NON-NATIVE INVASION

GRADES 5-8

JANIECE MISTICH

TIME ALLOTMENT:

Introductory Activity: 15 minutes
Learning Activity: 60 minutes
Culminating Activity: Two 60 minute periods:
1) Presentation Preparation
2) Class Presentation

OVERVIEW:

Organisms not native to America have been entering our country since the Europeans first moved here. Some were brought to remind early settlers of home or for their ornamental appeal. Others were brought for food, condiments, and medicinal herbs. Some were even brought as pets. Many flourished in their new environment, especially without the natural controls of their native environment. More recently, non-native species were brought to improve the genetic makeup of a native species or to combat the spread of an invasive species, only to become invasive species themselves.

In this lesson students will explore the problems created by non-native invasive species and evaluate methods used to control their spread.

SUBJECT MATTER:

Environmental Science

LEARNING OBJECTIVES:

Students will be able to:

- Determine the difference between native and non-native species.
- Identify problems created by the introduction of non-native species.
- Identify methods used to control the spread of non-native species.
- Evaluate the effectiveness of these control methods.
- Prepare and defend an argument of one method to control a specific species.

STANDARDS:

National Science Education Standards
http://bob.nap.edu/html/nses/html
Content Standard C: Life Science
Structure and function in living systems/ Populations and ecosystems
Content Standard F: Populations, resources, and environments and science and technology in society

Louisiana Science Frameworks:
State Standards for Curriculum Development
http:www.doe.state.la.us/doe/assessment/standards/SCIENCE.pdf
SE-M-1: Demonstrating knowledge that an ecosystem includes living and non-living factors, and that humans are an integral part of ecosystems;
SE-M-2: Demonstrating an understanding of how carrying capacity and limiting factors affect plant and animal populations;
SE-M-4: Understanding that human actions can create risks and consequences in the environment;
LS-M-C3: Investigating major ecosystems and recognizing physical properties and organisms within each;
LS-M-C4: Explaining the interaction and interdependence of non-living and living components within ecosystems;
SI-M-B 7: Understanding that scientific development/technology is driven by societal needs and funding.

MEDIA COMPONENT:

Video:
Enviro-Tacklebox™— *Non-Native Invasion*
An LPB Production that examines some of the impacts and controls of non-native animal and plant species.

Web sites:

Enviro-Tacklebox™ http://www.envirotacklebox.org This is Louisiana Public Broadcasting's Web site providing teaching information, films, articles and student activities involving environmental science.
Non-Native Invasion Module Background Information: http://www.envirotacklebox.org/teacherguide/module3/3nns.htm This Web site is useful for teachers to gain background information about non-native invasive species, including economic impacts, legislation, and control methods.

Exotic Aquatics on the Move: http://www.iisgcp.org/EXOTICSP/ans.htm This Web site provides an electronic tour of the world of exotic species, including pictures, descriptions, explanations of impacts, origin, and distribution within the United States.

MATERIALS:

Video: Enviro-Tacklebox™ — *Non-Native Invasion*
Per Group:

- Pictures of non-native species: zebra mussel, nutria, water hyacinth, hydrilla
- Student Handout #1— Chart/ Non-Native Species Data Collection Sheet
- Student Handout #2—Non-Native Species Blank Data Collection Sheet
- Student Handout #3—Control Methods Questionnaire
- Answer Key to Student Handout #2
- Control Methods Fact Cards

PREP FOR TEACHERS:

1. Preview the video "Non-Native Invasion" and **CUE** it to the segments indicated.

2. Access and review the websites to become familiar with the content and to check for broken links.

3. Make copies of handouts and Fact cards for students.

4. Obtain pictures of a zebra mussel, nutria, water hyacinth, and hydrilla from an internet or other source.

5. When using media, provide students with a **FOCUS FOR MEDIA INTERACTION**, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

INTRODUCTORY ACTIVITY:

