PENNSYLVANIA ENVIROTHON

2026
Teacher Resource Booklet

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2026 Teacher Resource Booklet

For more than 40 years, high schools in Pennsylvania have been recognizing the value of the Envirothon experience. Students and their teachers become empowered by their own motivation as the Envirothon engages them in an exciting, multi-faceted study of natural resources. Students involved in the Envirothon often pursue further education in natural resource fields. Many Envirothon participants pursuing degrees in various natural resource studies have indicated that their education choice was partly due, or strengthened by, their Envirothon experience. Many Envirothon coaches credit the Envirothon with increasing student interest and involvement in natural resource and environmental sciences. To many people involved, the Envirothon is more than just a competition.

We hope that whether this is your first Envirothon or you are a veteran participant, you and your team are excited to learn about the environment, our relationship with it, and how we can each work towards its protection and conservation.

This year features "Non-Point Source Pollution: It begins at home!" as the Current Environmental Issue. We have made an effort to link the other stations (Soils/Land Use, Aquatic Ecology, Forestry, and Wildlife) with the Current Issue in the Essential Topics and Learning Objectives.

This Teacher Resource Booklet is intended to help you and your teams become fluent in a broad range of natural resource topics. It outlines the program guidelines of the Envirothon, including the Learning Objectives and Reference Lists. Included are:

1. Envirothon Mission Statement and Objectives
2. Envirothon Sponsors, Partners, and Financial Contributors
3. General Information about the 2026 Pennsylvania and NCF Envirothon events
4. Brief History of the Envirothon
5. Overview of Station testing and a past current issue station test
6. Overview of state oral component and the 2019 scenario
7. Some Tips for Teaching Envirothon Material
8. Aquatic Ecology *
9. Current Issue – "Non-Point Source Pollution: It begins at home!" *
10. Forestry *
11. Soil/Land Use *
12. Wildlife *

** The following are specified for each station:*

a) Essential Topics

b) Learning Objectives

- *Each is correlated with the PDE Environment & Ecology and Science and Technology Standards*

c) Reference Materials List - If you are missing any of these materials, contact your County Conservation District.

MISSION STATEMENT

The mission of the Pennsylvania Envirothon is to provide students with the knowledge and tools necessary to address the natural resource challenges facing today's world.

The program emphasizes the importance of environmental sensitivity while stressing a need to achieve a social, ecological, and economic balance.

The learning objectives emphasize awareness, knowledge, and attitudes through outdoor hands-on applications while addressing the complex natural resource concerns facing today's world as well as the challenges of tomorrow.

OBJECTIVES

Awareness: The Envirothon will help students cultivate an awareness of the total environment and acquire sensitivity towards its limited natural resources.

Knowledge*:* The Envirothon will help students develop a basic understanding of the earth's ecological systems and the life-sustaining implication these systems have on all living things.

Attitudes*:* The Envirothon will help students develop attitudes, which embrace environmental sensitivity and instill the dedication to participate in activities geared towards protecting the environment.

Application*:* The Envirothon will help students develop skills needed to identify, investigate, and contribute to the resolution of environmental issues and problems.

PARTNERS and SPONSORS

Partners

Pennsylvania Association of Conservation Districts
Pennsylvania State Conservation Commission
Pennsylvania's sixty-six Conservation Districts
Pennsylvania Department of Agriculture
Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry
Pennsylvania Department of Conservation and Natural Resources Bureau of State Parks
Pennsylvania Department of Education
Pennsylvania Department of Environmental Protection
Pennsylvania Fish and Boat Commission
Pennsylvania Game Commission
U.S. Department of Agriculture, Natural Resources Conservation Service

Corporate Sponsors

Shell Oil Company	PPL Corporation	Chesapeake Energy
Weis	PA American Water	Smithfield Foods
PSECU		

BRIEF HISTORY OF THE ENVIROTHON

The Envirothon program began here in Pennsylvania as the "Envir-Olympics" in 1979 with three counties holding competitions. In 1984, the first State competition was held with six counties participating. 1988 marked an important year in our history: the event had grown to include thirty-eight teams; the program was officially changed to "Envirothon"; and Pennsylvania planned, hosted, and won the first National Envirothon, which is now an international competition. In Pennsylvania, more than 40,000 students participate each year and the program includes every county in the state.

2026 PENNSYLVANIA ENVIROTHON

What: Pennsylvania State Envirothon

Who: Teams of High School Students from all across Pennsylvania

-When/Where: Virtual Oral Component – In Person Station Testing, on May 20, 2026 at Camp Mt Luther, Mifflinburg, PA

Why: To test the students' knowledge of Pennsylvania's natural resources while providing them with the ability to address the complex environmental concerns facing today's world as well as the challenges of tomorrow.

How: Teams rotate through five stations.

Station	Cooperating Agency
Soil/Land Use	USDA Natural Resources Conservation Service
Aquatic Ecology	PA Fish & Boat Commission
Forestry	PA DCNR Bureau of Forestry
Wildlife	PA Game Commission
* Waste to Resources	PA Envirothon

(* The fifth testing station is a Current Environmental Issue, which changes annually.)

Past Current Environmental Issues:

1984 – Acid Rain
1985 – Hazardous Waste
1986 – Solid Waste Management
1987 – Water Quality
1988 – Farmland Preservation
1989 – Recycling
1990 – Wetlands
1991 – Energy Sustainability
1992 – Groundwater
1993 – Pesticides
1994 – Acid Rain
1995 – Groundwater
1996 – Greenways
1997 – Pest Management
1998 – Watersheds
1999 – Wildfire Management
2000 – Wetland Management
2001 – Urban Nonpoint Source Pollution
2002 – Introduced Species
2003 – Farmland Preservation & Conservation
2004 – Natural Resource Management in the Urban Environment
2005 – Managing Cultural Landscapes
2006 – Water Stewardship in a Changing Climate
2007 – Alternative/renewable Energy
2008 – Recreational Impacts on Natural Environments
2009 – Biodiversity in a Changing World
2010 – Protection of Groundwater
2011 – Salt and Fresh Water Estuaries
2012 – NPS & Low Impact Development
2013 – Grazing and Pastureland Management
2014 – Sustainable Agriculture/Buy Locally
2015 – Urban and Community Forests
2016 – Invasive Species
2017 – Agricultural Soil and Water Conservation
2018 – Grassland and Pastureland Management
2019 – Agriculture and the Environment: Knowledge and Technology to Feed the World
2020 – "Pennsylvania Envirothon Week"
2021-- Water Resources Management: Local Control and Local Solutions
2022-Waste to Resources
2023- Adapting to a Changing Climate
2024- Renewable Energy
2025- Roots and Resilience
2026-Non-Point Source Pollution: It begins at home

2026 NCF-ENVIROTHON

The winning team of the Pennsylvania Envirothon will advance to the NCF-Envirothon being held July 19 – July 25, 2026 at Mississippi University-Starkville Missippi. Over forty-seven states, nine Canadian provinces/territories, and two Chinese provinces are expected to participate in this international event!

