PURDUE EXTENSION

EXPERT REVIEWED

FNR-532-W

The NATURE OF TEACHING

WILDLIFE

Hellbenders Rock!

LESSON PLAN

This lesson teaches students about the endangered eastern hellbender and the importance of conserving it.

AUTHORS / CONTRIBUTORS

Rebecca Busse and Rod N. Williams, *Department of Forestry and Natural Resources, Purdue University*
Thomas G. Kronewitter and Jeffrey J. Rollins, *Department of Agricultural Communication, Purdue University*

OVERVIEW

ESTIMATED TIME

60 minutes

VOCABULARY

- Eastern hellbender
- Amphibian
- Larvae
- Juvenile
- Sediment
- Indicator species
- Ecosystem
- Habitat

UNIT OBJECTIVES

Students will be able to:

- Identify the eastern hellbender
- Describe the life stages of the eastern hellbender
- Explain the eastern hellbender's relationship to clean water
- List ways to conserve the eastern hellbender

TARGETED LEVEL INDIANA STANDARDS

English/Language Arts

K.RF.1, K.RV.1

1.RF.1, 1.RV.1

2.RF.1, 2.RV.1, 2.SL.1, 2.W.1

3.RF.1, 3.RV.1, 3.W.1

4.RF.1, 4.RV.1, 4.RL.4.1, 4.SL.2.1, 4.SL.2.2, 4SL.2.5, 4.SL.3.1, 4.W.1

5.RF.1, 5.RV.1, 5.RL.5.1, 5.SL.2.1, 5.SL.2.2, 5.L.2.5, 5.SL.3.1, 5.W.1

Math

4.DA.1

5.DS.1

Science

2.LS.1

2.LS.3

4.LS.1

REQUIRED MATERIALS

- 1 Hellbenders Rock! PowerPoint (*https://www.extension.purdue.edu/extmedia/FNR/FNR-532.zip*)
- 1 Juvenile_Hellbenders_RB video (*https://youtu.be/ZOb3YTDmqmQ*)
- 1 Adult_ Hellbender_SK video (*https://youtu.be/rEw07bEywyY*)
- 1 per student, Hellbenders Rock! Vocabulary True-False Pre-test
- 1 per student, Hellbenders Rock! Vocabulary True-False Post-test
- 1 per student grade K–1, Hellbenders Rock! Adventure Worksheet
- 1 per student grade 2–5, Hellbenders Rock! Data Sheet
- 1 per group of 4–6 students, tablet or smart phone with the free "Purdue Hellbender Havoc" app installed (search "Purdue Hellbender Havoc" on Google Play or the Apple iStore)
- Coloring utensils and one pencil for every student
- 1 per student, "the life cycle of the eastern hellbender" coloring page (*https://ag.purdue.edu/department/extension/hellbender/kids.html*)

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PURDUE UNIVERSITY

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INDICATOR SPECIES

An indicator species is a type of organism that reveals the health of an ecosystem. An ecosystem is a network of organisms and their environment that are all connected in some way. The eastern hellbender is an indicator species for a healthy freshwater ecosystem. If you see an eastern hellbender, you know the water is clean and healthy. This is important, because if we start losing our indicator species, we know that something has changed in the ecosystem.

EASTERN HELLBENDER

The hellbender is North America's largest salamander, growing up to 2 feet long. It is a fully aquatic salamander that spends its whole life swimming along the bottom of clean, fast-flowing, freshwater rivers and streams. A hellbender has four legs and a long, flat body that lets it squeeze under rocks, where it can hide from predators and ambush its prey.

Ninety percent of the hellbender's diet consists of crayfish, though it does occasionally eat small fish and insects. The hellbender needs to eat lots of crayfish to grow, reproduce, and complete its life cycle.

Hellbender Life Cycle

Hellbender salamanders are amphibians and are more closely related to other salamanders, frogs, or toads than lizards or snakes. "Amphibian" means "two lives." Many amphibians have an aquatic larval stage and a semi-aquatic or a terrestrial adult stage. Since hellbenders are fully aquatic, all life stages remain tied to water. During reproduction, female hellbenders seek out the males with the largest, best-looking nest rocks. Several females might lay their eggs under one male's rock. The males, called den masters, guard the eggs for up to two months, until they hatch into larvae. Larvae have gills for two years, after which they grow into juveniles. Juveniles absorb their gills and breathe through their skin. After three to four years as juveniles, the hellbenders become adults at about six years old. They grow even bigger, up to two feet long, and can reproduce. Hellbenders can live up to 30 years.

