



Promoting Interest in Science & Science Careers through Field Trips to the Belle Isle Aquarium and Lesson Plans about Invasive Species



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Native Species and Invaders: Which One Doesn't Belong?

Target Grade: _____ 5th _____

Unit Driving Question: What are invasive species and how do they impact our environment?

Lesson Level Question: What properties of an invasive plant or animal distinguish it from a native species?

Plan for success using NGSS: Lessons and assessments should be designed in a way that allows students to engage in all three dimensions simultaneously.

NGSS Performance Expectation(s):	The 3-Dimensions of the Next Generation Science Standards		
5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Science and Engineering Practices: Eight practices that represent how scientists investigate the natural world.	Disciplinary Core Ideas: Key ideas in science that have broad importance.	Cross Cutting Concepts: Concepts that have connections across all domains of science.
	SEP: Asking questions, engaging in argument from evidence, and obtaining, evaluating, and communicating information.	DCI: LS2 Ecosystems: interactions, energy, and dynamics.	CCC: stability and change
Learning Target: <i>(Written in a way that does not give away any scientific discovery opportunities)</i> At the end of this lesson students will be able to identify common invasive species.	Academic Language: <i>(Students should <u>discover</u> these terms and concepts through scientific investigations)</i> Invasive Species		Materials: Smart board/ Projector Student Science Journals Which one doesn't belong? visual document Invasive Species books
	3-Dimensional Learning Elements		
Phenomena: <i>(Real-world/natural occurrence used to create or support the Driving Question)</i> Engage: Pacific salmon are currently found in the Great Lakes but originally were found along the west coast of the United States. The alewife fish and the sea lamprey came from the Atlantic Ocean. Lake trout have been in the Great Lakes for thousands of years. Lake trout are considered to be native species. The alewife and sea lamprey are both considered to be invasive species. What do you think about Pacific salmon? Are they invasive species? Background (teacher guide): Here is some background on the fish mentioned in the engagement "phenomena,"		Lesson Connection to Phenomena: <i>(How does this investigation help students explain the phenomenon)</i> Students will analyze the phenomenon and discover that (a) native species (e.g., lake trout) are not considered invasive species; (b) a non-native species may be considered invasive if it harms a native species or causes harm to the economy or	

quoted from <https://dnr.wi.gov/wnrmag/html/stories/1998/jun98/mich.htm>

“The sea lamprey was first observed in Lake Michigan in 1936. This eel-like predator with rasp-like teeth victimized lake trout, lake sturgeon, lake whitefish, and burbot. These fish had no natural defenses against the sea lamprey. By the mid 1950s, lamprey had all but eliminated the native population of lake trout in Lake Michigan, and significantly reduced populations of other species.

Like the sea lamprey, the alewife also entered the upper Great Lakes through the Welland Canal and was first documented in Lake Michigan in 1949. When the lake trout population collapsed in the 1950s, there were no predators to control alewife and their population grew rapidly. By 1967, alewife comprised an estimated 85 percent of the mass of the Lake Michigan fishery. [Large die-offs of alewives often washed up on shore creating a nuisance and making some beaches unusable].

The alewife population explosion affected many other fish species in Lake Michigan. Six of seven chub species were eliminated and the commercial chub season was closed. Lake herring, yellow perch, and emerald shiner populations crashed. From the mid 1950s through the mid 1960s, neither commercial netters nor sport anglers found the Lake Michigan fishery desirable.

During the mid 1960s the U. S. Fish and Wildlife Service and its Canadian counterpart developed techniques to limit sea lamprey reproduction. Selective chemicals and physical barriers were used throughout the Great Lakes and lamprey populations were reduced, but not eliminated. Unfortunately, lamprey control came too late to save Lake Michigan lake trout.

Predatory fish were desperately needed to control the burgeoning alewife population. Fish managers selected strains of Pacific salmon to do the job. In 1966 coho salmon were stocked in Lake Michigan followed by chinook salmon in 1967. Salmon did well and grew quickly. Twenty-pound coho and 30-pound chinook were not uncommon. Rainbow, brown, brook, and lake trout were also stocked in Lake Michigan.

Sport anglers quickly learned how to catch the trout and salmon, and an exciting new sport fishery was born.” Here are pictures of an alewife (left) and a Pacific (Chinook) salmon (the other two are already included in the “Which one doesn’t belong?” game).



to human health (e.g. sea lamprey harm a native species, lake trout; alewives crowded out other species and when they died on the beaches were human health hazards and caused economic harm to tourism)

(c) a non-native species may be helpful to native species and therefore not considered to be invasive (e.g., Pacific salmon reduced the number of alewives greatly and became a favorite catch for people who liked to fish).

