

Native Species Restoration and its Impact on Local Populations

Teachers: This lesson contains two classroom activities with discussion questions related to the AFG video clips about threatened species and native species restoration. These parts may be used individually or together, depending on the needs of your class.

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

Grade Level: 9-12

Background

In many parts of the country, native species have been driven out of their habitats by human activities leading some species to become endangered or even extinct. Today, several large animal species are being reintroduced to their native ecosystems. These include large predators such as gray wolves. Many people see the reintroduction of predator species as a threat to their livelihood. People are also afraid that large predators are a danger to other humans. Other groups of people see native species, including large predators, as part of the natural ecosystem and are working to reintroduce them to their native habitats.

This lesson addresses the complexities of native species reintroduction. Students will learn that the carrying capacity of an ecosystem depends on a variety of limiting factors, of which, predators are just one. In fact, the presence of predators can help control the growth of prey species for a more balanced ecosystem.

Related National Standards

Content Standard C: As a result of their activities in grades 9-12, all students should develop understanding of

- Interdependence of organisms
 - Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.
 - Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.

- Matter, Energy, and Organization in Living Systems
 - The distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials.

Extension Websites from PBS

- **Scientific American Frontiers – the New Zoos: Return to the wild**
http://www.pbs.org/safarchive/4_class/44_guides/guide_805/4485_return.html
Activities about designing zoo habitats and maintaining genetic diversity in captive breeding programs for reintroduction.
- **Newton’s Apple – Bison Roundup**
<http://www.pbs.org/ktca/newtons/11/bison.html>
This site contains activities related to the return of the bison from near extinction. It includes an activity about how scientists count populations of animals.
- **Nova – Night Creatures of the Kalahari**
<http://www.pbs.org/wgbh/nova/teachersguide/kalahari/>
Go to the “Life in a Bottle” activity for a classroom lab that tests the predator-prey relationship.
- **Nova – Relocation Challenge**
http://www.pbs.org/wgbh/nova/teachersguide/wolves/wolves_sp2.html
This site outlines the challenges of relocating wolves to their native habitat.
- **The Living Edens – The Wolf and the Moose**
<http://www.pbs.org/edens/denali/mooswolf.htm>
This is a role-playing activity that shows students the dynamics of the predator-prey relationship.

Acknowledgements

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Activity 1: Extinction and Endangered Species: What Can You Do?**Time allotted:**

20 minutes

Materials:

No special materials necessary.

Objectives:

- Students will understand that human activities are leading to the extinction of record numbers of species.
- Students will determine methods that humans can use to slow the current rate of extinction.
- Students will predict the result of reintroducing a native predator species to a local ecosystem.

**Watch the AVG Video Segment: "Protecting the San Pedro River Watershed"**

Watch from the beginning until you hear 'and we should be the ones that monitor that.'

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

Brainstorming Questions

Do these questions as a group, or have students work in groups of three to write ideas on a paper before discussion.

- What human activities are leading to the extinction of such record numbers of species?
- What are some actions that humans might take to slow the current rate of extinction?

**Watch the AVG Video Segment: "Return of the Wolf"**

Start at 'we're part of the animal world, we're not separated from it' and watch to the end.

Related Sites

A congressional report discussing the effects of this wolf reintroduction can be found at <http://www.cnies.org/nle/biodv-13.html>

Writing Activity

Ask students to write in their journals about the following question:

According to the video, the reintroduction of the Grey Wolf in Idaho is causing problems in ranching communities. What affect do you think it might have on native populations such as deer?

Activity 2: Oh Deer, Here Come the Wolves**Time Allotted:**

45-minute class period

Materials:

Graph Paper

Objectives:

- Students will plot graphs of animal populations to understand the concepts of carrying capacity, population explosion, limiting factors, and biotic potential.
- Students will analyze data to correlate the population dynamics between a predator and a prey species.
- Students will challenge their assumptions regarding the impact of reintroducing a predator species.

