**ISSUE LESSON:**

**WOLF RE-INTRODUCTION**

**IN**

**YELLOWSTONE NATIONAL PARK**

**By Cynthia Lauster**



**“The aboriginal people of North America did not have the mindset to eradicate every wolf. So the loathing came with the arrival of Europeans and their ideas of manifest destiny and ''civilizing'' the continent. The Europeans wanted to rid the area of wolves to civilize it. Wolves are the antithesis of civilization.”**

**By Dr. Douglas Smith**

*In 1872, President Ulysses S. Grant signed a law making Yellowstone our first national park stating, “dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people”*

*The National Park System was set up by Theodore Roosevelt to “conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same by means as will leave them unimpaired for the enjoyment of future generations.”*

*In 1920, Victor Shelford wrote,”Biologists are beginning to realize that it is dangerous to tamper with nature by introducing plants and animals, or by destroying predatory animals or by pampering herbivores…The reserved areas in the National Parks are possibly too small, but in any event should by zoned about by (buffer) areas of complete or partial protection of the roaming animals.”*

*Each of us is an artist whose task it is to shape life*

*Into some semblance of the pattern he dreams about.*

*The molding is not of the self alone but of shared tomorrows*

*And times we shall never see. So let us be about our task.*

*The materials are very precious and perishable.*

*By Arthur Graham*

*In our efforts to convince people that Yellowstone is not just another Disneyland, or just another roadside attraction, we must show them that it does more than merely entertain or divert. We must show them that it teaches ecological unity of a sort that can be applied to the rest of the world, that it reveals fabulous uncultivated beauty, and that it enriches our lives as it heals our spirits.*

*By Paul Schullery*

LESSON DESCRIPTION

This lesson is on the re-introduction of the wolves into Yellowstone National Park Ecosystem. It is a part of a larger unit on issues affecting Yellowstone National Park and applying the process of studying issues to issues affecting the Indiana Dunes National Lakeshore and the Wildcat Creek watershed, which they will visit during the year. The larger unit will entail approximately nine weeks to study Yellowstone and extra time to go in depth of the local Indiana issues. This lesson will be used with the Advanced Placement Environmental Science class.

The wolves were re-introduced into Yellowstone National Park from 1995 to 1996 from Canada. With the introduction, there began a conflict between the wolves, ranchers, and hunters. This lesson is on whether wolves should have been introduced to the park and the affect of these wolves within and outside of the park. The students will research background information on wolves and their behavior as well as to what as occurred since the re-introduction of the wolves. The students will become active in defending their stance on the issue of wolves by lobbying with letters and also continue tracking wolves at Yellowstone.

INTRODUCTION:

RE-INTRODUCTION OF WOLVES IN YELLOWSTONE NATIONAL PARK ECOSYSTEM

After completing the lesson on introduction to Yellowstone National Park ecosystem and the lesson on Bison in the Yellowstone Ecosystem, the unit on wolf re-introduction will begin. In the previous units, the students will view a power point on Yellowstone National Park and a presentation on the history of the park. They will have been presented the issues around the park as well as an activity on the “Tragedy of the Commons”, Fishing for the Future, from Facing the Future: People and the Planet, [www.facingthefuture.org](http://www.facingthefuture.org). This activity will lead into discussion of questions such as; who owns the park?, who decides what happens in the park?, why do we need national parks? And what determines how people respond to the park? Scarcity concept will be presented and the role of government in economics. The students will use of Principles of Ecodetection card to determine if the decisions they create match economics as well. They will study the Principles of Ecodetection from participating in Lesson One in Economics and the Environment. The students will use the Iceberg Model (systems thinking approach), also from [www.facingthefuture.org](http://www.facingthefuture.org). to analyze issues.

Following the bison lesson ending with a debate on from the viewpoints of the Buffalo Field Campaign, ranchers, park scientists, tourists, native Americans, and hunters, we will lead into the relationship the wolves have with the bison and the elk as well as the ecosystem of the greater Yellowstone. The students will be looking at the carrying capacity of the ecosystem, opportunity costs of having the wolves in the park, the predator/ prey relationship, the ecosystem pyramid of life, and protection of endangered species. The students will be using background information from the following sources to understand the issue of re-introducing the wolves into the greater Yellowstone ecosystem. Background material will come from Yellowstone Resources and Issues 2009, Issues: Northern Range p. 177-179, and Issues: Wolf Restoration p. 191-193

<http://www.nps.gov/yell/planyourvisit/resourceandissues.htm>; Doug Smith on Yellowstone Wolf Project, <http://www.pbs.org/wnet/nature/episodes/the-wolf-that-changed-america/video-wolf-expert-doug-smith-on-the-yellowstone-wolf-project/4332/>, Conflict Yellowstone Wolves, <http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm>; Yellowstone National Park. Com wolves, <http://www.yellowstonenationalpark.com/wolves.htm>; CRS Report for Congress, <http://www.ncseonline.org/NLE/CRSreports/Biodiversity/biodv-13.cfm?&CFID=9115575&CFTOKEN=93268807> ; the Total Yellowstone Page, <http://www.yeloowstone-natl-park.com/wolfmap.htm> ; “A Top Dog Takes Over”, [www.nwf.org/nationalwildlife/article.cfm?articleld=829&issueld;=64](http://www.nwf.org/nationalwildlife/article.cfm?articleld=829&issueld;=64) ; “Re-wilding the Great Plains, [www.npr.org/templates/story/story.php?storyld=4806987](http://www.npr.org/templates/story/story.php?storyld=4806987); Wild Wolves, [www.pbs.org/wgbh/nova/wolves/howl.html](http://www.pbs.org/wgbh/nova/wolves/howl.html); wolf Country, [www.wolfcountry.net/information/myth\_stories/red\_riding.html](http://www.wolfcountry.net/information/myth_stories/red_riding.html); Hinterland Who’s Who, [www.hww.ca/hww2asp?cid=8&id;=107](http://www.hww.ca/hww2asp?cid=8&id;=107); the International Wolf Center, [www.wolf.org/wolves/index.asp](http://www.wolf.org/wolves/index.asp); Yellowstone wolves.org, <http://www.yellowstonewolves.org/>; Wolves of Yellowstone, <http://www.windowsintowonderland.org/wolves/part_one_high/index.html>; Distemper devastates Yellowstone wolves, <http://powelltribune.com/index.php/content/view/837/2/>; In remembrance of wolf # 10, <http://www.angelfire.com/nj/wolf/>; A Conversation with Doug Smith on the Yellowstone Wolf Project, <http://www.nytimes.com/2003/07/22/science/a-conversation-with-douglas-smith-following-the-wolves-number-by-number.html>; and the Yellowstone Wolf Report page, <http://www.us.national-parks.net/wolf.htm>. The students will also be viewing all or part of the following DVDs on wolves. The DVDs are “The Wolf That Changed America, Nature; Christmas in Yellowstone, Nature; and In the Valley of the Wolves, Nature. They students will be also getting information that I obtain about the wolves from my reflections of the Yellowstone trip. The students will also again be looking at government involvement and how politics(lobbying) influences government decisions.

