

Invasive Species Game – Lesson Plan

Purpose:

Students will be introduced to the effects an invasive species has on an ecosystem. The limit of food and other nutrients will cause stagnation of native species growth or even decline, depending on the behavior of the organism.

Objectives:

- 1) Students will understand that resources are limiting factors in an ecosystem
- 2) Students will understand that each organism has adaptations that allow it to obtain resources
- 3) Students will understand that invasive organisms can upset the balance of an ecosystem and out compete native species for available resources

Context (Background Information):

This particular game involves the Goby an invasive species in Lake Erie. This game can be modified to be any invasive species depending on your region and natural inhabitants.

This game can be utilized when teaching about life cycles, pollution (pollution would reduce vital nutrients), invasive species, and aquatic life.

Ohio Academic Content Standard:

Explain how living things interact with biotic and abiotic components of the environment (e.g., predation, competition, natural disasters and weather).

By the end of the 12th grade, students should know that:

- Ecosystems can be reasonably stable over hundreds or thousands of years. As any population grows, its size is limited by one or more environmental factors: availability of food, availability of nesting sites, or number of predators. 5D/H1*
- If a disturbance such as flood, fire, or the addition or loss of species occurs, the affected ecosystem may return to a system similar to the original one, or it may take a new direction, leading to a very different type of ecosystem. Changes in climate can produce very large changes in ecosystems. 5D/H2*
- Human beings are part of the earth's ecosystems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems. 5D/H3

Equipment:

Per five person group:

5-cups
2-plastic knives
1-plastic spoon
3-plastic forks
1-large binder clip
10 red pom-poms
12 black pom-poms
10 white pom-poms
3x4 piece of felt
25 bingo chips
1 timer

Per four person group:

4-cups
2-plastic knives
1-plastic spoon
1-fork
1-large binder clip
8 red pom-poms
10 black pom-poms
8 white pom-poms
3x4 piece of felt
20 bingo chips
1 timer

Set-up:

There are four native species; one with a plastic spoon (perch), one with two knives (bass) in one hand, one with one fork (blue gill), one with two forks (walleye) in one hand. It is important to note that tools can only be held in ONE hand. So holding the two knives will take the dexterity of operating chopsticks. If this is too difficult for students, make changes as necessary.

Eating habits:

Perch eats only white

Walleye eats only white and red pom-poms

Blue gill eats only black

Bass eats black and red

Gobies eat anything (using a binder clip) and are introduced after a few rounds so students can see how stable their ecosystems are before and after the Goby.

Instructions:

- Randomly distribute the pom-poms onto the felt.
- Each of the four native fish will have 30 seconds per round to collect food using one hand and their assigned tools.
- The native fish will play 3 rounds before the invasive (Goby) arrives.
- Play will continue with the goby now competing for resources for 3-5 more rounds.
- It should be made clear to the gobies that it is in their benefit to eliminate native species. Their tactics should include selective feeding to knock out other species, e.g., eating only white, so the species that can only eat white cannot get enough to reproduce.

Scoring:

Each fish starts off with three lives represented by bingo chips.

At the end of the round each fish needs 5 pom-poms to survive the round

For every 3 pom-poms beyond the first 5 the fish produces 1 offspring which counts as an extra life. e.g. after round one the perch has collected 9 pom-poms, the perch does not lose a life (bingo chip) this round since he found five. The perch also gets one additional life (bingo chip) because of his three additional pom-poms. The ninth pom-pom only serves to keep other fish from reproducing.

Once the fish is out of lives he becomes extinct and that player joins the Goby player, collecting pom-poms with another binder clip.

Post-activity discussion questions:

- 1) Were you able to compete with the other native species for resources necessary to your survival and reproduction?
- 2) Were you able to compete with the invasive species for resources necessary to your survival and reproduction? Why? What made the Goby so successful?
- 3) What could be the consequences of organisms entering an ecosystem that have a competitive advantage over the native species?

