



# Crayfish

Use the case study, lesson plan, activities, assessment questions, and Aquatic Invader Investigator page to enhance student understanding of crayfish and connect these organisms to the community. Assign assessment questions as a homework assignment, or use the questions for classroom discussions or final evaluation.

## CASE STUDY

### Perfect Invaders: How Crayfish Are Threatening Crater Lake's Smallest Creatures

<http://www.opb.org/news/article/how-crayfish-are-threatening-crater-lake-smallest-creatures-newts/>

### Invasive Crayfish May be Class Pets First

<http://www.opb.org/news/article/invasive-crayfish-may-be-class-pets-first/>

## LESSON PLAN

### Stone Soup® Crayfish Lesson Plan

Excerpt from the Introduction of the lesson plan:

Through an engaging and humorous comic strip, students will learn about biology, ecology, how invasive species are special, and the importance of learning from one's actions. Renowned cartoonist and writer Jan Eliot devoted 16 episodes of her "Stone Soup" syndicated comic strip to the story of a young girl, Alix, who releases her pet crayfish, Pinchy, into a stream near her home. Later, through a school activity, Alix learns that her crayfish is considered nonnative—or invasive—and that there are unintended consequences of releasing an invasive species. Through reading the comic strip, students learn some of the biology and ecology of invasive species and discover how humans can be both the cause of and the solution to environmental problems. Using graphic organizers, students will describe what impacts invasive species can have on the environment. After learning about biology through the lens of invasive species, students will then expand

their knowledge through a group discussion on how invasive species are spread, and then discuss the role of humans as causes of and possible solutions to problems. Finally, students will have a chance to demonstrate their knowledge of biology through invasive species and demonstrate writing skills and creativity by creating their own comic strips. An alternative assessment is available if creating a comic strip is not possible.

## About Crayfish

Crayfish are 10-legged, freshwater crustaceans that resemble miniature lobsters. Their bodies have two main sections—the cephalothorax (fused head and thorax) and the abdomen, which together have 19 segments. Large pincers and a powerful tail (abdomen) are distinguishing features of these invertebrates. Color patterns and texture on their claws and body can sometimes be used to distinguish between species. Crayfish are one of the most threatened groups of animals in the world. About 45 percent of North American crayfish species (representing about a quarter of all the world's species) are considered to be at risk of extinction. However, a few crayfish species are among the world's most invasive freshwater organisms. Taking into consideration that invasive crayfish are the leading cause of decline in native crayfish populations, it seems that the crayfish's greatest threat is other crayfish. Small populations of several species of introduced crayfish are present in California, Oregon, and Washington, but four species have been established over a fairly large area.

## LEARNING ACTIVITY

1. Find the Invasive Crayfish: Have students look online and see how many Web pages they can find that sell the invasive crayfish to your region. Discuss the problems with this high level of accessibility to invasive species and how that increases their rapid spread.

- 2. Caring for Crayfish in the Classroom: FOSS provides a descriptive instruction list about how to properly prepare for welcoming crayfish into the classroom for an interactive learning experience. Students can observe crayfish behavior, including molting, first-hand in a safe manner for the students and the organisms. This activity is a good introduction to hypothesis formulation, scientific observation, and note taking. <https://www.fossweb.com/crayfish>
- 3. Habitat and Resource Needs of Crayfish: Along with the discussion of crayfish, classes can talk about what crayfish and other organisms require for a healthy habitat, including food resources and water conditions. <http://www.nsta.org/publications/news/story.aspx?id=51806>
- 4. Crayfish Dissection: After studying the features of the living crayfish, older students can discover the anatomy through a dissection lab. Students will learn about invertebrate anatomy and be able to better understand the life cycle and habits of crayfish. Alternatively, classrooms can just use images and study the anatomy of crayfish through discussion

rather than dissection. [http://www.biologyjunction.com/crayfish\\_dissection.htm](http://www.biologyjunction.com/crayfish_dissection.htm)

- 5. Mud Bugs: All About Arkansas Crayfish: This interactive coloring book and activity guide provides an introduction to crayfish, or mud bugs, for younger students. This is specific to crayfish in Arkansas, but provides students with a learning possibility to compare crayfish characteristics and discuss why different abilities would be favorable in different environments. <http://www.agfc.com/youth/Pages/YouthPublications.aspx>

ASSESSMENT QUESTIONS AND ANSWERS

- 1 Approximately, how many crayfish species are there in the world? How many of those species are in North America? Approximately 500 species in the world, and a little more than 350 are found in North America.
- 2 At one time, how many fertilized eggs can a female crayfish produce? They can produce 200 to 800 fertilized eggs per brood.
- 3 Take a look at the Table below.