CONCEPTS

ECONOMIC CONCEPTS:

Scarcity

Opportunity Costs

Economic Systems

Spillovers and the environment

Economic Functions of Government

Incentives

Costs/Benefits

Choices

Private Property Rights

Decision Making Grid

Economic systems

Economic Way of Thinking

Externalities

Logrolling

Public and Private Goods

Public Choice Analysis

Resources

Secondary Effects

Shortage and Surplus

Special Interest Groups

Tragedy of the Commons

Unintended Consequences

GOVERNMENT CONCEPTS:

Civic and Political Life

Meaning of Citizenship and Roles of Citizens in the United States

Justice and Equality

Principles and Values of American Democracy

The Role and Workings of Special Interest Groups

Influence of the Media on Public Opinion and Public Policy

SCIENCE CONCEPTS:

The Nature and Impact of Science and Technology

Critical Scientific Thinking and the Role of Evidence-based

Decision Making

Ecosystems integration and management

Influence of people and social systems to the environment

Natural Selection and adaptation in plants and animals

Systems homeostasis and equilibrium

Integrative natural resource management

Animal and plant population dynamics

Historical perspectives on ecosystems management

ACADEMIC STANDARDS

ECONOMIC STANDARDS:

Standard 1: Scarcity and Economic Reasoning

E.1.2, E.1.4, E.1.6, E.1.7

Standard 2: Supply and Demand

E.2.1,E.2.6

Standard 4: The Role of Government

E.4.1, E.4.3, E.4.4, E.4.9, E.4.10

GOVERNMENT AND HISTORY STANDARDS:

Standard 1: The Nature of Politics and Government

USG.1.2

Standard 2: Foundations of Government

USG.2.2,USG.2.5,USG.2.6, USG.2.7

Standard 3: Purposes, Principles and Institutions of Government

USG.3.8, USG.3.12, USG.3.17, USG.3.20

Standard 5: Roles of Citizens in United States

USG.5.5, USG.5.6, USG.5.7, USG.5.12

Standard 9: Human and Environmental Interactions

GHW.9.2

Standard 11: Sports, Recreation and Tourism

GHW.11.2, GHW.11.3, GHW.11.4, GHW.11.5, GHW.11.6

ENVIRONMENTAL SCIENCE, ADVANCED:

Standard 1: Principles of Environmental Science

Env.1.1, Env.1.3, Env.1.4, Env.1.6, Env.1.8, Env.1.14, Env. 1.19, Env.1.20,

Env.1.30

OBJECTIVES

\*Student will demonstrate that a piece of land can only support a limited number of animals;

\*Student will define the concept of carrying capacity;

\*Student will understand concept of limiting factors on a population; Student will understand predator-prey interactions.

\*Student will utilize Google’s mapping technology to create an informative, interactive map of wolves in Yellowstone.

\*Student will analyze information to create an educational program about the impact of wolves on Yellowstone’s ecosystem.

\*Student will describe the effect of changed incentives on classroom decisions.

\*Student will explain why people might resist protecting an endangered species.

\*Student will propose ways to protect an endangered species by providing positive rewards to property owners.

\*Student will analyze policy options for protecting endangered species, using the concept of incentives to predict which policies will be effective.

\*Student will collect and chart data.

**The time required, materials, procedures, and assessments are listed with each activity.**

ACTIVITIES

Students will view a slide in the power point of the hoof print of buffalo and elk, and the paw print of the wolf in the algae at the hot springs. Students will be asked what their relationships are. The students will then do the following activity.

Students will view video from Nature <http://www.pbs.org/wnet/nature/episodes/the-wolf-that-changed-america/video-wolf-expert-doug-smith-on-the-yellowstone-wolf-project/4332/>, on the Yellowstone Wolf Project narrated by Doug Smith.

**Wolf   
Survival Game**

**Focus:** Teaches concepts of population, carrying capacity, and predator-prey interactions within an ecosystem.

**Objectives:** Student will demonstrate that a piece of land can only support a limited number of animals; Student will define the concept of carrying capacity; Student will understand concept of limiting factors on a population; Student will understand predator-prey interactions.

**Duration:** 45 minutes

**Location/ setting:** gym (large, open area)

**Materials (for 25 students):**

* 85 Note cards to be used as “prey cards”
* Marker
* Bandana for blindfold
* **4 Hazard cards**
  + You stepped on a sharp object. For the next three hunts, hop on one foot.
  + You tackled a big elk and have a broken leg. Hop on one foot for the entire game.
  + You are a female with two pups. Each pup needs an additional 50 lbs. of food for survival.
  + You slid into a juniper plant and got poked in the eyes. You are blind. Wear a blindfold throughout the entire game.
* 25 Envelopes

**Set-Up:**

Prior to activity, mark the note cards as follows:

* 35 cards marked **S** for ground squirrel
* 30 cards marked **R** for rabbits
* 15 cards marked **B** for beaver
* 5 cards marked **E** for elk

**\*\*\* Adjust quantity of prey according to number of students:**

**There should be less than 100 lbs. of prey per student (see approximate prey weights under “Procedure”).**

Photocopy “hazard cards” and place them within four separate envelopes; Randomly shuffle in the stack with remaining envelopes.

Designate an area that will be wolves’ dens. Distribute “prey cards”, letter down, randomly throughout the rest of gym/playground area. This area is now known as **habitat**.

**Procedure:**

1. **The object of the game** is for each wolf (student) to obtain enough prey (100 lbs. per lion) to live for two weeks.
2. Have each student write his or her name on an envelope and place it in den area.
3. Tell students that each prey card represents meat from four different types of prey animals. Students must collect 100lbs. of food in order to live. Weights for the animals they kill are as follows:

* **Squirrel: 2 lbs.**
* **Jackrabbit: 4 lbs.**
* **Beaver: 55 lbs.**
* **Elk: 150 lbs.**

1. Students are now wolves. They must walk out to their prey (the “prey cards”) and bring one prey card back to their den (envelope) at a time. Students are not allowed to run – wolves stalk their prey.
2. Students who have received a “Hazard card” must abide by the hazard rules while hunting. Blind wolf must be blindfolded, a student or teacher can accompany him/her to prevent injury (though assistant should not help at all in obtaining prey).
3. Pushing and shoving is not acceptable. A wolf with an injury from fighting would not be able to hunt.
4. When all the “prey cards” have been collected, the game is over. Each student should gather up his or her envelope and they should all sit in a circle to discuss the outcomes.
5. Explain what the letters on the cards stand for and have each student tally the weight of prey they have brought back to their “dens”. (You may want to write out the weights on the board). Have one student tally all the totals on the board. Instruct them to make a special column for the blind, injured, and crippled wolves, and the wolf with two pups. Decide how many wolves can live in the habitat based on the amount of available food.

**1.**    **Questions for Discussion:**

¨      Was there enough food for all?

¨      If not, how many wolves can live in this area? Why?

¨      What will happen in the case of too many wolves?

¨      Would they all starve?

¨      Which wolves would be most likely to survive?

¨      How did the blind wolf do?

¨      What would eventually happen to it?

¨      What happened to the crippled wolf?

¨      If the injury is permanent, what might this mean for the wolf?

¨      If the injury heals in two or three months, is it possible for the wolf to survive?

¨      How will the wolf with the cubs fare?

