

## **Invasive Species**

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### **LESSON OVERVIEW**

This lesson will provide background on the Great Lakes and will incorporate and promote maritime education through the lessons. It is common practice to teach about the diversity of species in natural habitats. Biogeography – the transfer of species throughout the earth by various methods – will be addressed in lessons leading up to the lesson on invasive species..

Many plant and animal species depend on the Great Lakes region for survival, but not all of the species are from the Great Lakes region. When non-native species come into a region, by air, over land, or in ballast water, we call these exotic species. These exotic species invade an ecosystem and often create detrimental effects to the local ecosystem because they use up the resources and create economic and ecological problems, such as destroying wetlands and other habitats that native species rely on. It can be very costly and often ineffective to remove exotic species, so prevention of future exotic species movement into the Great Lakes is vital to the health of the Great Lakes Ecosystem. Education our youth is an optimal way of controlling future accidental or deliberate introductions of invasive species.

Instructor should also teach students that dealing with environmental issues means making decisions on a personal level, or at local, national, or global levels. There are costs and benefits to decisions that are made by elected officials, and there are often more sides to an issue than just a basic “exotic species are bad” mind frame. The unit can be adapted to the individual teacher’s classroom by selecting parts of the lesson as needed.

### **SOURCES CONSULTED**

**The Great Lakes – At a Crossroads published by the International Association for Great Lakes Research**  
Edited by Joan Chadde, et al. Accessed May, 2011.

**Great Lakes Maritime Teacher Institute in Door County, WI, June 20-24, 2011** sponsored by Michigan Tech University with funding from the Great Lakes Maritime Research Institute and UW-Madison CFIRE program

**The Great Lakes: An Environmental Atlas and Resource Book.** (1995)  
Accessed July 11, 2011 from <http://www.epa.gov/glnpo/atlas/index.html>

**State of Wisconsin Department of Public Instruction Website - Science Standards**  
Accessed July 11, 2011 from <http://www.dpi.state.wi.us/standards/>

**State of Wisconsin Department of Public Instruction Website - Social Studies Standards**  
Accessed August 23, 2011 from <http://www.dpi.state.wi.us/standards/>

**Aquatic Invaders. National Geographic Society. Accessed August 25, 2011 at**  
<http://www.nationalgeographic.com/xpeditions/lessons/14/g68/invaders.html>

## LEARNING OBJECTIVES

*Students will be able to:*

- Explain the importance of the Great Lakes in my life, including how goods are transported, survival of species, and recreational uses of the Great Lakes.
- Impacts of invasive species.
- Make environmental decisions which may have consequences at the personal, local, national, and global level.
- Access the internet and printed documents to evaluate information about a current environmental issue.
- Write a letter to an elected official explaining my personal choices on a current environmental issue.

## STANDARDS/BENCHMARKS ADDRESSED – State of Wisconsin

### Social Studies Performance Standards **Grade 8**

**Standard A: Geography** By the end of **grade eight**, students will:

A.8.1 Use a variety of geographic representations, such as political, physical, and topographic maps, a globe, aerial photographs, and satellite images, to gather and compare information about a place

A.8.7 Describe the movement of people, ideas, diseases, and products throughout the world

A.8.8 Describe and analyze the ways in which people in different regions of the world interact with their physical environments through vocational and recreational activities

A.8.10 Identify major discoveries in science and technology and describe their social and economic effects on the physical and human environment

A.8.11 Give examples of the causes and consequences of current global issues, such as the expansion of global markets, the urbanization of the developing world, the consumption of natural resources, and the extinction of species, and suggest possible responses by various individuals, groups, and nations.

### Science Standards - Grade 8

#### Science, Standard B: Nature of Science Performance Standards - Grade 8

By the end of **grade eight**, students will:

B.8.6 Explain the ways in which scientific knowledge is useful and also limited when applied to social issues

#### Science, Standard F: Life and Environmental Science Performance Standards – Grade 8

By the end of **grade eight**, students will:

##### STRUCTURE AND FUNCTION IN LIVING THINGS

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

##### REGULATION AND BEHAVIOR

F.8.7 Understand that an organism's behavior evolves through adaptation to its environment

##### POPULATIONS AND ECOSYSTEMS

F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet

##### DIVERSITY AND ADAPTATIONS OF ORGANISMS

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

F.8.10 Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends.

