Louisiana Public Broadcasting

Enviro•Tackle Box™

Teacher's Guide

Module 3: Topics and Issues in Enviromental Science

Commons Sense
Non-Native Invasion
Spin on Sprawl
Student Solutions
Enviro Rules

ENVIRO-TACKLE BOX™

Module 3

Topics and Issues in Environmental Science

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Enviro•Tacklebox™

Module 3

Topics and Issues in Environmental Science

Funding for this module of Enviro-Tacklebox™ was provided in part from a 5-year Star Schools grant to the Satellite Educational Resources Consortium (SERC) from the U.S. Department of Education under contract R203A970032.

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Enviro-Tacklebox™ Overview

Enviro-Tacklebox™ Project Overview

Background Information

What is the Enviro-Tacklebox™ Project?

The Enviro-Tacklebox™ is a program directed toward middle school students that focuses on environmental education topics. The project is being developed by Louisiana Public Broadcasting working as a sub-grantee of the Satellite Education Resource Consortium. Enviro-Tacklebox™ is funded through a five year U. S. Department of Education Star Schools grant.

The goals of the project are to:

- Develop thematic modules that focus on environmental issues and promote student interest and the attainment of critical thinking skills that will support decision making;
- Enhance student learning by using the environment as an integrating theme;
- Engage and support community outreach efforts through workshop presentations at science conferences at the state, regional and national level; and
- Increase the level of awareness and understanding of K-12 teachers about environmental education issues.

The Enviro-Tacklebox™ includes the following components:

1. A series of five thematic modules, each of which consists of five tele-lessons and accompanying teacher guides with student activities. An interactive web site complements each module.

2. Professional development teleconferences, delivered by satellite, that address topics of national interest to all formal and informal educators involved in environmental education.

3. Workshops presented at professional conferences, in school districts and other appropriate educational settings to raise the awareness of the Enviro-Tacklebox™ project.

Topics for each module were selected in response to a national survey of middle school teachers and were developed by a curriculum design team of educators. Materials from each module have undergone extensive review at the state and national levels. All materials reflect the ***National Science Education Standards*** and the North American Association for Environmental Education's ***Excellence in Environmental Education-Guidelines for Learning (K-12).***

There are five student video lessons in each module, with the exception of Module II, which has four student video lessons and one teacher professional development video. This "how to" video for educators is not for student viewing but instead provides the instructor with a model for teaching decision-making strategies.

For information concerning purchase of the Enviro-Tacklebox™ materials contact:

GPN
P.O. Box 80669
Lincoln, NE 68501-0669
1-800-228-4630
http://gpn.unl.edu

Louisiana teachers interested in broadcast dates or purchasing information should contact:

Louisiana Public Broadcasting
7733 Perkins Road
Baton Rouge, LA 70810-1009
225-767-4206
http://www.lpb.org

Module 3

www.envirotacklebox.org

Commons Sense

ACTIVITY GUIDE

COMMONS SENSE: Tragedy of the Commons

Background Information

An important concept embedded in the current mainstream of environmental education and science education, both formal and informal, is **"sustainability."**

Sustainability has broad and widespread applications within economics, resource management, or artificial systems. The context being considered here is ecological sustainability which can be defined as: "To meet the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987).

As ecosystem natural resource conservation and preservation efforts occur, the ability to sustain that ecosystem or natural resource is of primary consideration. This is not an easy process. For decades, fisheries managers have struggled to develop optimal sustainable yields. The crash of the North Atlantic Cod industry is evidence that using the best science of biological and economic models failed to sustain that fishery.

The need for resource management for sustainability evolved from the over-utilization of limited resources. These resources were often shared resources such as pastures, ranges, fisheries, forests, water, and air. In 1968, Garrett Hardin published an essay in ***Science*** titled "The Tragedy of the Commons." In this context a "commons" is any resource used as though it belongs to all. A commons is destroyed by over-utilization, lack of personal ownership, and lack of control. Hardin uses a public pasture to illustrate such an exploitation. Herdsmen can quickly exceed the carrying capacity of that pasture (system) and thus degrade or completely destroy the pasture (resource). Hardin's pasture is also considered to be a metaphor for shared aspects of our society, such as our communities, roads, air, and water.

An Internet search for Tragedy of the Commons yielded several hundred matches. This is an indication that the concept of the Tragedy of the Commons and how to best utilize, manage, and conserve resources for sustainability is widely discussed. Social, economic, and political issues are often embedded in these discussions.

In an article in the journal ***Science*** titled "Principles for Sustainable Governance of the Oceans," five major Tragedy-of-the-Commons-related marine problems are identified:

1. overfishing;
2. ocean disposal and spills;
3. destruction of coastal ecosystems;
4. land-based contamination; and
5. climate change.

Each problem area is suitable for student exploration and learning. These problems facing our oceans provide excellent opportunities for students to apply "commons thinking" to their ecological decision-making and stewardship practices. Why? Because the vast oceans are being impacted by the pressure exerted by humanity on global resources. Therefore, the largest ecosystems on earth are calling out for sustainable management. The ten keys to successful resource management include:

Equal access
Economics
Social fairness
Integration
Recognition of potential impacts
Social and individual decision making
Restoration
Preservation
Management
Multiple use

COMMONS SENSE: Tragedy of the Commons

Lesson 1 Activity: Scenic Tragedy

Lesson Overview:

The lesson will focus on an example of a commons often taken for granted. It is a commons that is often not regulated. Critical to the recognition of this type of commons are student-generated solutions.

National Science Education Standards:

Content Standard A: Science as Inquiry
Abilities necessary to do scientific inquiry

Excellence in EE — Guidelines for Learning:

Strand 3: Skills for Understanding and Addressing Environmental Issues

1. *Skills for Analyzing and Investigating Environmental Issues*
2. *Decision-Making and Citizenship Skills*

Key Concepts:

1. There are common resources that we all share.
2. Thoughtful use of resources can lead to conservation.
3. Resource limitations may create a supply and demand system.

Objectives:

Students will

- develop an understanding of the concept of "sustainability."
- be able to identify a commons.
- propose and justify solutions to excessive common resource depletion.
- recognize that there is often an economic basis to resource depletion.

Cross-Curricular Connections:

Economics
- Simulate supply and demand.

English
- Read books such as ***Common Ground,*** and ***The Lorax*** for similarities.

History
- Review historical accounts of species over-fishing such as the great whales.

Social Studies
- Compare exponential rise in human population with rise in resource demand.

Lesson 1 Activity: Scenic Tragedy

Process Skills:

Communicating Interpreting Modeling

Materials:

Per Student

Copy of the story, ***Home with a View.***

Suggested Time Frame:

One 50 minute class period

Procedure:

1. Read the following story

Home with a View

As long as a certain couple have been together, they loved going to the mountains with their children. For forty years they loved the breathtaking views and scenery, and their kids seemed to enjoy playing, hiking, and skiing. They admired the snow in the winter, the green foliage of the summer, and the fall colors. Early in their marriage, they decided the mountains would be the place where they would retire. They found some mountainside property and made payments on it for several years. After they finished paying off the mortgage on the property, they were able to start construction of a nice small house for their retirement—a cottage if you will. Their dreams seemed to be fulfilled. They spent long weekends and holidays at their mountain home, never tiring of the view that was before them. They were looking forward to their retirement when they would be able to enjoy the scenery and hopefully visits by their children and grandchildren. A heritage was in the making.

One spring the couple noticed a lot of surveying activity in the area along with what seemed like hundreds of little red flag survey markers littering the side of their mountain. During an excursion into the nearby town they noticed a picture of a high rise condominium project in a realtor's window. The location of this high rise condominium was to be in front of their house. Their house would literally be in the shadow of this building. Their view of the landscape before them, that they considered to be key to their retirement plan, would be blocked.

As they tried to complain to neighbors and public officials they became even more discouraged. It seemed the economic stakes were too high. There was a lot of money going into the project with expected high rates of return for the investors, many of whom were local people. The realtor felt no need to compensate the couple for blocking their scenic view. The couple did not have the monetary resources to try legal action. They just didn't know what to do!

2. Consider what to do.

Your goal is to consider all the issues and reach some sort of solution that is justifiable.

This activity may be done in several ways. One way is to assign each cooperative group a role to play. The roles to be taken on include the couple and their similarly affected neighbors, realtors, the town's business people, and the project investors. Other roles may be added. For instance, an outside advocacy group that believes scenic views are a commons property may be included. Another way to conduct this activity is to have each individual student consider the questions below and formulate solutions on this/her own.

1. Put yourself in this couple's place for a few minutes. What would you do? Explain.
2. What rights does this couple have regarding their scenic view?
3. What rights do the developers have to build their structure?
4. Do the developers have any responsibilities to those people whose scenic view has been blocked?
5. What can be done to prevent future problems concerning the loss of scenery?

Suggested Discussion Questions:

- What is an expanded definition of a commons?
- What do you think are the best solutions to avoid tragedies of the commons? Why? (Justify.)
- Evaluate the statement, "The good of the many outweigh the good of the individual." Is this always the case? When? Why or why not?

Further Investigations:

- Locate other areas where scenery loss may be occurring. What can be done in these locations to deter scenery loss?
- Demonstrate that economics may drive resource depletion. Fisheries scientists often use the phrase, "chicken is cheaper." Using web sites, newspapers, or visits to the grocery store compare the prices of various species of fish with chicken.

Career Opportunities:

Range Manager
Town/City Planner
Realtors and Developers
Professional position within an environmental advocacy group

Assessment Procedures:

- Assessment of this activity should include written summaries with justification of the group's or individual's responses to the questions in the activity.

- A rubric may be constructed using the following criteria:
  1. The question was answered in an expanded form, not just yes or no.
  2. The answer considered multiple points of view.
  3. Any personal decision or proposed societal action was justified.

Additional Resources:

Baden, J. A. & Noonan, D. S. (1998). ***Managing the Commons.*** Indianapolis, IN: Indiana University Press

Chiras, D. (1993). "Eco-logica: Teaching the Biological Principles of Sustainability." ***The American Biology Teacher***, 55, (2).

Meadows, D. L. (Ed.) (1977). ***Alternatives to Growth I.*** Cambridge, MA: Ballinger Publishing.

Peine, J. D. (Ed.), (1999). ***Ecosystem Management for Sustainability.*** New York: Lewis Publishers.