OVERVIEW OF THE 2026 STATION TESTING

To prepare teams for the Pennsylvania Envirothon, most counties model their testing stations after the state competition.

Traditional state testing evaluates team performance in four universal areas (i.e., soils/land use, aquatic ecology, forestry, wildlife) and a different current environmental issue each year. At each station, written tests assess each team's knowledge of the specific resources at that site.

For example, the forestry station relates to forest ecology, forest structure and composition, regional tree and plant species, and silvicultural and forestry practices; the aquatic ecology station relates to aquatic ecosystems, species diversity, and aquatic resource management; the soils/land use station relates to land formation, use of a soil survey, and land management practices; and the wildlife station relates to wildlife ecology, conservation and management practices, regional wildlife species, and issues involving wildlife and society.

Station testing is designed to provide a challenging, hands-on opportunity for each team to demonstrate and apply its knowledge of environmental science and natural resource management.

As teams rotate through each of the five testing stations, they experience a variety of testing formats. Most tests include some type of identification, including wildlife tracks or mounts, bird calls, skins, fish, macroinvertebrates, trees, soil textures and soil horizons. The majority of the other questions will be in the format of matching and multiple-choice, with fill-in-the-blank and short answer questions. At each station, teams receive a brief introduction to the specific site. The test is usually administered by a natural resource professional with expertise in that field. Students spend 25-35 minutes at each testing station with a five minute period for questions and review, and a five minute period for travel between stations.

Sample Station Test

The following are questions taken from the **2019 Current Issue** station exam. This county level test was based on the theme "Agriculture and the Environment: Knowledge and Technology to Feed the World." These are examples of the types of questions you <u>might</u> experience at any given Envirothon competition.

1. The development of _____ agriculture has been made possible by combining the use of Global Positioning System (GPS) and Geographic Information Systems (GIS)?

    A. Production
    B. Precision
    C. Pesticide free
    D. Predictive

2. Genetic engineering permits increased efficiency in developing new crop varieties with new and desirable traits. This ultimately occurs because there is a _____ transfer of genes.

    A. Random
    B. Highly targeted
    C. Greater
    D. Frequent

3. Plants that have genes from other organisms are referred to as what?

A. Transferred
B. Transgenic
C. Translated
D. Trans-compliant

4. Crops produced through genetic engineering are sometimes referred to as GMO. What does the acronym GMO stand for?

5. There are many types of native bees. Some common types of bees are named by their nest-building habits. Name two common bees reflecting their types of nests.

6. Project Integrated Crop Pollination (ICP) is conducting research on pollinator habitat enhancement and techniques for managing alternative bees for crop pollination. List two species of alternative bees that ICP.

7. If the soil texture of a field is such that the soil infiltration rate is undesirable, which management practice would be best for improving the infiltration rate?

    A. Increase the degree of soil tillage
    B. Decrease manure and fertilizer application
    C. Increase soil organic matter content
    D. Decrease use of continuous no-till

8. Soil organic matter serves all these functions except for one of the following?

    A. Serves as a reservoir of nutrients for crops
    B. Retaining moisture
    C. Reducing water infiltration into soil
    D. Reducing soil compaction

Using the provided word bank, answer the following.

9. The soil's ability to allow water movement into and through the soil profile.

10. The weight of dry soil per unit of volume.

11. The organic component of soil.

12. The stable organic fraction of soil organic matter.

ORAL COMPONENT

What is the Oral Component?

The Oral Component (OC) offers Envirothon teams a chance to address real-life environmental problems as presented through a written scenario. The OC challenges a team's ability to consider an environmental issue, discuss its likely ramifications and effects, develop possible solutions, and present their findings to a panel of judges and then answer the judges' questions during a 20-minute session. Participation in the OC is mandatory. The OC offers students a chance to hone their public speaking, problem solving, and presentation skills, and it also helps the students prepare for the upcoming testing stations.

How does it Work and What will it Teach My Students?

The 2026 scenario will be posted on the Pennsylvania Envirothon website (www.envirothonpa.org) on Friday May 1st. Posting the scenario provides teams an opportunity to better prepare their oral presentation. Teams can utilize existing resources and research new information. Teams may also receive limited guidance (i.e., review score sheet, clarify scenario) from their advisors; advisors are encouraged to **NOT** prepare their team's presentation.

The Pennsylvania Envirothon oral component presentation segment is taking on a new look and transitioning into the age of technology. Oral presentations will be done digitally, moving away from the use of poster boards and markers. The Oral Component (OC) offers Envirothon teams a chance to address real-life environmental problems as presented through a written scenario. This transition provides teams with the full experience of developing a presentation based on a written scenario from start to finish.

Teams will have from Friday May 1st through 8:00 a.m., through Tuesday May 12th to complete and submit their 20-minute pre-recorded Oral Presentation. Once the team has its presentation completed and recorded, it will be submitted to the Pennsylvania Envirothon according to the provided instructions. The following week the presentations will be viewed and scored by volunteer judges. Teams will receive their Oral Component Score at station testing.

This is a great opportunity for students to work together and apply the things they have learned while studying for the Envirothon competition. Teams discuss their findings prior to presentation time and decide which of their recommendations is feasible in a real life situation. They are asked to defend and explain their recommended actions. Students are not judged on what is "right" or "wrong", they are judged on their ability to think on their feet and incorporate their existing knowledge of Soil/Land Use, Aquatic Ecology, Wildlife, Forestry and the year's current issue. The scenario is based on the Current Issue theme each year when applicable.

