

## Overview

Protecting Land Resources includes four activities:

**Activity 1:** *Wildlife and Land Use*

**Activity 2:** *Ecosystem Services*

**Activity 3:** *Tools to Protect Land Resources*

**Activity 4:** *Jonestown: A Case Study (Following the Greenway)*

“Green” is essential for community health, recreation and aesthetics. Protecting valuable green spaces, trees and other natural resources, should be a priority in community plans. It is important for communities to protect and manage their green space and parks in sustainable ways.

This lesson provides opportunities to discuss the value of environmental services, the impact of unplanned development and the strategies for protecting natural resources and green space. Participants will focus on the story of endangered and threatened species, discuss the values of trees and forests in urban and rural settings and apply land use tools that help protect resources and open space. They will develop a community plan proposing strategies for implementing tools and forming partnerships.

Participants will conduct a study of Jonestown, Pennsylvania and provide recommendations in the development of a greenway. A greenway is a corridor of green space that connects to nodes or destinations, drawing people and wildlife to move within this natural pathway. Participants will apply their knowledge and skills in helping Jonestown design their greenway.

### Activity 1:

#### *Wildlife and Land Use*

**Summary:** Participants will discuss the changes in Pennsylvania’s natural resources since the arrival of William

Penn, reviewing the impact of development on endangered and threatened species as well as the challenges of managing white-tailed deer.

**Questions:** What historical events caused changes to Pennsylvania’s natural resources? What organizations and agencies evolved to manage natural resources?

What are the main reasons for endangered and threatened species? Why is it important to manage white-tailed deer? Why is it important to remove invasive species and promote native plantings?

### Preparation

- Prepare information sheets on threatened and endangered species for each participant (pp 141-144). Work groups can be organized by the organism. Each group should have a work space with poster board and markers.
- Prepare information on white-tailed deer (pp 145-147) for each participant.
- Prepare the Problem Solving Worksheet (pp 148) for each group.
- If using the lesson “Oh Deer,” set up as directed by the lesson.

### Procedure

**1. What changes happened to the Pennsylvania environment over the past 250 years?** List responses. Develop time line cards or a presentation of the following historic events that created environmental changes and ask participants to place them in chronological order.

Think back about 250 years ago to the land seen by William Penn. Here is a quote that Mr. Penn wrote in 1684, two years after he arrived on the west shore of the Delaware River. As it is read, compare the wildlife you see today with the animals highlighted by Mr. Penn.

*“The food the woods yield is your elks, deer, raccoons, beaver, rabbits, turkeys, pheasants, heath-birds, pigeons and partredge innumberably. We need no setting dogs to ketch, they run by droves into the house in cold weather. Our rivers have also plenty of excellent fish and waterfowl as sturgeon, roeshad, herring, cadfish, or flatheads, sheeps heads, roach and perch; and trout in inland streams. Of foule, the swan, white gray and black goose and brands, the best duck and teal I ever eate and the snipe and curloe with the snow-bird are also excellent.”*

If you were to design a travel brochure based on Penns Woods, it would be quite different than today. People impact their environment in many ways. The landscape changes as resources are removed or extracted. William Penn valued Pennsylvania’s natural resources and promoted conservation in his original charter.

Mr. Penn directed the new colonists to preserve one acre of trees for every five acres cleared, setting a vision in the early colony for the protection of natural resources. He and many early colonists extolled the virtues of the wildlife, the forests and the abundance of natural resources.

Since that time, 56 percent of Pennsylvania wetlands have been lost. The Pennsylvania of William Penn had at least 156 more species of native vascular plants and vertebrates than we see today. Among the animals that are now extinct include the passenger pigeon, woods bison, blue pike, eastern tiger salamander and the small white lady’s slipper.

**Historical Background Information:** (To be reviewed with students) What William Penn experienced was a great American wilderness filled with giant chestnut forests where wild turkey and deer thrived. Beech trees crowded the ridges where passenger pigeons fed on the nutritious nuts. Two hundred foot white pines and hemlocks loomed where elk and black bear meandered.

Elk and wood bison herds summered on mountain meadows. Wetlands rich in biodiversity provided habitat for a host of other plant and animal species.