#### Science, Standard G: Science Applications, Performance Standards – Grade 8

By the end of **grade eight**, students will:

G.8.3 Illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life

G.8.7 Show evidence of how science and technology are interdependent, using some examples drawn from personally conducted investigations

Science, Standard H: Science in Personal and Social Perspectives Performance Standards – Grade 8

By the end of **grade eight**, students will:

H.8.1 Evaluate the scientific evidence used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources

H.8.3 Understand the consequences of decisions affecting personal health and safety

## **MATERIALS NEEDED**

Student Materials: notebooks, pencils, colored pencils and/or markers, erasers, etc.

Classroom Materials: Computer Lab, including file of acceptable web sites on student drive; Reference materials collected on invasive species including but not limited to pamphlets, flyers, books, etc.; State of Wisconsin Invasive species cards; Addresses of elected officials; Science Explorer, Environmental Science textbook; Field Guide to Terrestrial Invasive Plants in Wisconsin (two copies preferred, if possible, separated and collated); one set of index cards, labeled with aquatic invasive species from Appendix D for each class or set of paper sheets with aquatic invasive species to be handed out for computer research day; classroom materials such as colored pencils, markers, erasers, etc.

Materials needed for Biogeography activity listed in Appendix A: Materials for each group: pie pan or paper plates, seeds or corn kernels, water, straw, tape, and/or other materials to move seeds. Teacher/classroom materials: index card, ice cubes, paper towels for cleanup or spills

## **VOCABULARY**

**Biogeography** - The study of where organisms live is called biogeography.

**Dispersal** - The movement of organisms from one place to another is called dispersal.

**Biodiversity** - The number of different species in an area is called its biodiversity.

**Exotic Species** - An organism that is carried into a new location by people is referred to as an exotic species.

**Invasive Species** - A species not native to and tending to spread widely in a habitat or environment are called invasive species.

## CLASSROOM ACTIVITIES LEADING UP TO INVASIVE SPECIES LESSON

- Look at a map of continental drift from internet or textbook. Remind students that they learned about continental drift and the movement of humans in social studies/geography class. Teach them that many other species moved when the continents moved, which led to isolation of some species. Define Biogeography as the study of where organisms live.
- Ask students to try to move seeds in a pan – See Appendix A activity attachment. Follow up activity with notes on dispersal of species. Define dispersal, and talk about the main ways that organisms can move from place to place: wind, water, or by living things. Define limiting factors to dispersal (physical barriers, competition, and climate factors).
- Discuss types of environmental decisions: Resource Use, Population Growth, and Pollution. These issues are very interrelated. Remind students that actions cause reactions. Teach students that every decision has some kind of impact on the environment, so people must make choices to balance needs of many groups. For example, Great Lakes fisheries might want to fish in a lake that has abundant fish, but Great Lakes Shippers want to bring goods in to ports. Emptying ballast water in the Great Lakes can have harmful effects on the fishing industry if all food is depleted due to ballast pollution and the introduction of exotic species. There are good and bad things about decisions (economic terms – costs and benefits) that need to be balanced out.
  - Resources are anything in the environment that is used by people.
  - Population growth increases the need for resources such as water.
  - Earth’s land, water, air, and other resources are often used in ways that lead to pollution. Pollution is contamination of resources.
- Define Biodiversity as the number of different species in an area. Ask students what kind of human activities threaten biodiversity? Ask students how to protect biodiversity? Discuss factors affecting biodiversity such as area, climate, and niche diversity, and gene pool diversity.
- Teach students about the importance of preserving species for medicines and other uses not even discovered yet. Discuss taxol, a chemical found in the Pacific Yew. Taxol is used as a cancer treatment to prevent the spread of cancer and to shrink tumors. As the demand for taxol increased, scientists became concerned with the supply of Pacific Yew trees. Ask students: Is treating cancer worth giving up a species? Tell students that scientists have now found ways to copy the good properties of taxol in the lab, and now don’t use the trees in the manufacture of taxol. Remind students that scientific discovery often has a cost associated with a benefit. Also remind students that protection of biodiversity is important because we haven’t discovered what medicines might be created from species that could become endangered by destruction of habitats or overuse by human activities.

