**Warning Signs**

**Topic:** Invasive species and impacts on ecosystems

**Target Grade Range:** 3rd-5th and secondary

**Time:** 60-90 minutes (in addition to schoolyard exploration)

**Category:** Create and research

**Summary:** After surveying and/or researching their geographic area, students will create informational signage to alert people of unwanted contact or unintentional spreading of invasive species near their home, school, or community.

**Goal:**

* Students understand how invasive species interact with natural ecosystems and people.
* Students communicate invasive species concerns to community members.

**Objective(s):**

* Students research invasive species near their home, school, or community and the impacts these species have on native species and ecosystems.
* Students design signage to inform and educate community members about invasive species concerns in their area.

**Background knowledge/prior experience:**

* Prior to this activity, students should survey a natural area to observe plants and animals near their home, school, or community. (Consider the “Schoolyard Plant Bingo” activity resource as an introduction to outdoor exploration and observation.)

**Note:** before taking students outdoors for scientific exploration, educators should survey the area (with an expert from a local natural resources agency if available) to ensure any organisms that may have a health concern are marked (e.g., poison ivy, *Toxicodendron radicans*)

* Students might already be familiar with invasive species or this can be an introductory exercise.

Resource: Introduction to invasive species video, Michigan Department of Environment, Great Lakes, and Energy (MI EGLE), *Invasive Species: The Basics* (<https://www.youtube.com/watch?v=yIgysZ5Hho8>)

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**Procedure:**

*Materials:*

* Warning Signs: student guide teacher example
* Warning Signs: student guide
* Warning Signs Rubric
* Example Templates:
	+ Warning Signs Template 1
	+ Warning Signs Template 2
* Example posters:
	+ Warning Signs example poster 1
	+ Warning Signs example poster 2
* Creative tools: coloring tools, rulers, poster paper, printed templates or software such as canva, publisher, PowerPoint, etc.
* Technology to access resources and research background information

*Set-Up:*

* Have devices such as tablets available for research
* Group tables together for collaboration (activity can also be done individually)
* Spread out materials for students to make their posters (see materials)
* Print the brainstorming page/guide for students or supply electronic version (see materials)

*Activity Description:*

1. Start by introducing students to invasive species. Explain what it means when a species is invasive and why they are harmful. Resources below can be used to gather information on invasive species.
	* Resource: National Ocean Service, *What is an Invasive Species* (<https://oceanservice.noaa.gov/facts/invasive.html>)
	* Resource: National Invasive Species Information Center, *What are Invasive Species?* (<https://www.invasivespeciesinfo.gov/what-are-invasive-species>)
2. Students do a schoolyard survey and/or use resources such as [michigan.gov/invasives](http://michigan.gov/invasives), Midwest Invasive Species Information Network (<https://www.misin.msu.edu/>), Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) (<https://www.glerl.noaa.gov/glansis/>), or information from their local Cooperative Invasive Species Management Area (CISMA) (<https://www.michigan.gov/invasives/take-action/local-resources>) to determine invasive species in their area.
3. Students research a nearby invasive species independently, with a partner, or in a small group. Students may choose their species or the teacher may assign.

It is suggested that students choose invasive species that impact their local region.

1. Students use the “Warning Signs: Student Guide” and the “Warning Signs: Rubric” to guide their research and “warning sign” design.
2. To make an informational sign, students might use the Warning Signs Template 1 or Template 2 files or or create their own.
	* Components that should be found in the warning sign can be found on the “Warning Signs: Student Guide” as well as the “Warning Signs Rubric”.
3. Student signs could be posted around the school or community and presented to fellow students or school/community leaders.

**Discussion:** (10-15 minutes)

*Sample inquiry questions are below* (allow for open discussion):

Possible student answers are in red (**note:** there are not “right”/”wrong” answers, just ideas).