1. Show students pictures of a zebra mussel, nutria, water hyacinth, and hydrilla. Ask students to identify them or provide them with the identifications; then ask, "What do all of these organisms have in common?" Allow for student responses. ***(Guide students to understand that these are aquatic organisms that are not originally from the United States, but now live here and have reproduced so excessively that they are causing problems to native species.)***
2. Ask students, "What do these and all organisms need in order to flourish? ***(special living conditions that they are adapted to such as food, habitat, water, etc.)*** What is needed to control the excessive growth of organisms? ***(natural controls such as predators and environmental conditions)*** Ask students, "What happens when there are no predators or negative environmental conditions to check the growth of a species?" ***(The species reproduces excessively and competes with other species for the same needs.)***
3. Tell students that species not originally from an area, that have been purposely or accidentally introduced are called **non-native species**. When they out-compete native species, they are called **non-native invasive species.**

LEARNING ACTIVITIES:

1. **Provide students with a Focus for Media Interaction,** telling them to view the first segment of the video to learn how one organism was introduced into the United States and the problems it created. **Play** the video from the beginning until you see Hawaii's native bird, the Nene, and hear the words, "With its taste for bird eggs, things have gotten so bad that the mongoose now threatens the Nene, Hawaii's state bird." **Pause** the video.

2. Ask students, "How did the Norwegian Brown Rat first arrive in Hawaii? ***(in the hull of a ship).*** What threat did it pose to Hawaii? ***(it started destroying the sugar cane crop).*** What was done by native farmers to get rid of the rat? ***(the mongoose was brought in as a predator for it)***. Why was this action not effective? ***(the rat foraged at night while the mongoose was sleeping and was asleep when the mongoose was active).*** What new problem was created as a result of introducing this new predator into Hawaii? ***(the mongoose had no native predators to keep it from over-populating and the mongoose population has grown out of control. It has been eating all of the Nene's bird eggs, threatening the existence of Hawaii's state bird.)*** From what you observed with the brown rat and the mongoose, what causes an introduced species to become invasive? ***(no controls that keep the species from out-competing native species or overpopulating an area).***

3. Provide students with **Student Worksheet #1 (Chart of Non-Native Invasive Species).** Provide students with a Focus for Media Interaction, telling them to view the video to find out about other non-native invasive species in order to complete the chart. **Play** the video until you see a helicopter behind a herd of mustangs and hear the words, "Whenever mustang numbers get out of control, people in the area hold big round-ups so mustangs can be adopted and removed from the range. **Pause** the video to allow students to fill in the chart. While students are completing the chart, **Fast Forward** the video until you see a bottle of Tabasco Sauce and hear the words, "Back in Louisiana, in the late 1930s, a family that makes Tabasco Hot Pepper Sauce, began raising an animal from Argentina, called a nutria." Once students have completed the chart, **Play** the video segment until you see a nutria being shot and pulled out from a canal and hear the words, "This has cut back on the population for now." **Pause** the video once more to allow students to fill in the chart.

4. Review answers with students, emphasizing the fact that none of these introduced species had natural predators to keep their numbers manageable and all have threatened or destroyed native species.

5. **Provide students with a Focus for Media Interaction,** telling them that not all invasive species are animals. **Ask** students how non-native plants can be introduced into the United States. Then tell students to view the video to learn how plant invasive species are introduced into the United States and about their impact on native species and ecosystems. **Play** the video until you see a cartoon image of a fish and the

words HOLY MACKEREL and you hear the words, "In just three months, Giant Salvinia has been known to cover 40 square miles of waterways one meter thick." Ask students to fill in the chart with information about the water hyacinth and hydrilla.

6. Review answers with students, emphasizing the harm these aquatic plants are causing to waterways and organisms living in them.

7. **Fast Forward** the video until you see Greg Grandy, the host, standing in front of a cash register and hear the words, "The cost of fighting non-native damage can be mind-boggling." **Pause** the video right before this frame.

8. Ask students for ideas that could be used to control the invasive species listed on the chart. List these ideas on the board. Ask students to describe what costs might be associated with these methods of control. Explain the control methods described on the **Control Method Fact Cards**, making sure that students understand them.

9. **Provide students with a Focus for Media Interaction,** asking them to view the video to learn a few methods that are used to control invasive species. Tell students that after viewing this segment of the video they will be working in small groups to research other methods of non-native invasive species control.

