

Crayfish as Invasive Species

Science Instructional Materials Lesson Upgrade

This lesson upgrade was developed as part of an Office of Superintendent of Public Instruction (OSPI) and Washington State Leadership and Assistance for Science Education Reform (LASER) project funded through an EPA Region 10 grant. The purpose of the lesson upgrades is to incorporate environmental and sustainability concepts into high use science instructional materials and also address the cultural relevancy of the lessons by incorporating Native American stories.

Grade: 3-4

This lesson replaces Investigation 3, Part 4 from the FOSS[®] “Structure of Life” instructional materials kit.



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Lesson Summary

The upgrade for Investigation 3, part 4 is a lesson about the impact of invasive species on ecosystems in which they are introduced and the impact to native species in the ecosystem.

Lesson Objectives

Students will:

- Experience through a simulation the impact that the introduction of invasive plants and animals can have on an ecosystem and the native plants and animals that live there.
- Engage in scientific practices including inquiry.
- Synthesize understanding of the impact of invasive species and apply to new ecosystems.

Student Friendly Learning Targets

- I can explain what happens to the plants and animals living in an ecosystem when a new plant or animal is introduced to that ecosystem and becomes invasive.
- I can describe the consequences if the new plant or animal is invasive.
- I can hypothesize about the outcomes when new plants or animals are introduced into any ecosystem if the new plant or animal is invasive in that ecosystem.

Essential Questions

- How do invasive plants and animals change the environment they are invade?
- How do humans impact ecosystems positively and negatively?
- How are Native American stories connected to the science and environmental concepts?

Content Standards Connections

- Environmental and Sustainability Standards: ESE1, ESE3
- Science Standards: 2-3 INQE, INQF, 2-3 LS2D, LS2C; 4-5 LS1C, LS2D, LS2E, LS2F
- A Framework for K12 Science Education (and NGSS Placeholder): CCC: Cause and Effect; LS2A,C,D
- ELA Common Core: Reading Informational Text (7)
- Social Studies: EALR 2.2.1, 2.2.2 Economics, EALR 3.3.2 Geography

Key Vocabulary

- Species
- Native
- Invasive
- Habitat
- non-native
- ecosystem
- diversity
- food chain
- predator/prey relationship

Materials

For each student:

- Green and red paper cut into approximately 2x2 inch squares with the name of a native species written on the green pieces and an invasive species written on the red pieces.
- (Optional) Invasive Species Webquest (handout at the end of this lesson).
- Large white paper or whiet board for graphing in front of the class.

- Red and green marking or white board pens.

For the class:

- Map 1-OR WA, Map 2-Dixon Creek, and Map 3-Elementary Schools (1 copy with document camera is fine)

For the Teacher:

- Teacher may do the Invasive Species Webquest should the background be helpful to their understanding of the lesson.
- Native American Story Lesson Plan
- MP3 of native American Stories
- Video of Roger Fernandez on Native American Stories

Getting Ready

1. Time to do the lesson: 60 minutes total. 20 minutes invasive species game; 20 minutes introduction and video (6 minutes and 29 seconds); 20 minutes map study.
2. Site Preparation: chairs in formation like musical chairs but with one chair per student; preload invasive species videos.
3. Materials Preparation:
 - Invasive and non-invasive species names need to be added to red and green paper for game.
 - Load video clips.
 - Do Invasive Species Webquest (see #7. below).
4. Tips for Success: students get into the game. Be sure to save enough time to debrief and discuss.
5. Safety Considerations: Caution students about running around chairs when playing game.
6. Sustainability/Conservation: Rethink, Reduce, Reuse, and Recycle materials as much as possible.
7. Teacher background knowledge: Invasive Species
 - Definition of invasive species: Invasive species are non-native species of animals, plants, microorganisms, or pathogens that take over the habitat of other species, forcing the native species to decline in population or to disappear from their natural environment. Invasive species tend to be highly competitive, highly adaptive, and successful at reproducing. (From www.wise.wa.gov, Washington Invasive Species Education)
 - Review the material at these websites:
 - www.wise.wa.gov
 - <http://www.weedcenter.org/education/k-12.html>

