

Next Generation Science Standards

Crosscutting Concepts

- Cause and Effect: Mechanism and Explanation
- Stability and Change
- Systems and System Models

Science & Engineering Practices

- Developing and Using Models
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information

Core and Component Ideas in the Life Sciences

LS2: Ecosystems: Interactions, Energy, and Dynamics

- LS2.A: Interdependent Relationships in Ecosystems
- LS2.C: Ecosystem Dynamics, Functioning, and Resilience



Common Core State Standards

Speaking and Listening Standards for Grade 6

(similar standards for grades 4–5; 7–12)

Standard 1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Standard 4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Standard 6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

College and Career Readiness Anchor Standards for Writing

Standard 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Standard 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.



Center for Great Lakes Literacy Principles

Principle 5. The Great Lakes support a broad diversity of life and ecosystems.

Principle 6. The Great Lakes and humans in their watersheds are inextricably interconnected.



Teacher Background

An **invasive species** is defined as any non-native organism that causes harm to the environment, economy, or human health (EPA: epa.gov/greatlakes/invasive-species-great-lakes-0). It can take over the habitat of native 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 (Washington Invasive Species Education: wise.wa.gov).

A few species of crayfish are invading freshwater ecosystems around the world at an alarming rate. This negatively impacts countless species, including many native crayfish species, which have become one of the most threatened groups of organisms in the world. In fact, an estimated “45 percent of North American crayfish species are considered to be at risk of extinction” (“Menace to the West: Crayfish”:
seagrant.oregonstate.edu/sites/seagrant.oregonstate.edu/files/invasive-species/toolkit/crayfish.pdf). Invasive crayfish are believed to be the leading cause of this decline, and humans have played a significant role in their spread, through release of classroom science organisms, live fishing bait, pets, etc.

Additional information and visuals are found in the introduction to this curriculum and in the “Expand Knowledge + Skills” section at the end of the lesson.

Materials

- Copies of the following for each student (found after lesson):
 - “The Mystery of the Changing Crayfish Populations”
 - *Optional*: “Invasive Species Project”
- Graph paper or graphing software
 - Graph paper can be generated in different formats and printed free at incompetech.com/graphpaper.
 - Alternatively, Microsoft Excel and Google Sheets are two programs that can be used to create graphs. “How to Make a Line Graph in Excel” is one of many videos and web pages online that explains the process: youtu.be/3o11OllgYDo
- Markers, crayons, or colored pencils for students to share
- *Optional*: Posterboard

Preparation

1. Ensure all materials above are ready for student use.
2. *Optional*: Learn more about topics in the lesson in the More Resources/References section at end of the lesson to prepare to answer student questions.
3. *Optional*: Arrange for a guest speaker with expertise on freshwater habitat restoration projects to visit your class. Contact us here for possible recommendations: invasivecrayfish.org/contact-us

Teaching Suggestions in the 5E Model

Engage

1. Engage students and encourage them to apply prior knowledge by asking what they would do if they discovered that native crayfish and other macroinvertebrates (small animals without backbones) seem to be less common in a nearby stream, while some new crayfish species are appearing there.