¨      For the mother and her pups, 200 lbs. of prey are needed every two weeks. If less is caught, what will happen?

¨      Who will go hungry?

¨      What will eventually happen? (The adult will eat first and the pups will die – how does this work in favor of survival of the species?)

**\*\*\***Conclude the activity with a discussion on how any particular habitat can only support so many animals. This is true with wolves, squirrels, jackrabbits, beavers, elk, *and humans*.

***WOLF LEGENDS AND MYTHS ACTIVITY:***

OBJECTIVE:

Students research historical views on wolves.

Students will create stories and fables.

TIME REQUIRED:

1 class period and home assignment

MATERIALS:

Computers

Paper

Drawing Materials

Power point slides of myths

*There have many stories and fables written about wolves, some like "little Red Riding Hood",and stories about Werewolves have made the wolf a symbol of evil, a monster to some.*

The wolf was often portrayed as the Anti-Christ, epitome of evil. There are also many legends of wolves as noble creatures who can teach us many things.



The following are some of those stories and myths, Please enjoy them.

**Reading of Little Red Riding Hood**

**Music and words from theme of “dances with wolves”**

**The Strength of the Wolf**

The spirit of the Wolf resides in my heart  
Mostly peacefully, yet ever wild  
Running in time to the blowing wind  
Dancing in the clouds that drift in the Heavens.

The spirit of the Wolf resides in my soul  
Longing to hear the song of the Great One  
Striving to be that which I am in my natural state  
Succeeding only because of the Love that the Universe grants me.

*Theme from Dances with Wolves*

STUDENT ASSIGNMENT:

Select one of the myths/legends and one of Aesop’s fables and rewrite it so the wolf is not evil. Please illustrate your stories. The choices may be reached at the following URL address: http://www.wolfcountry.net/stories/

**Myths & Legends**

* [How Brave Walter Hunted Wolves](http://www.wolfcountry.net/information/myth_stories/how_brave.html)
* [Wolf and the Sea](http://www.wolfcountry.net/information/myth_stories/wolfandsea.html)
* [Ankakumikaityn the Nomad Wolf](http://www.wolfcountry.net/information/myth_stories/ankakumikaityn.html)
* [The Strength of the Wolf](http://www.wolfcountry.net/information/myth_stories/wolfstrength.html)
* [The Three Little Pigs](http://www.wolfcountry.net/information/myth_stories/3pigs.html)
* [Wolf & Hound](http://www.wolfcountry.net/information/myth_stories/wolf_hound.html)
* [The Wolf Ceremony](http://www.wolfcountry.net/information/myth_stories/wolfceremony.html)
* [The Final Song](http://www.wolfcountry.net/information/myth_stories/finalsong.html)
* [The Wolf and the Boy](http://www.wolfcountry.net/information/myth_stories/wolfandboy.html)
* [How Rabbit Fooled Wolf](http://www.wolfcountry.net/information/myth_stories/rabbitfooledwolf.html)
* [Romulus and Remus](http://www.wolfcountry.net/information/myth_stories/romulusandremus.html)
* [Wolf Myth of the Middle Ages](http://www.wolfcountry.net/information/myth_stories/middleages.html)
* [Greek Wolf Myth](http://www.wolfcountry.net/information/myth_stories/greekwolfmyths.html)
* [Werewolves](http://www.wolfcountry.net/information/myth_stories/werewolves.html)
* [Quotes](http://www.wolfcountry.net/information/myth_stories/nativeamericanquotes.html)
* [Signy (Norse Legend)](http://www.wolfcountry.net/information/myth_stories/Signy.html)
* [St. Francis and the Wolf](http://www.americancatholic.org/Features/Francis/stories.asp#wol)
* [Moon when Wolves run together](http://www.wolfcountry.net/information/myth_stories/moonwolf.html)
* [Little Red Riding Hood (Original)](http://www.wolfcountry.net/information/myth_stories/red_riding.html)

**Aesop's Fables -**

* [Kid and wolf](http://www.wolfcountry.net/information/myth_stories/as_kidandwolf.html)
* [Wolf and the Lion](http://www.wolfcountry.net/information/myth_stories/as_wolf_lion.html)
* [The ASS and the wolf](http://www.wolfcountry.net/information/myth_stories/as_wolfas.html)
* [Wolf and dog](http://www.wolfcountry.net/information/myth_stories/wolfanddog.html)
* [Wolf in Sheep's Clothing](http://www.wolfcountry.net/information/myth_stories/wolfsheep.html)
* [A Gullible Wolf Is Scared Away](http://www.wolfcountry.net/information/myth_stories/gullible_wolf.html)
* [The Lion, the Wolf, and the Fox](http://www.wolfcountry.net/information/myth_stories/loinwolffox.html)
* [The Dogs against Wolves](http://www.wolfcountry.net/information/myth_stories/dogvswolf.html)
* [The Nurse and the Wolf](http://www.wolfcountry.net/information/myth_stories/as_nurse_wolf.html)
* [The Wolf and the Crane](http://www.wolfcountry.net/information/myth_stories/as_wolfcrane.html)
* [The Wolf and his Shadow](http://www.wolfcountry.net/information/myth_stories/as_wolfshadow.html)
* [The Wolf and the Goat](http://www.wolfcountry.net/information/myth_stories/as_wolf_goat.html)
* [The Wolf Fails To Deceive the Horse](http://www.wolfcountry.net/information/myth_stories/as_wolf_horse.html)

## Wolves: Friend or Foe? Lesson

* [Who’s Afraid of the Big, Bad Wolf? ~ Lesson](http://www.pbs.org/wnet/nature/lessons/whos-afraid-of-the-big-bad-wolf/lesson/210/)
* [In the Valley of the Wolves ~ Video: Casanova and the Druid Daughter](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/video-casanova-and-the-druid-daughter/222/)
* [In the Valley of the Wolves ~ Interactive Map: Where Yellowstone Wolves Roam](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/interactive-map-where-yellowstone-wolves-roam/228/)
* [In the Valley of the Wolves ~ Video: Wolves on the Hunt](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/video-wolves-on-the-hunt/220/)
* [In the Valley of the Wolves ~ Introduction](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/introduction/212/)
* [Animal Guide: Gray Wolf](http://www.pbs.org/wnet/nature/animal-guides/animal-guide-gray-wolf/476/)
* [In the Valley of the Wolves ~ The Druid Wolf Pack Story](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/the-druid-wolf-pack-story/209/)
* [In the Valley of the Wolves ~ Reintroduction of the Wolves](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/reintroduction-of-the-wolves/213/)
* [In the Valley of the Wolves ~ Podcast: Interview with Wildlife Cinematographer Bob Landis](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/podcast-interview-with-wildlife-cinematographer-bob-landis/224/)
* [In the Valley of the Wolves ~ Download Wolf Wallpaper](http://www.pbs.org/wnet/nature/episodes/in-the-valley-of-the-wolves/download-wolf-wallpaper/450/)

**Overview**

For centuries, wolves have been the object of fear and hatred for many people, and, for many, these feelings still run deep. Over eighty years ago, wolves were eradicated from Yellowstone. The wolf has only recently been re-introduced back into many ecosystems, including Yellowstone. In this lesson, students will create an interactive map that may be used as a tool to educate people on where and how the wolves of Yellowstone live. Students will also examine why the wolf is considered to be a keystone species, and create an informational program to educate people as to the benefits of the wolves’ presence in the Yellowstone ecosystem.

