtles from competitors being released into the wild?

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Topic 5

Recreation Disturbance: Human Shenanigans!

People often like to spend time outdoors doing recreational activities in the water and on the land areas that are the habitat of the western pond turtles. Recreational activities are activities done outdoors for fun. Disturbance by human recreation may have been responsible for population decreases of freshwater turtles in some areas (Garber and Burger 1995, Mitchell and Klemens 2000). Semi-aquatic turtles are very sensitive to disturbance when they are basking in the sun and nesting (Moll 1974, Mitchell and Klemens 2000). If their lifestyle is disturbed by humans, this can affect their thermoregulation, or ability for them to control the temperature of their bodies. Western pond turtles are reptiles, and reptiles rely on lifestyle (basking in the sun, staying out of the cold) to keep their body temperature stable for survival. If their body temperatures are greatly affected, this will cause problems with digestion and parts of their bodies.

There are many water environments that are used for recreation and this human activity can negatively impact the turtles. The main areas that would be affected would be near urban areas and in areas where there are a lot of people performing recreational activities in the water (Hardin 1993). For example, trails used by many people for hiking, bicycling, and dog walking are next to aquatic habitats where western pond turtles live (L. Holts, pers. obs). In Fern Ridge, Lookout, and Fall Creek reservoirs, recreationists use areas for swimming, boating, and fishing that are occupied by western pond turtles (e.g., Hardin 1993). Hardin (1993) expressed concerns over recreation effects including boating, fishing, and swimming in reservoirs with turtles, especially near areas with campgrounds, because these areas not only attracted large numbers of people, but were also located in the same space that was being used by the western pond turtles.

Trails are an important issue because they are planned for many natural areas in urban centers, such as the Portland metropolitan region (S. Bielke, ODFW, pers. comm., July 2009). In some counties, trails are often allowed within areas that are supposed to create a buffer, or "cushion" between the area being used by the humans and the turtle habitat (S Bielke, ODFW, pers. comm., July 2009). In some areas, these trails will likely negatively impact

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native turtles. Some proposed trails would go through or nearly next to nesting areas. Some of the turtle populations in these areas are the only ones known to still exist in the area (S. Bielke, ODFW, pers. comm., July 2009).

Native turtles in the Pacific Northwest are also known to get caught by fisherman using bait (Croghan 1983, Hays et al. 1999, Horn 2000, S. Barnes, pers. obs.). Holland (1991) estimated that 3.6% of the turtles captured at a site in Oregon had evidence of fishing trauma, which means that they were injured when a person accidentally caught them instead of catching a fish.

How can we protect the western pond turtles from being disturbed by people trying to have fun outdoors?

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SESSION 2: FieldSTEM outdoor observation: human impacts

Warm-up

Find a place in or near campus where students can visit to make some observations. Tell students that today we will try to find some examples of how humans have impacted the natural ecosystem around the school area.

Materials Needed
Hard surface or clipboards
Blank paper, pencils

Main activity

Ask students to sit or stroll in teams. Do they see any signs of people having changed the environment around the school? How have people affected the ecosystem? How might the plants or animals be affected by people being here? Ask students to draw their ideas and use words to describe their thoughts.

Wrap-up

Allow students time to share their models with other groups.

SESSION 3:
Refining our solutions

Main activity

Give students time to research and refine their ideas about potential solutions to the threat that they are tackling. This simple thinking template can help them to keep track of their ideas.

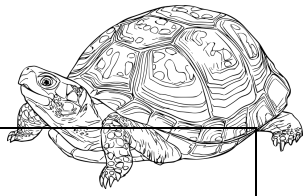
Feedback session

Have teams partner with another team and share their solutions. Ask teams to give each other feedback. Give teams time to process feedback and make changes to their solution ideas.

Materials Needed

- Teacher slides
- Articles on threats to the Western Pond Turtles
- Model of the WPT
- Student devices to research
- Refining a Solution Template

Refining a Solution



What is this threat such a problem for the western pond turtle?

What are some solutions you can share with your community? Draw or write your thoughts below. Can the community act on them?

SESSION 4+:
Project building sessions

Give students several sessions over the span of several weeks to create their final product. The structure below can aid in students' development of material. These sessions will look different based on the type of public product students decided to create and the degree of student choice you feel comfortable with allowing for the final product.

Threat to the Western Pond Turtle public product plan

Information deep dive:

"Make sure you know the following things about your topic so you can become an expert:"

1. Why is this {your topic} a threat to the Western Pond Turtle?
2. How have humans contributed to or caused the problem?
3. What are some solutions you'd like to propose?

