



Golden Invader

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DPSCD Lesson Planner

Teacher: Marcerlean Green Grade: 5th

Unit Driving Question: How do invasive species affect the ecosystem of the Great Lakes?

Lesson Level Question: Why are goldfish considered an invasive species?

Plan for success using NGSS: Students will be able to build a model demonstrating the invasiveness of GOLDFISH in the Michigan Great Lakes			
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: #1 Asking questions and defining problems. #2 Developing and using models #3 Planning and carrying out investigations. #4 Analyzing and Interpreting data #6 Constructing explanations and designing solutions. #8 Obtaining, evaluating, and communicating information.	DCI: LS2: Ecosystem, Interactions, Energy, and Dynamics LS4: Biological Evolution, Unity, and Diversity ETS1: Engineering Design	CCC: CCC #2 Cause and Effect CCC #4 System and System Models CCC #7 Stability and Change

Learning Target: (Written in a way that does not give away any scientific discovery opportunities)

How do invasive species affect the ecosystem of the Great Lakes

What are five aquatic invasive species that live in Michigan?

Why and how are GOLDFISH an invasive species?

Academic Language: (Students should **discover** these terms and concepts through scientific investigations)

- Invasive species
- Ecosystem
- Primary Producers
- Food Chain
- Food Web
- Algae Blooms
- Great Lakes

Materials:

- Poster Boards
- Markers/ Color Pencils
- Computer
- Shuffle Cards with Invasive Species and their characteristics
- White and Colored card stock
- Tape
- One set of 16 Aquatic Invasive Species Game Cards

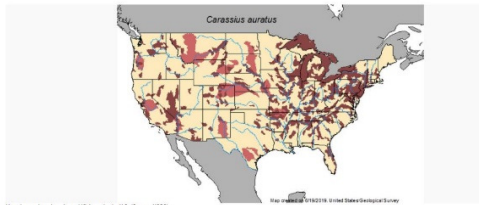
3-Dimensional Learning Elements

Phenomena:

Show a picture of goldfish that have been observed in some of the Great Lakes.



Goldfish in Lake Ontario

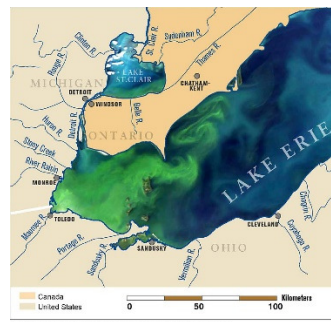


Map showing where goldfish have been found in USA

Show a picture of an algal bloom in western Lake Erie.



Bolles Harbor



The algal bloom in Lake Erie is bright green.

Ask: Is the goldfish natural to these lakes? Could the occurrence of algae blooms be caused by the goldfish?

Lesson Connection to Phenomena: (How does this investigation help students explain the phenomenon)

- Students will investigate how goldfish got into the Great Lakes and whether they are invasive species. The students will create informational text that will provide information on GOLDFISH and their invasive habits in the great lakes.
- Together, students will create a Great Lakes food chain with and without GOLDFISH and will explore the questions: Could goldfish be the cause of algal blooms in a lake? Are they the cause of the algal bloom in Lake Erie?

Exploration, Discussion, Investigation Activities:

Ask driving questions:

1. What are invasive species?
2. How do invasive species affect the GREAT LAKES ecosystem?
3. What are the reasons why GOLDFISH are considered invasive species in the Great Lakes?
4. What effects have GOLDFISH had on the GREAT LAKES ecosystem?

Review Definitions:

- **Invasive species:** a non-native species that causes harm to the environment, human health, or the economy
- **Great Lakes:** five freshwater lakes of central North America between the United States and Canada, including Lakes Superior, Michigan, Huron, Erie, and Ontario.
- **Algae Blooms:** a rapid growth of microscopic algae (single celled plants that contain chlorophyll) or cyanobacteria (these also contain chlorophyll) in water, often resulting in a colored scum on the surface.
- **Goldfish:** aquarium pet fish that are domesticated carp that were originally bred in China. Often bright orange, they can have many different color patterns.
- **Food Consumption:** the eating, drinking, or ingesting of something for nutrition
- **Food Web:** the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community
- **Sediment:** the accumulation of sand and dirt that settles in the bottom of lakes.
- **Erosion:** A type of weathering in which surface soil and rock are worn away through the action of glaciers, water, and wind
- **Primary producer:** Usually plants and algae, which perform photosynthesis in order to manufacture their own food source.
- **Primary consumer:** herbivores eat only plants and algae as their sources of energy.
- **Secondary consumer:** Animals that consume only herbivores are referred to as secondary consumers.
- **Disease:** an illness of people, animals, plants, etc., caused by infection or a failure of health rather than by an accident

