



Social Carrying Capacity: AIS Edition

Authors: Michigan Water Stewardship Program, Eaton Conservation District, borrowed from the Department of Natural Resources (Aquatic Invasive Species Education Project)

Lesson Overview: Discuss how different interested parties affect the management of fisheries issues through a hands-on balancing act.

Objectives: Students will be able to:

- ~ Identify different interested stakeholders for a variety of situations.
- ~ Recognize the difference between social and biological carrying capacities.
- ~ Construct an argument based on opinion and facts, and be able to relay that information to others.

This lesson meets the following Michigan Department of Education standards:

Next Generation Science Standards (NGSS):

- ✓ MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- ✓ MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- ✓ MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- ✓ HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- ✓ HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Recommended Grade(s): 6th, 7th, 8th, 9th, 10th, 11th, 12th

Recommended Subject(s): Science **Duration:** Prep time: 10 min., Activity: 40 min

Materials Required: at least three 20 ft lengths of rope, each tied to make a skinny long oval (1 length of rope for every 2-4 students); natural resource issue cards; stakeholder cards; natural resource/wildlife issue props.

Suggested Vocabulary for Students: words, words

Background Information for Educator:

Wildlife management is defined as “the science and art of managing wildlife and its habitat, for the benefit of the ecosystem, the animals and humans”. But how do fisheries biologists do that? They do it by following a few basic rules:



- ~ Good management must be based on solid biological information.
- ~ Good management must include the management of humans, because our activities affect the ecosystem.
- ~ Good management must benefit plants and other animals, not just one species of wildlife.
- ~ Good management must put animals' numbers at a level we can live with—not too many and not too few.
- ~ Good management must balance animal numbers with the habitat (food, shelter, water and space) available for those animals.
- ~ Good management must balance conservation (wise use) of the resources—not total preservation (non-use) of the resources.

Biological carrying capacity is the number of animals an area can support throughout the year without permanently damaging the habitat or starving the animals. Example—when there are too many animals for the habitat, the animals may eat too much of the vegetation that makes up its food and cover. Once that vegetation is gone, the habitat is damaged and the carrying capacity of the area goes down. With less habitat or poor habitat, the weaker animals will die from disease, starvation, predators or other causes. Fewer animals will be able to live there. As habitat is improved and food becomes more abundant (often initiated by DNR biologists), the carrying capacity goes up again.

Social tolerance (Social Carrying Capacity/Cultural Carrying Capacity) is the number of animals the resource managers or public will allow in an area.

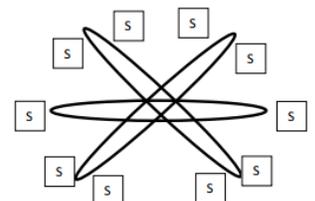
Lesson Procedure:

Introduction:

- ~ What are biological and social carrying capacity? What is a stake holder?

Activity:

- ~ Have the students choose a natural resource issue that people may have varied or opposing opinions about (or introduce one). Examples can be found in the Issues Cards copy me pages. Discuss the scientific facts surrounding the issue and why controversy may be present.
- ~ Each student should choose one Stakeholder Card that they feel would have an opinion about the issue, and develop their position statement from that stakeholder's perspective. If there are more students than cards, students may pair up.
- ~ Place the Issue Card you've discussed in the middle of a table. One at a time have students announce which Stakeholder Card they chose, and present their position about the issue, then place their Stakeholder Card in a circle surrounding the Issue Card.
- ~ Ask the students if there is a way to balance the opinions of the stakeholders to fix the issue, or implement a unified strategy about the issue, if there are solutions list them. What happens if there are none?
- ~ Next, lay out the 3 ropes, with the centers overlapping in a starburst pattern.
- ~ Have the students choose another issue by selecting from your prop choices. For example, a stuffed salmon. Discuss the scientific facts surrounding the raising of salmon in hatcheries for the purpose of stocking the great lakes. Which lakes are successful? How do you balance the fishers need for more fishing opportunities?



- ~ Have each student or pair of students choose a Stakeholder Card to build a position statement, and have them state their position, then place their card at one end of a rope, so that each rope end ends up with at least one Stakeholder Card next to it -shown by the S boxes above.
- ~ Place the stuffed animal on the nexus of the 3 ropes, have the students each grab an end of each rope next to their card.
- ~ Direct the students to work together to raise and balance the stuffed fish in the center of the ropes. Is it easy? What happens if you drop the bottom rope a few inches-which stakeholders does that rope represent? Are all stakeholders equal in this simulation? What happens if one rope goes off center? When is it easiest to balance the fish?
- ~ Ask the students if they know the definition for Biological Carrying Capacity. Ask them if they know what Social Carrying Capacity is? Explain that Social Carrying Capacity is often lower than the Biological Carrying Capacity—and ask them why?
- ~ Have the students run through another round with a familiar issue. Have them choose their Stakeholder Card and determine their position statement, and place their cards on the rope ends where they feel their impact fits (maybe animal rights activists and universities at either end of the bottom rope, with fishers and boat owners on the top rope), place a small toy boat on the center of the ropes.
- ~ Have them again manipulate the ropes to see if they can balance the boat, and discuss what happens to the social carrying capacity when the bottom rope is removed, or others move off center.
- ~ Wrap Up: Have the students summarize what inferences they could make about future natural resource issues.

Adaptations/Extension/Enhancements:

- ~ With younger students, you can skip the stakeholder discussion portion of the activity and begin with the rope balance as a game. Have them wear the stakeholder cards as name badges, and have them work to balance the stuffed animal on the center of the ropes.
- ~ Discuss how there are a lot of people involved in helping our lakes to be balanced. Do they have people in their family that use or depend on the lakes? (Fishers, boaters, scientists, etc.)
- ~ Use larger and smaller stuffed animals to make the game easier and harder. Are some species easier to make a decision about?

Additional Resources:

- ~ MWSP website: www.miwaterstewardship.org
- ~ This is the link to the original DNR invasive species lesson plan series: https://www.michigan.gov/documents/dnr/Aquatic_Invasive_Species_Education_project_607805_7.pdf
- ~ MDARD: https://www.michigan.gov/mdard/0,4610,7-125-1599_29980---,00.html
- ~ Great Lakes Restoration Initiative: <https://www.glri.us/>

Our MWSP logo represents the two hands of Michigan - both the upper and lower peninsulas - and caring for our water resources and water quality. The green hand symbolizes all vegetation and crops in our state and the tan hand symbolizes soils. The lighter blue water signifies the vast surface water throughout the state and the darker blue water denotes groundwater.



Boat Owner	Fishers
Law Enforcement	Media
Animal Rights Activist	Department of Natural Resources
Canadian Government	Department of Environmental Quality
Department of Agriculture and Rural Development	Stakeholders (Trout Unlimited, Steelheaders, etc.)

Universities	Local Community Citizens
Lakeshore Property Owners	Economic Development Agencies
Business Partners (oil, gas, minerals)	Retail Sales (Bait shops, sporting goods)
Local Businesses (restaurants, hotels)	Commercial Fishers
Other Great Lakes State Governments	Fisheries Commission