Coach your students: Circulate the classroom and check-in with teams to ensure that they have the right amount of information they need to be successful, provide support to teams who need it.

Planning your public product:

1. Who is your targeted audience?
2. How will you share your message with this audience?
3. How will you convince the audience to make a change to help the western pond turtle?
4. On your team, who will do what? How are jobs being balanced so everyone is helping to complete the mission?
5. What materials do we need to gather?
6. Is our plan realistic considering how much time we have to prepare?

Coach your students: Circulate the classroom and check-in with teams to ensure that the public product they are planning is realistic and appropriate for the audience. Check with teams to see if the workload is being distributed evenly.

Create public awareness materials:

Create your materials and constantly check:

- Is your work presentable to your audience?
- How might you improve your materials or your message to help people understand how important the issue is?
- Are you on time? How much time do you need to finish?

Coach your students: Circulate the classroom and check-in with teams to see if their work is progressing and if they need some support with adjusting their plan. Will teams finish on time? Is their product presentable? Recruit "consultants" from other teams to provide feedback about a certain aspect of the product in case there are things lacking (ex. if students are not creating an item that is visually appealing at all, maybe a representative from another team can provide some coaching).

Materials Needed

Teacher slides

Articles on threats to the Western Pond Turtles

Model of the WPT

Student devices to research

Refining a Solution Template

Other materials requested by students (posters, markers, audio recording or video recording device, etc.)

SESSION 4+:
Project building sessions (cont.)

Practicing with peers:

Allow students to share their products with their classmates before things go live. Pair teams together and have each team share with another team and provide warm but helpful feedback. ***Ask teams to help their partner teams with these ideas:***

- Are the materials easy to understand? (too much or too little info?)
- Are they clear?
- Are they visually or auditorily engaging? (ex. How well will a poster with some pictures slapped on and illegible text engage an audience's attention?).

Get Ready for Launch:

Explain to students exactly how and when their public product will launch and give students some extra time before then to get their materials refined.

Coach your students: Remind students how valuable and powerful their voices are and tell students that they are now experts on their topic and should feel proud to share their knowledge with the world!

FINAL SESSION:
Launch of public campaign

Congratulate your students for their amazing work in helping the western pond turtles here in the Pacific Northwest! If possible, organize an event where students have a chance to share their hard work with their community. Invite families, administrators, and community members who played a part in their project.

Some possible formats:

- Save the Turtles STEM Fair: Each team sets up their materials and the audience circulates and visits each exhibit. Multiple classes can contribute to the fair.
- "Save the Turtles" movie screenings of the final video created by the class or classes in your building.
- Check our google drive folder LESSON 5 for more ideas!

Materials Needed

Student's Public Products and other things needed by them for the STEM Fair or other event

How Lesson 5 Supports Next Generation Science Standards

5.Matter and Energy in Organisms and Ecosystems

The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

Performance Expectation	**Connections to Classroom Activity,** *Students:*
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. 5-LS2-1 Develop a model to describe the movement of matter among plant, animals, decomposers and the environment.	• Have completed their models of the WPT in its ecosystem. • Use their models to see how humans are threatening the WPT's survival by disrupting its niche through changing various factors. • Analyze as a team how one particular threat is being caused by people. • Design and present solutions for the threat they are focusing on and create a public product to present their solution to their community.
SCIENCE & ENGINEERING PRACTICES	
Asking questions and defining problems Designing Solutions Developing and using models Engaging in argument from evidence Obtaining, evaluating, and communicating information	• Obtain information about a threat that is causing a decline in the populations of western pond turtles in the pacific northwest. • Design and refine a solution to the threat they are focusing on. • Develop materials sharing their argument with a public audience and present a solution.
DISCIPLINARY CORE IDEAS	
PS3.D: Energy in Chemical Processes and everyday life LS1:C: Organization for matter and energy flow in organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	• Finish their model of the ecosystem where the WPT lives. • Work with expert groups to study one way that humans negatively impact the WPT with a variety of activities. • Develop a solution that will help bring balance to the habitat of the WPT by reducing human impact on that ecosystem.
CROSSCUTTING CONCEPTS	
Systems and Systems Models Energy and Matter	• Study how different parts of the ecosystem interact with each other to create balance. • Study how disruption of an ecosystem by humans can cause a population to decline, become threatened, and become endangered.