Understanding these phenomena therefore will help students understand how to identify when a non-native plant or animal should be considered an invasive species.

Exploration, Discussion, Investigation Activities:**Explore**

After discussing the four species in the “engagement” phenomenon, the teacher will project the Which one doesn’t belong? Visual document for the class. The students should have their science journal open to a blank page to record their thinking throughout the lesson. The teacher will then instruct the students that they will be acting as scientists to determine which plant or animal doesn’t belong and explain why. The teacher will direct the class to look at the first set of images and will give them about 5 minutes to decide which one doesn’t belong and record their thinking in their science journal.

Discussion: Explain

After a reasonable amount of time has passed ask students to share their thinking with a table partner. After about 2 mins bring the classes attention back to the front and start a whole group discussion. The teacher can ask students to raise their hand and share their thinking. After the student is done the teacher can have other students share their evidence in favor or disagreement to promote a scientific discussion.

Investigate: Elaborate

When the discussion is over the teacher can scroll to the next set of images and repeat the above steps. The last set of images should make for an especially vigorous discussion. Unlike the previous sets of images in which only one of the organisms is an invasive species, in the last set, the “odd one out” is a native species. All the rest are invasive species. After discussing all of the sets of images, students should record in their journals any new ideas they have about how to identify an invasive species

Differentiation of instruction for exceptional learners:

Gifted or advanced students can be challenged to create their own “Which one doesn’t belong?” set of pictures to share with classmates. Introduce these students to where they can look up the names and pictures of more invasive species on the internet, for example, at <https://www.michigan.gov/invasives/0,5664,7-324-68002---,00.html> and https://www.michigan.gov/invasives/0,5664,7-324-68002_74188---,00.html . Pictures of Michigan native species can be found at https://www.mlive.com/entertainment/2017/02/michigans_endangered_and_threa.html and <https://www.exploringnature.org/db/view/Michigan-Habitats-Mammals-Birds-Amphibians-Reptiles>

Students with learning challenges can work with a partner for the journaling task and the teacher can re-teach concepts in small group as needed.

Formative Assessment(s): *(Progress monitoring strategy used to assist with lesson adaptations based on students’ needs)*

<p>Student Artifact: <i>(Tangible evidence of student learning)</i> Journal entry Student created “Which one doesn’t belong?” (optional for advanced students)</p>	<p>Student Discourse: <i>(What you should hear that is evidence of student learning; see Talk Moves)</i> Students should explain their thinking and provide evidence (I chose this one because...) (I think this because...) (This one doesn’t belong because...)</p>
<p>Learning Extensions: <i>(Learning beyond the classroom)</i> For further investigation students can read books on invasive species, use online resources such as the Michigan DNR website, or visit the Belle Isle Aquarium.</p>	

Resources consulted for this lesson:

For the history of lake trout, alewives, sea lamprey, and Pacific salmon in the Great Lakes: <https://dnr.wi.gov/wnrmag/html/stories/1998/jun98/mich.htm>

For pictures of invasive species in the Great Lakes: <https://www.michigan.gov/invasives/0,5664,7-324-68002---,00.html>

For pictures of Michigan native species https://www.mlive.com/entertainment/2017/02/michigans_endangered_and_threa.html and <https://www.exploringnature.org/db/view/Michigan-Habitats-Mammals-Birds-Amphibians-Reptiles>

For a “watch list” of potential new invaders of Michigan: https://www.michigan.gov/invasives/0,5664,7-324-68002_74188---,00.html

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Which One Doesn't Belong?



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Turtles



ADAM WITTE, BEEBEE/ISTOCKPHOTO

Lake Sturgeon



Goldfish



Catfish

Which One Doesn't Belong?



Phragmites



Strawberries



Lily Pads



Tiger Lily

Which One Doesn't Belong?



Wasp



Honeybee



Emerald Ash Borer



Mosquito

Which One Doesn't Belong?



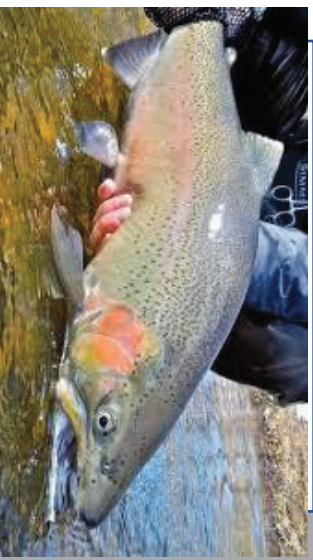
Zebra Mussel



Sea Lamprey



Asian Carp



Lake Trout