## LESSON PLAN & FOCUS QUESTIONS

What do you remember about movement of the continents from Geography class? Have you ever been affected by the movement of continents? What might happen?

How else might species move besides continental drift?

What does the word invade mean?

What does the word exotic mean?

### LESSON PROCEDURE

1. Lead student groups in a discussion about exotic species and the issues of invasive species as a threat to biodiversity.

Noteable examples can include:

- a. European sailors visiting Hawaii introduced rats (escaping from the ships). No predators meant rats multiplied. They ate native species Nene goose. Someone tried to bring rat-eating mongoose in to control rats, but mongoose preferred Nene goose eggs. Nene geese are now an endangered species.
  - b. Zebra mussels came in on ships through the Great Lakes shipping industry.
  - c. Asian Carp is a current issue in invasive species. They have traveled through other water systems and now threaten the Great Lakes ecosystem as they have traveled up the Illinois River and may enter Lake Michigan near Chicago.
2. Use Field Guide to Terrestrial Invasive Plants in Wisconsin to assign a plant to each student or student pair. Ask students to make a short presentation in front of class, showing picture of plant with a short description and then telling about the ecological threat to Wisconsin habitats. It might be helpful to break apart the ringed Field Guide and also to give each student or group two copies of each card for each plant, in order to demonstrate proper presentation mode. If two copies of Field Guide are not available, show pictures on document reader and have student take notes about the ecological threats on a separate note card to use as a guide during presentation. Remind students to give eye contact with the audience and practice before coming to the front of class. Teacher should model this with students, if not common practice in classroom.
  3. Bring students to computer lab. Students should log on to Wisconsin DNR site for Invasive Species, <http://www.dnr.state.wi.us/org/caer/ce/eeek/earth/aliens.htm>. Students should look at site and examine various types of exotic species. Students can then explore other exotic species sites from teacher list in Appendix C. Students should record notes about the species in their science notebook. Teacher should pass out slip of paper with name of one aquatic invasive species from list in Appendix D. Students will work on researching that species, collecting information in their notebook to use back in the classroom.

4. Students should make an aquatic invasive species card on a note card in the style of the Field Guide from step two above. Important details should include
  - i. Picture on front of card
  - ii. Description on back of card
  - iii. Habitat
  - iv. Ecological threats
  - v. Other as desired
5. Students should make classroom presentations for aquatic invasive, exotic species in front of classmates. As differentiation, assign to advanced students the task of talking about control measures for the invasive species and the cost and benefits associated with control measures.
6. Ask students to write a post card, email, or letter to a public official describing the official about the issue and about their beliefs on the issue. Students can work independently or in pairs on this activity. Students should form a rough draft and peer edit before sending mail to elected official.
7. Return to computer lab to type correspondence to elected official.
8. Summarize activity in interactive science notebook. Summary should include main idea of invasive species unit to show evidence of learning, reflection of effort on various tasks, and pride in work.
9. Teacher should pass out rubrics after grading with suggestions for improvement.

## ASSESSMENT OF STUDENT LEARNING

Teacher can use and adapt attached rubric to fit classroom needs. Students should show improvement in presenting to classmates from the terrestrial to the aquatic invasive species cards. Students should be able to make a card with important features of an aquatic invasive species. Students should use time wisely, both in the computer lab and in the classroom setting. Students should also be able to pass information along detailing their position on a scientific issue.