**Grade level:** Grades 9 - 12

**Subject areas:** Geography, Science, Language Arts

**Learning objectives:**

Students will be able to do the following:

Utilize Google’s mapping technology to create an informative, interactive map of wolves in Yellowstone. Analyze information to create an educational program about the impact of wolves on Yellowstone’s ecosystem.

**Materials:**

* Computers with Internet access
* The video of the episode “In the Valley of the Wolves” from the Thirteen’s series NATURE
* “Wolves of Yellowstone Map” rubric
* “Wolf Reintroduction Presentation” rubric
* “Wolf Reintroduction Program Organizer”

**Bookmark the following sites:**

Google Earth  
<http://earth.google.com/>  
This website contains interactive maps and satellite/aerial imagery of the United States.

Explore Google Maps  
<http://www.google.com/help/maps/tour/#create_a_map>  
This site contains a tour that may be used to learn about the unique features available to use in the creation of a personal Google Map.

The Total Yellowstone Page  
[http://www.yellowstone-natl-park.com/wolfmap.htm](http://www.yellowstone-natl-park.com/wkolfmap.htm)  
This site contains information about the location of the various packs of wolves in Yellowstone.

National Wildlife Foundation  
[http://www.nwf.org/nationalwildlife/article.cfm?articleId=829&issueId;=64](http://www.nwf.org/nationalwildlife/article.cfm?articleid=829&issueid=64)  
This website contains the article “A Top Dog Takes Over.”

NPR: Talk of the Nation, August 19, 2005  
[http://www.npr.org/templates/story/story.php?storyId=4806987](http://www.npr.org/templates/story/story.php?storyid=4806987)  
This site contains a program entitled “Re-wilding the Great Plains.”

**Standards**

[www.mcrel.org](http://www.mcrel.org)

Level IV [Grade: 9-12]

Geography

Standard 1. Understands the characteristics and uses of maps, globes, and other geographic tools and technologies

2. Knows the characteristics and uses of geographic technologies (e.g., geographic information systems (GIS) and satellite-produced imagery)

3. Transforms primary data into maps, graphs, and charts (e.g., charts developed from recent census data ranking selected information on various topics, cartograms depicting the relative sizes of Latin American countries based on their urban populations)

Language Arts

Writing Standard 8. Uses listening and speaking strategies for different purposes

Level IV [Grade: 9-12]

1. Uses criteria to evaluate own and others’ effectiveness in group discussions and formal presentations (e.g., accuracy, relevance, and organization of information; clarity of delivery; relationships among purpose, audience, and content; types of arguments used; effectiveness of own contributions)

4. Adjusts message wording and delivery to particular audiences and for particular purposes (e.g., to defend a position, to entertain, to inform, to persuade)

5. Makes formal presentations to the class (e.g., includes definitions for clarity; supports main ideas using anecdotes, examples, statistics, analogies, and other evidence; uses visual aids or technology, such as transparencies, slides, electronic media; cites information sources)

6. Makes multimedia presentations using text, images, and sound (e.g., selects the appropriate medium, such as television broadcast, videos, web pages, films, newspapers, magazines, CD-ROMS, Internet, computer-media-generated images; edits and monitors for quality; organizes, writes, and designs media messages for specific purposes)

7. Uses a variety of verbal and nonverbal techniques for presentations (e.g., modulation of voice; varied inflection; tempo; enunciation; physical gestures; rhetorical questions; word choice, including figurative language, standard English, informal usage, technical language) and demonstrates poise and self-control while presenting

Life Sciences

Standard 6. Understands relationships among organisms and their physical environment 1. Knows how the interrelationships and interdependencies among organisms generate stable ecosystems that fluctuate around a state of rough equilibrium for hundreds or thousands of years (e.g., growth of a population is held in check by environmental factors such as depletion of food or nesting sites, increased loss due to larger numbers of predators or parasites)

Standard 7. Understands biological evolution and the diversity of life

3. Knows how variation of organisms within a species increases the chance of survival of the species, and how the great diversity of species on Earth increases the chance of survival of life in the event of major global changes

ISTE Technology Standards

National Educational Technology Standards

<http://cnets.iste.org/currstands/cstands-netss.html>

GRADES 9 - 12

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 12 students will:

Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)

Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)

Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

**Procedures for Teachers**

**Introductory Activity**

The purpose of this activity is to introduce students to the Google Earth website and to activate background knowledge about Yellowstone.

**Time** for completion: 30 minutes

**Teacher Note**: In preparation for this activity, make sure that Google Earth software is downloaded onto your computer. If it isn’t, you may download it for free at <http://earth.google.com/>

Send students to the Google Earth web site. Depending on the number of computers you have access to, this activity may be completed as an individual, small-group, or whole-class activity.

Tell students that they are going to use the cursor to navigate to the following coordinates: 44.27N - 110.22W. It is not necessary to be completely precise with the location. Before beginning, you may choose to ask students to predict what area of the world these coordinates correspond to.

After students have discovered that they are in Yellowstone, tell them that they are going to use the site to explore and gather information about Yellowstone. Explain to students that the graphic web layer contains content that has been contributed by Wikipedia and Panoramio. Ask students to record five pieces of information, or observations, about Yellowstone from the Google Earth website.

After students have finished collecting information, provide time for students to share what they discovered about Yellowstone.

**Steps**

**Activity One**

In this activity, students will use the Google Maps website to create an interactive map that informs people of where and how the wolves of Yellowstone live.

**Time for completion**: Two 50-minute class periods

Tell students that they are going to create a map that shows where and how wolves of Yellowstone live. Explain to students that they will use the tools on the Google Maps website to create the map. As a class, visit the link listed below to take the online tour of Google Maps. When the page opens, click on the “Create a Map” button to begin the tour. <http://www.google.com/help/maps/tour/#create_a_map>

**Teacher Note**: This activity may be completed as an individual, or small-group assignment depending on the computer access available.

Pass out the “Wolves of Yellowstone Map” rubric and review with students. Explain to students that they should incorporate as many of the Google Map features as possible into their maps. Before beginning you may want to review the following features of Google Maps and discuss how they might be used in this particular task:

Place markers with the informational balloons: This feature may be used to add informational text about the wolves and/or Yellowstone to the map. Line tool: This tool may be used to draw a line or highlight the areas of the map where the wolves live. Photos: Importation of photos of wolves or geographic features of Yellowstone may be added to the map. Embedding a video: Students may find an appropriate video to embed in the map. If possible, students may choose to incorporate the clips of the “In the Valley of the Wolves” program found on the Nature website.

**Teacher Note**: There are several options for this assignment. You may choose to have students create a map that shows where all of the wolf packs are located in Yellowstone, focus on the Druid pack that was featured in “In the Valley of the Wolves,” or focus on one of the packs highlighted in the Yellowstone website listed below. This site shows where the various wolf packs live in Yellowstone and also contains additional information about the Yellowstone wolves. <http://www.yellowstone-natl-park.com/wolfmap.htm>. My students will create a map of all the wolf packs located in Yellowstone.