How Can My Team Prepare?

To help your county team prepare for the Oral Component experience, peruse the "Learning Enhancement" activities provided in this booklet. Many of the activities allow students to role-play in situations that affect various environmental areas. These role-playing extensions can be very valuable in preparing a team to think in terms of how all the station areas interconnect. Also, the Pennsylvania Envirothon offers training videos that highlight the Oral Component. These videos can be found on the Pennsylvania Envirothon – Station Training – Oral Component web page prior to the competition. Teams will need a password in order to access the videos. The password is found in the team registration packet. In addition, your teams can view the top presentations from previous NCF-Envirothon competitions by visiting the NCF-Envirothon web site – The Competition, Past Competition and Final Presentations. You many also view the presentations by following the YouTube link at: https://www.youtube.com/watch?v=yIYJTlqpGMc&feature=youtu.be.

The following scenario was used for the 2019 oral component. This provides an example of the types of issues you might be asked to address at any given Envirothon competition.

2019 Oral Component Scenario

The Scenario:

The Pennsylvania Association of Sustainable Agriculture (PASA) is holding a workshop for PASA member farmers, entitled *"Agriculture and the Environment: Knowledge and Technology to Feed the World."*

Workshop attendees already believe that sustainable agriculture is a worthy investment but are coming to this event to gain more knowledge about how they might make their farm operations more resilient, especially as they face the challenges of feeding a growing population, increasing severe weather events, and new pests.

The Presentation:

As an Envirothon team, you are a group of five experts hired by PASA to give a presentation at this workshop. As a group, you have diverse experiences in conservation, agricultural technology, and sustainable farming.

Your audience, the judges, is PASA member farmers who are attending your workshop.

Develop a 10-minute presentation to describe how these farmers will be able to feed the expanding human population while also protecting vital natural resources. Your presentation should discuss what practices farmers can begin adopting today that will have multiple impacts, addressing each of the following:

I. **Reduce Inputs**: Explain ways that farmers can reduce fertilizers, pesticides, water, and energy while their farms maintain productivity.

II. **Climate Change**: Describe farming techniques that can also serve as a source for climate change mitigation and how farms can be prepared for more frequent severe weather events.

III. **Pollinators and Pests:** Present ways farmers can enhance pollinator populations and utilize pollinators to the farmers' benefit, while also building resilience to changing pests in their management systems.

IV. **Utilize New Technologies:** Demonstrate available technologies (drones, GIS, precision ag, biotech, etc.) that farmers might utilize to increase production and decrease negative impacts of agriculture.

V. **Economic Sustainability**: Describe how farmers can remain economically viable while implementing these new strategies, as outlined in Tasks I-IV.

While one agricultural practice might address multiple tasks, please describe that practice while addressing the solution for each. You may cross-reference practices that have multiple benefits during several parts of the presentation.

Incorporate/cite at least three (3) spoken, relevant, and reputable references as you present, such as a formal publication or information provided in the 2019 Current Issue resources.

Examples of references:

"According to _____'s publication entitled _____, [fact that supports scenario]."

"Research from [organization/agency/etc.] outlined in their article _____, suggests [fact that supports scenario]."

"An article entitled _____, on _____'s website, says [fact that supports scenario]."

SOME TIPS FOR TEACHING ENVIROTHON MATERIAL

1. **Arrange a visit to a local park or nature center!** Just one day or afternoon "in the field" can do wonders for bringing all of your team's studying to life. Many environmental educators in parks and nature centers can lead hikes based around themes or concepts that *you* want covered with your students. Hands-on investigations, tree identification walks, stream investigations – all of these may be possible at sites near your school.

2. **Ask your Conservation District about tree and log scales, diameter tapes, wedge prisms, clinometers, aquatic specimens for identification, topographic maps, deer aging tools, soil pit profile posters, and other available educational resources and programs!** Many Conservation Districts have educational resources that you can borrow to assist with training your Envirothon teams. They also offer a variety of training workshops. Talk to your County Envirothon Coordinator about the possibilities of a school program or educational activity. This person(s) is your contact for a wide array of helpful services. Write or give them a call! A listing of contacts and phone numbers can be found on the Envirothon website.

3. **Follow environmental issues in your local newspapers!** This is a great way for your students to connect all of the environmental concepts the Envirothon covers with "real life." In every spot in Pennsylvania on every day, something is happening which affects the health of our forest ecosystems and watersheds, the quality of living for local residents, and the use of our resources. There are success stories as well as hard lessons in economics, politics, and sociology. Following a current local event in the classroom is an effective way of engaging students in informed discussions and action.

4. **Check out Bay Journal!** This is a broad-reaching and informative monthly publication put out by the Alliance for the Chesapeake Bay that focuses on issues and updates on our downstream estuary. It would be a great addition to teacher reference materials for use in student research assignments, in-class discussions of current events, or a year-long monitoring of this critical ecosystem's health.

5. **Last, but certainly not least: HAVE FUN!** One key to a meaningful natural resource and environmental education experience is *fun*. Reading up on your local ecosystems, having an energetic discussion about a wildlife issue, investigating a stream for water quality, measuring trees like professional foresters, even getting your hands "dirty" in an exposed soil profile, all of these can be fun and exciting adventures in learning. If it's fun, you will not only get the students excited for more, but they will learn information that will stick with them for years to come. Have a great time with the Envirothon!

REFERENCE MATERIAL AVAILABLE ON THE PENNSYLVANIA ENVIROTHON WEBSITE
www.envirothonpa.org

For each station, the majority of the references listed are available on the Pennsylvania Envirothon website under the tab - **Station Training**.

Please visit the site at *http://www.envirothonpa.org*.

Some publications are not available in electronic format or via the internet. These publications are available in hard copy by contacting your County's Envirothon Coordinator.

2026 AQUATIC ECOLOGY

Essential Topics

1. Aquatic Ecology
2. Aquatic Resource Issues
3. Aquatic Resource Management and Protection

Learning Objectives

Correlated to the Pennsylvania STEELS Standards.