Distinguishing Features

Eastern hellbenders have folds of skin on their sides that look like lasagna; flat, round heads; tiny eyes; five toes on their back feet; and four toes on their front feet. The folds on their sides help them take in oxygen from the water by increasing their surface area. They do have lungs, but use them mostly to stay buoyant in the water; they breathe primarily through their skin.

Water quality

One of the most common problems with water quality is sedimentation. Sediment is the sand, silt, clay, and rocks at the bottom of a river. Coarse sediment like gravel and cobble (2–256 mm) is good for water quality, because it allows light and oxygen to reach the bottom of the riverbed. Coarse sediment is beneficial to hellbenders as well. Larval hellbenders and crayfish use the spaces between gravel and cobble as their primary habitat. Fine sediment like silt, clay, and sand (0–2 mm), however, often does not sink to the bottom and gets stirred up easily, filling in the spaces between coarse sediment and under rocks. This is called sedimentation. Fine sediment can also be carried with rainwater runoff from agricultural fields, streets, and construction sites, where it can pick up nutrients like phosphorous and nitrogen that encourage the growth of algal blooms. Algal blooms consume the dissolved oxygen in the water that hellbenders and fish breathe.

Ways to Conserve

- Never move rocks and always carry your canoe or kayak over shallow places in the river. Moving rocks and dragging your canoe or kayak through shallow places stirs up fine sediment, filling in the spaces between coarse sediment and under rocks that hellbenders and crayfish use as habitat.
- Do not pour toxic chemicals (like oil, cleaning supplies, or pharmaceuticals) down the drain or toilet at home, and do not litter. Most of what washes down storm drains goes straight to the river, untreated.
- Do not blow leaves and grass clippings into the street, because they will wash into the river via storm drains. Once in the river, they release nutrients as they decompose that encourage algal blooms, which reduce dissolved oxygen in the water that aquatic organisms need to breathe.
- Pet waste can also encourage algal blooms when washed into rivers, and contains harmful bacteria, so always pick up pet waste before it rains.
- Use a rain barrel or plant a rain garden to prevent storm water runoff from entering the waterways. Storm water runoff flows over surfaces like houses, cars, and streets, collecting chemicals, nutrients, and fine sediments that pollute rivers and streams. Rain barrels collect the runoff and allow you to use the collected water to water your garden or wash your car. Rain gardens hold runoff until it can soak into the ground to be naturally filtered.

- If you catch a hellbender on your fishing line, cut the line. Do not try to remove the hook. Hellbenders eat by sucking their food into their mouth, and if they swallow a hook it might be lodged somewhere deep in their stomach; we want to prevent further harm to the hellbender that might be caused by removing the hook.

There are many other things we can do to conserve the eastern hellbender. Anything that promotes clean, healthy water helps the hellbender.

Learn more at *helpthehellbender.org*.

SOURCES

Bourassa, N. and A. Morin. 1995. Relationship between size structure of invertebrate assemblages and trophyand substrate composition in streams. *Journal of the North American Benthological Society* 14(3):393-403

Nickerson, M. A. and C. E. Mays. 1973. The Hellbenders: North American "giant salamanders." Milwaukee Public Museum. Milwaukee, WI.

Nickerson, M. A., K. L. Krysko, and R.D. Owens. 2003. Habitat differences affecting age class distributions of the Hellbender salamander, *Cryptobranchus alleganiensis. Southeastern Naturalist* 2(4):619-629.

Unger, S., and R.N. Williams. Eastern Hellbender: North America's giant salamander. Purdue Extension, FNR-471.

Williams, D. D. 1978. Substrate size selection by stream invertebrates and the influence of sand. *Limnology and Oceanography* 23(5):1030-1033.