After students have completed their maps, provide time for them to present their maps to the class.

Prior to Activity Two, students will be involved in part of the Lesson from Nature: Who’s Afraid of the Big, Bad Wolf? at <http://www.pbs.org/wnet/nature/lessons/whos-afraid-of-the-big-bad-wolf/lesson/210/>. They will listen to wolf howls and experience how they communicate and distinguish the differences.

**Procedures for Teachers**

The purpose of this activity is to pique students’ interest and to build background knowledge on wolves.

**Time for completion**: 20 minutes

1. Ask students to predict why wolves howl. Record their answers on the board. After students have finished giving their answers, read the following information from the PBS NOVA Online “Wild Wolves” website. http://www.pbs.org/wgbh/nova/wolves/howl.html

“The center of a wolf’s universe is its pack, and howling is the glue that keeps the pack together. Some have speculated that howling strengthens the social bonds between packmates; the pack that howls together, stays together. That may be so, but chorus howls can also end with nasty quarrels between packmates. Some members, usually the lowest-ranking, may actually be “punished” for joining in the chorus. Whether howling together actually strengthens social bonds, or just reaffirms them, is unknown.

We do know, however, that howling keeps packmates together, physically. Because wolves range over vast areas to find food, they are often separated from one another. Of all their calls, howling is the only one that works over great distances. Its low pitch and long duration are well suited for transmission in forest and across tundra, and unique features of each individual’s howl allow wolves to identify each other. Howling is a long distance contact and reunion call; separate a wolf from its pack, and very soon it will begin howling, and howling, and howling”

2. Write the following three options on the board:

* Confrontational howl
* Pup howl
* “Lonesome” howl
* Chorus howl

Making certain that students can’t see the webpage, click on and play the four different howls one at a time. Stop after each howl and ask students to predict which of the four howls it was.

3. After students have listened to the howls, provide time for them to listen to the howls a second time. This time have students “read” the sound spectrographs as they listen to the howls. Share with the students the explanation found on the site of how to read the spectrographs. After students have listened to all of the howls, discuss how wolves use howls to communicate.

Before students begin investigating the issue of wolf re-introduction, the Principles of EcoDetection will be reviewed from previous lesson on The Problem of Homeless Salmon presented at the beginning of the discussion of Yellowstone Issues. Each student will have a card to remind them of the Principles that they will use during discussions of environmental issues during the year.

VISUAL 4

**THE PRINCIPLES OF ECODETECTION**

1. People's *choices* influence the environment.
2. People's choices have *unintended results.*
3. People's choices are influenced by *rewards.*
4. People are more likely to take better care of things

they *own and value.*

**Activity Two**

In this activity students will investigate the wolf, people’s perceptions of the wolf, and the ways the wolf impacts ecosystems. They will create a program to educate people about why the wolf has been reintroduced into ecosystems from which it was once eliminated.

**Time for completion**: Two - 50 minute class periods, and several homework assignments

Write the definition for a keystone species on the board.

Keystone Species - Species who enrich ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often loss of diversity. <http://www.pima.gov/cmo/sdcp/kids/gloss.html>

*Watch “In the Valley of the Wolves” from 04:14 to 09:45, and from 43:35 to 45:22.* After viewing the clips, ask students to give examples of how the wolves’ behavior in the program indicates that they are a keystone species.

Explain to students that eighty years ago wolves were eradicated from Yellowstone and that they were only fairly recently re-introduced to the park. Tell students that they are going to gather examples of how the wolves’ presence in the valley has benefited the ecosystem. Divide the class into small groups and ask them to read the “A Top Dog Takes Over” article on the National Wildlife Foundation’s website, and the “Reintroduction of the Wolves” article on the Nature website. The “A Top Dog Takes Over” article may be found at [http://www.nwf.org/nationalwildlife/article.cfm?articleId=829&issueId;=64](http://www.nwf.org/nationalwildlife/article.cfm?articleid=829&issueid=64).

Because some people do possess a fear of wolves that may or may not be based on factual information, people may be a little unsettled by the reintroduction of wolves into places around the country. Tell students that they are going to work in small groups to create a program that will educate people on the topic of why wolves are being re-introduced to places around the country and particularly why they have been reintroduced into Yellowstone. Pass out and discuss the “Wolf Reintroduction Program Organizer” and the “Wolf Reintroduction Presentation” rubric.

Provide time for students to develop and present their programs.

**Assessment Suggestions**

The Wolf myths and fables created by the students rubric will be used to evaluate the activity after the map. The “Wolves of Yellowstone Map” rubric may be used to evaluate Activity One. The “Wolf Reintroduction Presentation” rubric may be used to assess Activity Two.

**Extension Activity**

Investigate the concept of “re-wilding” North America. Have students listen to and discuss NPR’s Talk of the Nation program “Re-wilding the Great Plains.” [http://www.npr.org/templates/story/story.php?storyId=4806987](http://www.npr.org/templates/story/story.php?storyid=4806987)

Talk of the Nation, August 19, 2005

**About the Author**

Laurel Blaine is founder of Digital Narratives LLC, a curriculum design company. In addition to content development, Digital Narratives also works with young people to enhance their literacy skills as they explore the power of digital storytelling. Over the past decade, Laurel has created educational materials for a diverse range of clients including The Kennedy Center, Oakland East Bay Symphony, Learning Matters/Listen Up! and Smithsonian’s Cooper-Hewitt Museum

In order to do in depth research on the wolves in Yellowstone, the students will also include the following lesson on wolves with each student at the end writing a letter to a specified individual involved in the wolf re-introduction.