Envirothon students will be able to:

1. **Aquatic Ecology**
    - Explain the influence of water's chemical and physical properties on aquatic organisms.
      STEELS: 3.1.3.G; 3.3.K.C; 3.1.3H; 3.1.6-8.L; 3.1.9-12.M; 3.1.6-8E; 3.1.9-12.W; 3.1.9-12.X
    - Describe the influence of the water cycle on aquatic ecosystems.
      STEELS: 3.3.2.B; 3.3.4.B; 3.3.2.D, 3.3.6-8H; 3.3.9-12.K
    - Identify watersheds of Pennsylvania.
      STEELS: 3.3.2.D; 3.4.6-8.C
    - List and compare stream order within a watershed.
      STEELS: 3.4.6-8.C; 3.3.6-8.H; 3.4.6-8.C
    - Identify aquatic organisms and describe their life cycles, adaptations, functional feeding groups, and habitat needs.
      STEELS: 3.1.3.F; 3.1.3.D; 3.1.3.A; 3.1.6-8.D; 3.1.6-8.E
    - Explain energy flow in aquatic food chains.
      STEELS: 3.1.6-8.I; 3.1.9-12.H; 3.1.6-8.K; 3.1.9-12.J

2. **Aquatic Resource Issues**
    - Analyze human impacts on aquatic ecoystems (pollution, overharvesting, development, engineering practices, movement of invasive species)
      STEELS: 3.1.3.H; 3.1.6-8.U; 3.3.K.B; 3.3.K.C; 3.3.K.E; 3.3.5.E; 3.3.5.F; 3.3.6-8.N; 3.3.9-12.Q; 3.4.3-5.F; 3.1.9-12.V; 3.1.9-12.X; 3.1.2.C; 3.4.3-5.A; 3.4.9-12.A
    - Identify invasive species and describe the impacts they have on Pennsylvania ecosystems.
      STEELS: 3.1.3.G; 3.1.6-8.T; 3.1.9-12.V; 3.1.9-12.X; 3.4.3-5.E; 3.4.6-8.F
    - Identify threatened and endangered species and their contribution to aquatic ecosystems.
      STEELS: 3.1.3.G; 3.1.6-8.T; 3.1.9-12V; 3.1.9-12.W; 3.1.9-12.X

3. **Aquatic Resource Management and Protection**
    - Describe the Pennsylvania Fish and Boat Commission's role in management, conservation, and protection of aquatic resources.
    - **STEELS:** 3.4.9-12.A; 3.4.9-12.G
    - Identify major aquatic wildlife management practices (habitat assessment, habitat improvement, fishing regulations, stocking programs, water quality improvement) and evaluate their effectiveness.
    - **STEELS:** 3.4.9-12.G; 3.4.9-12.H; 3.4.6-8.G; 3.4.9-12.C; 3.3.9-12.R
    - List regulations for fish and aquatic wildlife and analyze their role in resource protection.
    - **STEELS:** 3.4.9-12.G; 3.4.9-12.H

Reference Materials List - 2026

The references are found on the PA Envirothon web site under *Station Training*.

2025-2026 Species Profile

Students should be able to identify, describe the natural history, determine the wildlife biology, and evaluate habitat for the animals listed below. In the case of macroinvertebrates, they should be able to identify functional feeding groups (predator, scraper, shredder, etc) and whether the animal goes through incomplete or complete metamorphosis. For frogs and toads, they should be able to identify the calls of these animals. For fish, students should be able to identify if they prefer coldwater, coolwater, or warmwater aquatic communities. Students should also recognize which animals are listed as threatened, endangered or as invasive. There are 36 animals and 5 macroinvertebrate orders in the 2025-2026 Aquatics Profile.

Fish

- Brook Trout
- Rainbow Trout
- Lake Trout
- Muskellunge
- Northern Pike
- Yellow Perch
- Chesapeake Logperch (PA Status: Threatened)
- Lake Sturgeon (PA Status: Endangered)
- Burbot (PA Status: Endangered)
- Sea Lamprey (Invasive)
- Round Goby (Invasive)
- White Perch (Invasive)
- European Rudd (Invasive)

Amphibians

- Wood Frog*

- Green Frog*
- Eastern Spadefoot Toad* (PA Status: Threatened)
- Spring Peeper*
- Eastern Cricket Frog* (PA Status: Endangered)
- Eastern Hellbender
- Mudpuppy
- Spotted Salamander
- Green Salamander (PA Status: Threatened)
- Red-spotted Newt (Red Eft and Adult Stages)

Reptiles

- Eastern Massasauga
- Timber Rattlesnake
- Eastern Hog-nosed Snake
- Eastern Musk Turtle
- Wood Turtle
- Spotted Turtle
- Bog Turtle (PA Status: Endangered)
- Yellow-bellied Slider (Invasive)
- Red-eared Slider (Invasive)

Invertebrates

- Dobsonfly
- Caddisfly
- Cranefly
- Isopod/Aquatic Sowbug
- Dragonfly
- Digger Crayfish (PA Status: Endangered)
- Blue Crayfish
- Red Swamp Crayfish (Invasive)
- Rusty Crayfish (Invasive)

1. Books & Guides:

- PA Fishes Book- Pages 1-23
  *The Pennsylvania Amphibians and Reptiles book is not available electronically. New teams should contact their County Conservation District to obtain a copy of this book.
- Fish Habitat Management for PA Impoundments
- Habitat Improvement for Trout Streams

2. Fact Sheets

A River Flows Through It
Caddis Flies
Clams and Mussels
Dobsonfly
Dragons and Damsels
ENA and ELPA
Macroinvertebrate Feeding Frenzy
Pond/Stream Study Guide & Key to Macroinvertebrates
Riparian Buffers
Snails [Remove]
Stream Reader
Water Walkers

3. PLAY Issues and Select PLAY

- Dive into Stream Ecology
- Focus on Habitat: Wild Brook Trout
- H2O on the Go
- Pennsylvania FSI: Fish Scene Investigation
- Rivers Run Though Pennsylvania
- Six Legs Underwater
- Vernal Pools
- Water Flows Through Pennsylvania
- Water Water Read All About It