10. Assign students to small groups. Assign each group one of the invasive species studied or others mentioned in the video. Give each group the **Control Methods Fact Cards** and **Student Handout # 3 (Control Methods Questionnaire)**. **Provide students with a Focus for Media Interaction,** asking them to research the various control methods used for their assigned species by utilizing the following web sites: http://www.iisgcp.org/EXOTICSP/ans.htm and http://www.envirotacklebox.org/teacherguide/module3/3nns.htm. In small groups, discuss benefits and disadvantages to each control method using the **Control Methods Questionnaire** to guide the discussion. Record responses on the questionnaire. Have each group then choose one method to explain and defend as the best method.

CULMINATING ACTIVITIES:

1. Have each group prepare a poster presentation. The following information is suggested for each presentation:
   a. Illustration of species and the compromised habitat (Students can obtain pictures from the web site they use for their research.)
   b. Map illustrating the geographic area(s) of invasion.
   c. Chart of information gathered during video and independent research — Provide students with **Student Handout #2** if they are researching invasive species other than ones in the video.

2. When presenting the information to the class, each group should also talk about the various control methods utilized and tell which one they believe is best. New ideas for control should be accepted if students can defend their ideas.

CROSS-CURRICULAR EXTENSIONS:

ART:

- Create an advertisement educating people about a particular invasive species and how they can help control it. Get permission to display advertisements in an area where people affected by the invasive species will see it.

HISTORY:

- Create a timeline illustrating when a species was introduced and its development/spread until the present. Include dates and methods attempted to control or eradicate it.

LANGUAGE ARTS:

- Compare and contrast the benefits and disadvantages of a particular invasive species. Create a compare/contrast chart to display information.

MATHEMATICS:

- Find facts about the growth rate of one of the invasive species highlighted in the video. Determine the available growth area in the state being compromised or the student's own state. Calculate how long it would take for the species to completely cover the growth area if not controlled.

SCIENCE:

- Gather data about an organism that is impacted when an invasive species gets out of control. Identify other organisms that are then impacted by the loss of the native species. Create a web showing how they are all connected and how the invasive species impacts more than just the original threatened species.

SOCIAL STUDIES:

- Have students research the geographic origin of each species and compare the habitat in that location to the habitat in the United States that is being compromised. Similarities that make the species successful in its new habitat should be identified and explained.

COMMUNITY CONNECTIONS:

- Invite a local agent from the U.S. Fish and Wildlife Service to discuss with your class local invasive species and methods used to control them.
- Prepare and post/distribute advertisements educating the public about local invasive species and ways citizens can help control their spread.
- Find out how your students can become active participants in removing invasive species from a local waterway or land area.
- Invite a Plant Protection and Quarantine Officer from the Department of Agriculture to visit your class and discuss how imported products are inspected to prevent invasive species from entering our country.

STUDENT MATERIALS:

- Student Handout #1— Chart/ Non-Native Species Data Collection Sheet
- Student Handout #2—Non-Native Species Blank Data Collection Sheet
- Student Handout #3—Control Methods Questionnaire
- Control Methods Fact Cards

ADDITIONAL RESOURCES:

Ecological Society of America ***"Invasion!"*** http://www.esa.org/education/edupdfs/invasion.pdf

Actionbioscience.org "Introduced Species: ***The Threat to Biodiversity & What Can be Done***
http://www.actionbioscience.org/biodiversity/simberloff.html

Handout #1

NON-NATIVE INVASIVE SPECIES

SPECIES NAME	MUSTANG	NUTRIA	WATER HYACINTH	HYDRILLA
Place of Origin				
When Introduced into United States				
Why Introduced				
How Released into Environment				
Environment Best Suited For				
Predators in U.S.				
Benefits of Species				
Problems Created by Species				
Area of Penetration				
Control Methods Used				
Best Method of Control				

Handout #2

NON-NATIVE INVASIVE SPECIES

SPECIES NAME				
Place of Origin				
When Introduced into United States				
Why Introduced				
How Released into Environment				
Environment Best Suited For				
Predators in U.S.				
Benefits of Species				
Problems Created by Species				
Area of Penetration				
Control Methods Used				
Best Method of Control				

Handout #3

Control Methods Questionnaire

The purpose of this questionnaire is to guide your thinking and discussion about possible control methods for an assigned species. As you focus on the non-native species, use the questions to determine what control methods would be beneficial or disadvantageous. Once you have completed the questionnaire, use it to discuss the benefits and disadvantages of each method with your group members. As a group, determine which method you believe is the best for controlling your invasive species. Be prepared to defend your choice to your classmates.