The Tragedy of the Commons
http://dieoff.org/page95.htm
(accessed January, 2002)

The Tragedy of the Commons Game
http://olymp.wu-wien.ac.at/usr/ai/mitloehn/commons
(accessed January, 2002)

Tragedy of the Commons homepage
http://www.members.aol.com/trajcom/private/trajcom.htm
(accessed January, 2002)

Ecosystem Sustainability Project
http://www.esig.ucar.edu/espweb4.html
(accessed January, 2002)

COMMONS SENSE: Tragedy of the Commons

Lesson 2 Activity: Undersea Commons

Lesson Overview:

Students will locate sites on the Internet for various marine sanctuaries and will characterize each sanctuary as to its special physical or biological elements. The students will evaluate each sanctuary with regard to what habitat and species are being sustained.

National Science Education Standards:

Content Standard C: Life Science
Population and Ecosystems

Excellence in EE — Guidelines for Learning:

Strand 3: Skills for Understanding and Addressing Environmental Issues

1. *Skills for Analyzing and Investigating Environmental Issues*
2. *Decision-Making and Citizenship Skills*

Key Concepts:

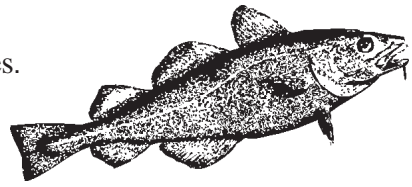
1. The earth's resources are limited.
2. People share common resources.
3. Human endeavors need to be balanced between needs and wants.
4. Careful and thoughtful planning can offer sustainable solutions.

Objectives:

Students will

- develop the concept of sustainability.
- recognize that there may be critical environments or resources needed to insure continued sustainability.
- evaluate National Marine Sanctuaries in terms of their contributions to sustainability.

Cross-Curricular Connections:



Arts
- Discuss aesthetics of common resources.

Economics
- Simulate supply and demand.

Mathematics
- Graph growth rates of populations.

Science
- Define Eco-Oceanography.

Lesson 2 Activity: Undersea Commons

Process Skills:

Communicating Interpreting Modeling

Materials:

Per Student

Internet access

U. S. Map (page 18)

Suggested Time Frame:

One 50 minute class period for presentation of the report. The research may be completed outside of class time.

Procedure:

1. Read the following descriptions and wording of the National Marine Sanctuaries Act.

The Marine Protection, Research and Sanctuaries Act (Title III) of 1972 authorized the Secretary of Commerce to designate and manage areas of the marine environment with nationally significant aesthetic, ecological, historical, or recreational values as National Marine Sanctuaries. The primary objective of this law is to protect marine resources, such as coral reefs, sunken historical vessels or unique habitats, while facilitating all "compatible" public and private uses of those resources. Sanctuaries frequently compared to underwater parks, are managed according to Management Plans, and prepared by NOAA on a site-by-site basis.

The Act allows the Secretary of Commerce to designate a discrete area as a National Marine Sanctuary if the designation would fulfill the purposes and polices in three areas:

- The marine site is of special national significance
- Existing state and federal authorities are inadequate or should be supplemented to insure coordinated and comprehensive conservation and management
- The area is of a size and nature that will permit coordinated and comprehensive conservation and management

2. Locate designated National Marine Sanctuaries on a map. There are webs sites that provide such information. For example, there is a NOAA web site (www.sanctuaries.nos.noaa.gov) that links to each sanctuary. This site also has links to information about the sustainable seas expeditions. The sustainable seas program is assessing biological diversity within National Marine Sanctuaries.

3. Have cooperative groups select one of the sanctuaries and answer the following questions:

- Why is this area nationally significant?
- What value is this area for scientific research and education?
- How is this area being managed?
- Why is this area important to someone in Kansas who is far removed from the site?

4. Report the information: There are several ways for the groups to report the information about their selected sanctuary. Access to images, location maps, and a computer with a color printer will aid in the presentation such as:

- Power point presentation.
- Poster board presentation.
- Development of a fact sheet.
- Development of a travel brochure.
- Oral presentation to the class .

Suggested Discussion Questions:

- What are the physical and biological similarities between the Marine Sanctuaries?
- What are the physical and biological differences between the Marine Sanctuaries?
- Is the designated area large enough? Why or why not?
- Within many sanctuaries there are "No-Take Zones." Why is this necessary?

Further Investigations:

- Brainstorm other areas that should be designated as a sanctuary on land or sea.
- Follow the progress and report from the Sustainable Seas Expedition.
- Research the Man and the Biosphere Project and select sites and evaluate as above. (http://ice.ucdavis.edu/mab/).

Career Opportunities:

Oceanographer
Ecologist
Park Manager
Eco-tourism Manager

Assessment Procedures:

- Suggested criteria for written responses to questions are:
  - Answers are adequate and whole (not fragmented).
  - Answers use scientific principles.
  - Opinions are identified as such.
- A rubric may be constructed using the preceding criteria.

Additional Resources:

Baden, J. A. & Noonan, D. S. (1998). ***Managing the Commons.*** Indianapolis, IN: Indiana University Press

Costanza, R.; Andrade, F.; Antunes, P.; van den Belt, M.; Boersma, D.; Catarino, F.; Hanna, S.; Limburg, K.; Low, B.; Molitor, M.; Pereira, J.; Rayner, S.; Santos, R.; Wilson, J.; & Young, M. (1998). "Principles for Sustainable Governance of the Oceans." ***Science***, 228, 198-199.

Fulghum, R. (1995). "Avoiding the Tragedy of the Commons." ***Global Jigsaw***, 1, 1 pp. 1-2.

Meadows, D. L. (Ed.) (1977). ***Alternatives to Growth I.*** Cambridge, MA: Ballinger Publishing.

CNN. ***Killing Tide.*** (1994). CNN Special. Video. (order information (212) 564-2887)

PBS Frontline. (1991). ***The Last Fish.*** Video. (order information: PBS Video, 1320 Braddock Place, Alexandria, VA 22314)

Peine, J. D. (Ed.), (1999). ***Ecosystem Management for Sustainability.*** New York: Lewis Publishers.

The Tragedy of the Commons
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The Tragedy of the Commons Game
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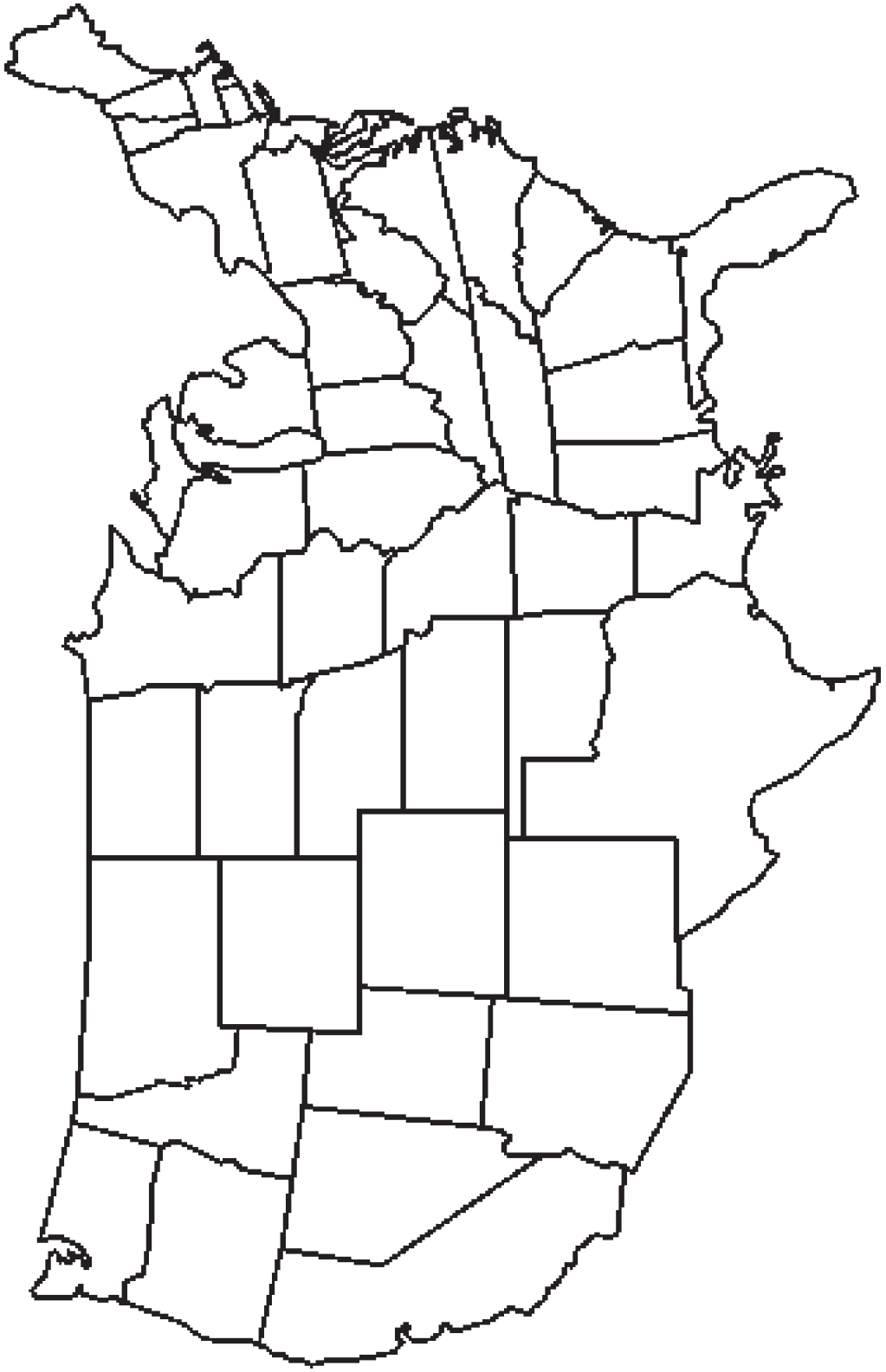
(accessed January, 2002)

Ecosystem Sustainability Project
http://www.esig.ucar.edu/espweb4.html
(accessed January, 2002)

Fishbanks Ltd.
http://www.unh.edu/ipssr/Lab/FishBank.html
(accessed January, 2002)

Worksheet: U. S. Map



Non-Native Invasion

ACTIVITY GUIDE

NON-NATIVE INVASION

Background Information

What's in a name? Invasion species, non-native species, non-indigenous species, introduced species, exotic species, and lots of other names are used to describe parasites, plant and animal species that are not native to a particular area. Today many of these non-native species are thriving in North American competing against native species for food or space and damaging environments. Three often asked questions about non-native species are:

1. How do non-native species get brought, imported, or migrate into North America?
2. What are the impacts of non-native species on the environments, animals, and plants of North America?
3. What is our responsibility to the environment and species native to North America?