Classroom Activity

Have students follow the directions and complete the activities outlined in the Student Instructions handout (attached).

1. Have students read over the scenarios and make a prediction about which case would be better for the deer population. You may want to do this part as a class wide discussion so that students can explain their reasoning and hear what the other students are thinking.
2. Students may work with a partner to graph the data. They will eventually produce two line graphs (for assessment see graph samples attached)
3. After students complete question # 4, tell them that the wolves were reintroduced to the population illustrated in graph A between the 1980 and 1981 population counts.
4. Once this is complete, have students analyze their predictions and answer the questions on the student sheet. This will allow students to evaluate their own assumptions regarding the effects that the wolf population will have on the deer population.

Note: The data in this lab is based on several real cases in which reindeer were introduced to Islands in the Pribilof Islands. For more information on the population studies of reindeer go to <http://www.dieoff.org/page80.html>. The population of deer affected by wolf reintroduction is fictitious with some data based on information provided by Daniel Pletcher.

Extension Activity

Have students examine graphs of human population growth. Discuss what might happen to the global human population based on what the students saw from their graph.

Assessment

Answer key for student activity hypothesis and analysis questions

Describe and Hypothesize

1. In graph A, population drops for a number of years and then begins to oscillate. In graph B, the population grows exponentially and then crashes.

2. Both show a significant drop in population. However, in graph A, the drop doesn't decimate the deer population and the population is able to become stable (an S-shaped curve). In graph B, population skyrockets and then plunges (a J-curve showing exponential growth).
3. Answers may vary.
4. Answers may vary.

Analysis

1. Other factors may have limited the deer population growth. In this case it was food.
2. Food, water, shelter, climate, space, predators, reproduction rate
3. In graph A, the reintroduction of wolves caused the carrying capacity to lower. In graph B, the carrying capacity was temporarily exceeded.
4. Very bad shape. You can tell your students that the deer had eaten and destroyed all the food by trampling it. The primary source of food was lichens which are very slow to grow. Once they were depleted, there was no renewed source of food.
5. Answers may vary
6. Yes, depending on the types of limiting factors (e.g., predators, climate etc.)
7. Yes
8. Not necessarily. Populations can grow out of control and limiting factors help keep populations within boundaries. Perhaps the presence of a predator would have helped keep the deer population on the island down so that they wouldn't have caused so much damage to the surrounding ecosystem.
9. Answers may vary. According to Daniel Pletcher, one of the complications in a real system was the severity of the winters. In very cold winters, the wolves killed more deer than in milder winters.

Activity 3: The Reintroduction of the Bighorn Sheep**Time Allotted:**

15-20 minutes

Materials:

No special materials necessary

Objectives:

- Students will learn how non-native species can lead to the extinction of natives.
- Students will consider the value of native species reintroduction.
- Using knowledge about population growth, students will predict the future of the Bighorn Sheep population.

**Watch the AVG Video Segment: "Reestablishing Bighorn Sheep in Oregon".**

Start the video at the beginning and watch to the end.