4. Articles & Presentations

- PA's Threatened and Endangered Fishes
- PA's Wild Trout Streams
- Lake Shoreline Stabilization Practices
- Trout Habitat Improvement
- Trout Stream Top to Bottom
- Wetlands: The Vital Link

5.Pennsylvania Fishing Summary

The summary book is available interactively on the Pennsylvania Fish and Boat Commission's website. Teams should review the following regulations or information (in order as they appear in the Summary):

- General Fishing Regulations

- Unlawful Acts
- Commonwealth Inlands Waters
- Delaware River and Estuary
- Lake Erie and Tributary Streams
- Reptiles and Amphibians
- Aquatic Invasive Species
- Trout Fishing Regulations

7. Amphibians and Reptiles

- PA Herps Website for calls and to assist with identification [Add]
- Herp Sweet Home

8. Threatened & Endangered Species

- Current List of PA's Endangered, Threatened, and Candidate Species
- Endangered Species and the PFBC
- Bog Turtle Action Plan
- Burbot Action Plan
- Chesapeake Logperch Action Plan
- Timber Rattlesnake Action Plan
- Eastern Spadefoot Action Plan

The PFBC Aquatic Ecology Coordinator can be contacted at 215-968-3631 or RA-seedureach@pa.gov

FORESTRY

Learning Objectives – 2025-2026

The basic resources for each objective are found on the Pennsylvania Envirothon web site under Station Training.

**Correlations with the Academic Standards for Environment and Ecology and Science and Technology are provided.*

After completing study on this issue, students will:

1. Trees
    a. Identify common species without a key and specific or unusual species of trees or shrubs using a botanical key. (Use of a botanical key is an important skill in many environmental professions.
    Practice with the Key to Some Common Trees of Pennsylvania provided.)
    Pay special attention to shade tolerance and soil moisture requirements of each tree species studied. Understand their timber and wildlife values.
        **4.3 Natural Resources – 4.3.10.A*

    b. Explain typical tree growth and life cycle. Be able to describe the parts and tissues of a tree and their arrangements and functions. Recognize defects that effect a tree's health, quality and resource potential.
        **4.3 Natural Resources*
        **3.1 Biological Sciences – 3.1.10.A3*

    c. Explain the cause and effect relationships between environmental factors (light, soil and moisture), and tree growth. Be able to interpret these effects in the growth rings of a sample of wood (either a "tree cookie" or core taken with an increment borer).
        **4.3 Natural Resources*
        **3.1 Biological Sciences – 3.1.10.A3*

    d. List products and uses of the 10 important hardwoods grown in Pennsylvania cited in From the Woods Series: Ten Important Hardwoods resource and of the important conifers — White pine and Eastern hemlock — described in The Common Trees of Pennsylvania.
        *4.3 Natural Resources – 4.3.10.A

2. Forest Ecology
    a. Explain general forest typing based on the dominant tree species. Describe the most abundant forest types found in Pennsylvania. Analyze and type a specific forest site.
        **4.3 Natural Resources – 4.3.10.A, C*

    b. Explain typical forest structure (canopy, understory and ground layers) and crown classes.
    c. Explain typical forest succession from open areas to closed canopy and back again. Analyze the successional stage of a specific forest site.
        **4.1.Ecology – 4.1.10.E*
        **4.3 Natural Resources – 4.3.10.C*

    d. Explain how wildlife habitat relates to the forest plant community (i.e. tree species present, age structure, snags and dead-and-down trees, availability of food and riparian zones).

**4.1 Ecology – 4.1.10.C, D*

e. Explain what effects a specific species increase or decrease might have on the forest ecosystem.

**4.1 Ecology – 4.1.10.E, 4.1.12.E*

**3.1 Biological Sciences – 3.1.10.A3*

f. Evaluate species diversity and its importance. Explain biological diversity as an indicator of a healthy environment as well as analyze the effects of species extinction on the health of an ecosystem.

**4.1 Ecology – 4.1.10.A, 4.1.12.A*

3. Forest Resource Management and Protection

a. Study *Forests of Pennsylvania 2017.* This is a summary of the most current data available describing Pennsylvania's forest resources. Particularly note the patterns of forestland ownership, area of forests, distribution of age and size classes and of tree species, wood volume statistics and regeneration issues.

b. Describe values and benefits of forests for recreation, wildlife and watershed quality.

**4.1 Ecology – 4.1.10.A*

c. Explain the uses of silviculture techniques in even-aged and uneven-aged forest management:
thinning, clear-cutting, seed-tree method, shelter wood method, and selection method. Describe the practices of "high grading" and "diameter limit" cutting.

**4.3 Natural Resources – 4.3.10.A, C, 4.3.12.C*

d. Summarize State and local regulations and programs pertaining to timber management including PA Code Chapter 102 Erosion & Sedimentation Control regulations, waterways management regulations–PA Code Chapter 105.

**4.2 Watersheds and Wetlands – 4.1.12.A*

**4.3 Natural Resources – 4.3.10.B*

e. Explain how forests grow, describe steps to planning for their management, and understand how to sell and market trees.

**4.3 Natural Resources – 4.3.10.A*

**4.5 Humans and the Environment – 4.5.10.C, 4.5.12.C*

f. Demonstrate the use of common forestry equipment (Biltmore stick, diameter tape, wedge prism, and clinometer), to measure tree diameter and height. Be able to calculate wood volume.

g. Identify and describe the life cycle and impacts of common forest pests and invasive plants. Research integrated pest management strategies for selected pests.

**4.5 Humans and the Environment – 4.5.10.B, 4.5.12.B*

h. Predict how human or natural action can produce change to which an organism cannot adapt (Gypsy Moth, Chestnut blight, invasive species, etc.)

**4.1 Ecology – 4.1.10.A, 4.1.12.A*

i. Explain the role of fire in forest ecosystems. Describe the basic principles of wildfire prevention and control. Explain the use of prescribed fire.

**4.1 Ecology – 4.1.10.E*

Reference Materials List – 2025-2026

Most of these references materials are excerpted from publications produced by the Pennsylvania DCNR Bureau of Forestry, Pennsylvania State University, or the USDA Forest Service. Many topics are covered more than once in different ways. So the volume of material is not as overwhelming as it might appear.