The number of non-native plants and animals has risen dramatically during the 1900s as travel and trade increased worldwide. Currently non-native species come to North America in a number of different ways. Listed below is a way of classifying how or why some non-native species come to North America.

1. Exotics (people like rare and different animals and plants) - piranha, European starlings
2. Usefulness/Research (animals and plants are brought to North America to control a current problem, aid the local environment, or for profit) - kudzu, nutria, Chinese tallow trees
3. Migration (animals or plants find their way to North American through their own persistence or because someone imports them intentionally or accidentally)
   a. Natural Migration - armadillos, Argentine fire ants, African honey bees
   b. Man's Actions Cause for Migration - rats, horses, milk and beef cows, zebra mussels, kudzu, Formosan termites, sea lamprey

The first non-native plant and animal species to come to North America were brought to aid Europeans in their quest to explore and settle North America. The Spanish explorers brought horses to ride and cattle to eat. Some of these animals escaped from early explorers and settlers and started wild populations that flourished in some parts of the North America, especially in the western parts of the United States. Early English settlers brought farm animals, spices, and grains to grow for food. These early farmers brought seeds from Europe to plant (wheat, barley, potatoes) in the new world. But mixed in with the seeds for the farm crops were weeds and other plants. Many of these weeds were new in North America and sometimes flourished and replaced native plants.

Non-native plants and animals that get into the natural environment and begin to reproduce in large numbers can be a threat to native animals and plants in the environment. The most common reasons non-native species thrive in a new environment is because abundant food sources are available and they have few, if any, natural predators or parasites to moderate their growth.

Non-native species can cause consequences that are often unseen when they begin to inhabit an area or while their numbers are low. In the western United States non-native horses and burros have thrived over the past 200 years. Their numbers have grown, subsequently decreasing the food supply available to the native deer and antelopes. They also impact the land by making trails that increase the potential for erosion. There are almost no native predators for the burros and horses. As long as they can find food their numbers grow, as does their impact on the environment.

Economic Impact of Non-native Species

Each year non-native species cause millions of dollars of damage and problems for individuals, governments, businesses and industries. Consider the economic impact caused by non-native species listed below:

- Florida spends more than $14 million per year to control the growth of hydrilla in its fresh water lakes and rivers.
- Business, industries, and municipalities around the Great Lakes and on the Mississippi River spend as much as $360,000 each per year to control zebra mussels from restricting their intake of water from lakes and rivers. It was estimated that during a five year period, from 1989-1994, $120 million was spent to control zebra mussel infestations.
- The Great Lakes sport and commercial fishing industries, which account for more that $4 billion annually in revenue and more than 7500 jobs, are at risk due to growing numbers of non-native species fish (ruffe and round goby), sea lamprey, and mussels that are decreasing the commercial and sport fish caught by these industries.

Our National Parks Are Under Attack

Alien or non-native species are considered to be one of the greatest threats to the animal and plant life in our national parks. A tourist who caught a mature lake trout in Yellowstone Lake, Yellowstone National Park on July 30, 1994, was not big news. But scientists in the park considered the event a biological catastrophe because the trout was a non-native species and could signal the end of the native cutthroat trout. The Hawaii Volcanoes National Park has more than 1000 plant species, of which more than 600 are non-native species.

Control of Non-native Species

With more that 4500 non-native species in North America and many who are pests to agriculture, businesses, industries, and humans, people have developed methods to get rid of non-native species. A few of the methods used to control non-native species are:

- **Physical control for plants** - Cutting or harvesting plants, crop rotation, and burning to keep their numbers from growing, spreading and reduce their reproductive rates.
- **Chemical control for plants** - Chemicals can be sprayed directly on plants to kill them or introduced in the soil to inhibit plants from germinating.
- **Physical control for animals** - Hunting to extinction, trapping, and fencing to control their movement into uninfested areas. In the case of zebra mussels, washing boats in infested waters with soap and hot water will control growth and further infestations. Alternation of planting dates for crops are used to control insects.

- **Chemical control for animals** - Field sanitation with chemicals are used to control insects. Poisons can be used to kill animals that are hard to catch. Chemicals can often be added to water to kill or retard the growth of animals. Water can be chlorinated to kill zebra mussels or other aquatic plants and organisms.
- **Biological control for plants and animals** - This method generally consists of identifying a natural enemy or predator for the known pest and introducing it into an area to control the population of the pest. In some instances animals can be given birth control chemicals to decrease the birth rate. A birth control program has worked well with wild horses in the western United States.

Many of these control methods can significantly decrease non-native populations and their effect on the environment.

Legislation

The United States government, as well as many states, local governments, and private initiatives, have sought to pass ordinances and laws to control the importation of non-native species. The United States government passed the U.S. Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 which established the Great Lakes Panel on Aquatic Nuisance Species (ANS). The panel coordinates research and information/education efforts and advises the U.S government on ANS prevention and control. The U.S. government also passed the National Invasion Species Act of 1996 to help control the growing number of non-native/invasion species being found more and more in the U.S.

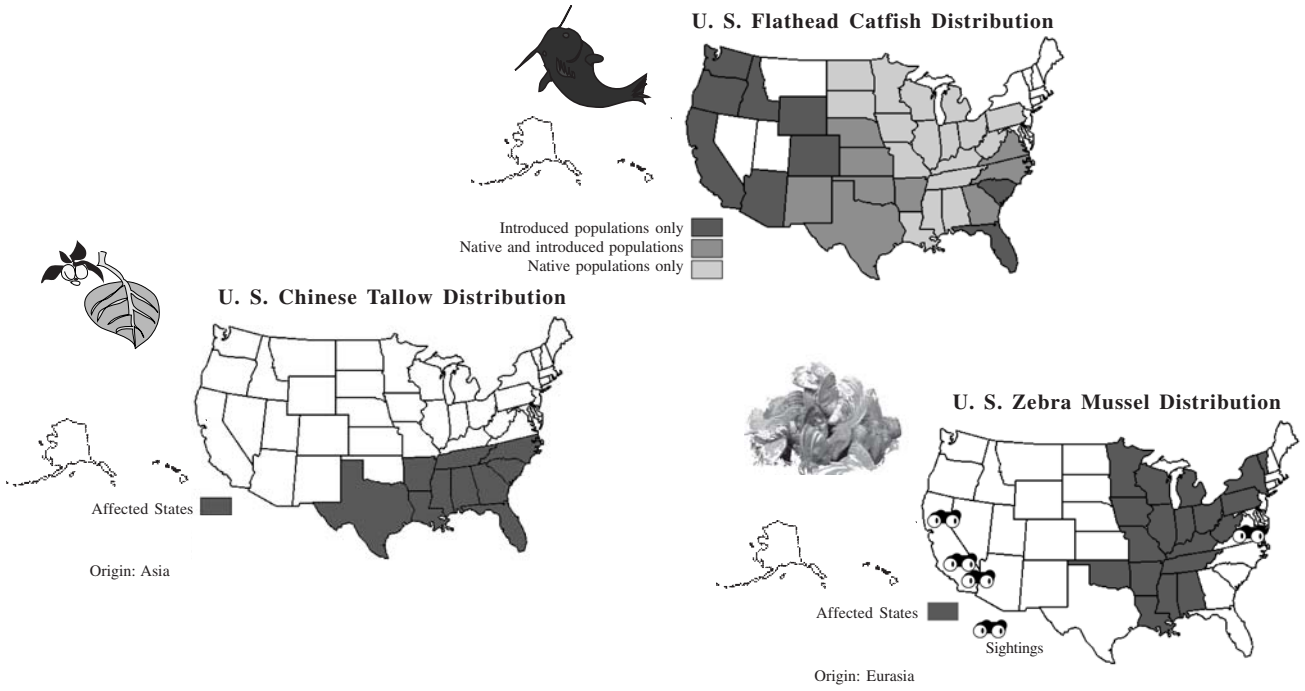
A Short List of Non-native, Non-indigenous, Invasion, Exotic Species That May Be In Your Backyard

Plants - Eurasian watermilfoil, hydrilla, kudzu, purple loosestrife, tallow trees, water chestnut

Animals - African honey bee, Asian clam, blue tilapia, fire ants, European gypsy moth, Japanese shore crab, Russian wheat aphid, salt cedar, zebra mussels

Maps of the Distribution of Some Non-native Species

Below are some maps showing current infestations of Flathead Catfish, Chinese Tallow, and Zebra Mussels.



Map Source: The Nature Conservancy

NON-NATIVE INVASION

Lesson 1 Activity: Create A Non-Native/Invasion Species

Lesson Overview:

As of 2000, more than 4500 non-native/invasion species have been introduced on the North American continent dramatically effecting native plants and animals. During this activity students will use their knowledge of native species to create a non-native species that might threaten local plants, animals, gardens, farms, sport fishing and hunting.

National Science Education Standards:

Content Standard A: Science as Inquiry
Content Standard C: Life Science
Living Systems, Populations, Ecosystems, Diversity, Adaptions

Excellence in EE—Guidelines for Learning:

Strand 2: Knowledge of Environmental Process and Systems
2. *The Living Environment*
4. *Environment and Society*

Strand 4: Personal and Civic Responsibility

Key Concepts:

1. Non-native/invasion species have both positive and negative effects on environments and the plants and animals that are native to those environments.
2. Non-native/invasion species do not generally have predators or parasites in the environments they invade that would control their population.

Objectives:

Students will:

- identify non-native/invasion species that have been introduced to North America over the past 500 years.
- compare and contrast the beneficial and harmful effects of non-native/invasion species to an environment.
- identify what individuals can do to help lessen the impact of non-native/invasion species on native environments, plants and animals.

Lesson 1 Activity: Create A Non-Native/Invasion Species

Cross Curricular Connections:

Arts:
- Use graphing and video presentations.

Language Arts:
- Prepare written materials or do oral presentations.

Mathematics:
- Quantify and graph data.

Social Studies:
- Research the historical, geographical, and societal implication of invading species.

Process Skills

Communicating	Analyzing	Inferring
Comparing	Applying	Observing

Materials:

Per Student	*Per Class*
Paper	Overhead projector
Pencil	***Non-Native Invasion*** Video
	Library and/or Internet access
	Overhead

Suggested Time Frame:

Two 50 minute class periods

Procedure:

1. Students view the ***Non-Native Invasion*** video and/or read periodical articles or agency publications about non-native/invasion species to set the stage for the activity.
2. Have the class discuss and list the characteristics of native species and local environments.
3. Have students individually, or in small groups, create a non-native/invasion species using the list and examples of non-native/invasion animals and plants discussed in the video and in class. Students create a non-native/invasion plant or animal (Invasion Species XQ) that they think will have a potential impact on farming, industry, recreation, or water in the local environment.
4. Each student or pair of students prepares a one page paper to describe their Invasion Species' impact on the local environment. The paper should include:
   - A description of the physical appearance of the Invasion Species XQ;
   - Where the non-native/invasion species originated;
   - When it entered North America or local environments;
   - How it entered North America or local environments;
   - The current state of its invasion into the local environment;
   - The impact the non-native/invasion species is having on the environment; and
   - What animals or plants it threatens in local environments.
5. Students present their Invasion Species XQ to the class.