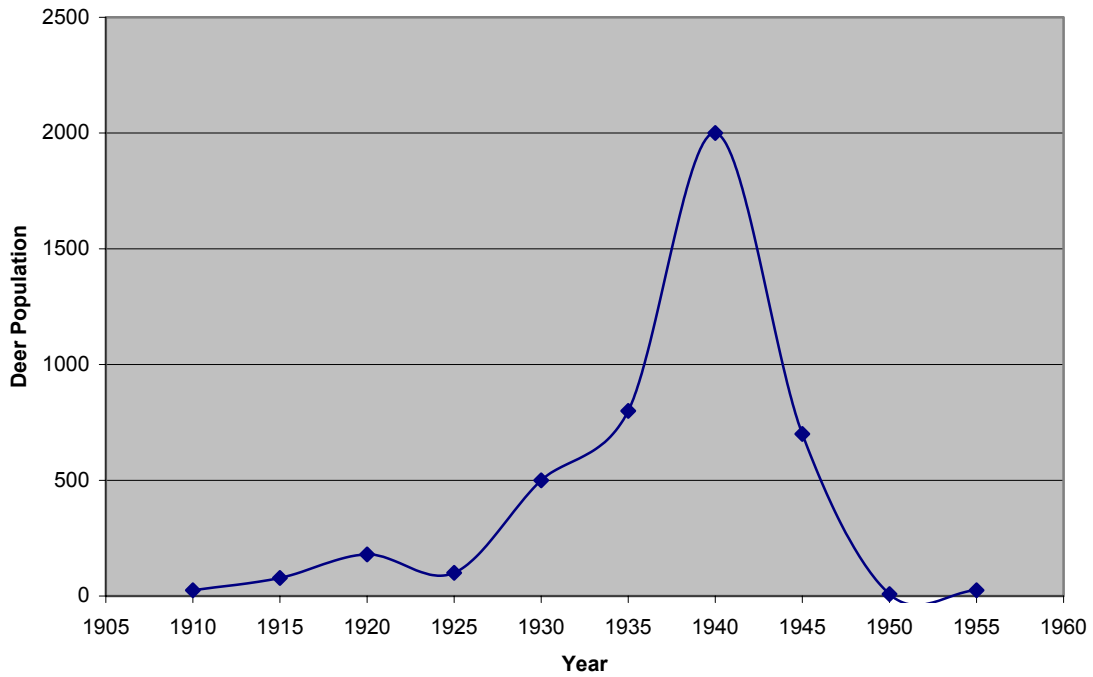
Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

Discussion Questions for Video Segment

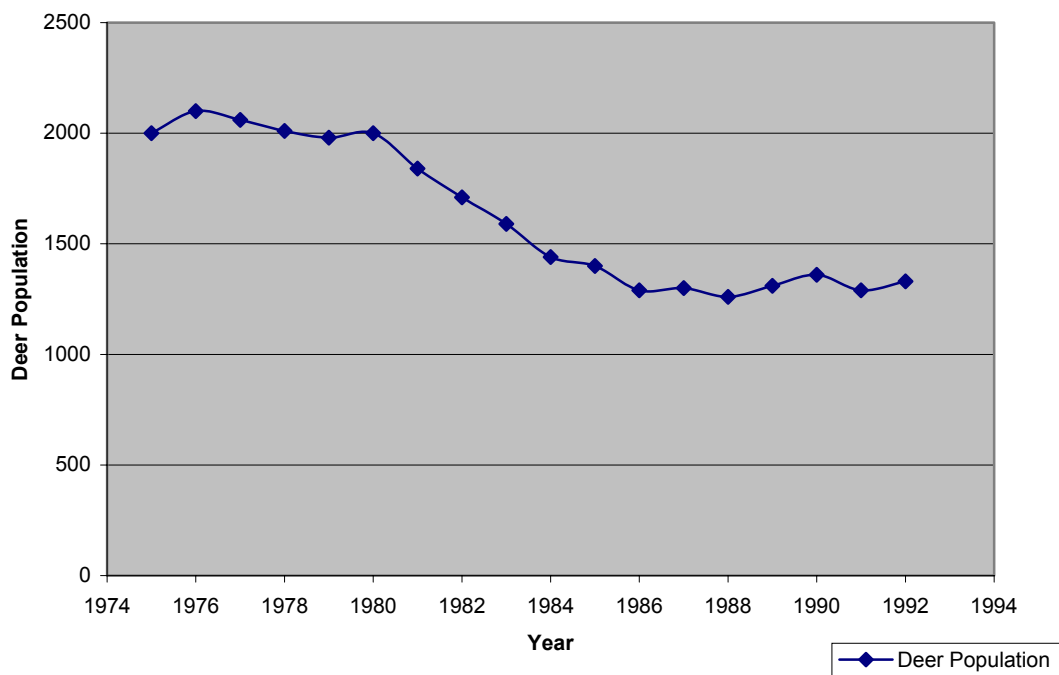
- How did the actions of humans lead to the local extinction of the big horn sheep?
- Why do you think people will go to this much effort to reintroduce native species? Do you think it's worth it?
- Why do you think the relocation effort has been so successful in this area? What would happen if the sheep were released in Florida?
- Originally 20 Bighorn Sheep were reintroduced to this area. Now there are nearly 2000. These numbers are similar to the numbers of reintroduced deer before the population crashed. Do you think the bighorn sheep are due for a population crash soon? Why or why not?
- Do you think that the reintroduction of Bighorn Sheep will have an impact on local domestic sheep populations? Why or why not?