The references are found on the Pennsylvania Envirothon web site under *Station Training*.

1. Trees
   - 1.1. Common Trees of Pennsylvania
   - 1.2. From the Woods Series: Ten Important Hardwoods
   - 1.3. Penn State School of Forest Resources: Identifying PA Trees Program
   - 1.4. Key to Some Trees of Pennsylvania
2. Forest Ecology
   - 2.1. Forest Types of Pennsylvania
   - 2.2. Forest Succession and Wildlife
   - 2.3. Habitat Adaptations of Some Common Trees of Pennsylvania
   - 2.4. Forest Stewardship #5 - Wildlife
3. Forest Resources, Management and Protection
   - 3.1. Forest Stewardship Best Management Practices for Pennsylvania Forests
   - 3.2. Forests of Pennsylvania, 2017
   - 3.3. Agricultural Alternatives – Managing Small Woodlots
   - 3.4. Wildfire and Prescribed Fire in Pennsylvania
   - 3.5. Forest Stewardship Teaching Youth about Forest Stewardship
   - 3.6. Just Say No to High-grading, Selective Cutting, and Diameter Limit Cutting
   - 3.7. Insect Threats - 1. Asian Longhorn Beetle; 2. Emerald Ash Borer; 3. Gypsy Moth; 4. Hemlock Wooly Adelgid; 5. Spotted Lantern Fly
   - 3.8. What is an Invasive Plant?
   - 3.9. Invasive Plants - 1. Autumn-olive; 2. Bush honeysuckle; 3. Garlic mustard; 4. Japanese barberry; 5. Japanese knotweed; 6. Multiflora-rose; 7. Tree-of-heaven
   - 3.10. Pennsylvania Envirothon Forest Measurements and Management 2019
   - 3.11. Basal Area: A Measure Made for Management

Bureau of Forestry Service Foresters can help coaches prepare for local Envirothon events. See the Bureau's web site for the service forester assigned to your county.

Learning Enhancements:

1. **i-Tree** - i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools.

2. **leafsnap** - Leafsnap is a series of electronic field guides being developed by researchers from Columbia University, the University of Maryland, and the Smithsonian Institution. The free mobile apps use visual recognition software to help identify tree species from photographs of their leaves.

SOIL/LAND USE

Essential Topics

I. Basic Soils Knowledge
a. Formation
b. Water in soils
c. Soil horizons
d. Hands-on investigations
e. Soil quality, fertility, and chemistry
f. Soil biology and diversity

II. Understanding Maps, Surveys and Landforms
a. Soil survey maps and data tables: **Websoilsurvey**
b. Topographic maps
c. Landforms and geologic terms

III. Land Use
a. Agriculture and conservation practices
b. Current environmental concerns and land use issues
c. Soils and history
d. Pollution remediation
e. Identification and benefits of wetlands
f. Carbon sequestration

IV. Decision-Making and Protection of Soils
a. Scenarios
b. Actions at home and at school

Learning Objectives

The basic resources for each objective are found on the Pennsylvania Envirothon web site under Station Training.

**Correlated with the Academic Standards and Assessment Anchors for Environment and Ecology*

After completing study on this issue, students will:

1. Describe the relationship between soil formation and the movement of water both within the soil and across the landscape.
   **4.4 Agriculture and Society – 4.4.10.C*

2. Describe how soil characteristics are affected by water, and how to control water movement to prevent erosion and pollution. Understand how topography, stream movement, and drainage are related.
   **4.2 Watersheds and Wetlands – 4.2.10.A*

3. Explain the importance of wetlands and how to recognize potential wetland areas and hydric soils. **4.2 Watersheds and Wetlands – 4.2.10.B, D 4.2.12.D*

4. Explain the importance of soils as a natural resource which must be managed properly in order to sustain a healthy society. Understand that soils are in some ways nonrenewable, and what effects gross mismanagement of soils has had historically.

**4.3 Natural Resources – 4.3.10.A, B, 4.3.12.B*

5. Describe the effects of human activity on soils and how soils can be used to clean up pollutants or can become a major pollutant.

**4.5 Humans and the Environment – 4.5.10.A, C, 4.5.12.C*

6. Describe basic soil chemical and physical properties and how they interact with other variables to determine soil fertility or the ability of a soil to remediate pollution and improve environmental health.

**4.5 Humans and the Environment – 4.5.10.E*

7. Explain how soil is alive, and how biological diversity is important for soil health and hence human, plant, and environmental health.

**4.1 Ecology – 4.1.10.B, D, E*

8. Explain the soil food web and the different roles and survival strategies that various soil microbial organisms develop within the soil environment.

**4.1 Ecology – 4.1.10.C, D, 4.1.12.C*

9. Understand and be able to describe the importance of soils to agriculture and soil quality properties. Describe current research findings on best management practices to maximize agricultural production, maintain and build soil health, and prevent soil loss and pollution.

**4.4 Agriculture and Society – 4.4.10.A, B, C, D*

10. Use the soil survey to evaluate the best crops to grow in a given area and what limitations certain soils have to agricultural productivity. Also identify areas of prime farmland that should be preserved.

**4.4 Agriculture and Society – 4.4.10.C, D*

**3.4 Technology and Engineering Education – 3.4.12.E2*

11. Describe the hydrologic, carbon, and nutrient cycles and how soil management relates to those processes.

**4.1 Ecology – 4.1.10.B*

**3.3 Earth and Space Education – 3.3.10.A2*

12. Explain how societal needs, economic forces, and natural forces affect soil resources and how we can ensure long term sustainability of soil health.

**4.4 Agriculture and Society – 4.4.10.B, C, D*

**4.5 Humans and the Environment – 4.5.10.A*

13. Explain historical events that led to the creation of the soil conservation service.

14. Explain in detail the role that geology plays in soil formation, the kinds of soils that are formed, and their basic characteristics including texture, pH, color, and structure.