Lesson 1 Activity: Create A Non-Native/Invasion Species

Suggested Discussion Questions:

- What are the characteristics that make your Non-native/Invasion Species XQ potentially harmful to the local environment? (Answers must be based on scientific facts about the species in question and not just inferences about how students feel).
- What makes a non-native species harmful to an environment?
- What laws need to be adopted to protect the native environment from non-native/ invasion species?

Further Investigations:

- Invite in a speaker who has expertise in non-native plants or animals.
- Visit a farm, business, or state agency that is developing chemicals or procedures to help control certain animals or plants.
- Draw an example of their Invasion Species XQ.
- Prepare a one page press release to describe their Invasion Species XQ environmental impact.
- Prepare a one minute TV/video presentation about their Invasion Species XQ environmental impact.

Career Opportunities:

Entomologist
Botanist
Zoologist

Assessment Procedures:

- Use the characteristics identified by the students with the teacher in the initial discussion to establish a suitable rubric for grading the Invasion Species XQ. The rubric should be established collaboratively by the teacher with the class before students begin to construct their Invasion Species XQ.
- Have students develop a news release informing local citizens about the dangers or benefits of the new non-native/invasion species.
- Evaluate the press release.

Additional Resources:

National Science Teachers Association. (1998). ***Introduced Species, Global Environmental Change.*** Arlington, VA: NSTA

Davis K. & Myers D. (1993). ***Killer Bees.*** New York: Dillon Press

National Science Teachers Association. (1998). ***Introduced Species, Global Environmental Change.*** Arlington, VA: NSTA

"Exotic Threat." Marshall, B. (1999, March 17) ***The Times Picayune***, pp. D1, D6.

Invasive Aliens
http://www.ct.nrcs.usda.gov
(accessed January, 2002)

Invasive Species
http://www.invasivespecies.gov
(accessed January, 2002)

National Agricultural Pest Information
http://ceris.purdue.edu/napis/
(accessed January, 2002)

NON-NATIVE INVASION

Lesson 2 Activity: Investigate Non-Native Neighborhood Invasion Species

Lesson Overview:

Non-native/invasion species have both positive and negative effects on the environment and the plants and animals that are native to those environments. Students will discover and investigate non-native species that are invading local or state environments.

National Science Education Standards:

Content Standard C: Life Science
Structure and function in living systems
Populations and ecosystems

Excellence in EE—Guidelines for Learning:

Strand 2: Knowledge of Environmental Process and Systems
2. *The Living Environment*
4. *Environment and Society*

Strand 4: Personal and Civic Responsibility

Key Concepts:

1. Non-native/invasion species are invading environments throughout North America.
2. Some non-native/invasion species are affecting farming and recreational activities.

Objectives:

Students will:

- identify and classify non-native species living in local environments.
- describe the impact of non-native species on local environments.

Cross Curricular Connections:

Language Arts:

• Read, research, discuss and write about non-native species.

Mathematics:

• Graph the growth rate of non-native/invasion and native species.

Social Studies:

• Research the history of the environments in which students live.

Lesson 2 Activity: Investigate Non-Native Neighborhood Invasion Species

Process Skills:

Communicating	Researching	Comparing
Analyzing	Inferring	Observing

Materials:

Per Class

Non-Native Invasion video
Articles from periodicals
State or federal publications about non-native species invasion
Library and/or Internet access
Map of U. S. (page 18)

Suggested Time Frame:

Two 50 minute class periods

Procedure:

1. Students view the ***Non-Native Invasion*** video and/or read articles about local, state, or regional non-native/invasion species.
2. Have the class discuss and list resources they should use to gather information on non-native/invasion species and how they would develop a press release to inform the public of the potential threat from these species.
3. In cooperative groups have students investigate local non-native/invasion species. Each group should strive to make a list of at least five examples of non-native/invasion species animals and plants found in local or state environments.
4. Have students select, research, and report on one non-native/invasion species. The map master should be duplicated and a copy provided to each group.

Suggested Discussion Questions:

- Why should people learn about non-native/invasion species?
- How can interested individuals help with non-native species invasion?

Further Investigations:

- Conduct surveys or interviews to determine the extent of awareness about non-native species.
- Publish a list to inform individuals what they can do to reduce the invasion of non-native species.
- Develop a press release to inform the public of the potential threat from a specific non-native/invasion species.

Career Opportunities:

Entomologist
Botanist
Zoologist
Geographer

Assessment Procedures:

- A rubric should be developed collaboratively by the teacher and the students for scoring the press releases and/or presentations.
- Short answer or essay questions could be developed for assessments to see if students can apply what they learned to new situations. An example would be to give students the characteristics of a non-native species and a native environment and ask students how the native environments might be affected by non-native species. Give credit for answers that cite scientific evidence (i.e., the non-native species populations might grow rapidly due to a lack of natural enemies which keep their populations under control) that might allow the non-native species to thrive.

Additional Resources:

National Science Teachers Association. (1998). ***Introduced Species, Global Environmental Change.*** Arlington, VA: NSTA

Davis K. & Myers D. (1993). ***Killer Bees.*** New York: Dillon Press

"Nutria Menace to the Marsh." (1999, March 14) ***The Times Picayune***, pp. A1, A12.

Stuart, D. (1993). ***The Astonishing Armadillo***. Minneapolis: Carolrhoda Books, Inc.

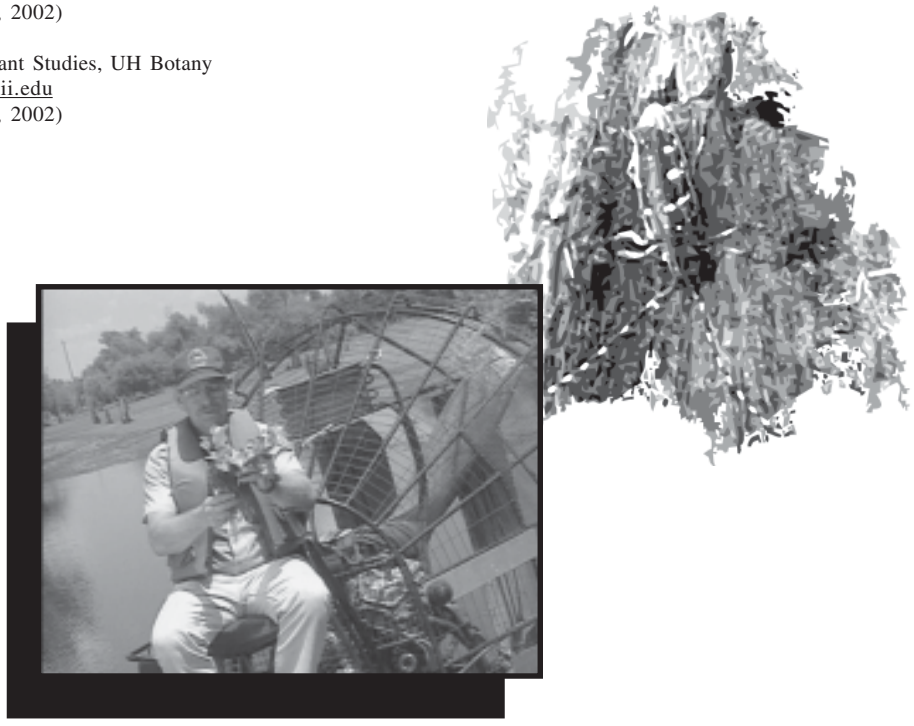
Invasive Aliens
www.ct.nrcs.usda.gov
(accessed January, 2002)

Hawaiian Alien Plant Studies, UH Botany
www.botany.hawaii.edu
(accessed January, 2002)

North American Native Plant Society
http://www.nanps.org
(accessed January, 2002)

National Agricultural Pest Information
http://ceris.purdue.edu/napis/
(accessed January, 2002)

Sea Grant's National Aquatic Nuisance Species Clearinghouse http://www.sgnis.org
(accessed January, 2002)



Spin on Sprawl

ACTIVITY GUIDE

SPIN ON SPRAWL

Background Information

Sprawl is low-density development beyond key city centers of employment and service. It separates the areas of work from living areas; and in some cases separates shopping areas, schools, and recreation areas from one another. This separation causes people to travel more to accomplish the same tasks (working, going to school, attending church, playing sports) as in years past, but increases travel time, gasoline, air pollution and traffic congestion. The result on our lives is simple: STRESS. The result on the surrounding environment is even worse, as animals and plants give up their habitats so that people can have different zones in which to live,

Some of the consequences of suburban sprawl are:

1. Air and water pollution
2. Traffic congestion, resulting in increased commute times
3. Loss of farmland, fields, forests, and wetlands
4. Increased flooding
5. Increased taxes to pay for new schools, new sewage systems, new police and fire departments, etc.
6. Destruction of downtown commerce

Between 1970 and 1990, almost 20 million acres of rural land were developed nationwide. In addition, 70% of prime farmland is now directly in the path of rapid development and in danger of being lost. Texas alone lost nearly a half million acres of farmland from 1982 to 1992. Sprawl has also meant the loss of many historic sites and scenic areas in both cities and countryside. Developers whose main concern is making a profit give little regard to the inherent aesthetic beauty of either a natural or man-made environment.

There are several solutions to the problem of suburban sprawl, but all of them require cooperation among citizens, government agencies, and business people. The solutions listed below are examples of the types of issues currently being discussed across the country as ways to accommodate more people without harming the environment.

- Land purchase by communities and non-profit organizations
- Establishment of urban growth boundaries, which are lines that separate urban areas from the surrounding open land
- Revitalization of existing towns and cities
- Voter approval of open-space revenues to preserve lands
- Mobilization of grassroots efforts to have a greater voice in decision-making
- Agricultural zoning, which allows development on lots of minimum size
- Clustering, which allows the same number of lots on a given parcel of land, but requires that they be clustered in one part of the lot so that sensitive areas are still protected.
- Conservation easements, when land owners donate their development rights to environmental organizations
- Tax-base sharing, which reduces the competition for new development.