Name of Invasive Species: _____

Place of Origin: _____

Original Habitat of Organism: _____

_____

Habitat at New Location of Invasion: _____

_____

How Organism Reproduces: _____

_____

Survival Requirements of Organism _____

_____

Special Traits that Aid in Survival: _____

_____

Mark an X through each box that is not applicable (doesn't have to do with assigned species) or write the words N/A. Then list the process followed to control your species. List the advantages and disadvantages of each method of control that you considered.

Control Method	Process Followed	Advantages	Disadvantages
Physical Control for Plants			
Chemical Control for Plants			
Physical Control for Animals			
Chemical Control for Animals			
Biological Control for Plants and Animals			
Ecological Control for Plants and Animals			

Questionnaire

Use the questionnaire to guide your discussion about each method you are considering. If there are more disadvantages than advantages to the method, another method might be more effective.

My invasive species is a (plant——animal).

Control Method #1—Invasive Plant Species

Yes—No **1. Can the invasive species be removed completely by cutting, harvesting, rotating the crops it lives on or eats, or burning?**

Yes—No **2. Can the invasive species reproduce by part of it remaining in the habitat?**

Yes—No **3. Can the invasive species break apart easily when trying to remove it?**

Yes—No **4. Would it take many people and/or many hours to completely remove it from an area?**

Control Method #2—Invasive Plant Species

Yes—No **1. Is the chemical toxic to other native species in the area?**

Yes—No **2. Can the chemical pollute the water supply that is used by people?**

Yes—No **3. Is the chemical expensive?**

Yes—No **4. Is it possible for the invasive species to become immune to the chemical being used?**

Yes—No **5. Is the chemical effective in completely killing the invasive species with one or only a few treatments?**

Control Method #3—Invasive Animal Species

Yes—No **1. Does the invasive species reproduce rapidly?**

Yes—No **2. Is there a use for the hunted animal once it is killed?**

Yes—No **3. Would it take many people and/or many hours to completely remove the invasive species from an area?**

Yes—No **4. Is the invasive species easy to find when hunting or trapping?**

Yes—No **5. If the organism is an insect on a crop, can the organism find an alternate food source easily?**

Yes—No **6. Is it easy to remove boats from the water to clean with soap and hot water?**

Yes—No **7. Is the area that needs to be fenced off to control movement of the invasive species easy to fence?**

Control Method #4—Invasive Animal Species

Yes—No **1. Is the chemical/poison used to kill the invasive species also toxic to native species in the area?**

Yes—No **2. Is the chemical/poison expensive?**

Yes—No **3. Can the chemical pollute the water supply needed by people in the area?**

Yes—No **4. Does the effectiveness of the chemical disappear quickly in the environment?**

Yes—No **5. If the chemical does disappear quickly, is it long-lasting enough to kill a large number of the invasive species?**

Control Method #5—Invasive Plants or Animals

Yes—No **1. Can the natural enemy of the invasive species survive in the environment in which it is being placed?**

Yes—No **2. Will the natural enemy of the invasive species also attack any native organisms (plants or animals) in the area?**

Yes—No **3. Does the natural enemy of the invasive organism reproduce quickly?**

Yes—No **4. If the natural enemy doesn't reproduce quickly, will there be enough of them to effectively do the job?**

Yes—No **5. If the natural enemy does reproduce quickly, will the large numbers of this species cause any problems in the new habitat?**

Yes—No **6. Are there any native organisms that will prey upon this natural enemy of your invasive species?**

Yes—No **7. Can the birth control chemical that is given to the invasive species also reduce the birth rate of native species?**

Yes—No **8. Is the method expensive?**

Control Method # 6—Invasive Plants or Animals

Yes—No **1. Will the change made in the environment negatively affect any native species?**

Yes—No **2. Is the method being used expensive?**

Yes—No **3. Can the method negatively affect humans living in the area?**

Yes—No **4. Does the method have to be repeated many times to be effective?**

Yes—No **5. Would it take many people and/or many hours to effectively use this method?**