**4.1 Ecology – 4.1.10.F, 4.1.12.D*

15. Describe the basic geological features and rocks of the state of Pennsylvania and how they were formed.

**4.1 Ecology – 4.1.10.F*

**3.3 Earth and Space Education – 3.3.10.A1*

16. Understand and interpret geographical and geological information from topographic maps. Be able to make some basic assumptions about appropriate land use from topographic and geologic maps and information.

**4.1 Ecology – 4.1.10.F, 4.1.12.F*

**3.4 Technology and Engineering Education – 3.4.10 and 12.E2*

17. Use a soil survey or web-soil survey data to evaluate land use in Pennsylvania. Show how information in soil surveys can help the land user predict or avoid problems like sinkholes, or regions prone to landslides, flooding, drought, or soil instability.

**4.1 Ecology – 4.1.10.F, 4.1.12.F*

**3.4 Technology and Engineering Education – 3.4.10 and 12.B2, 3.4.10 and 12.E2*

18. Compare different kinds of land uses and conservation practices on erosion and sedimentation. **4.4 Agriculture and Society – 4.4.10.E*

19. Explain how climate is a major soil forming factor through its effect on vegetation, organisms, water, and weathering.

**4.3 Natural Resources – 4.3.10.C, 4.3.12.C*

20. Explain how soils and soil management are integral to maintaining clean water and a healthy aquatic environment.

**4.2 Watersheds and Wetlands – 4.2.12.A*

**4.5 Humans and the Environment – 4.5.10.C*

Reference Materials List – 2025-2026

1. An Introduction to Soils of Pennsylvania
2. Websoilsurvey: http://websoilsurvey.nrcs.usda.gov
3. Web soil survey - Introduction to soils part 1
4. Web soil survey - Introduction to soils part 2
5. Soil Quality
   - Bulk Density Moisture/Aeration - pp. 1-4 (The measuring soil bulk deinsity section is optional.)
   - Infiltration - pp. 1-3 (The measuring infiltration section is optional.)
   - Organic Matter - pp. 1-4 (The measuring soil organic matter section is optional.)

- pH - pp. 1-6 (Use Cornell soil pH kit to measure pH, or whatever pH kit you have available.) ○ Soil Health Nuggets ○ Soil Health - What is soil health? Why should I care?

6. From the Surface Down 2nd Edition (New for 2020)
7. Topographic Map Symbols
8. Soil Biology Primer – (pp. 4 – 17 only)
9. Soil References for Landforms and Geologic Terms "Soil Structure" "Soil Texture"
10. Do You Dig Wetland Soils? -Section 1 & 2
11. Basic Soil Color Guide
12. How Does Your Garden Grow? Some information on soil fertility. NASA soil science website about soil and NPK

Learning Enhancements (not required)
The YouTube videos found on the Pennsylvania Envirothon website are courtesy John Chibirka, U.S.D.A. Natural Resources Conservation Service Soil Scientist, and the Lancaster County Conservation District.

- Envirothon Soils Study Session 1
- Envirothon Soils Study Session 2
- Envirothon Soils Study Session 3

WILDLIFE STATION

Essential Topics

1. Wildlife Identification and Natural History
2. Wildlife Biology and Adaptations
3. Wildlife Ecology
4. Conservation and Wildlife Management
5. Wildlife and Society
6. Wildlife Health
7. Field and Analytical skills

Learning Objectives

Correlated to the Pennsylvania STEELS Standards.

Envirothon students will be able to:

1. **Wildlife Identification and Natural History**
   - Identify Pennsylvania birds and mammals, describe their natural history, and be able to define their ecological roles.
     STEELS: 3.1.3.G; 3.1.6–8.T; 3.1.9–12.W
   - Differentiate between herbivores, carnivores, and omnivores using skull morphology and dentition.
     STEELS: 3.1.6–8.D; 3.1.6–8.E; 3.1.5.B
   - Evaluate habitats to determine which species are most likely to be present.
     STEELS: 3.1.3.G; 3.1.6–8.U
2. **Wildlife Biology and Adaptations**
   - Explain how anatomical, physiological, and behavioral adaptations help wildlife survive in their ecosystems.
     STEELS: 3.1.3.G; 3.1.6–8.T; 3.1.9–12.W
   - Describe the significance of life cycles, migration, circadian rhythms, and seasonal changes for Pennsylvania wildlife.
     STEELS: 3.1.6–8.F; 3.1.9–12.H
   - Compare generalist vs. specialist species and predict responses to environmental change.
     STEELS: 3.1.9–12.I; 3.1.9–12.M

3. **Wildlife Ecology**
   - Define habitat and identify essential components required by different wildlife species.
     STEELS: 3.1.3.G
   - Model food chains, food webs, and energy pyramids to explain energy flow in ecosystems.
     STEELS: 3.1.6–8.F; 3.1.5.B; 3.1.9–12.H
   - Analyze predator-prey relationships and their impact on population dynamics.
     STEELS: 3.1.6–8.I; 3.1.9–12.I
   - Explain ecological concepts such as succession, carrying capacity, competition, and biodiversity.
     STEELS: 3.1.6–8.L; 3.1.9–12.M; 3.1.9–12.L; 3.1.9–12.N
   - Assess the role of biodiversity in ecosystem resilience and stability.
     STEELS: 3.1.9–12.V
4. **Conservation and Management**
   - Describe the role of the Pennsylvania Game Commission and the Game & Wildlife Code.
     STEELS: 3.3.9–12.Q
   - Identify major wildlife management practices (habitat improvement, hunting regulation, reintroduction programs, disease monitoring) and evaluate their effectiveness.
     STEELS: 3.4.6–8.G; 3.4.9–12.G
   - Explain biological vs. cultural/social carrying capacity and how they affect human-wildlife interactions.
     STEELS: 3.1.6–8.I; 3.1.6–8.U; 3.4.6–8.B; 3.4.9–12.C
   - Analyze the role of hunting, trapping, and reintroduction programs as wildlife management tools throughout conservation history.
     STEELS: 3.3.9–12.Q; 3.4.6–8.H; 3.4.9–12.H
   - Evaluate conservation strategies at local, state, and international levels, including legislation such as the Endangered Species Act.
     STEELS: 3.4.9–12.C; 3.3.9–12.R
5. **Wildlife and Society**
   - Assess human impacts (habitat loss, fragmentation, climate change, pollution) on wildlife.
     STEELS: 3.4.6–8.B; 3.4.9–12.B; 3.4.9–12.D
   - Explain threats and impacts of invasive and exotic species on Pennsylvania ecosystems.
     STEELS: 3.1.9–12.L; 3.1.9–12.N; 3.4.6–8.D; 3.4.9–12.D