	Native range	Adult size	Claw	Carapace
Red Swamp Crayfish	South-central U.S. and northeastern Mexico	up to 4.7" (12cm - front of carapace to tip of tail)	Very bumpy; bright red spots	Rough; reddish, may have dark and light bands
Virile Crayfish	South-central Canada, northern U.S.	up to 5.1" (13cm)	Very bumpy; blue-green may have orange tips	Smooth; faint to few markings
Ringed Crayfish	Central plains and Ozarks regions of the U.S.	up to 4.7" (12cm)	Bumpy; tips with black and orange rings	Smooth; dark and light bands on either side;
Rusty Crayfish	Indiana, Kentucky, Michigan, Ohio	up to 4" (10cm)	Bumpy; tips with black and orange rings	Smooth; rust-colored spot on each side
Signal Crayfish	Oregon, Idaho, Washington, and British Columbia (invasive in California)	up to 6.3" (16cm)	Smooth; white or pale patch over the claw hinge	Smooth; variable color with faint to few markings

**Table 2.** Native range and characteristics for crayfish species invasive to the west coast. The characteristics above are of typical adults but there is a lot of variability, particularly in color, within each species.

# Crayfish

- a. Which crayfish is native to Oregon and Washington but invasive in California?  
Signal Crayfish
  - b. Which crayfish has a smooth carapace with a rust-colored spot on each side? Rusty crayfish
  - c. Which crayfish has a rough carapace and right red spots on its claws? Red swamp crayfish
- 4 Would you consider crayfish to be experts at bluffing? Yes. When fighting, the crayfish with the largest claw wins, even if the largest claw is not the strongest. In an experiment, if the claw of one crayfish were significantly larger than another's, the other would simply turn and run.
  - 5 What do you think is the evolutionary advantage of this behavior? One idea is that it reduces the amount of actual fighting and injury to the crayfish. Can you think of others?
  - 6 In Oregon, Washington, and California, which species of crayfish are you likely to find in ponds and lakes, rivers and streams, and in still and moving water? The red swamp crayfish tends to be found in pools and lakes; the ringed and rusty crayfish tends to be found in rivers and streams; and the virile crayfish tends to be found in still and moving water.
  - 7 What does it mean to be omnivorous? How could this be an advantage for invasive crayfish? Able to eat a wide variety of foods, including invertebrates, fish eggs, plants, etc. It allows them to compete with native crayfish species for food, and possibly prey on native species.
  - 8 What is something people can do to prevent the spread of crayfish? Don't move live crayfish from one location to another.

## Don't Let it Loose!

Be careful not to spread invasives: Any time you visit a natural area, either in the water or on dry land, you could be spreading invasive species. Before you leave for the field trip, it is important to inspect your boots, nets, or any other gear to make sure they do not have seeds or other plant material attached. You should also check and clean your boots and gear before you leave the field site.

## ADDITIONAL RESOURCES

Crayfish Species Guide from the Menace to the West Curriculum  
<http://seagrant.oregonstate.edu/menacetothewest/species-guide/crayfish>

Red swamp, virile, and native signal crayfish identification:  
[http://wdfw.wa.gov/fishing/shellfish/crayfish/crayfish\\_id\\_guide.pdf](http://wdfw.wa.gov/fishing/shellfish/crayfish/crayfish_id_guide.pdf) [last accessed April 2017]

Identification guide for Pacific Northwest invasive species  
[http://depts.washington.edu/oldenlab/wordpress/wp-content/uploads/2013/03/Orconectes-rusticus\\_Govas.pdf](http://depts.washington.edu/oldenlab/wordpress/wp-content/uploads/2013/03/Orconectes-rusticus_Govas.pdf) [last accessed April 2017]

Crayfish Invasion, an OPB video  
<http://www.opb.org/television/programs/ofg/segment/crayfish-invasion/> [last accessed April 2017]

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