Wolman, M. G. 1954. A method of sampling coarse river-bed material. *Transactions of the American Geophysical Union* 35(6):951-956

OTHER HELLBENDER EDUCATIONAL MATERIALS

1. Healthy Water, Happy Home Lesson Plan *https://www.edustore.purdue.edu/item.asp?Item_Number=FNR-527-W*
2. Discovering the Watershed Lesson Plan *https://www.edustore.purdue.edu/item.asp?Item_Number=FNR-476-W*
3. Help the Hellbender, Purdue Agriculture activities and coloring pages *https://ag.purdue.edu/department/extension/hellbender/kids.html*
4. Help the Hellbender, Purdue Agriculture videos *https://www.youtube.com/playlist?list=PLgoGnq-fak7XTV-p8jV7d0jjCO6aOeOSq*
5. Help the Hellbender, Purdue Agriculture website *https://ag.purdue.edu/department/extension/hellbender/*
6. Missouri Stream Team Hellbender Lesson Plan *http://www.mostreamteam.org/eduprojects.asp*
7. National Wildlife Federation, Wildlife Library, Hellbender website *https://www.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Hellbender.aspx*

PROCEDURE

1. Download the *Hellbenders Rock! PowerPoint, Adult_ Hellbender_SK* video, *Juvenile_ Hellbenders_RB* video, and *The Lifecycle of an Eastern Hellbender* coloring sheet from *purdue.edu/nature*. Print one coloring sheet per student (*https://www2.ag.purdue.edu/extension/hellbender/Pages/Kids-Resources.aspx*), one vocabulary pre-test per student, one vocabulary post-test per student, one adventure worksheet per student grades K-1, and one data sheet per student grades 2-5. Download the "Purdue Hellbender Havoc" app onto one tablet or smart phone per group of 4-6 students from the Google Play or the Apple App Store.
2. Before teaching about hellbenders, have each student complete one Hellbenders Rock! Vocabulary True-False pretest. Collect these pretests.
3. Introduce a few key terms.
   a. Ask students: "What is an indicator species?" Introduce the concept of an **indicator species** within an **ecosystem**. Ask the students to provide examples of ecosystems (forests, oceans, desserts). Introduce the **eastern hellbender** as an example of an indicator species for a healthy freshwater ecosystem (see Teachers' Notes). Show the students slide 2 of the Hellbenders Rock! PowerPoint and then the video: Adult_ Hellbender_SK.
   b. Ask students: "What is a **habitat**?" Ask students what three things all animals need in their habitat (food, water, shelter). Ask students: "What do you think the eastern hellbender uses for food and shelter?" Explain that hellbenders eat crayfish (slide 3) and live under large, flat rocks (slide 4) (see Teachers' Notes).
4. Explain the life cycle of the eastern hellbender.
   a. Ask students what kind of animal they think the eastern hellbender is (reptile, amphibian, mammal, or fish). Ask them for examples of **amphibians**. Ask them what they know about the life cycles of amphibians. Explain that amphibian means "two lives." Explain the life cycle of an eastern hellbender, emphasizing the different life stages (see Teachers' Notes). Show students the picture of hellbender eggs (slide 5). Introduce the terms **larvae** and **juveniles** (slides 6–7 and 8 respectively). Explain how the hellbenders change from larvae to juveniles and how long each life stage lasts (see Teachers' Notes). Show students the video: Juvenile_Hellbenders_RB. Show slide 9 as an example of an adult hellbender. Keep the slide up for the next step.
   b. Explain that the students are going to study the life cycle of an eastern hellbender by coloring an image of its lifecycle. Give one coloring page and set of coloring utensils to each student. Allow the students 5–10 minutes to color "the lifecycle of an eastern hellbender" coloring sheet. As they color, walk around and ask students to describe the hellbender based on the coloring sheet and the PowerPoint slide (e.g., How many toes does a hellbender have on its front feet? Its back feet? Is its head flat and round or snake-shaped and sort of triangular? Is its skin smooth or wrinkly?).
5. Review key identifying features of an eastern hellbender.
   a. Turn off the PowerPoint and ask students to flip their coloring pages over. Ask students to direct you as you draw an eastern hellbender, step by step, on the board. Ask them to also draw their own hellbenders on the backs of their coloring pages as you draw yours. Ask students to raise their hands to provide examples of key identifying features of the eastern hellbender (i.e., body shape, head shape, and number of toes on each foot). Draw each feature on the board until you have a complete eastern hellbender and they have drawn hellbenders on the backs of their coloring pages as well.
6. Teach students why it is important to know how to identify the eastern hellbender and how they can help conserve the eastern hellbender.
   a. Ask students: "Why is it important to identify the eastern hellbender?" Explain that hellbenders are endangered and revisit the idea that they are an indicator species. Ask students what they think makes the hellbender endangered. Introduce the term **sediment** (slide 10) and how certain kinds of sediment are important to hellbenders (slide 11) (see Teachers' Notes).
   b. Ask students: "How can you help the hellbender?" Provide examples using visuals on slide 12.
7. **Purdue Hellbender Havoc** activity (see Directions for Activity: Purdue Hellbender Havoc).
8. **Review.** Ask questions like: "What do hellbenders eat? What do you do if you catch a hellbender on your fishing line? What are newly hatched hellbenders called while they still have gills? What are two-year-old hellbenders called after they absorb their gills? How did playing the app help you remember what we learned about hellbenders? How would it have been different if we just read and talked about hellbenders?"
9. Have each student complete one Hellbenders Rock! Vocabulary True-False post-test. Collect these post-tests for points and to evaluate their change in knowledge about hellbenders.