* How could these signs help our community?
	+ People might understand the negative effects invasive species have on the community from a human perspective and from an ecological perspective. Information they might learn from these signs:
		- Some plants might: be hard to manage or get rid of in personal gardens; suffocate wanted plants; or spread out of control from their garden to natural areas.
		- Aquatic invasive species like European frog-bit can damage boats by getting stuck in the propeller.
		- Ecologically, invasive plants can take over regions and kill the native plants that insect species may utilize as a protection, home, or a food resource.
		- Invasive insects might harm large fully-grown trees that provide homes for other animals and cost a lot of money and years to replace.
	+ People might take action to personally change behaviors or suggest changes around them. Some actions people might consider:
		- Choose plants for their gardens or communities that are safe for the environment (i.e., not spread out of control, not hurt people or wildlife).
		- Volunteer with local natural resource agencies to survey for and safely remove invasive species from gardens or nearby natural areas.
		- Challenge local garden supply shops to offer non-invasive plants.
		- Propose non-invasive plantings to neighbors and community leaders.
		- Remember not to transport untreated plants/lumber between regions.
	+ The community might become a safe-haven for native species due to people’s positive action to remove invasive species and re-introduce native species.
* What are signs that an invasive species has moved or might move into a new area?
	+ We might notice changes in ecosystem/habitat, a lot of new plants/animals/insects never before seen or native species are no longer as noticeable.
	+ If land areas are completely cleared, sometimes invasive species might take hold of the open spaces. (Note: consider putting in native plants immediately in these open areas to reduce space for invasive species to take hold.)
* What are signs that your area might be at risk of species invasion (or at risk of invasive species take-over)?
	+ A high-tourism area or outdoor recreation activities (hiking, fishing, boating, mountain biking) might bring in plant parts, seeds, small larvae, bacteria, etc. into our area from other regions.
	+ Large areas of cleared land would provide space for new rapid growth of invasive plants.

**Variations and Extensions:**

* Teachers pre-survey school grounds then take kids outside to also survey school grounds to see what they find.
	+ The survey could be done using the “Schoolyard Plant Bingo” activity with each student/team matching a photo of a plant.
	+ Students use an app such as iNaturalist or SEEK to survey school grounds and map where plants of concern are located.
* Combine individual student ideas into a collaborative whole-class sign to be placed on school grounds or in the community (with permission).
	+ If the district offers a design or machine-shop course, partner with those students/teachers to build a permanent sign for a location.
* Students present signs to each other or students in other classes/grades and then take a nature walk to locate the invasive species.
	+ Use guide books, identification guides, or apps to help identify invasive species (SEEK app, LeafSnap, etc.)

**Additional Resources:**

* Three Shores CISMA 10 invasive species in the Eastern Upper Peninsula
* Invasive vs Native Species (PowerPoint resource)
* Invaders of the Great Lakes Book PDF
* Aquatic invasive plants and their look-alikes
* Michigan Watch List Aquatic Invasive Plants Guide
* Michigan invasive plant species (<https://www.michigan.gov/invasives/id-report/plants>)

**Research Connections:**

**Lake Superior State University Center for Freshwater Research and Education (LSSU CFRE) *Hydrocharis morsus-ranae* (European frogbit) research:**

CFRE research teams collaborate with EGLE and Three Shores CISMA to conduct field and lab experiments on the invasive plant European frogbit. The goal is to gain more knowledge on the distribution and winter survival of the species as well as how to effectively remove it.

**Lake Superior State University Center for Freshwater Research and Education (LSSU CFRE) *Didymosphenia geminata* (didymo) research:**

CFRE research teams conduct lab experiments and field sampling for didymoin order to understand what is causing the growth of the invasive algae. LSSU CFRE also conducts eDNA and water quality analyses. University of Wisconsin Oshkosh, Michigan Sea Grant, and EGLE all partner with CFRE on this project.

**Michigan Department of Education Standards**

*Next Generation Science Standards Performance Expectations*

**2-LS4-1** Make observations of plants and animals to compare the diversity of life in

different habitats.

**5-ESS3-1** Obtain and combine information about ways individual communities use

science ideas to protect the Earth’s resources and environment.

**3-5-ETS1-2** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

*This activity provides support for the following performance expectations:*

**3-LS4-3** Construct an argument with evidence that in a particular habitat some

organisms can survive well, some survive less well, and some cannot

survive at all.

**3-LS4-4** Make a claim about the merit of a solution to a problem caused when the

environment changes and the types of plants and animals that live there

may change.

**MS-LS2-4** Construct an argument supported by empirical evidence that changes to

physical or biological components of an ecosystem affect populations.

**MS-LS2-2** Construct an explanation that predicts patterns of interactions among

organisms across multiple ecosystems.

*Social Studies/Civics*

8-P4.2.3 Participate in projects to help or inform others.

P2.4 Know how to find relevant evidence from a variety of sources.