Pennsylvania did not stay wild for long. The first colonists enjoyed the fertile soils, climate and growing season.

Colonists grew in numbers. New farms needed fields for crops, wood for heat and lumber for houses, barns and tools. Iron furnaces that forged the iron plows and rifles needed charcoal to melt the ore. Each iron furnace consumed an acre of forest a day.

From 1850 to 1870, Pennsylvania produced more lumber than any other state. Forests disappeared and so did the wildlife. By 1750, deer and squirrels were scarce in many areas. Native elk disappeared and the original woods bison, wolves and mountain lions were extinct before the end of the 1800s. As the old-growth forests disappeared, forest birds such as grouse, wild turkeys, barred owls and pileated woodpeckers declined. (Today, only in remote areas of Pennsylvania, such as the Alan Seeger Natural Area in Huntingdon County, can we find evidence of what forests use to look like.)

The log boom moved west and provided relief to Pennsylvania forests. The American Chestnut, the dominant hardwood, was attacked by an introduced fungus which destroyed most of the remaining trees. Oaks siezed the vacant spaces and by the 1930s, new woodlands were taking hold. Deer thrived on acorn mast and herds increased.

Pennsylvania’s mineral wealth was discovered early in its history as iron furnaces smelted iron ore, using the limestone resources and the forests for charcoal. Miners opened the coal fields and the demand for coal grew.

The Commonwealth contains the northern segment of the world’s largest deposits of bituminous coal and the

world's greatest deposits of anthracite coal. By the late 1800s the appetite for coal caused intensive mining and the growth of dense communities of miners and workers. As coal was extracted, sulfur combined with water and air-forming sulfuric acid which flowed from the mines and poisoned streams.

Oil was first discovered in America at Titusville, Crawford County in 1859 and its discovery spread to other counties. Wooden oil pipelines burst and salt brine from wells seeped into streams, suffocating aquatic life.

Today, Pennsylvania's minerals continue to change the landscape, the environment and the economy. With new technologies, the Marcellus Shale, located deep in Pennsylvania's geology, has the potential to produce enormous quantities of natural gas. This discovery has created a "gold rush" mentality in Pennsylvania that will challenge today's communities, and those of the future.

People also found other ways to change Pennsylvania's environment by introducing exotic species imported from other parts of the world. The gypsy moth and the blights that threatened elms and chestnuts were the most famous. For example, in 1904, horticulturists imported the Asian chestnut tree into New England which carried a fungus under its bark. By the 1920s, the beneficial chestnut trees were nearly extinct. Invasive species continue to degrade natural native habitats and much effort is directed at removal of species that impact native wildlife.

In 1866, Governor Andrew G. Curtin established the Commissioner of Fisheries making the Pennsylvania Fish Commission one of the oldest fisheries and conservation agencies in the United States. In 1895, Pennsylvania Bureau of Forestry was established and in 1898, the first forest reserve was started which began the two million acre state forest system. In 1895, the Pennsylvania Game Commission was also

organized to protect the remaining wildlife. In 1902, Pennsylvania established the first state park at Mont Alto, Franklin County. Setting aside land for wildlife, natural resources and recreation became a priority for many Pennsylvanians.

Because of the efforts of early conservationists, Pennsylvania today has a rich diversity of species and natural communities. More than 3,500 species of plants and animals have been documented in Pennsylvania. If you include the fungi, protista and nonvascular plants you could add 20,000 more species.

Unfortunately, land use change is the greatest threat to Pennsylvania's natural communities and biodiversity. Habitat loss and degradation are the greatest threats to native diversity. Some 156 species of vascular plants and vertebrates have disappeared and another 351 species have become endangered or threatened in Pennsylvania.