PURDUE HELLBENDER HAVOC: DIRECTIONS FOR ACTIVITY

1. Divide students into groups of 4-6 and call those groups teams.
2. Give every student in grades K–1 a Hellbenders Rock! Adventure Worksheet. Explain that each team will be playing a video game about eastern hellbenders. Students waiting their turn to play the video game will complete the Adventure Worksheet. In the worksheet, students pretend they are the hellbender following the path that will take them to the end of the river to find their eggs. They must avoid paths that lead to things that reduce water quality, like blowing leaves into the street, and choose paths that lead to things that improve water quality, like rain barrels and trees. They must avoid algal blooms and follow crayfish. Students can also work on their coloring pages.
3. Give every student in grades 2–5 a Hellbenders Rock! Data Sheet. Explain that each team will be playing a video game about eastern hellbenders. Before playing the video game, students will work in their teams to answer questions 1 and 2 on the Data Sheet. At the end of every turn, **every student** must record **every team members' points** earned with each game play using the graph on the Data Sheet. After the game, students will work in their teams to answer questions 4 and 5 on the Data Sheet.
4. Explain the directions for the Hellbender Havoc activity; Purdue Hellbender Havoc is an app where you get to be a hellbender. As a giant salamander, you swim, eat crayfish, grow, and earn points. Watch out though! Dangers lurk in the water.
   - You must avoid algal blooms, nets, and fishermen's hooks. If you get caught in a net, the game is over.
   - If you get caught on a fishing hook, swipe your finger over the fishing line to cut your hellbender free before you're dragged ashore and the game is over. Remember that we learned to cut the line, not remove the hook, if you catch a hellbender.
   - If you swim into algae, you will slow down for a couple of seconds.
   - Eat as many crayfish and fish as you can to grow bigger and collect the most points. The more you eat, the more time you will get to play and the more points you will score.
   - Try to grow as big as you can to increase your hellbender's survival.
   - Tap your finger on the screen to move. Good luck!
5. Give each group one tablet or smart phone with the Purdue Hellbender Havoc app installed.
6. Have students switch players within their teams every 2 minutes.
7. For grades K–1, once everyone has had a turn playing the video game, proceed to step 8 (Review) in the Procedure on page 5.
8. For grades 2–5, remind students to record **every group members' points scored** with **each game play**. Each person's turn counts as a separate game play for the group. If that person dies in the game, record the score before they died as their game play. They can retry until their time runs out and it is time to switch, but only record one game play per person. Once everyone has had a turn playing the game, have students work in their groups to complete questions 4 and 5 on their Hellbenders Rock! Data Sheet. Ask the students to share their observations with the class. Ask them questions like: "Did the points you scored change with each game played? Did you get more or less points with each game play? Why do you think you saw a change? Why did you not see a change?" Proceed to step 8 (**Review**) in the Procedure on page 5.

VOCABULARY: PRE-TEST

NAME: _____

Is the sentence true or false? Select thumbs-up for true and thumbs-down for false.