# APPENDIX A

## Biogeography Activity

- Materials for each group: pie pan or paper plates; seeds or corn kernels; water, straw, tape, and other materials to move seeds
- Teacher items – index card, ice cube - to show limits to dispersal (ice, mountains, etc.)
- Ask students to predict what the activity is about.
- Ask student groups to move the seeds using the materials given.
- Ask students to decide what each method is supposed to represent (wind, water, or living things)
- Ask for student volunteers to come to the front to show students how the experiment worked. Then, teacher should take the following steps to demonstrate limits to dispersal (physical barriers, competition, climate)
  - Use an ice cube when student wants to use water, to represent changing climates.
  - Place a card in front of straw to represent a physical barrier, such as a mountain.
  - “Eat” the kernel of corn to represent competition for the survival of the species.
- Ask students to summarize the activity with their group; share summaries with classmates

# Appendix B Elected Officials

## Congressional

[Senator Ron Johnson](#) - U.S. Senate  
Junior Seat (Republican)

Washington, D.C. Website:

[http://www.ronjohnson.senate.g ...](http://www.ronjohnson.senate.g...)

Washington, D.C. Webmail:

[http://ronjohnson.senate.gov/p ...](http://ronjohnson.senate.gov/p...)

Washington, D.C. Address

2 Russell Courtyard

Washington, DC 20510

Phone: 202-224-5323

Fax: 202-228-6965

District Address

517 Wisconsin Avenue

Milwaukee, WI 53202

Phone: 414-276-7282

[Senator Herbert H. 'Herb' Kohl](#) - U.S. Senate  
Senior Seat (Democratic)

Washington, D.C. Webmail:

[http://kohl.senate.gov/contact ...](http://kohl.senate.gov/contact...)

Washington, D.C. Website:

<http://kohl.senate.gov/>

Washington, D.C. Address

330 Hart Senate Office Building

Washington, DC 20510

Phone: 202-224-5653

Fax: 202-224-9787

District Address

310 West Wisconsin Avenue, Suite 950

Milwaukee, WI 53203

Phone: 414-297-4451

Toll Free: 800-247-5645

Fax: 414-297-4455



[Representative Reid J. Ribble](#) - U.S. House  
District 8 (Republican)

Washington, D.C. Webmail:

[https://ribble.house.gov/conta ...](https://ribble.house.gov/conta...)

Washington, D.C. Website:

<http://ribble.house.gov/>

Washington, D.C. Address

1513 Longworth House Office Building

Washington, DC 20515

Phone: 202-225-5665

Fax: 202-225-5729

District Address

333 West College Avenue

Appleton, WI 54911

Phone: 920-380-0061

Fax: 920-380-0051

Gubernatorial

[Governor Scott Walker](#) – Governor (Republican)

Capitol Email:

[govgeneral@wisconsin.gov](mailto:govgeneral@wisconsin.gov)

Capitol Address

Office of Governor Scott Walker

115 East Capitol

Madison, WI 53702

Phone: 608-266-1212

(Republican)

State Legislative

[Assembly Member John Klenke](#) - State Assembly

District 88 (Republican)

[Assembly Member Chad Weininger](#) - State Assembly

District 4 (Republican)

[Senator Robert L. Cowles](#) - State Senate  
District 2 (Republican)

[Senator Dave Hansen](#) - State Senate  
District 30 (Democratic)

Mayoral

Green Bay Mayor James J. Schmitt

City Hall, 100 North Jefferson Street, Room 200,

Green Bay, WI 54301-5026.

Current elected official information available at Project Vote Smart internet site.

Accessed 8-26-11 at <http://www.votesmart.org/search.php?search=54301&x=0&y=0#current>