In 300 years following Penn's landing on the Delaware, three million acres of natural habitat have been converted to urban uses. In the past two decades 1982 to 2002, another million acres have been converted to development. In 1982, Pennsylvania was changing 100 acres per day from the natural environment to the built environment. Today, the rate is estimated to be more than 350 acres per day and it's accelerating. Pennsylvania has one of the highest per capita rates of land consumption in the country

## *2. Some species actually increase due to changing landscapes.*

Development is not always a one-way street for some animals and plants. Some species thrive, causing serious problems for other species. Invasive species threaten our native species. Define the terms "native species" and "invasive species." Using photos from brochures and websites, provide photos of native and invasive species and allow participants to categorize them. Information can be located at [www.invasive.org](http://www.invasive.org), or on the DCNR website:

[www.dcnr.state.pa.us/forestry/wildplant/index.aspx](http://www.dcnr.state.pa.us/forestry/wildplant/index.aspx),  
[www.dcnr.state.pa.us/forestry/wildplant/invasive.aspx](http://www.dcnr.state.pa.us/forestry/wildplant/invasive.aspx),  
 and [www.dcnr.state.pa.us/forestry/wildplant/native.aspx](http://www.dcnr.state.pa.us/forestry/wildplant/native.aspx).

Species of plants and animals that have existed in Pennsylvania prior to the arrival of the first settlers are considered native species. They have adapted to soils and conditions of the ecoregions in which they live. Invasive species are plants or animals that are not native to the region. Their proliferation causes harm or threatens habitat of native species.

Year after year, species are introduced to areas without knowledge or understanding of their potential powers to cause harm. Plant species such as purple loosestrife and Japanese knotweed, grow without natural controls and, in time, will become the dominant species, crowding out any native plants and thus diminishing native food sources for native animals. There are invasive insects, animals and pathogens as well. Forest pest insects include the hemlock woolly adelgid and gypsy moth which have destroyed native trees. Threats can be so severe that entire species have almost been obliterated.

Communities are encouraged to design parks and greenspaces utilizing native plants and avoid invasive species. *Creating Sustainable Community Parks, A Guide to Improving Quality of Life by Protecting Natural Resources* is an excellent resource produced by DCNR's Office of Conservation Science in partnership with Pennsylvania Recreation and Park Society, Inc. Information can be found at [www.dcnr.state.pa.us/brc/GreeningPennsylvania.pdf](http://www.dcnr.state.pa.us/brc/GreeningPennsylvania.pdf).

*Discuss:* As communities grow, leaders should reflect on the impact that growth and development may have on environmental services and features. What are some of the consequences of unplanned development to wildlife and the environment?

- Removal and destruction of wildlife habitat
- Fragmentation of habitat: Breaking up forests or migratory routes
- Stormwater runoff impacts wildlife in streams and causes erosion
- Pavement and rooftops are hot in the summer, heating up rainwater before it enters waterways causing a form of thermal pollution
- Impervious surfaces impacts groundwater recharge
- Homeowners and commercial sites use fertilizers and pesticides that could impact water quality
- Increase in automobiles: Discharges from automotive fluids that wash into waterways
- Wildlife/Vehicular collisions (deer, toads, owls, etc.)
- Winter street maintenance increases salts into waterways
- Light pollution impacts migratory animals
- Windows in tall buildings block flight of birds and bats
- Wind turbines may be detrimental to migratory animals and birds

Communities should value their natural resources as an asset and a vital part of their character.

*3. What impact does growth and development have on some of the state's wildlife species?* In this activity we will discover some of the species impacted by destruction of their habitat and discuss ways to manage lands to protect sensitive species.

Write the following words on a flip chart: "Extinct," "Endangered," "Threatened" and "Extirpated." Define each of the words.

What do we mean by the word "extinct?"

**“Extinct”** refers to species that occurred in Pennsylvania but no longer exist across their entire range. There are 156 species of vascular plants and vertebrates known to have become extinct in Pennsylvania over the past 250 years. Today, more than 350 species are currently at risk in the Commonwealth.

**“Endangered”** refers to species in imminent danger of extinction or extirpation throughout their range in Pennsylvania

**“Threatened”** refers to species that may become endangered within the foreseeable future throughout their range in Pennsylvania.