1	Hellbender habitat includes crayfish, water, and large flat rocks.	👍	👎
2	Eastern hellbenders are the largest lizards in North America.	👍	👎
3	An ecosystem is all the living and non-living things in an area working together.	👍	👎
4	Sediment is grass at the bottom of a river.	👍	👎
5	Larval hellbenders have gills.	👍	👎
6	Juvenile hellbenders have gills.	👍	👎
7	Hellbenders are a kind of amphibian.	👍	👎
8	Indicator species tell us the health of an ecosystem.	👍	👎

VOCABULARY: POST-TEST

NAME: _____

Is the sentence true or false? Select thumbs-up for true and thumbs-down for false.

1	Hellbender habitat includes crayfish, water, and large flat rocks.		
2	Eastern hellbenders are the largest lizards in North America.		
3	An ecosystem is all the living and non-living things in an area working together.		
4	Sediment is grass at the bottom of a river.		
5	Larval hellbenders have gills.		
6	Juvenile hellbenders have gills.		
7	Hellbenders are a kind of amphibian.		
8	Indicator species tell us the health of an ecosystem.		

VOCABULARY: PRE- & POST-TEST KEY

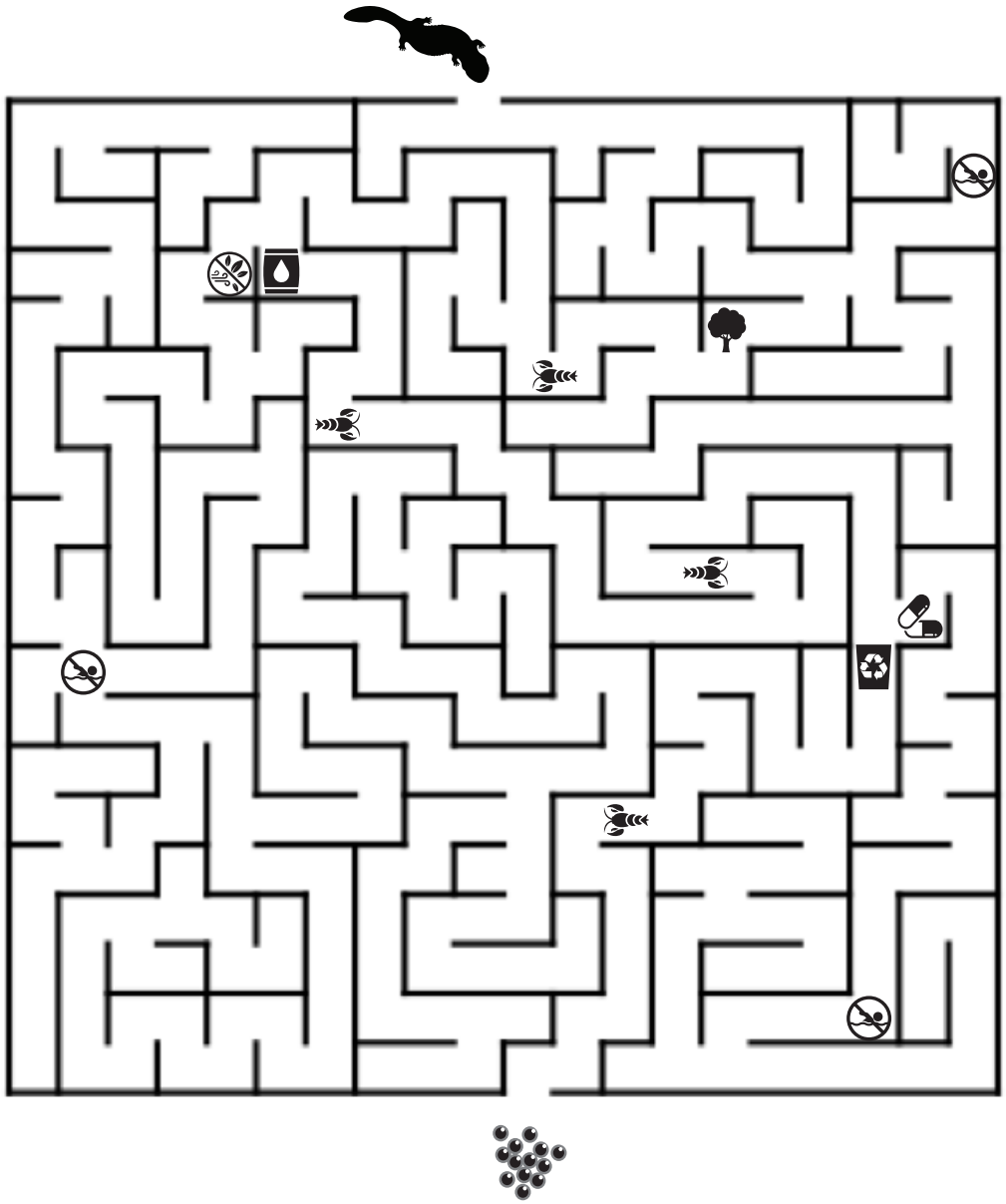
Is the sentence true or false? Select thumbs-up for true and thumbs-down for false.

