Finding the Niche (Learning Experience #2)
Lesson Plan

Overview
Students will work in teams as they play the role of biologists with the West Virginia Department of Natural Resources. As they consider the future of the hellbender in West Virginia's streams, student teams will predict what may happen to its home ecosystem if it disappears and construct a conservation plan. Their final challenge is to apply what they have learned about the hellbender and the effects of climate change to the future of a species in their home region.

Objectives
The students will:
- research and construct a food web and identify the place of a species within it.
- develop a conservation plan for a bioindicator species.
- apply the knowledge gained in this scenario to a species in the student's home region.
- design and present a report to classmates.
- work productively as a part of a project team.
- use a variety of resources to investigate the background information necessary for this project.
- keep accurate, complete records in a journal

Materials for Learning Experience #2
- One packet per group containing one copy each of the following materials:
  - *Where Do Hellbenders Fit In?* (Student Sheet #1)
  - *Help the Hellbender!* (Student Sheet #2)
- Internet and computer access in the classroom or library including power point capability.
- Notebooks or small binders or folders to be used as journals, one (1) for each student
- Chart paper and markers

Target Student Grade Level: 8-12

Subject Areas
Environmental science, biology, geography, history, ecology

Timeline
Teacher preparation: 20 minutes
Student Learning Experience: 90 minutes

Setting
Classroom, library or computer lab

Skills
Research on web sites and in print materials, organize information, solve problems as part of a team, communicate to team and classmates, present a project plan

Vocabulary
Bioindicator, climate change, ecosystem, food web, habitat, niche, predator, prey, producer, watershed

Advance Preparation

Make copies of the student sheets listed, one for each project team. Provide chart paper and markers or access to technology that will allow students to present their ideas to their classmates. Prepare a chart that will be a class version of the Student Sheet #1 food web.

Essential Question for *Move, Adapt or Die*

- How will climate change affect the organisms that live in the watershed of the Chesapeake Bay?

Essential Question for *Finding the Niche* (Learning Experience #2)

- How does loss of a species from an ecosystem affect the other species in that ecosystem?

Procedure (for the Teacher)

1. Remind students about the special status of hellbenders as a bioindicator species in West Virginia streams. Ask them to write a reflection in their journals about the continued presence of hellbenders in these streams as climate change leads to warmer water. Post a piece of chart paper that gives each team a place to vote: Will the hellbender move, adapt or die (become locally extinct) in the next 50 years?

2. Post the essential question for the learning experience on a piece of chart paper or a SMART Board. Instruct students to copy the question and a preliminary answer into their science journals. They will revisit their answers at the conclusion of this learning experience.

3. Each team should research the niche of the hellbender within its habitat. Remind the students to pay special attention to the hellbender's place in the living community's food web. Teams will summarize what they have discovered as they complete *Where Do Hellbenders Fit In* (Student Sheet #1) and be prepared to share their answers on a chart-size class food web that you have posted, and have the recorder of the group add any new information to their group's data sheet.

   Note: *The middle space on the food web is reserved for the primary producer (algae).*

4. Instruct the teams to consider what will happen to the food web within this habitat if the hellbender becomes extinct due to an increase in water temperature. On the class food web, have a student draw a line through the hellbender (eggs and larvae as well as adults) and place X's along the lines that they drew from the hellbenders to all of the other organisms that serve as their predators or prey.

5. Scientists estimate that crayfish make up 80 – 90% of an adult hellbender's diet. Ask the students to answer the following questions in their science journals. Each group should be prepared to share their ideas with the class.

   a. If a stream loses its hellbender population because of the effects of climate change, how will the crayfish population be affected?
   b. How will changes in the crayfish population affect the overall balance in the ecosystem? (*Hint: what do crayfish eat?*)

6. Instruct student teams to create a conservation plan for the hellbender based on the research they have conducted. Students will use *Help the Hellbender* (Student Sheet #2) to organize the conservation plan. Group plans will be presented during a mock meeting of biologists, role-played by their classmates. Each member of the team should contribute to the development of the conservation plan and be prepared to answer questions from the audience.

   Note: *If the students have mastered this content, teams may choose a different species in their home region that would be affected by climate change.*

7. Instruct students to review the essential questions for the entire scenario and for Learning Experience #2 and respond to the following questions in their science journals.

   a. Is it important to preserve all of the species in an aquatic community? Explain.
   b. What can individual citizens do to preserve threatened species in your local streams?
   c. What information would you and other citizens need to know about global climate change and its effects on living communities in order to make appropriate recommendations for local efforts?
   d. What can individuals do to reduce the amount and rate of climate change?
   e. What can local, state and national governments contribute to solving this problem?