## Appendix C Approved Websites for Invasive Species Research

<http://www.invasivespecies.org/resources/FromWhere.cfm>

<http://www.invasivespecies.org/resources/TimeWarp.html>

<http://www.invasivespecies.org/resources/IndirectC.cfm>

<http://www.fws.gov/midwest/ashland/images/Battling-Invasives-In-the-G.jpg>

<http://www.fws.gov/midwest/ashland/images/Battling-Invasives-In-the-G.jpg>

<http://invasivespeciesinfo.gov/aquatics/main.shtml>

<http://www.invasivespeciesinfo.gov/unitedstates/wi.shtml>

<http://www.invasivespeciesinfo.gov/aquatics/education.shtml>

## Appendix D Aquatic Invasive Species

### **Aquatic Plants**

Alligatorweed (*Alternanthera philoxeroides*)  
Brazilian Waterweed (*Egeria densa*)  
Caulerpa, Mediterranean Clone (*Caulerpa taxifolia*)  
Common Reed (*Phragmites australis*)  
Curly Pondweed (*Potamogeton crispus*)  
Eurasian Watermilfoil (*Myriophyllum spicatum*)  
Didymo (*Didymosphenia geminata*)  
Giant Reed (*Arundo donax*)  
Giant Salvinia (*Salvinia molesta*)  
Hydrilla (*Hydrilla verticillata*)  
Melaleuca (*Melaleuca quinquenervia*)  
Purple Loosestrife (*Lythrum salicaria*)  
Water Chestnut (*Trapa natans*)  
Water Hyacinth (*Eichhornia crassipes*)  
Water Lettuce (*Pistia stratiotes*)  
Water Spinach (*Ipomoea aquatica*)

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### **Aquatic Animals**

Alewife (*Alosa pseudoharengus*)  
Asian Carps  
Asian Clam (*Corbicula fluminea*)  
Asian Shore Crab (*Hemigrapsus sanguineus*)  
Asian Swamp Eel (*Monopterus albus*)  
Bullfrog (*Rana catesbeiana*)  
Chinese Mitten Crab (*Eriocheir sinensis*)  
Clubbed Tunicate (*Styela clava*)  
Eurasian Ruffe (*Gymnocephalus cernuus*)  
European Green Crab (*Carcinus maenas*)  
Flathead Catfish (*Pylodictis olivaris*)  
Lionfish (*Pterois volitans*)  
Northern Snakehead (*Channa argus*)  
New Zealand Mud Snail (*Potamopyrgus antipodarum*)  
Nutria (*Myocastor coypus*)  
Quagga Mussel (*Dreissena bugensis*)  
Round Goby (*Neogobius melanostomus*)  
Rusty Crayfish (*Orconectes rusticus*)  
Sea Lamprey (*Petromyzon marinus*)  
Sea Squirt (*Didemnum vexillum*)  
Spiny Water Flea (*Bythotrephes longimanus*)  
Veined Rapana Whelk (*Rapana venosa*)  
White Spotted Jellyfish (*Phyllorhiza punctata*)  
Zebra Mussel (*Dreissena polymorpha*)

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# Appendix E Rubric

Invasive Species Rubric		Name _____ Period _____		
CATEGORY	4 Excellent Project	3 Great Work	2 Good Work	1 Needs More Effort
Presentation Terrestrial Invasive Plant Card	Confident and accurate presentation.	Good presentation.	Presentation was done, but without effort, energy, or accuracy.	Refused to come to present information.
Computer Research	Used time well during each class period. Focused on getting research done by exploring sites. Never distracted others.	Used time well during each class period. Usually focused on exploring sites and never distracted others.	Used some of the time well during time on computer. There was some focus on getting the research done but occasional distraction.	Did not use class time to focus on the research OR went on inappropriate sites OR often distracted others.
Visual Attractiveness of Invasive Species Card	Graphics are all in focus and the content easily viewed and identified. All work and print is neat.	Most graphics are in focus and the content easily viewed and identified. Mostly neat work and print.	Some graphics are in focus and the content is easily viewed and identified. Some work and print is messy.	Many graphics are not clear or are too small. Work and print is messy.
Presentation of Aquatic Invasive Species Card	Confident and accurate presentation.	Good presentation.	Presentation was done, but without effort, energy, or accuracy.	Refused to come to present information.
Letter to Elected Official	The letter includes all required elements as well as additional information.	All required elements are included on the letter.	Most of the required elements are included on the letter.	Several required elements were missing.
Knowledge Gained	Student can accurately answer all questions related to Invasive Species.	Student can accurately answer most questions related to Invasive Species.	Student can accurately answer some questions related to Invasive Species.	Student appears to have insufficient knowledge about the facts about Invasive Species.
Summary Paragraph	Summary is well-written and shows evidence of learning. Summary is complete.	Summary is well-written and shows evidence of learning, but is missing minor details.	Summary is turned in, but missing a few key elements.	Summary is not turned in, or is not complete.
Additional Information (Effort, use of time, etc.)	Excellent	Great	Good	Needs Improvement