1	Hellbender habitat includes crayfish, water, and large flat rocks.	✓	
2	Eastern hellbenders are the largest lizards in North America.		✓
3	An ecosystem is all the living and non-living things in an area working together.	✓	
4	Sediment is grass at the bottom of a river.		✓
5	Larval hellbenders have gills.	✓	
6	Juvenile hellbenders have gills.		✓
7	Hellbenders are a kind of amphibian.	✓	
8	Indicator species tell us the health of an ecosystem.	✓	

ADVENTURE WORKSHEET

NAME: _____

Help the Den Master get back to his eggs. Avoid paths with things that are bad for water quality, choose paths with things that are good for water quality, and follow the crayfish.

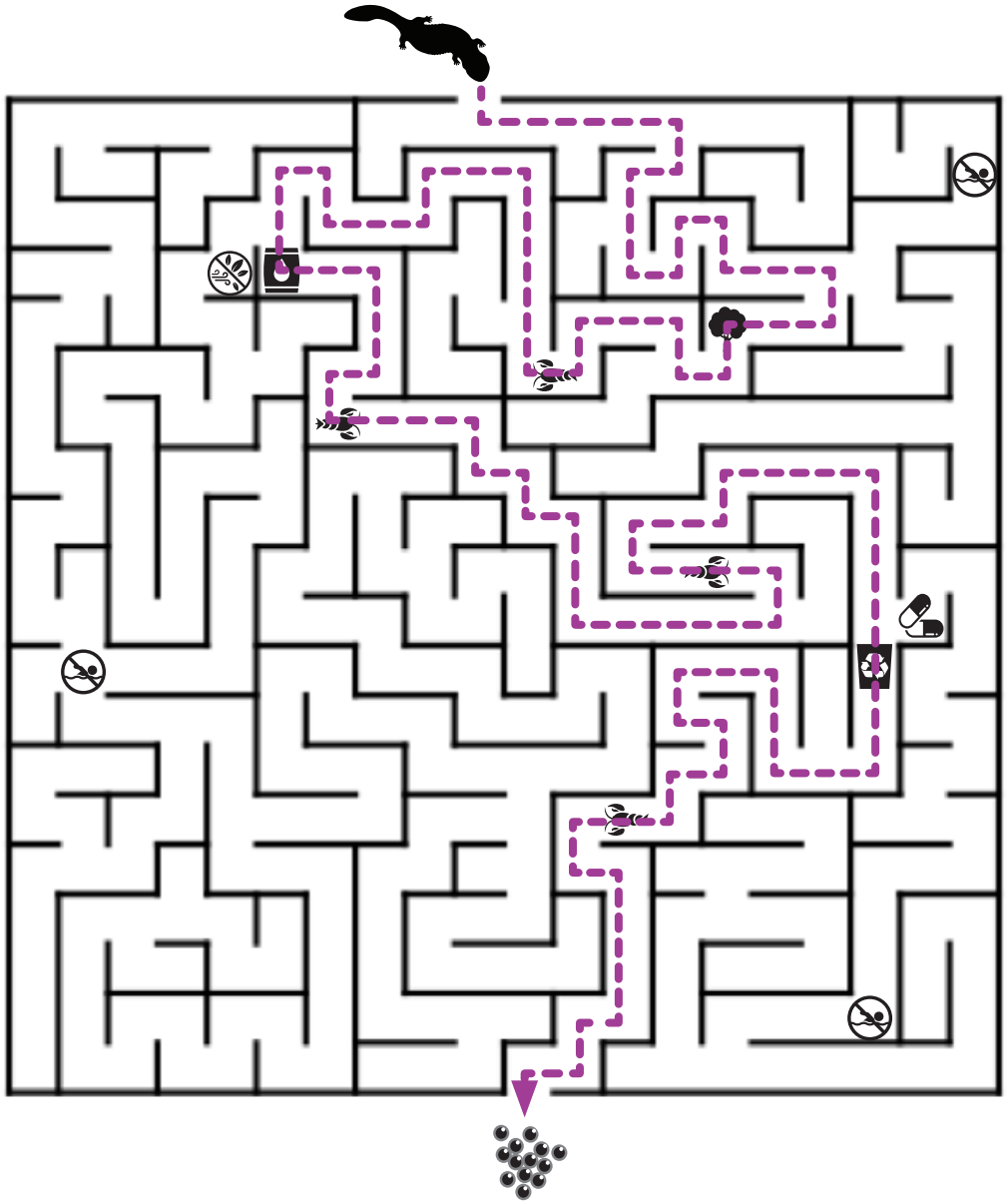


Legend

- Blowing leaves into the street
- Crayfish
- Recycling
- Trees
- Rain Barrel