- <http://invasivespecies101.wordpress.com/resources>

Guiding the Investigation

Part 1: Introduction to Invasive Species

1. (Optional) Have students listen to the Native American story. Use the lesson plan as a guide.
2. Administer the Crayfish as Invasive Species pre-assessment. Score assessment using the rubric.
3. Accessing prior knowledge: In science notebooks have students record what they know about invasive or non-native plants and animals.
4. Making Predictions: Explain to students they are going to play a game where green paper represents native species and red paper represents an invasive species. In student's science notebooks have students predict what they think will happen when red species are introduced into the environment of the native green species.
5. Play invasive species game:
 - a. Set up the classroom like musical chairs, having a chair for every student. Each chair represents a potential habitat.
 - b. Give 2/3 of your students a piece of green paper with the name of a native plant species local to your school.
 - c. Give the remaining 1/3 of your students a piece of red paper with the name of an invasive plant species near your school. (The red paper will be torn up, but it does not have to have the names of invasive species on each piece)
 - d. Tell them the rules of the game. Each time a student with a red card sits in a chair that student must rip off a piece of their red paper and leave it on the chair. Then in subsequent rounds of the game, students with red cards (invasive species) can sit on blank (no paper chairs) or chairs with red paper while students with green paper (native species) can only sit on blank chairs.
 - e. Play musical chairs but do not take away any chairs. After each round of the game graph the number of **chairs** with red paper and students with red paper (as the red number) and the number of students with green paper still in the game (as the green number). Make sure to use corresponding colors as you graph the red and green students. As the game progresses all students with green cards will be eliminated from the game and only students with red cards and chairs with red paper on them will remain.
 - f. Continue playing the game until all students with green paper have been eliminated from the game.
6. Discuss the game with your students. Suggested questions:
 - a. When we started, were more of you native species (with green paper) or were more of you invasive species (with red paper)?
 - b. Students with red paper left some behind each time they sat down. What happened next?
 - c. What happened to the students with green (native species) paper?

- d. Why do you think we played this simulation (may need to explain what a simulation is?)
- e. If this is a model for something that happens in the real world, what might this be modeling? (Students should begin to realize that the chairs represent habitat space that invasive species occupy, leaving little to no habitat space for native species.)
7. Watch invasive species video (6 minutes and 25 seconds):
<http://vimeo.com/29708846>
8. From California SeaGrant. Explore www.wise.wa.gov with your students or have your students do the Invasive Species Webquest (see handout). Discuss how invasive species get to a new place, why it is important that we control invasive species (especially important to discuss: why invasive species reproduce faster than native species so they take over an environment and invasive species change their environment so native species cannot grow there anymore), what students can do to make sure they don't introduce invasive species, and what students can do to reduce or eliminate invasive species in their hometown.

Guiding the Investigation

Part 2: Crayfish

1. Accessing Prior Knowledge: Tell students, "We've been learning about crayfish. What do you already know about the habits and lives of crayfish?" Have them record in their science notebooks.
2. Activity/Investigation:
 - a. Play the first minute or so of the Dixon Creek Video:
http://www.youtube.com/watch?v=ym_hAkgTn08 While it is playing say in a dramatic voice:

"Dixon Creek is being invaded
The native signal crawfish are dying
The fish eggs are being eaten before they can hatch
The plants that live in the creak are being eaten
The problem isn't pollution...
What is it?"
 - b. Ask students to look at Map 1-OR WA, Point out Corvallis, Oregon on the map and the location of your school on the map. Now show Map 2-Dixon Creek and point out Dixon Creek on the map (the only creek on the map).
 - c. Ask students what they notice about the map, what does it look like a map of (students should recognize the map is of a city or town). This could be a map of any city or town with a creek running through it - maybe it looks similar to their home city or town.
 - d. Ask: Could something in the city be causing harm to the creek? Have students discuss in groups: What are some of the potential issues from the city that could affect the creek? (Some issues are: pollution from storm

water run-off that has motor oil, gas, or other auto fluids in it; extra fertilizer or pesticides running off of people’s lawns or gardens into the creek; garbage or other pollutants making it into the creek.) Discuss the symptoms the creek is experiencing (see symptoms above) and discuss possible reasons for these symptoms.