CONFLICT YELLOWSTONE WOLVES

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [Introduction](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm" \l "Introduction) | [Task](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#Task) | [Process](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#Process) | [Pre-Write Activity](http://www.powayusd.com/projects/MT&R/PreWrite.cfm) | [Conclusion](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#Conclusion)  [Teacher Toolbox](http://www.powayusd.com/projects/MT&R/wolftoolbox.htm) | [Return to Planet Earth](http://www.powayusd.com/projects/MT&R/PlanetEarthMainPage.htm)  **Introduction**  The Three Little Pigs and Little Red Riding Hood are classic children's fairy tales, but the tale of the Rocky Mountain Gray Wolf is real.  Wolves are predators, and in 1914, the United States Congress huffed and puffed and approved the funding to destroy the wolves.  Government bounty hunters helped ranchers protect their livestock by killing the wolves.  Sixty years later the Gray Wolf was listed as endangered.   In 1973, Congress enacted the Endangered Species Act, and the Wolf Recovery Program was started to reintroduce the Gray Wolf to its natural habitat.   Currently about 160 wolves have been reintroduced to central Idaho and Yellowstone National Park.  But this story does not have a fairy tale ending.  Fearing for their livestock, the ranchers filed a lawsuit, and in December 1997, U.S. District Judge William Downes ruled that all the wolves and their offspring must be removed.   |  | | --- | |  |   **Performance Task**  Your task will be to analyze the Rocky Mountain Gray Wolf problem, and draw your own conclusion to the following question.   |  | | --- | | **Should the wolves in Yellowstone National Park be removed?** |   Remember that there is no right or wrong answer.   The Gray Wolf issue is complex.  You will be assessed on how you support your conclusion, communicate effectively, and collaborate with your peers.  Your final activity will be to make your ideas known by writing an editorial. [[Grading Rubric](http://www.powayusd.com/projects/MT&R/rubric.htm)]   Government, environmental, and agricultural leaders can't seem to solve the issue.  Maybe they need to see it through the eyes of a student.   |  | | --- | |  |   **The Process**  You will be working together in a small group of 3 to 6 students.  As an individual member of your group, you will be called on to explore several Web pages.  You will be the expert, and your group will be counting on you to provide a clear explanation of your portion of the information.  As a group, your job will be to:   1. [Investigate wolf behavior.](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#step1) 2. [Research the Yellowstone Wolf Reintroduction Program](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#step2). 3. [Define and analyze the current problem from different perspectives](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#step3). 4. [Develop a solution](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#step4). 5. [Report your solution to the world.](http://www.powayusd.com/projects/MT&R/conflictyellowstonewolf.htm#step5)   The Yellowstone Wolf Conflict is a real problem.  Your opinion is important, and your solution will give adult leaders insight.  Step 1 - Investigate Wolf Behavior  Assign each group member one of the Web pages below.  It's ok if more than one student reads an article.  After exploring the Web pages individually, get back together in your group and answer the questions below.   1. Describe each type of howl. 2. Identify two ways that humans communicate with their pack. 3. How do wolves help the environment? 4. Why is it important that the wolves be reintroduced to Yellowstone National Park? 5. Explain why wolves are considered predators. 6. Why do wolves kill sheep and other livestock? 7. How is family life for a wolf similar to that of a human?   Resources   * [What's in a howl?](http://www.pbs.org/wgbh/nova/wolves/) by Nova online (You will need [Real Audio](http://www.realaudio.com).) * ["Wolves' Return to Yellowstone Sparks Controversy"](http://cnn.com/EARTH/9711/12/yellowstone.wolves/) by CNN interactive. * ["WHAT GOOD IS THE WOLF"](http://www.boomerwolf.com/wolf1b.htm) by BoomerWolf * [Expert Interview](http://www.powayusd.com/projects/MT&R/WolfPeople.htm) by Wolf People   *Prior to Step 2, students will view power point on Wolf#10 created from information at* “In remembrance of wolf # 10”, <http://www.angelfire.com/nj/wolf/>  Step 2  - Yellowstone Reintroduction Background Information  Assign each group member one of the articles below.  It's ok if more than one student reads an article.  While you are exploring the Web page, answer the following questions.  Concentrate on not reaching any conclusion about the wolf reintroduction program.  Just the facts!   1. What is the Wolf Reintroduction Program trying  to accomplish? 2. Who are the organizations (people) involved in reintroducing the wolves? 3. Where, when, and how were the wolves reintroduced in Yellowstone? 4. Why are many of the local ranchers opposed to the wolves being reintroduced?   Resources   * ["Farm Bureau and the Gray Wolf"](http://www.fb.com/news/graywolf.html) by American Farm Bureau News * ["The Call of the Wild"](http://pathfinder.com/TFK/archive/tfk020797.html) by Time for Kids * ["Bringing Wolves Home: Ed Bangs"](http://www.pbs.org/wgbh/nova/wolves/bangs.html) by Nova On-Line * [Analysis of Farm Bureau Victory](http://www.powayusd.com/projects/MT&R/Krause.htm) by Expert Interview   Now get back together in your group and share each individual's answers to the questions.  Create a group response to the questions.  Remember, try not to take sides!  Just the facts!  At this step, students will participate in activity: Lesson Six – How Can We Help the Endangered Species? and Lesson Seven – Using Rewards to Protect Endangered Species (Activity 8) from *Economics and the Environment:EcoDetectives.* These activities can be found at the end of the activities.  A discussion will be held over the statement made by State Representative Malcolm that all ranchers know the 3 S’s (Shoot, Shovel, Shut-up)  Step 3 - What Seems to be the Problem?  Identifying the problem is frequently the most difficult part of a good solution.  Instead of identifying the true problem, people tend to focus on obstacles to the problem.  This is because people have deep feelings about their side of the issue.  Here are two editorials appearing on the same day in The Post Register Online.  Resources   * [Send the Wolves Back](http://www.idahonews.com/011898/opinion/12520.htm) by Jerry Miller * [You Really Don't Understand the News](http://www.idahonews.com/011898/opinion/12521.htm)  by Renee Askins   Your group needs to review both articles, and for each article, write a single sentence that identifies what the author believes is the real issue behind the wolf reintroduction program.  Remember that you are reading articles written by real people with a passion for their side of the issue.  Step 4 - Time to Take a Stand  Can man and wolf live together peacefully?  Does a rancher have the right to protect his/her livestock from wolf attack?  If the wolves are removed from Yellowstone, what will the impact be on other animals in the park?  **Should the wolves in Yellowstone National Park be removed?** Each of you may have a different opinion on the subject.  Use the information that you have gathered to support your decision.  Step 5 - Write your individual editorial  The conclusion to this project is real.  You will be writing a letter to a person that has deep feelings about the wolf issue.  Your letter needs to be polite and well written.  Most importantly, you need to be sure that your facts are straight, and your solution is realistic.  [[Grading Rubric](http://www.powayusd.com/projects/MT&R/rubric.htm)] Use the [Pre-Write](http://www.powayusd.com/projects/MT&R/PreWrite.cfm) activity to construct your letter. You will be writing to one of the following four people:[[A note to both teachers and students.](http://www.powayusd.com/projects/MT&R/note.htm)] These names may need to be changed.   * [Marie Michelson](mailto:MMichelson@Defender.Defenders.org), Defenders of Wildlife * [Rick Krause](mailto:rickk@fb.com), American Farm Bureau Federation's General Counsel * [Linda Grosskopf](mailto:bestnwest@imt.net), Editor of Agra News: Western Livestock News * [Robert Kezer](http://www.powayusd.com/projects/MT&R/rkezer@nortelnetworks.com), Boomer Wolf * [Bruce Babbitt](mailto:Bruce_Babbitt@ios.doi.gov), Secretary of the Interior  |  | | --- | |  |   **Conclusion**  The Yellowstone Wolf Conflict is a real problem.  The people involved are passionate about their side of the issue.  Your solution will not be taken lightly.  It's time to take a stand, and do your best work.  Other resources to used in the research will be the following:  \*Notes from Teacher’s Reflections on Information provided by Malcolm.  \*Yellowstone Resources and Issues p.191-193 and p. 177-179.  \*”Introduction to Yellowstone National Park” powerpoint |

\*”Lessons from the wolf” <http://www.wolfandwildlifestudies.com/archivenews/060104newslessonsfromthewolf.php>

\* “Predator-Prey in the National Park” <http://www.wildlifemanagementinstitute.org/PDF/14-PredatorPrey%20Management%20in....pdf>

\*”Bringing the Top Predator Back to Yellowstone….” <http://www.flatrock.org.nz/wolf/wolf_den/wolves/bringing_the_top_predator_back.htm>