- Throwing medicine down the drain
- Algal Bloom

ADVENTURE WORKSHEET KEY

Help the Den Master get back to his eggs. Avoid paths with things that are bad for water quality and choose paths with things that are good for water quality.



Legend

- Blowing leaves into the street
- Crayfish
- Recycling
- Trees
- Rain Barrel
- Throwing medicine down the drain
- Algal Bloom

HELLBENDER HAVOC DATA SHEET

NAME: _____

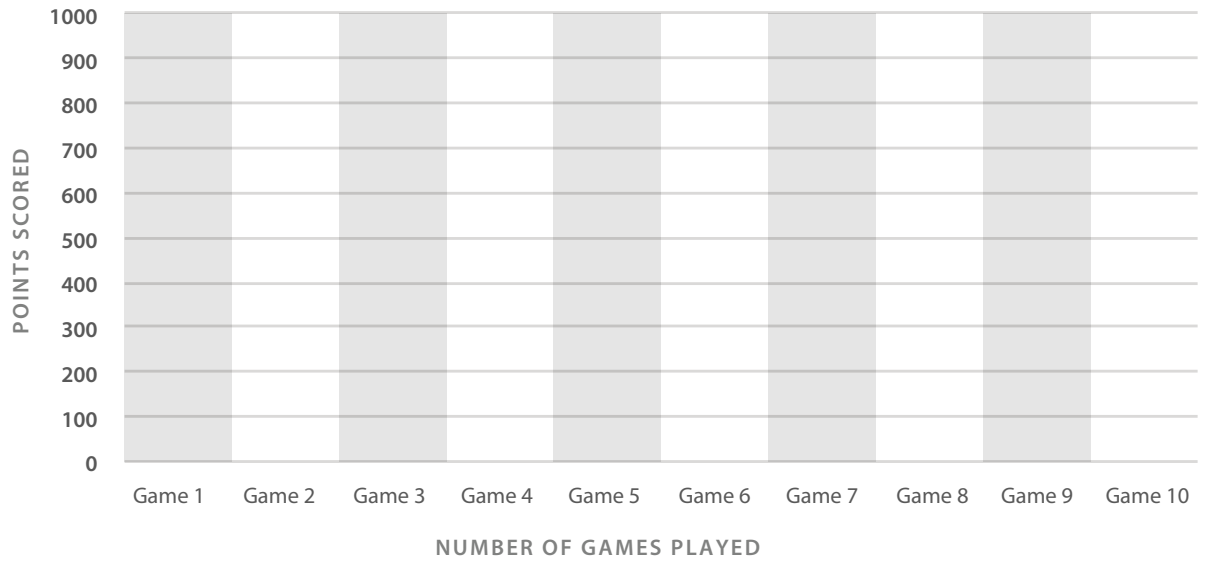
1 Will your team score more or fewer points with each game played? _____

2 Why do you think that will happen? _____

_____

_____

3 Plot the total length of your eastern hellbender at the end of each game played.



4 Did your team score more or fewer points with each game played? _____

5 Why do you think that happened? _____

_____

_____

_____