- e. Show students “Map 3 Elementary Schools”, each letter on map represents an elementary school. Ask students what they notice about where the schools are located. Ask students, “Could the schools in the town have anything to do with the problems happening in the creek?”
- f. Give New Clues:

A scientist was investigating the creek and noticed a crawfish he hadn’t seen before walking on the creek bed.

NOTE for teacher: The students in the schools nearby use the FOSS structures of life kits. **Do not reveal to students.**
- g. Ask students, based on what they know about native and non-native species if they have any ideas about what could be happening in Dixon Creek?
- h. Watch video: <http://news.opb.org/article/invasive-crayfish-may-be-class-pets-first/>

Student Reflection (metacognition):

1. Come back to the original game and ask students to reflect on their prediction before the green card/red card game. Did your learning change?
2. What kind of crayfish have we been using in our classroom? Do you know? Is the crayfish native to your school area?
3. What happens to the crayfish from your FOSS kit? (Make sure students understand plants and animals from classroom or home should never be released into the wild.)
4. What other kinds of science and/or school activities might be influencing the environment?

Assessment

- Formative: Monitoring student notebooks.
- Pre and Post Assessment: Crayfish as Invasive Species assessment.

Teacher Reflection

After teaching the lesson spend some time reflecting on how the lesson went, whether students met the objectives, and what adjustments you would do if and when you (or your colleagues) teach the lesson again.

Credits

- Lesson upgrade developed by Joanne Johnson, LASER Alliance Director and Kim Jones, Americorp Washington, ESD 113.
- Lesson Part 1: Introduction to Invasive Species adapted from Project WET.

Accessing Lesson Online

http://www.wastatelaser.org/_support/ESEL/structures/index.asp

Handout Invasive Species Webquest

Directions: Answers to the following questions can be found at the Washington State Invasive Species Education website www.wise.wa.gov and at <http://www.invasivespecies.wa.gov/about.shtml> the Washington Invasive Species Council website. Please be prepared to share your answers to the following questions with the class.

1. In your own words, what is an invasive species? Include information on why we care about invasive species, with special attention paid to economic and ecological reasons we care about them. The answer to this question can be found in the “About Invasive Species” section of Washington Invasive Species Council’s website <http://www.invasivespecies.wa.gov/about.shtml>.
2. What are 3 ways invasive species are introduced into a new area? For each method of introduction explain where the invasion is coming from, how this location is leading to an invasion of an exotic species, and how invasions from this location can be stopped. The answer to this question can be found in the “Pathways: How do invasive species move around?” section of Washington State’s Invasive Species Education website <http://www.wise.wa.gov/pathways/index.aspx>.
3. Give 3 examples of invasive species near your school. For each species state what the species is, what niche it takes in the environment, how the species is being controlled or eradicated, and how the species was originally introduced. The answer to this question can be found in the “Invasive Species: What might I encounter?” section of Washington State’s Invasive Species Education website <http://www.wise.wa.gov/invasiveSpecies/index.aspx>.
4. What can you do to prevent the introduction and spread of invasive species? Choose 3 user groups from the “solutions” page on wise.wa.gov and explain 3 ways each of those user groups can prevent the introduction of new invasive species or prevent the further spread of existing invasive species. The answer to this question can be found in the “Solutions: Where do I fit in?” section of Washington State’s Invasive Species Education website <http://www.wise.wa.gov/solutions/index.aspx>.
5. What should you do if you come across an invasive species? The answer to this question can be found in the “Report Sightings” section of Washington Invasive Species Council’s website <http://www.invasivespecies.wa.gov/report.shtml>.