Review background information:

Background about these phenomena can be found on the following web sites:

<https://www.arcgis.com/apps/MapJournal/index.html?appid=510f12b73dc14b449e07dd181bbfbfa>

https://www.youtube.com/watch?v=Ahn94mX_vM

<https://www.youtube.com/watch?v=Zysydqn6P1o>

<http://root-cause-analysis.info/2015/07/09/small-goldfish-can-grow-into-a-large-problem-in-the-wild/>

A short explanation is the following: Goldfish have been found in large numbers in some parts of Lake Ontario and Lake Erie. They were probably introduced to the lakes by people disposing of pet goldfish into a stream or pond that ultimately runs into the Great Lakes. Most of the goldfish now found in the Great Lakes probably were born in the Great Lakes as a result of the introduced pet fish. They compete with native fish for food and they may also eat the eggs of native fish. Some scientists think their interactions with sediments and with native herbivores may result in algal blooms. The algal blooms in Lake Erie depend greatly on nutrients that drain off farm fields, but other factors, such as the type of algae or the presence (or absence) of herbivores, may contribute to their recent broad occurrence. The algal blooms in Lake Erie are particularly bad because they are a type of bacteria that produces toxic chemicals that make the water unhealthy to drink and have bad effects (like slowing reproduction and growth) on animals living in the water where the algal blooms occur.

See also:

"Invasive goldfish draw concern from wildlife officials: <https://www.apnews.com/5bec91823f574d16bf81535392300eda>

State Officials classify goldfish as an invasive species. The aquarium pets are domesticated carp originally bred in China. Goldfish can carry diseases and bacteria that harm the ecosystem and other marine animals and among other misplaced aquatic species causing damage in Alaska."

5 things to know about Great Lakes goldfish - https://www.mlive.com/news/2016/04/lake_erie_goldfish

https://www.mlive.com/news/2016/04/great_lakes_goldfish.html

Apr 28, 2016 - Goldfish, also called gold carp, are not native to the U.S. and Canada. In Michigan, the species isn't invasive per se, but they are considered to be a nuisance; though, not a very problematic one.

Activity

- The students will research background information in small groups to organize invasive species cards, and rank the species from, "Most Invasive," to "Least Invasive."
- Students will then present their findings, and likely ruling out GOLDFISH as the most invasive in the Great Lakes. [however, students may find that in some places GOLDFISH are considered to be most invasive]
- Students will learn what an algae bloom is and consider whether goldfish may have contributed to algae blooms in Lake Erie
- Students will then create a 5 STEP action plan poster displaying all of the solutions to the GOLDFISH invasive species problem as it relates to the Great Lakes.

Procedure:

- Students will be divided into groups of 3 or 4 and are given 16 shuffled cards- 8 photo cards and 8 characteristic cards.
- Match each invasive species with the corresponding characteristics and impacts on the GREAT LAKES
- Review matches and cards once they are done.
- Rank from "Most," to "Least," invasive, and explain the rationale for your ranking.
- Students will discuss whether goldfish might have contributed to algae blooms in Lake Erie or elsewhere in the Great Lakes.
- After presenting their findings, students will create a 5 STEP action plan poster displaying possible solutions to the GOLDFISH invasive species problem while using a GOLDFISH invasive species food web as a reference.

Time

- 120 minutes (two 60-minute classes)

Differentiation of instruction for exceptional learners:

- Assign groups and assign roles within each group (reader, recorder, presenter.)
- Use drawing/colorful pictures with electronic media to create a representation of the invasive species.
- students will create a 5 STEP action plan poster displaying all of the solutions to the GOLDFISH invasive species problem while using a GOLDFISH invasive species food web as a reference.

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

Student Artifacts:

- Drawing of an invasive species, focusing on the distinguishing characteristics of the species
- 5-step action plan poster focusing on solutions to the GOLDFISH invasive species problem.
- GOLDFISH Food Web

Student Discourse:

Turn and Talk

- Knowledge of what an invasive species is.
- The effects of an invasive species once it enters the GREAT LAKES
- The rationale on which species is the most invasive and why

Learning Extensions:

- Create a cartoon or story explaining the invasive impact of a GOLDFISH in the GREAT LAKES.