Assessment: Samples of Population Graphs

Arctic Deer Population Graph



Graph of Deer Population where Wolves were Reintroduced



Student Handout: Oh Deer, Here Come the Wolves

Imagine you are a wildlife manager working to restore the population of an endangered species of deer. Currently, the herd is small and your task is to find the best habitat and situation for the population to grow and develop into a healthy herd. Which of the following scenarios do you think would provide the best situation for your herd of deer?

Scenario 1: The herd is currently living in a 100 square mile range in the Bitterroot Mountains of Montana which has been continually inhabited by this species for centuries. Human settlers eradicated wolves (one of the deer's principle predators) over 100 years ago although other habitat changes caused by human development have continued to keep the deer's populations low. Now, the habitat is improving and the deer population is growing slowly but steadily. However, some wildlife managers are planning to reintroduce wolves to your region. They plan to bring in several families of wolves into the area. The deer population is just beginning to rebound and you are concerned about the effects of the wolf introduction on the continued growth of the herd.

Scenario 2: You have the opportunity to move the deer herd and reintroduce it to a new, more favorable habitat. The new area is a deserted island in the arctic region. There is a lot of food (no animal has filled the deer's niche for many many years) and there are no natural predators. The island has 41 square miles of good habitat for the population.

Prediction: Which of these scenarios would produce the fastest growth of the deer population? Which would potentially provide the healthiest long-term situation for the deer?

Graphing: Graph the following data showing the changes in deer population over time for each of the two regions described above. You will make 2 line graphs.

Data Set A:

Year	Deer Population
1975	2000
1976	2100
1977	2060
1978	2010
1979	1980
1980	2000
1981	1840
1982	1710
1983	1590
1984	1440
1985	1400
1986	1290
1987	1300
1988	1260
1989	1310
1990	1360
1991	1290
1992	1330

Data Set B:

Year	Deer Population
1910	25
1915	78
1920	180
1925	100
1930	500
1935	800
1940	2000
1945	700
1950	8
1955	25

Step 2: Describe and hypothesize.

1. What do you see happening to the two deer populations over time?
2. What similarities do you see in the two graphs? What differences?
3. Why do you think the population changes that you see have occurred?
4. At some point, wolves were reintroduced, write a hypothesis explaining when you think this happened (which graph and what year) and why you think it happened at that point.

Before moving to the analysis portion of this activity, obtain the information that shows when and where the wolves were reintroduced from your teacher.

Step 3: Analyze

Answer the following questions:

1. Look at graph B. If there were no predators, why couldn't the deer population continue to increase indefinitely?
2. Limiting resources are factors that limit the growth of a population. What are some limiting resources that might control the population of deer?
3. Carrying capacity is the maximum number of individuals an environment can support for an extended period of time. Explain what happened in each of the graphs in terms of carrying capacity.
4. What shape do you think the local ecosystem of graph B was in when the deer population crashed?
5. Did the wolves have the effect that you expected?
6. Do you think the carrying capacity of a region can change?
7. Did the wolves have an effect on the region's carrying capacity?
8. Is reintroducing a native predator species harmful to the local ecosystem?
9. According to wildlife biologist Daniel Pletscher, after wolves were reintroduced, they may have depleted the deer population from between 3% and 12% each year. Why do you think this rate may have varied?