Extensions

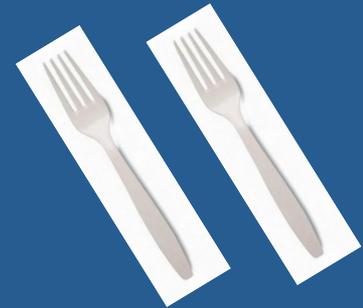
This can be applied to any ecosystem and can be used for pollution as it removes nutrients (eliminate some pom-poms after a few rounds) or as pollution as a poison (have one random color be a poison each round, this would require more pom-poms and a few more colors to make feeding more random).



Round Goby

Neogobius melanostomus

- Invasive, bottom dwelling fish
- Mottled coloring with frog-like raised eyes
- Habitat: Nearshore areas of the Great Lakes and tributaries



Walleye

Sander vitreus

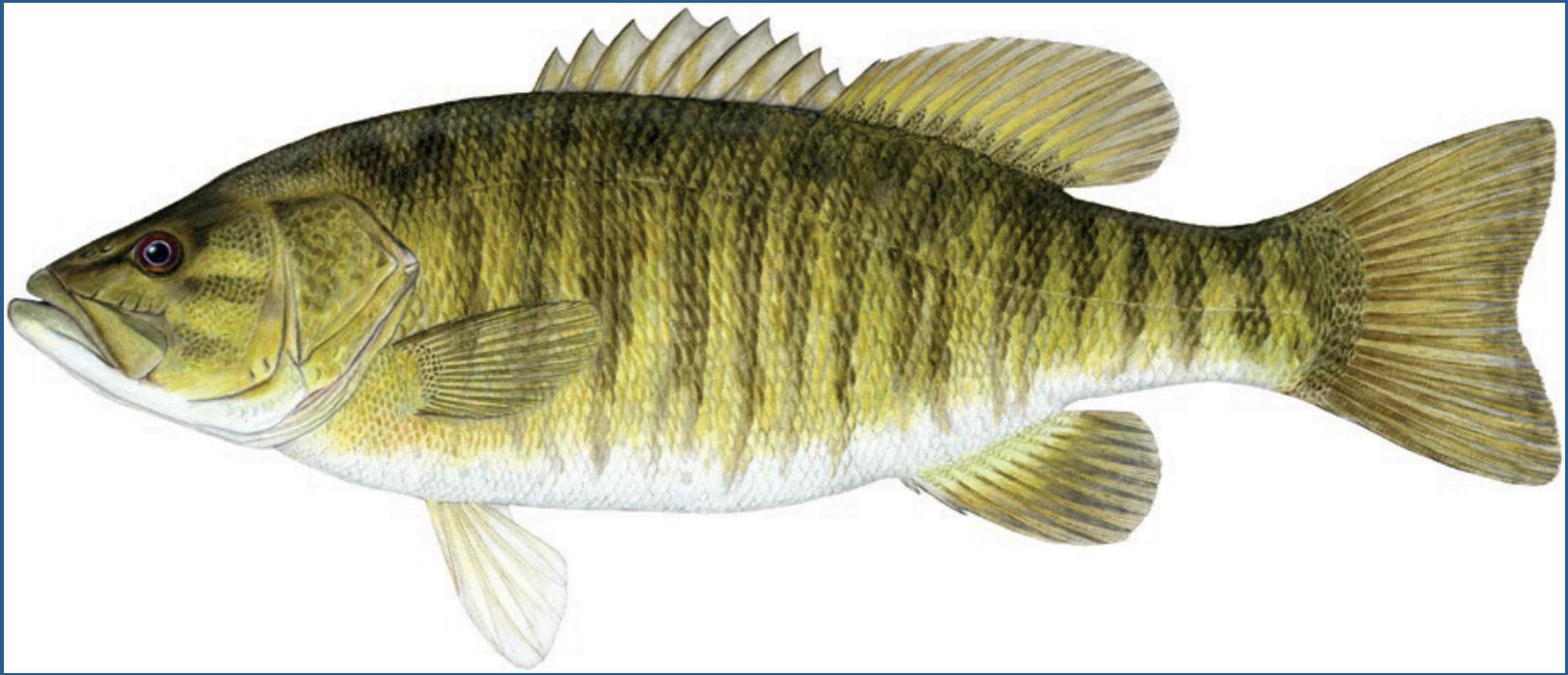
- Popular Great Lakes sport fish
- Slender body with pointed snout. Two dorsal fins.
- Habitat: Moderately fertile lakes with primarily sandy basins.