**“Extirpated”** refers to species that have disappeared from Pennsylvania but still exist elsewhere.

*4. Let’s be wildlife detectives and find out the reason why some of our wildlife is in danger. We are going to study some animals and plants from Pennsylvania and learn what is happening to them, why it is happening and what we need to do about it.*

Each participant will be in a work group of a plant or animal as designated by information sheets. Copy and distribute enough of each information sheet so that each student has one sheet. Have students form the following work groups based on the handouts:

- Short-Eared Owl
- Showy Lady’s Slipper
- New Jersey Chorus Frog
- Bog Turtle

Participants read the handouts, research and develop a poster of the natural history and information on their plant or animal. Participants prepare a presentation and discuss strategies for habitat management for survival.

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*Activity 1*

Discuss the importance of conducting natural resource inventories of the community. Organize a “bio-blitz” or large-scale inventory to determine the biodiversity of the community. Contact the Western Pennsylvania Conservancy ([www.paconserve.org](http://www.paconserve.org)) for information on bio-blitzes. What are some strategies for communities to protect wildlife species?

*5. Some species are successful in adapting to changing habitats. What are some of the birds, mammals and plants that are successful in surviving in urban/suburban areas and why?*

The white-tailed deer was declared the state mammal of Pennsylvania in 1959. It is one of Pennsylvania’s most influential species of wildlife. Deer are the most popular watchable wildlife as well as the most hunt-able resource, providing venison for countless families. Pennsylvania’s rural, cultural heritage is linked to the white-tailed deer.

Deer management is a controversial topic. What are some of the impacts and effects of a growing deer population? As deer populations grow, deer are accused of over-browsing forests, attacking seedlings, shrubs and wildflowers, reducing the understory to ferns and invasive species. In southeastern Pennsylvania, deer have flourished and feed on ornamental gardens, crops and urban plants.

Deer densities over 20 per square mile impact forest regeneration, create greater potential for car accidents and increase Lyme disease. Deer management is essential for healthy forests and healthy communities. For additional information visit the Pennsylvania Game Commission at [www.pgc.state.pa.us](http://www.pgc.state.pa.us) and the Bureau of Forestry at [www.dcnr.state.pa.us](http://www.dcnr.state.pa.us).

Distribute copies of the white-tailed deer information and deer photos. Allow students to discuss what they

learn from the deer photos. Divide the report into sections. Assign groups to read sections of the information sheet and report to the large group. After learning about deer, each group is to complete the worksheet entitled Problem Solving Worksheet.

Discuss the Problem Solving Worksheet in a large group. Discuss the pros and cons of different deer management strategies. Discuss the concerns of different people from state forests, state parks, agricultural lands, hunters, animal rights activists and homeowners as deer populations encroach on resources. Discuss current strategies on management.

- Deer exclosures
- Hunting regulations
- Fertility control
- Trapping and transporting
- Repellants
- Fencing

*Optional:* Visit a deer exclosure area and demonstration plots that prevent deer from browsing in the understory.

*Optional:* Conduct the following activity:

## Project Wild, “Oh, Deer”

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

The activity involves participants assuming the role of deer while others become elements of the environment. The activity illustrates that limiting factors maintain populations at a predictable level.

- Good habitat is key to wildlife survival;
- A population will continue to increase in size until some limiting factors are imposed; limiting factors contribute to fluctuations in wildlife populations;
- Nature is never in balance but constantly changing.

## Activity 2: *Ecosystem Services*

*Summary:* The ecosystem provides valuable services that have great economic and environmental value. In this activity, participants will gain a perspective of the value of land and the services provided by environmental systems.

*Questions:* How valuable is productive land? What are the services provided by the environment? What would happen if the services were eliminated?

### Preparation

- Earth is an Apple Activity: Apples, plastic knives and plates for each group.
- Copy and distribute Ecosystem Services Worksheets (p 149). Answer sheet on pp 150.
- Have flip chart and markers available.
- Prepare Thank You Trees Worksheet (pp 151-152).
- Review Economic Benefits of Ecosystems Information Sheet (p 153).

### Procedure

*1. We realize how important planning is for protecting habitats and considering the consequences to wildlife as habitats are altered.* How valuable are Earth’s services to us? What services does the ecosystems provide that we take for granted? What services do ecosystems provide for us that should be valued as we look at land use choices?

Brainstorm some ideas from students and write them on the board. We will discuss services in depth following the first demonstration.