Possible Timeline

DAY ONE - TWO: Investigate Wolf Behavior

DAY Three - FOUR: Research the Yellowstone Wolf Reintroduction Program

DAY FIVE: Define and analyze the current problem from different perspectives

Day SIX - Seven: Develop a solution, Pre-Write, Email

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| |  | | --- | |  |   Possible Grading Rubric   |  |  |  |  | | --- | --- | --- | --- | |  | **Focus/ Organization** | **Support** | **Conventions** | | **Exemplary** | Clearly describes the central question, develops a thoughtful solution, and suggests possible consequences associated with the solution. | Uses specific evidence from student research to support suggested solution and uses this evidence to generate consequences associated with the solution. | Solid work that demonstrates careful attention to details. Few errors. | | **Accomplished** | Clearly describes a central question, develops a thoughtful solution. | Uses specific evidence from student research to support suggested solution. | Solid work that demonstrates attention to details. several errors. | | **Developing** | Describes a central question and develops a solution. | Uses limited evidence from student research to support suggested solution. | Does not demonstrate attention to details. Many errors. | | **Beginning** | Does not describe a  central question, or develop a solution. | Does not include any evidence from the research to support ideas. | Does not demonstrate attention to details. Many errors. Very brief. | |

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**LESSON SIX**

**LESSON SIX**

**HOW CAN WE HELP**

**THE ENDANGERED**

**SPECIES?**

**BACKGROUND**

Several species of animals and plants are threat­ened with extinction. Examples of endangered or threatened animals include the northern spotted owl. the timber wolf. the black panther, and the

grizzly bear. In order to protect these animals, the U.S. Congress in 1973 passed the Endangered Species Act, which requires citizens not to harm the specified animals or their habitats. Any time an endangered animal is found living on private land. the owner is required to stop using the land and leave it for the use of the animal. According to the Act, the cost to the landowner is not to be consid­ered. No compensation is provided for owners if their land must be taken out of production to pro­vide habitat for an endangered species. This policy requires sacrifices on the part of farmers and devel­opers who had planned to use their land for such things as food production or the building of homes.

**ECOMYSTERY**

Why would people with supposedly good inten­tions attempt to kill wildlife listed as endangered species?

**ECONOMIC REASONING**

The theory of the Endangered Species Act is that animals and plants provide a benefit to every­body. Since the public benefits from their enjoy­ment of plants and animals, individual landowners should not be allowed to harm those plants and animals, even if protecting them requires landowners to hold back on farming, grazing, building, or other activities. As a result, the public receives a benefit that it does not pay for. The costs are borne by the individual landowners. Many landowners resent having to pay these costs for others. If no endangered species were to be found on their land. they would not have to pay the costs. The Environmental Protection Act creates an incen-

tive for landowners to kill or otherwise remove certain animals they find on their property. Most people are influenced by incentives.

**ECONOMIC CONCEPTS**

Incentives Costs

Benefits

**OBJECTIVES**

I. Students describe the effect of changed incentives on classroom decisions.

1. Students explain why people might resist protecting an endangered species.
2. Students propose ways to protect an endan­gered species by providing positive rewards to property owners.

**TIME**

One class period

**MATERIALS**

* Visuals 13 and 14
* Activity 6
* Five small tables
* Eight packages of M&M candies
* 30 small containers of paper clips, each with 18 silver clips and two red clips.

**PROCEDURE**

1. Explain that the purpose of this lesson is to demonstrate how efforts to protect endangered plants and animals can unintentionally put them into greater danger.
2. Display Visual 13. Explain that each individ­ual was described by friends as a pleasant and kind individual who loved the outdoors and wanted to preserve the environment. Invite the students to describe situations they know about where animals-squirrels, ants. goldfish. cats—may have been killed or hurt by supposedly kind or well-meaning people.

C. Display Visual 14. Invite students to specu­late on why some people with supposedly good intentions would want to harm endan­gered species.

**LESSON SIX**

1. To help explain this mystery. tell students that. with their help. you will conduct a class experiment. This experiment will require them to work together in small groups near a table and to follow directions.
2. Distribute Activity 6 to students and explain the directions. Model the collection method described in direction 7. Emphasize direction 12. It will be important to the outcome that students do not feel closely monitored by the teacher when they make their decisions.
3. Place students into five groups near five dif­ferent tables. They do not have to sit or stand around the table. The table will be used by the collector of paper clips.
4. Choose a student to help the teacher distrib­ute paper clips to each table and to watch informally how the groups conduct their work.
5. Ask students in each small group to decide who will be the collector for the first round.
6. Remind students that they will have 30 sec­onds to pick up as many paper clips as possi­ble, using only the second and third fingers of one hand.
7. Begin round 1. Stop the activity after 30 sec­onds. Ask each group representative to bring the paper clips to you. Trade one M&M for each paper clip. Let the students distribute the M&Ms among themselves. Check for any confusion or misunderstanding.
8. Ask students if they noticed the red paper clips. Tell them these clips are rare, and we would like to preserve them so that students in the next class can see the red clips also.

L. Before round 2. ask students as a favor to other classes not to collect red clips. If they do happen to collect a red clip, *it will be accepted and exchanged* for an M&M. Begin round 2. Stop the activity after 30 seconds. Ask each group representative to bring the paper clips to you. Trade one M&M for each paper clip. Let the students distribute the M&Ms among themselves. Check for red

clips. Probably some will have been collected and exchanged. If not, imply nonetheless that some groups have been collecting red clips.

1. Get ready to conduct round 3 using the same rules—but *with one exception. In this round, if a group has a red paper clip, somebody from the group must notify the instructor before the col­lecting begins so that the instructor can set up a protection area for the red clip. The protection area includes all the paper clips within a I square foot area of the red clip. If anybody col­lects a red clip, it will not be accepted and the group will be fined 20 paper clips. After all red clip areas have been identified and protection zones established, the collecting may begin.*
2. Begin round 3. After 30 seconds. stop the trading, exchange paper clips for M&Ms. and listen to complaints about unnecessary levels of protection. Sympathize with the students, but state that the law is needed to protect red clips for the next classes.

0. Begin round 4 with the same directions as those used in round 3. *Before the round begins, one or more groups will probably decide to hide or do away with the red clips on their table. They will not call the instructor over to set up the protection area. Do not question this behavior. Act as if you are unaware of their actions.* After 30 seconds stop the collection and exchange M&Ms for clips. Express relief that there were no red clips collected in this round. Students should get a chuckle out of this statement since some of them will have removed the red clips distributed to every group with each new batch of clips.

1. Conduct round 5. with one new rule. *In this round any group with a red clip will receive a bag of M&Ms if they do not disturb the red clip and do not disturb the clips lying against it.* All other clips may be collected.
2. Ask students if any table has a red clip this time. Each group should have at least two. because two were included in each container in preparation for the game. Identify the loca­tion of the clips on each table.