Yellow Perch

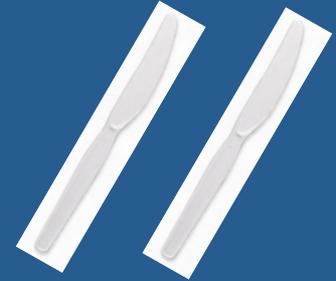
Perca flavescens

- Important food and sport fish throughout the southern part of the Great Lakes region.
- Two dorsal fins. Body has distinct vertical bands.
- Habitat: Quiet ponds, streams with little current; large and small lakes.

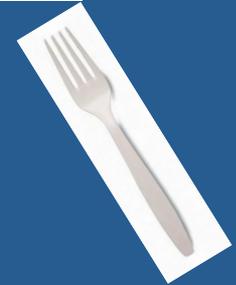
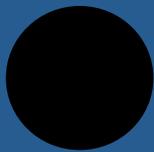
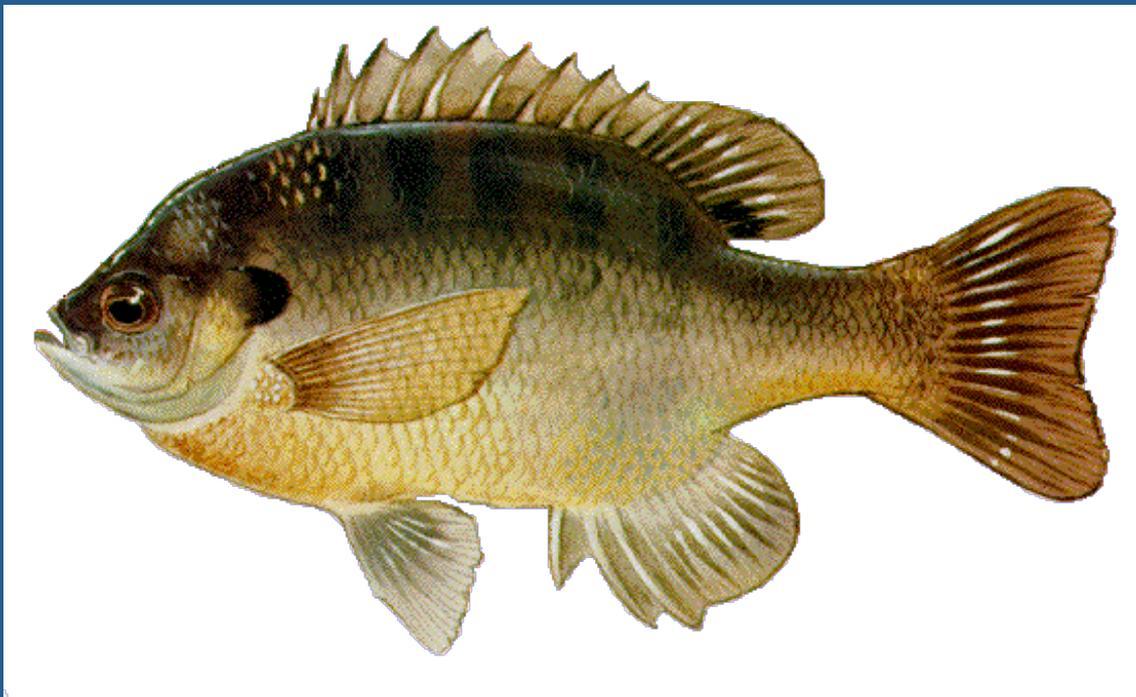


Smallmouth Bass

Micropterus dolomieu



- Popular sport fish in Canadian and U.S. waters
- Narrow, oval-shaped body. Long dorsal fin with spines in first half and soft rays near end.
- Habitat: Clear, gravel-bottom runs in flowing rivers; shallow rocky areas of lakes.



Bluegill

Lepomis macrochirus

- Common and abundant sport fish
- Deep bodied with a solid black operculum (ear flap).
- Habitat: Clear lakes and ponds that have some aquatic vegetation