As land space for new communities dwindles, planners are forced to be creative about land use when considering new developments. It is no longer acceptable for suburbs to be built wherever there is an open piece of land; environmental concerns must take precedence. As more and more people move out to the suburbs, more natural land area is covered by roads, parking lots, and foundations for houses and buildings. This loss of land leads to flooding problems, as snow and rain cannot be absorbed. Another damaging effect of sprawl is that the runoff from streets and farms can carry pollutants into the groundwater and bodies of water, thus contaminating habitats and reducing water quality.

SPIN ON SPRAWL

Lesson 1 Activity: Essential Services

Lesson Overview:

Students will discuss the essential needs and services that a community should provide for its citizens. They will then analyze these services according to the raw materials that must be used to produce the product or service required.

National Science Education Standards:

Content Standard C: Life Science
Populations and Ecosystems
Content Standard F: Science in Personal and Social Perspectives
Populations, Resources and Environments

Excellence in EE —Environmental Guidelines for Learning:

Strand 1: Questioning and Analysis Skills
Strand 2: Knowledge of Environmental Processes and Systems
3. Humans and Their Societies

Key Concepts:

1. People who move to the suburbs hoping to escape traffic, crime, and overcrowded schools soon find that these problems follow them as more and more people join them in the suburbs.
2. People in suburbs require certain essential services such as utilities, schools, and police protection.

Objectives:

Students will:

- list the essential needs of a community.
- determine inputs needed and outputs produced for each community service.

Cross-Curricular Connections:

Art
- Draw symbols for each of the essential services to be used later on map.

Language Arts
- Write a story which depicts the "ideal community."

Mathematics
- Research population statistics to determine feasibility of services listed.

Social Studies
- Discuss societal implications of suburban sprawl.

Lesson 1 Activity: Essential Services

Process Skills:

Analyzing Decision-making
Inferring Evaluating

Materials:

Per Class
Chart paper
Markers

Per Student
Community Services worksheet (page 40)

Suggested Time Frame:

One 50 minute class period

Procedure:

1. Students will brainstorm a list of services necessary in any community, such as utilities, fire departments, and stores. A definition of the term "essential" develops as students try to include only those services that are necessary for a community to function effectively.
2. Using the brainstormed list, students complete the Community Services worksheet by filling in the essential services, their inputs needed and their outputs produced in fulfilling their service. Inputs are the raw material needed to produce something; outputs are the products and by-products.
3. As a wrap-up, the effect of the outputs on the surrounding environment is discussed and evaluated.

Suggested Discussion Questions:

- What kinds of services are available in your community that you could do without?
- Some services that we rely on today were not present 100 years ago. Can you list some of the "new" essential services?
- What is the overall impact on the environment of the list of services you have made?

Further Investigations:

- Conduct informal interviews with senior citizens in your community. What kinds of services did they have when they were growing up? How was the community different? Compare their descriptions of your community to the way it looks today.

Lesson 1 Activity: Essential Services

Career Opportunities:

Planners for city/state government
Land developer
Architect
Public Works Supervisor

Assessment Procedures:

- Students should develop a working definition of essential service.
- Students should be able to successfully complete the Community Services worksheet and use their results to begin planning their own community.

Additional Resources:

Arendt, R. (1994) ***Rural by Design***
APA Planners Press

Hylton, T. (1995) ***Save Our Land, Save Our Towns***
Preservation Pennsylvania

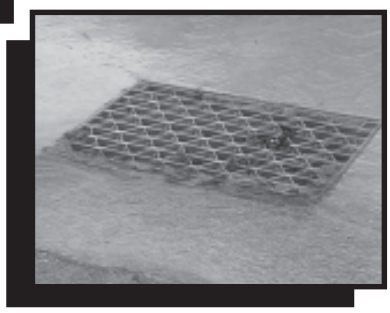
Nelessen, A.(1994) ***Visions for a New American Dream***
APA Planners Press

United States Department of
Housing and Urban Development.
http://www.hud.gov
(accessed January, 2002)

Urban Ecology, Inc.
http://www.urbanecology.org
(accessed January, 2002)

Center for Livable Communities.
http://www.lgc.org/center
(accessed January, 2002)

Center of Excellence for Sustainable Development.
http://www.sustainable.doe.gov
(accessed January, 2002)



SPIN ON SPRAWL

Lesson 2 Activity: Creating Communities

Lesson Overview:

Students will work in planning teams to design a community which reflects the decisions made in Activity 1. Depending on population, some nonessential services may be added, but all must be justified and minimal environmental impact should occur.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives
Populations, Resources, and Environments
Risks and Benefits

Excellence in EE — Guidelines for Learning:

Strand 2: Knowledge of Environmental Processes and Systems
4. Environment and Society
Strand 3: Skills for Understanding and Addressing Environmental Issues
1. Skills for Analyzing and Investigating Environmental Issues

Key Concepts:

1. 400,000 acres per year are used to build residential and commercial centers, which means that this land is lost as habitat for animals and vegetation.
2. One of the most damaging effects of sprawl is run-off from city streets that carries pollutants into waterways, degrading water quality and habitats.

Objectives:

Students will

- design a community which provides essential needs for its residents while maintaining environmental balance.
- use established guidelines to rate community designs and presentations.

Cross-Curricular Connections:

Art

- Construct a three-dimensional model of the community. Design a community web site.

Language Arts

- Read ***The Little House***, by Virginia Lee Burton. Write a story which depicts what might happen to ***The Little House*** in the next 50 years.

Lesson 2 Activity: Creating Communities

Mathematics
- Use measurement and scale to draw communities.

Social Studies
- Study the workings of local government agencies such as planning and zoning commissions to see how they impact land-use decisions.

Process Skills:

Measuring	Making Models	Decision-making
Inferring	Analyzing	Evaluating

Materials:

Per Group
- rulers
- pencils
- chart paper
- colored pencils,
- Community Services worksheet (page 40)

Suggested Time Frame:

At least three 50 minute class periods

Procedure:

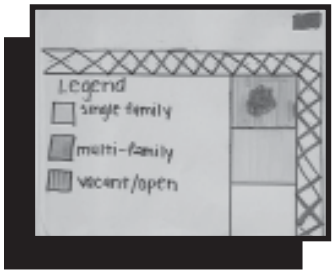
1. Introduce the term, "suburban sprawl" and discuss why unlimited community expansion without developmental control has caused problems.

2. Discuss the concept of an "ideal" community. Challenge students to develop an ideal community while keeping the following concepts in mind:

   a. A community should have services which meet the educational, health, occupational, safety, and recreational needs of the people who live there.

   b. Care should be taken to minimize environmental impact and maintain existing ecosystems.

   c. Interactions between residential areas and business areas should be minimal, though all areas should be easily accessible.



3. All community plans should include one major highway, a railroad, and a river or lake. In addition, students may want to consider drawing a buffer zone between residential and commercial areas.

4. Students should choose a suburb or town with which they are familiar; determine its land size, population, and population density; and then model their community along those guidelines.

5. When students are finished designing the community, they begin working on presentations for their peers. This presentation should include the advantages of life in their community, essential services provided, and environmental precautions taken.

6. Students will rate each community's presentation using the "Planning and Zoning Commission Rating Scale" established by the class.

Suggested Discussion Questions:

- What effect will the changes that occur as a result of building a community have on the different species which live in that environment?
- How does your community compare to communities in our area?
- Why is it necessary for people to plan communities instead of just building houses, businesses, and services as they are needed?

Further Investigations:

- This idea can be easily adapted into a year-long integrated study of sustainable communities. All subject areas can be covered as students study ecosystems, plan environmentally friendly communities, communicate their plans to others, and calculate costs associated with growth.

Career Opportunities:

City Planner
Architect
Politician
Parks and Recreation Director

Assessment Procedures:

- Rate each community design according to guidelines on rubric.
- Journal entry describing ideal community.

Additional Resources:

Arendt, R. (1994) ***Rural by Design***
APA Planners Press

Klein, R. D. (1990) Everyone wins!
A Citizen's Guide to Development
APA Planners Press

Hylton, T. (1995) ***Save Our Land, Save Our Towns***
Preservation Pennsylvania

The International Council for
Local Environmental Initiatives.
http://www.iclei.org/la21/onestop.htm
(accessed January, 2002)

American Planning Association.
http://www.planning.org
(accessed January, 2002)

Center for Livable Communities.
http://www.lgc.org/center/
(accessed January, 2002)

Worksheet: Community Services

COMMUNITY RATING SHEET

_____ PLANNING & ZONING COMMISSION

Community Name: _____

Planners: _____

Rate the following items based on this scale:

+ means above average, / means average, and **-** means below average.

1. Design is neat and easy to read _____
2. Group is well-prepared for presentation _____
3. Community has all essential services _____
4. Residential areas are easily accessible _____
5. Business areas are easily accessible _____
6. Plan provides for good traffic flow _____
7. Minimal environmental impact _____
8. Wise use of natural resources is evident _____
9. Interactions between residential and business areas are minimal _____

COMMENTS: _____

_____

_____

_____

COMMUNITY SERVICES		
INPUTS	**ESSENTIAL SERVICES**	**OUTPUTS**

Student Solutions

ACTIVITY GUIDE

STUDENT SOLUTIONS

Background Information

One of the most effective methods of encouraging student interest in environmental issues is through participation in student projects that focus on their immediate surroundings. Involving middle school students in environmental efforts that directly impact their school or community is empowering, especially if they have had input into selecting and developing the project. Students not only become part of the solution to an environmental problem; they develop problem-solving skills in a variety of arenas. Throughout the process, students gain confidence and recognize that their ideas and actions are important and make a difference in improving the quality of life. Designing research plans, collecting data, developing strategies to address important environmental issues, and defending actions require high levels of critical thinking. Navigating through all the phases required to successfully develop and implement a project hones citizenship and leadership skills, while emphasizing the importance of planning, gathering and presenting evidence, negotiating with opponents as well as working with peers and adults to effect change. Armed with information and a means of disseminating that information, young people develop life skills that will serve them well in future endeavors.

There are many examples of young people serving as catalysts to emphasize environmental stewardship. From helping to plant marsh grass in coastal restoration projects, to changing waste disposal policies, young people have enjoyed remarkable success in improving the environment.

While there have been a myriad of student-focused environmental activities completed in past years, the following collection of initiatives are offered to emphasize the vast array of potential projects available and to stimulate classroom discussion of possible topics for further study. Highlighted projects include those that have been done individually, within classrooms and through formal organizations. In many cases, the organizations or agencies have collaborated with the classroom teacher to strengthen the overall program. Local, state, and national governmental agencies, and some business organizations, have education components that offer assistance and valuable resources to classroom teachers. Many recycling programs have enjoyed district-wide success because of their school outreach programs.