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**LESSON SIX**

1. Begin round 5. Stop collection after 30 sec­onds. Look to see if the red clips are dis­turbed. Distribute one bag of M&Ms to the groups that did not disturb the clips. Also give them one M&M for each paper clip col­lected.
2. Ask students to discuss their behavior and examine the results of the experiment, using the following questions.
3. Why were there no red clips in round 4? (Students will suggest it was too costly to preserve them. It reduced their collection area too much. And they received little benefit from preserving the red clips.)
4. Why were there several red clips in round 5? (Students will suggest that it was worthwhile to preserve them in order to get the bag of M&Ms. The benefits outweighed the costs.)
5. Did they see themselves as "good" people even though they behaved very differently. given two different opportunities to pre­serve red clips?

(Most will see themselves as "good" people; they were merely attempting to respond to the incentives presented to them by the new rules.)

1. What do you think this experiment had to do with the four examples of people destroying endangered species described in Visual 13?

(Students should consider that the cost of preserving those species is very high for those individuals and the benefits very low.)

5. What could be done to help preserve these endangered species?

(Implement programs and rules that reward individuals and groups for preserving the habitat of the endangered species.)

**CLOSURE**

Summarize the main points of this experiment.

Display **The Principles of EcoDetection.** Ask students to explain which principles of ecodetec­tion are best illustrated in this lesson.

(They made choices that influenced the environ-

ment. Many choices had unintended conse­quences. Explain that a law to preserve endan­gered species might unintentionally put species more at risk if the law imposes too high a cost on individuals affected by the law. People's choices are influenced by rewards. Endangered species may be protected better by providing benefits to individuals who have the opportunity to protect habitats.)

**ASSESSMENT Multiple Choice**

**1.** Which of the following statements is true?

1. Only evil people would kill a member of an endangered species.
2. People will help protect endangered species no matter what the cost to themselves.

c. People will not help endangered species unless the government forces them.

\*d. People will protect endangered species if given positive incentives to do so.

2. Which of the following plans would help pre­serve the spotted owl nesting area in a private forest?

1. Require owners of the forest to feed the owl three times a day.
2. Ask all bird watchers to make room for owl nests in their homes.

c. Require owners of the forest to not disturb 80 acres of trees around each nest.

\*d. Give the forest owner $10.000 for each undisturbed nest on his or her forest land.

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**LESSON SIX**

ACTIVITY 6

**EXPERIMENT DIRECTIONS**

**Name**

1. Your goal as a group is to collect as many paper clips as you can and trade them for M&M candies.
2. Paper clips can be collected only during timed rounds. supervised by the teacher.
3. Each round will last 30 seconds.
4. There will be several rounds of collection.
5. Only one person in the group can collect paper clips during each round. Others may cheer or offer suggestions.
6. A different student must be a collector in each round.

7. Collectors can pick up only one paper clip at a time. using only their second and third fin­gers. The use of thumbs, sweeping motions, or tools is not allowed.

1. All new paper clips will he placed on the tables before each round by a student helper.
2. All collection will begin when the teacher says "go" and stops when the teacher says "stop".
3. Any paper clips not collected stay on the table for the next round.
4. After each round a group representative brings the paper clips to the teacher and trades them for M&Ms.

All groups pledge on their honor to be honest and accurate in their calculations and to observe the rule

**LESSON SEVEN**

ACTIVITY 8

**POLICY ANALYSIS**

**Name**

The International Species Protection Commission uses the principles of ecodetection to guide it in recommending actions to be taken by govern­ments. Review the principles below. Then read the following two cases, discuss the questions, and make your recommendations.

The commission has often been praised by envi­ronmental groups for its clear analysis of prob­lems. The success of past commission efforts can be explained by the fact that it follows these rules of ecodetection when examining policy recom­mendations:

1. People's *choices* influence the environment.
2. People's choices have *unintended* results.
3. People's choices are influenced by *rewards.*
4. People are more likely to take better care of things they *own and value.*

Case **1**

**Saving the Wolves**

*Policy Goal:* Wolves once lived in many places in North America. They were driven into near extinction because they damaged livestock and pets. Environmentalists wish to reintroduce wolves to the western United States. Today, wolves would help balance the ecology. In Montana, for example, wolves would help control the populations of deer and elk, which now over­graze the land.

*Policy Choice A*

When wolves are discovered on Ovate property, require ranchers to protect the wolves. For exam­ple, ranchers should not come close to the wolves or harm them in any way.

1. What is the policy goal?
2. What are the costs to ranchers?
3. What are the costs to tax-paying citizens?
4. What are the benefits to ranchers? 5. Will the ranchers protect the wolves?

*Policy Choice B*

When wolves are discovered on private property, pay the rancher $5,000 for not using the land occupied by the wolves and for any risk the wolves present to the ranchers' livestock.

1. What are the costs to ranchers?
2. What are the benefits to ranchers?
3. What are the costs to tax-paying citizens?
4. Will the ranchers voluntarily protect the wolves?

5. Which policy do you recommend? Why?

Case 2

**Saving the Owls**

*Policy Goal:* Government biologists have discov­ered a rare owl that lives in certain types of trees in the western United States. The government would like to protect this owl species.

*Policy Choice* A

When owls are discovered on privately owned forest land, require the owner to protect the owl. For example, the land owner may not harvest any trees within 20 miles of the owls' nest, or harm the owl in any way.

1. What is the policy goal?
2. What are the costs to the forest owners? 3. What are the costs to tax-paying citizens?

**EXTENSIONS:**

The study of the wolves will continue through the year by being involved in Yellowstone Wolf Project, <http://www.yellowstonewolves.org/>

The students will also study the other two issues in Yellowstone that we covered.

At the end of the Yellowstone Unit, the students will create a science scrapbook based upon the NASA lesson at <http://www.nasa.gov/pdf/292341main_Scrapbooks_in_Science.pdf>.

The study of Yellowstone issues will be expanded to use the same method to study issues with Wildcat Creek watershed that they study for the 2nd nine weeks, and the Indiana Dunes National Lakeshore that they study in the spring. The Backyard BioBlitz at [www.pbs.org/wnet/nature/yellowstone/ww.nrel.colostate.edu/projects/iboy/biomonth/backbioblitz.html](http://www.pbs.org/wnet/nature/yellowstone/ww.nrel.colostate.edu/projects/iboy/biomonth/backbioblitz.html) will also be used to aid in the extension. The Wildcat Creek unit ends with students representing sides in a trial to determine who is polluting Wildcat Creek.

INTERDISCIPLINARY FEATURES:

Language Arts:

Writing:

Standard 1: Uses the general skills and strategies of the writing process

Standard 4: Gathers and uses information for research purposes.

Standard 7: Uses reading skills and strategies to understand and interpret a variety of informational texts.

Standard 8: Uses listening and speaking strategies for different purposes.

Geography:

Standard 1: Understands the characteristics and uses of maps, globes, and other geographic tools and technologies.

Visual Arts:

[Content Standard: 4**:**](http://artsedge.kennedy-center.org/teach/standard.cfm?standard_id=42) Understanding the visual arts in relation to history and cultures

[Content Standard: 5:](http://artsedge.kennedy-center.org/teach/standard.cfm?standard_id=43) Reflecting upon and assessing the characteristics and merits of their work and the work of others

[**Content Standard: 6:**](http://artsedge.kennedy-center.org/teach/standard.cfm?standard_id=44) Making connections between visual arts and other disciplines

Math

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

Develop and evaluate inferences and predictions that are based on data

Understand and apply basic concepts of probability