Students Practicing Environmental ACTION

Improving the environment while helping people and animals is an integral part of learning for students at Pine-Richland Middle School in Gibsonia, Pennsylvania. As part of a unit entitled People to Animals: Making a Difference, Pine-Richland students help abused and homeless animals by collaborating with the Great Aluminum Can Roundup program and sponsoring Paws to Recycle, a can recycling campaign. Students also hold a community dog walk, an all-school pet show and collect supplies to raise funds for the Animal Friends Shelter, Pittsburgh's only 'no-kill' pet shelter.

Since joining the Great Aluminum Can Roundup, students have expanded their can recycling campaign throughout the school system. Another component of the unit involves visiting a local retirement home with shelter and personal pets as part of a shelter/pet therapy program. These middle school students were awarded an Encore Award of $1000 from the Points of Light Foundation and USA Weekend for their continued and expanded efforts to help their community through volunteer service. The middle school is also a National Make a Difference honoree.

In September, 1998, Clark-Winfield Girl Scouts, Clark, New Jersey, recycled their millionth aluminum beverage can during their monthly evening collection in front of the local firehouse. Girl Scout Brownies through Sr. Cadets recycle to help the burned children's center at the hospital and fund a fire education demonstration trailer that travels throughout the state. (Great Aluminum Can RoundUp Program)

Crawford 4-Hers, Crawford, Arkansas, recycle aluminum cans to fund a program enabling parents of school age children to have identification records of their children made at no cost. The students have involved eleven elementary schools and helped promote recycling events. They are assisting other 4-Hers throughout Arkansas and Oklahoma start "Remember Our Children" programs funded by aluminum can proceeds. Extra funds have been used to provide training, conduct child safety workshops for educating the community, expand school photo and identification days, and pay for printing materials. (Great Aluminum Can RoundUp)

A teacher at Place Middle School in Denver, Colorado, brought her students to a local river to do an environmental inventory on river pollution. Much to her surprise, the students were very concerned about the lack of handicapped accessibility down to the wild side of the river which prevented some of their classmates from being able to enjoy this natural resource. Through research into city and private ownership, the students were able to identify those responsible for the area and gain permission to create a handicap access. Now everyone can enjoy this local natural resource. (Earth Force)

Linda Gautier's class at St. Louis King of France Middle School in Baton Rouge, Louisiana, sponsors environmental "fairs" for younger students. They write grants to provide funds for activities at school, in the community and at a local hands-on science museum. Their participation in annual Earth Day festivities has garnered them special recognition from the mayor!

Habitat Loss

Air Quality

Water Quality

Litter

Resource Consumption

Girl Scout Troop #3011 in Newton, Massachusetts, decided to reduce pollution in the air caused by the idling cars of people trying to locate hard-to-read or missing house numbers. After conducting a community survey, they learned that most residents were unaware of an ordinance requiring house numbers to be visible and at least two inches high.

City engineers confirmed two inches was still inadequate. After petitioning the Board, the Girl Scouts were able to revise the ordinance to require that the house numbers be four inches. This improved safety conditions for responding police, ambulances, and fire departments as well as reduced air pollution through unnecessary vehicle idling. (Earth Force)

There are many other examples of youth activism in environmental education involving issues focusing on the use of water and water quality, pesticide and chemical use at home and in the surrounding community, energy conservation, biodiversity and the effects of non-native plants and animals, habitat loss, waste reduction, etc. Requesting information and assistance from local volunteer associations, governmental agencies, the Nature Conservancy and other environmental and service organizations will provide many project selections from which students can choose to become actively involved. Encouraging youth to become active participants in environmental action is self-affirming and can result in benefits that are far-reaching and exert a positive influence on the environment.

Enviro-Tacklebox™ is sponsoring a unique opportunity for you to publicize your project, exchange ideas or receive assistance from others who have been involved in successful student projects. Visit our Web site (www.envirotacklebox.org) to post a description of your project or request information (edserv@lpb.org) about the project program.

www.envirotacklebox.org

edserv@lpb.org

STUDENT SOLUTIONS

Lesson 1 Activity: You CAN Make a Difference!

Lesson Overview:

Students identify environmental issues affecting their community and determine ways they can address the issues.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:
Populations, Resources, and Environments
Risks and Benefits

Excellence in EE—Guidelines for Learning:

Strand 3: Skills for Understanding and Addressing Environmental Issues
2. *Decision-Making and Citizenship Skills*

Key Concepts:

1. People impact the environment in many different ways.
2. As members of the community, people can recommend possible solutions to environmental problems affecting everyday life.
3. Students can become active participants in their communities to address environmental issues and effect change.

Objectives:

Students will:

- identify environmental issues within their communities and determine how they can effectively address an environmental problem.
- recognize that they can be catalysts for change.

Lesson 1 Activity: You CAN Make a Difference!

Cross-Curricular Connections:

Language Arts:

- Communicate information through research and discussion.
- Construct graphic organizers.

Science:

- Investigate causes and effects of various environmental problems.

Social Studies:

- Identify and describe the many ways citizens can participate in and contribute to their communities.
- Discuss ways in which citizens can organize, monitor, and help shape policies and impact governmental decisions at the local, state, and national levels.

Process Skills:

Observing	Communicating	Comparing
Investigating	Inferring	Applying

Materials:

Per Class

Chart paper
Markers

Per Student

Data collection journal
Post-It Note

Suggested Time Frame:

One or two 50 minute sessions

Note: It is suggested that Lesson One be completed prior to viewing the accompanying video.

Procedure:

1. Individually, each student:

   a. writes three environmental issues in their journals that impact their communities.

   b. selects one of the problems he/she is most interested in addressing.

   c. writes the chosen problem on a Post-It Note, and posts the note on a chalkboard or poster for whole class discussion.

2. Conduct a class discussion and have the students categorize the problems by putting the selections in similar groups.

3. Divide the class into Action Groups according to their choices.

4. Each group discusses why the issue is important to the community, including how the issue negatively impacts the environment.

5. Each group determines an overall goal to accomplish to either eliminate the problem or lessen its environmental impact. In their journals, each member records the issue, goal to accomplish, and possible action steps to resolve the issue. (For example, if the problem is litter on the school grounds, students may choose their goal to be eliminating all litter. Possible solutions may include increasing the number of trashcans, starting a "Clean-up our School" campaign against littering that includes sponsoring a contest to write an anti-littering slogan, jingle or bumper sticker, posting anti-litter reminders throughout the school, etc.).

6. On chart paper, the group writes the issue and the goal to be accomplished in large print, and lists the possible action steps to solve the problem.

7. A reporter from each group presents the ideas from the group to the whole class. Conduct a class discussion focusing on the problems, goals and suggested action steps. Encourage all students to contribute ideas for the possible action steps.

8. Have the class choose at least one environmental issue to address and compile all the action steps needed to address their concerns. (Be flexible. If there are other classes involved in this study, all classes should have the opportunity to review the work of the others. Cross-pollination of ideas will make the project(s) stronger. It may be that all classes would want to work on one issue, or there may be some that feel very strongly about an issue and will want to work individually or band together in small groups and focus on different efforts. Encouraging students to pursue their interests will be the most productive. This project may be ongoing for a long period of time. The video introduced in lesson two has a number of examples that will provide motivation and additional information on beginning student-driven projects.)

Lesson 1 Activity: You CAN Make a Difference!

Suggested Discussion Questions:

- What do you notice about the ideas everyone has contributed?
- Are there any common issues and/or action steps?
- Can we really DO anything about the problems? What can we do?
- Can you think of a problem that would be difficult/easy for us to try to solve?
- Can just one person effect change to improve the environment?
- Do you know of any examples where just one person or a small group of people made a difference?

Further Investigations:

- Investigate the issues on a larger scale, including the state or region.
- Contact local and state government agencies for information pertaining to the environmental problems students identified.

Career Opportunities:

Ecologist
Environmental Engineer
Biologist
Resource Manager
Attorney
Governmental policy-maker

Assessment Procedures:

- Rubric that includes individual and group participation criteria
- Self-assessment of group participation
- Journal notations

Lesson 1 Activity: You CAN Make a Difference!

Additional Resources:

Stidworthy, J. (1992). ***Be An Expert Environmentalist.*** New York: Gloucester Press.

Owen, S. (1993). ***Eco-solutions: It's In Your Hands.*** Edina, MN: Abdo & Daughters.

Elkington, J., Hailes, J., Hill, D., Makower, J. (1990). ***Going Green: A Kid's Handbook To Saving The Planet.*** New York: Puffin Books.

Keep America Beautiful
http://www.kab.org
(accessed January, 2002)

The Great Aluminum Can Roundup
http://www.cancentral.com promotes recycling of aluminum cans.
(accessed January, 2002)

Environmental Youth Awards
http://www.epa.gov/students/awards.htm
(accessed January, 2002)

STUDENT SOLUTIONS

Lesson 2 Activity: Taking Part in the Plan

Lesson Overview:

What have other individuals or groups done to address environmental issues and effect change in their communities? Students view the accompanying video and design a comprehensive plan of action to assist in the resolution of one or more previously identified environmental problem(s).

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives
Populations, Resources, and Environments; Risks and Benefits

Excellence in EE—Guidelines for Learning:

Strand 3: Skills for Understanding and Addressing Environmental Issues

2. *Decision-Making and Citizenship Skills*

Key Concepts:

1. Maintaining a healthy environment is the responsibility of all citizens.
2. As members of the community, people can determine possible solutions to problems affecting everyday life.
3. One person armed with knowledge and conviction can influence social mores and policy makers.
4. Students can take active roles in their communities and develop action plans to address environmental problems.

Objectives:

Students will:

- view models of other middle school students that have effected environmental change in their communities.
- research environmental issues and determine methods of taking action.
- develop a plan of action that focuses on a local environmental issue that affects the everyday lives of people living in that community.
- design an evaluation plan to assess their work.

Lesson 2 Activity: Taking Part in the Plan

Cross Curricular Connections:

Language Arts
- Communicate information through research and discussion.

Science
- Investigate causes and effects of various environmental problems.

Social Studies
- Identify and describe the many ways citizens can participate in and contribute to their communities.
- Discuss ways in which citizens can organize, monitor, and help shape policies and impact governmental decisions at the local, state, and national levels.
- Practice good stewardship habits by implementing a plan of action to effect change.

Processes and Skills:

Observing	Communicating	Comparing
Investigating	Inferring	Applying

Materials:

per student
Data collection journal

per group
Chart paper
Markers

per class
Video: Enviro-Tacklebox™ ***Student Solutions***

Suggested Time Frame:

Three to four 50 minute sessions over several weeks or longer, depending upon the project

Procedure:

1. Students view the video that accompanies this module and discuss possible activities they could do to effect change.

2. Each group researches its previously chosen topic or modifies it based on examples from the video and further discussion. They may choose to interview community representatives, use surveys, attend meetings, read articles, etc., in order to determine how to meet the goals they have set.

NOTE: After conducting the research, the students may decide to adjust or completely change their initial selection. At this time, there may be one or possibly two common goals the class as a whole is interested in pursuing. It is important that each student

believes he/she is a part of the process and is interested in meeting the common goal. Whatever the issue(s) chosen, there needs to be a well-defined and manageable scope of work to ensure that achieving the goal is within the reasonable reach of middle school students to accomplish.

3. After gathering as much information as needed to determine a course of action, students design a plan to meet their goals. This may be as simple as organizing a letter writing campaign or joining a local clean-up initiative, to involving the school and the community in a comprehensive composting project.

4. Students implement their plans and devise methods to assess effectiveness. For example, if a letter writing campaign is begun, record: the number of letters written, include whether these were form letters or generated by individual students, print or E- mail communication, participation of influential people in the community in the letter writing program, problems encountered with accompanying solutions, the rate of return responses, press releases, news stories, etc. Projects should be posted on the Enviro-Tacklebox™ web site to share with other students across the nation.

Suggested Discussion Questions:

- What examples or issues did you notice in the video that were similar to our discussions?
- How are these the same or different?
- Can we really DO anything about the problems? What can we do?
- Can just one person effect change in the way things are done?
- Would it help to have other people or organizations join your effort?
- How can we implement a plan of action to address our issues?

Further Investigations:

- Continue implementing the action plan building upon the initial efforts.
- Establish a partnership with a business or environmental group to join forces in a common goal.
- Sponsor environmental education activities.
- Contact local groups that may be interested in helping fund new initiatives.
- Design a survey and have a large number of people (100+) complete it. Analyze the results and publish the findings.

Lesson 2 Activity: Taking Part in the Plan

Career Opportunities:

Ecologist
Environmental Engineer
Biologist
Resource Manager
Attorney
Governmental policy-maker

Assessment Procedures:

- Individual and group participation.
- Rubric-scored action and evaluation plans.
- Implementation of action plans.

Additional Resources:

Dashefsky, H.S. (1995). ***Kids Make a Difference! Environmental Science Activities.*** New York: McGraw-Hill.

Lowery, L., & Lorbiecki, M. (1993). ***Earthwise At School.*** Minneapolis, MN: Carolrhoda Books.

Bambaugh, R. (1990). ***Science Fair Success.*** Hillside, NJ: Enslow Publishers.

Earth Force
http://earthforce.org engages young people in national environmental campaigns and offers practical activities that can help improve their communities. (accessed January, 2002)

Student Environmental Action Coalition
http://www.seac.org/ provides additional information on other projects.
(accessed January, 2002)

Give Water a Hand, Univ. of Wisconsin
http://www.uwex.edu/erc/gwah
provides youth/teacher action guides.
(accessed January, 2002)

Enviro Rules

ACTIVITY GUIDE

ENVIRO RULES

Student Civic Participation: Influencing Environmental Policy

Background Information

Are you tired of hearing about all the environmental problems of the country? Do you want to start seeing some solutions? Well, here's how solutions happen...YOU HAVE TO GET INVOLVED! Want to know how to get involved? Ever heard of civic participation? How about a few basics in civics to show how that can be accomplished?

The following is adapted from CIVITAS: A Framework for Civic Education by the Center for Civic Education (www.civiced.org) and the National Standards for Civics and Government produced by the Council for the Advancement of Citizenship and the National Council for the Social Studies. CIVITAS quotes R. Freeman Butts in describing the "civic mission" of schools:

"Civic education in a democracy is education in self-government. Self- government means active participation in self-governance, not passive acquiescence in the actions of others....The ideals of democracy are most completely fulfilled when every member of the political community actively shares in government....The first and primary reason for civic education in a constitutional democracy is that the health of the body politic requires the widest possible civic participation of its citizens consistent with the common good and the protection of individual rights. The aim of civic education is therefore not just any kind of participation by any kind of citizen; it is the participation of informed and responsible citizens, skilled in the arts of effective action and deliberation."

The National Standards for Civics and Government are intended to

"help schools develop competent and responsible citizens who possess a reasoned commitment to the fundamental values and principles that are essential to the preservation and improvement of American constitutional democracy. Achievement of these standards should be fostered not only by explicit attention to civic education in the curriculum, but also in related subjects such as history, literature, geography, economics, and the sciences and by the informal curriculum of the school, the pattern of

relations maintained in the school and its governance. To achieve the standards students must be provided with the kinds of learning opportunities in the classroom, school, and community that foster the skills necessary for civic participation."

Activities in this module will combine civic and environmental education to become "civic environmentalism," where groups and individuals act to protect their environment by getting involved in the legislative process. These activities will help students learn to: participate in government, influence government, develop and evaluate laws, and monitor government.

FOCUS ON ENVIRONMENTAL POLICY

Environmental laws and regulations protect human health, animals, plants, and natural resources. There are many environmental, health, and community safety laws, policies and regulations protecting people, land, water, plants and animals. These laws, and others enacted by federal, state, and local governments, have various requirements and are enforced by various agencies. The following are examples of some of these agencies and the laws they implement. Some agencies share responsibilities for a particular law, but they have been listed here under the dominant agency. State and local governments also have some responsibility in regulating and/or complying with the following.

Major Environmental Laws and Regulations

U.S. Environmental Protection Agency

Clean Air Act

The Clean Air Act is the comprehensive federal law that regulates air emissions from area, stationary, and mobile sources. This law authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.

The goal of the Act was to set and achieve NAAQS in every state by 1975. The setting of maximum pollutant standards was coupled with directing the states to develop state implementation plans (SIP's) applicable to appropriate industrial sources in the state.

The Act was amended in 1977 primarily to set new goals (dates) for achieving attainment of NAAQS since many areas of the country had failed to meet the deadlines. The 1990 amendments to the Clean Air Act were, in large part, intended to meet unaddressed or insufficiently addressed problems such as acid rain, ground-level ozone, stratospheric ozone depletion, and air toxics.

Clean Water Act

The Clean Water Act is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to waters of the United States. The law gave EPA the authority to set effluent standards on an industry basis (technology-based) and continued the requirements to set water quality standards for all contaminants in surface waters. The CWA makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit (NPDES) is obtained under the Act. The 1977 amendments focused on toxic pollutants. In 1987, the

CWA was reauthorized and again focused on toxic substances, authorized citizen suit provisions, and funded sewage treatment plants (POTW's) under the Construction Grants Program. The CWA provisions for the delegation by EPA of many permitting, administrative, and enforcement aspects of the law to state governments. In states with the authority to implement CWA programs, EPA still retains oversight responsibilities.

National Marine Fisheries Service

Marine Mammal Protection Act (Sec. 1361)

States that

1. certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities;

2. such species and population stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part, and, consistent with this major objective, they should not be permitted to diminish below their optimum sustainable population. Further measures should be immediately taken to replenish any species or population stock which has already diminished below that population. In particular, efforts should be made to protect essential habitats, including the rookeries, mating grounds, and areas of similar significance for each species of marine mammal, from the adverse effect of man's actions;

3. there is inadequate knowledge of the ecology and population dynamics of such marine mammals and of the factors which bear upon their ability to reproduce themselves successfully;

4. negotiations should be undertaken immediately to encourage the development of international arrangements for research on, and conservation of, all marine mammals;

5. marine mammals and marine mammal products either -
   a. move in interstate commerce, or
   b. affect the balance of marine ecosystems in a manner which is important to other animals and animal products which move in interstate commerce, and that the protection and conservation of marine mammals and their habitats is therefore necessary to insure the continuing availability of those products which move in interstate commerce; and

6. marine mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic, and it is the sense of the Congress that they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem. Whenever consistent with this primary objective, it should be the goal to obtain an optimum sustainable population, keeping in mind the carrying capacity of the habitat.

U.S. Fish and Wildlife Service

Endangered Species Act

The Endangered Species Act provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The (FWS) maintains the list of 632 endangered species (326 are plants) and 190 threatened species (78 are plants).

Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. Anyone can petition FWS to include a species on this list. The law prohibits any action, administrative or real, that results in a "taking" of a listed species, or adversely affects their habitat. Likewise, import, export, interstate, and foreign commerce of listed species are all prohibited.

U.S. Coast Guard

Marine Pollution Control Act (MARPOL)

Under Annex V of MARPOL, the international marine pollution treaty signed by 79 countries including the U.S., dumping of plastic in any waters is prohibited.

Garbage Dumping Restrictions in U.S. Waters

Under federal law, it is illegal for any vessel to discharge plastics or garbage containing plastics into any waters. Regional, state or local laws may place further restrictions on the disposal of garbage. ALL discharge of garbage is prohibited in the Great Lakes or their connecting or tributary waters. Each knowing violation of these requirements may result in a fine of up to $500,000 and 6 years imprisonment.

ENVIRO RULES

Student Civic Participation: Influencing Environmental Policy

Lesson 1 Activity: Environmental Law-Making

Lesson Overview:

Students will go through the entire process of creating and passing a federal law. They will select an environmental issue, research related policies for the issue, draft the bill, discuss it among committee members, bring it before the class, vote on it, and attempt to get it passed.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:
Populations, resources, and environments
Natural hazards
Risks and benefits
Science and technology in society

Excellence in EE—Guidelines for Learning

Strand 2: Knowledge of Environmental Processes and Systems
3. *Humans and Their Societies*
4. *Environment and Society*

Strand 3: Skills for Understanding and Addressing Environmental Issues
1. *Skills for Analyzing and Investigating Environmental Issues*
2. *Decision-Making and Citizenship Skills*

Strand 4: Personal and Civic Responsibility

Key Concepts:

1. Environmental issues are controversial and there are many opinions as to how to handle them.
2. Regulations, policies and laws are tools used by legislators to govern society.
3. Citizen participation in government is important to help influence public policy.

Lesson 1 Activity: Environmental Law-making

Objectives:

Students will:

- understand the law-making process.
- debate and come to consensus about an environmental law.
- recognize that environmental issues are complex and there are differing opinions about them.

Cross-Curricular Connections:

Civics:

- Research government policy and make suggestions for policy adoption and/or modification.

Environmental Science:

- Analyze an environmental issue to discern what should be included in the law.

Writing:

- Research and write an environmental law.

Process Skills:

Analyzing	Communicating	Decision-making
Evaluating	Inferring	Problem-solving

Materials:

Per Class

Internet access
Copies of regulations
U.S. Constitution
References on how federal laws are passed

Suggested Time Frame:

This may be used as a long term or quarterly project.

Procedure:

1. Divide the classroom into the following groups:
   - citizen's advocacy group
   - House of Representatives committee
   - Senate committee members
   - the President (the teacher)
2. The citizen's advocacy group lobbies the House committee to create a law on a chosen environmental issue (based on research or experience, proposes environmental issue to legislators to create the law).
3. The environmental committee researches the environmental issue and related regulations and drafts a bill or an amendment to an existing law. See handout (page 64).

4. The House committee votes on the final draft and sends the bill to the Senate committee.
5. The Senate committee does further research and adds or amends the bill, votes on this draft and sends it back to the House committee.
6. The House committee then reads the amended bill and votes on it.
7. If there are more differences for the House committee they and the Senate committee select representatives to work together to come up with a compromise.
8. The full House and Senate vote.
9. The final bill is sent to the President to sign into law or veto: may vote yes if the bill is appropriate, may veto and send back to Congress, may have amendments).

TEACHER WARNING:
If you veto the bill you can be overruled by a two-thirds vote in each House (meaning the students) — that's democracy—- not usually the form of classroom government!

NOTE: If the students have difficulty coming up with a new environmental law, they can recommend an amendment to an existing law — refer to background material above for examples of existing laws.

NOTE ON VOTING: There must be a quorum (a majority consisting of more than half of the members) to hold a vote, with three-fifths voting yes to pass.

Suggested Discussion Questions:

- What is the purpose of an environmental law?
- How can citizens get involved in the legislative process?
- Does citizen involvement make a difference? How?
- What does it take to come to consensus on an issue?
- How different is the bill that is passed from the one initially proposed? If there are differences, why?

Further Investigations:

- Does environmental legislation work? Give examples of what works and does not work.
- Pick an existing environmental law and research the impact it has had on the environment.
- Choose an environmental issue in your community and research how you can influence local policies on the issue.
- Work with a social studies class assigning roles as expert witnesses for committees, lobbyists, etc.

Lesson 1 Activity: Environmental Law-Making

Careers Opportunities:

Environmental lawyer
Elected official
Environmental scientist
Government official
Lobbyist

Assessment Procedures:

- Drafts of the law (see handout, page 64).
- Recordings/video taping of debate.

Additional Resources:

From ***Closeup:***
Active Citizenship Today Field Guide for Students
Active Citizenship Handbook for Teachers

Service Learning Teacher Training Manual
From Center for Civic Education:
CIVITAS : A Framework for Civic Education

John, DeWitt, 1994. ***Civic Environmentalism: Alternatives to Regulation in States and Communities,*** CQ Press, Washington, D.C.

The THOMAS World Wide Web system
official U.S. government site.
http://thomas.loc.gov/home/lawsmade.toc.html
(How Laws Are Made)
(accessed January, 2002)

The Center for Civic Education
http://www.civiced.org
(accessed January, 2002)

Earth Force: youth for a change!
http://earthforce.org
(accessed January, 2002)

The Close Up Foundation
http://www.closeup.org
(accessed January, 2002)

Lesson 1 Activity: Environmental Law-Making Handout

HANDOUT

Excerpted from YMCA Youth Legislature Program:

A bill (has five parts and) should be set up in the following form:

Bill Form

Sponsor:
Co-Sponsor:

Bill #:
Committee:
Committee Action:
House Action:
Senate Action:
President Action:

THE BILL GOES THROUGH THE PROCESS

Design a flow chart (boxes) for the following steps:

1) Citizen's group lobbies House committee.
2) Environmental committee researches the environmental issue.
3) The House committee votes.

Passes (Continues on to #4) or Fails (Dead)

4) The Senate committee may make changes, votes.

Passes (Continues on to #5) or Fails (Dead)

5) House committee votes on amended bill.

More amendments (on to 6). Passes (on to 7).

6) House and Senate committee representatives compromise.
7) The full House and Senate vote.
8) President

Signs (on to 9). Vetoes (on to 10)

9) Becomes law.
10) Joint session.

Overrides (becomes law). Fails to override (dead).

AN ACT
TO: *(This is where the title should be placed. The title of the bill is a concise statement of the object of the law).*
BE IT ENACTED BY THE CLASS/LEGISLATURE *(this is the Enacting Clause and must appear on every bill).*
SECTION I - SEVERABILITY
BODY OF THE BILL: *The body of the bill contains the intentions of the bill stated as clearly and briefly as possible. It should include:*

A. *A restatement of the title if necessary - any action stated in the title must be restated in the body.*

B. *Definition of terms, if needed - Example: If you use the term "hazardous material," you will need to indicate the criteria necessary to classify substances as hazardous material.*

C. *The provisions of the bill should include some or all of the following:*

1. *Changes to be made in the law either by revising, repealing, or adding to a law.*
2. *Procedures and standards, means of implementation.*
3. *Penalties for violators, means of financing, effective date.*
4. *Do not write paragraphs that seek to prove the need or merit of the bill.*

SECTION .....
SEVERABILITY CLAUSE: *The second to last section of your bill should read as follows:* "If any provision of the Act or the application thereof to any person or circumstance is held invalid the invalidity does not affect the other provisions or applications of the Act which can be given effect without the invalid provision or application, and to this end the provisions of the Act are severable."
SECTION .....
REPEALER CLAUSE: *The final section of your bill should read as follows:* "All laws or parts of laws in conflict herewith are hereby repealed."

ENVIRO RULES

Student Civic Participation: Influencing Environmental Policy

Lesson 2 Activity: Environmental Regulations

Lesson Overview:

Student groups will research a local or state environmental issue affecting the environmental quality where they live and the local and/or federal legislation that regulates it. They will write or email the legislators who helped author it in order to find out their perspectives on it. They will present their findings to the class. This lesson helps students learn how environmental regulations are passed, monitored, and enforced.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:
Environmental Quality

Excellence in EE—Guidelines for Learning

Strand 4: Personal and Civic Responsibility

Key Concepts:

1. Environmental regulations are legal actions designed to improve the environmental quality of the areas in which we live.
2. Legislative governing bodies at the local, state, and federal level enact these laws and there are consequences if businesses, corporations, or individuals are not in compliance.
3. Compliance with environmental regulations is monitored and enforced.

Objectives:

Students will:

- learn how environmental quality is regulated by studying specific issues.

Cross-Curricular Connections:

Fine Arts:

- Design a visual representation to facilitate their class presentation.

Language Arts:

- Research primary and secondary information sources and communicate findings to the class.

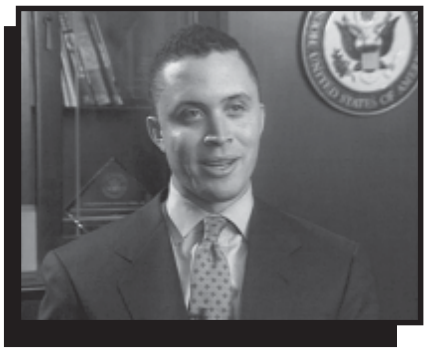
Social Studies:

- Research a local, state, or federal environmental regulation that addresses an issue in the area in which the students live.
- Communicate with the author(s) of legislation to find out their perspectives on the legislation.
- Develop an understanding of the consequences that result from noncompliance with the regulation.

Lesson 2 Activity: Environmental Regulations

Process Skills:

Goal Setting Inferring Analyzing
Problem Solving Predicting



Materials:

Per Group:

Student Report Form (page 68)
Materials used for visual representation

Suggested Time Frame:

Up to one week, to be determined by the teacher

Procedure:

1. Use the Enviro-Tacklebox™ video to introduce the activity and provide an overview of how environmental regulations are passed.
2. Facilitate a class brainstorming session during which students compile a list of local and state environmental issues that affect them. Then ask each group to select an issue to research.
3. Ask the groups to research their issue and record the information on the **Student Report Form.**
4. As soon as they know who authored the legislation, direct the students in the correct way to email or write the author(s). Explain that because of time restraints a representative in the legislator's office will probably respond. Ask the students to follow a specific format when writing. Allow several days for a response and possibly plan other activities while the students wait.
5. Ask the students to prepare a 10 minute class presentation that includes a visual representation. This could include a flow chart of the stages of passage, a flyer, or a bumper sticker.

Suggested Discussion Questions:

- What is the difference between a law, an ordinance, and a regulation?
- Which local environmental issues are currently addressed by laws and ordinances already in place?
- What local environmental issue(s) are not currently covered by legal actions?
- Which level of governmental authority has jurisdiction over this issue?
- What information is needed to draft a proposal that addresses this issue?

Further Investigations:

- Discuss examples of international regulations and why these are limited in number.
- Discuss ways to make the public more aware of the regulations presented in class.
- Invite a guest speaker from city or state government to talk to the class.

Career Opportunities::

Environmental lawyer
Lobbyist
Elected official
State Department head

Assessment Procedures:

Student Report Form
Class presentations
Visual representation
Group Interactions

Additional Resources:

DeWitt, J. (1994). "Civic Environmentalism: Alternatives to Regulation in States and Communities." Washington, D.C.: ***Congressional Quarterly Inc.***

Hartley, W. H. & Vincent, W. S. (1983). ***American Civics.*** Dallas, TX: Harcourt, Brace, and Jovanovich Publishers.

Miller, G. T. (1996). ***Sustaining the Earth: An Integrated Approach.*** Belmont, CA: Wadsworth Publishing Co.

Links to US Senate and House
http://www.firstgov.gov
(accessed January, 2002)

Library of Congress
http://thomas.loc.gov
(accessed January, 2002)

US Environmental Protection Agency
http://www.epa.gov
(accessed January, 2002)

Lesson 2 Activity: Student Report Form

GROUP MEMBERS _____

DATE _____ PERIOD _____

ENVIRONMENTAL REGULATIONS

ENVIRONMENTAL ISSUE _____

_____

_____

TITLE OF REGULATION _____

_____

PASSED BY **DATE PASSED**

_____

AUTHOR (S) **HOW TO CONTACT** **DATE** **RESPONSE**

_____

_____

SUMMARY OF REGULATION

_____

_____

WHO DOES IT IMPACT?

_____

_____

HOW IS IT MONITORED?

_____

_____

PENALTIES FOR NONCOMPLIANCE

_____

_____

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