- Evaluate case studies of endangered and threatened species in Pennsylvania and propose management strategies.
  STEELS: 3.4.6–8.B; 3.4.9–12.C; 3.3.9–12.R

- Discuss positive/negative human-wildlife interactions, in both rural and urban communities.
  STEELS: 3.1.6–8.T; 3.1.9–12.W

6. **Wildlife Health**
   - Identify common wildlife diseases (Chronic Wasting Disease (CWD), Epizootic Hemorrhagic Disease (EHD), Avian Influenza (AI), mange, West Nile) and their effects on populations.
     STEELS: 3.1.9–12.L; 3.3.9–12.Q

   - Explain monitoring and response strategies for wildlife disease outbreaks.
     STEELS: 3.4.9–12.F

7. **Field and Analytical Skills**
   - Use field guides, dichotomous keys, and digital tools for wildlife identification.
     STEELS: 3.1.6–8.E; 3.1.9–12.I

   - Interpret wildlife signs and sounds to infer behavior, diet, and habitat use.
     STEELS: 3.1.6–8.D; 3.1.9–12.W

   - Recommend best management practices for diverse landscapes (forests, wetlands, grasslands, urban areas).
     STEELS: 3.4.6–8.G; 3.4.9–12.G

Reference Materials

1. 2025-2026 Pennsylvania Hunting & Trapping Digest
   - Wildlife Classifications
   - Fluorescent Orange
   - Mentored Hunting Program
   - State Game Lands
   - Chronic Wasting Disease
   - Reporting a Violation
   - Reporting Banded Birds
2. How does the US Fish and Wildlife Service monitor migratory game bird harvest in the United States?

3. Why is it important to use non-toxic shot when waterfowl hunting?
4. Learning about the Pennsylvania Game Commission
    - How do I contact the Game Commission?
    - Who is the Game Commission?
    - What is a Game Commissioner?
5. Wildlife Health
    - Avian Influenza
    - West Nile Virus
    - Mange
    - Epizootic Hemorrhagic Disease
    - Chronic Wasting Disease
6. Wildlife Notes
7. Pennsylvania Species, Ecosystems & Biodiversity
8. North American Model of Wildlife Conservation (Summary from Project WILD)
9. Skulls Examining Predator and Prey Carnivore, Herbivore, and Omnivore

2025 - 2026 Species Profile

Students should be able to identify, describe the natural history, determine the wildlife biology, and evaluate habitat for the animals listed below. Identification signs could include: a picture, replica, decoy, fur, hair, feather, gnawing, rubbing, pellet, nest, scat, track, skull, song, sound, etc. Students should review the Pennsylvania Game Commission Wildlife Notes and supplemental information provided below. There are 45 animals designated in the 2025 – 2026 Wildlife Profile.

- Chimney swift, purple martin, and swallows (7 total)
- White-tailed deer
- Eagles and osprey (3 total)
- Squirrels (4 total)
- Chickadees, nuthatches, titmouse, and brown creeper (6 total)
- Diving ducks (15 total)
- Weasels
- Mink
- Fisher
- River otter
- Mourning dove
- Woodchuck

- Opossum

Mammal Sounds – The Cornell Lab of Ornithology Macaulay Library website

Bird Calls/Songs that are required for the 2025-2026 Envirothon include:

1. Mourning dove
2. Chickadee
3. Bald eagle
4. Chimney swift
5. Tree swallow
6. White-breasted nuthatch
7. Osprey
8. Bufflehead

Birds Songs – Utilize the Identiflyer or visit The Cornell Lab of Ornithology All About Birds website. Bird songs and calls on the state test will come from The Cornell Lab of Ornithology. We suggest using the Macaulay Library or the Merlin app to study.

Animal Tracks – Critter Cards or visit iTrack wildlife (Animal tracks App).

Learning Enhancements

Wildlife Station Training videos produced by the PA Game Commission and Lancaster County Conservation District

Wildlife Training Video – Session 1

Wildlife Training Video – Session 2

Wildlife Training Video – Session 3

Urban Wildlife Kit with Dan Lynch

Deer Aging Tool (available from your local County Conservation District)

For additional information, please visit the Pennsylvania Game Commission website.

Pennsylvania Game Commission

CURRENT ISSUE-2026 MATERIALS

2026 Current Issue

Non-Point Source Pollution: It begins at home!

The state of Mississippi has abundant surface water resources that are designated for uses that include navigation, recreation, fish and wildlife use, shellfish harvesting, and public water supply. Key waterways include the Mississippi, Pearl, Pascagoula, and Tombigbee Rivers. These waters have historical significance and will continue to play a vital role in the future, but pollution poses a major threat to water quality and public health.

The landmark Clean Water Act (CWA) of 1972 in the United States established a foundational framework for regulating the discharge of both point and non-point source pollutants into the nation's waters, as well as setting surface water quality standards. Point source pollutants come from a single, identifiable origin, such as a discharge pipe from a factory. On the other hand, non-point source (NPS) pollution originates from a wide area without a specific source, like runoff from agricultural fields or urban streets during a rain event. This widespread nature complicates the task of pinpointing the exact source of the pollutants. The CWA primarily addressed point source pollution through regulations and permits, while NPS pollution remained in the realm of voluntary or local action in urban and rural areas. In the mid-1990s, the U.S. Environmental Protection Agency began to address some non-point source pollution through a series of new stormwater permits, however mitigating NPS pollution and improving water quality requires coordinated efforts from individual and community-based efforts.

Many individuals do not realize how their actions contribute to non-point source pollution, either directly through their consumption and disposal habits or indirectly through the products and services they purchase (e.g., the life of a plastic water bottle). It is essential for individuals to acknowledge their role in this issue and understand how they can help provide solutions. Tackling non-point source pollution starts at the individual level - change begins at home.

Students will learn about NPS pollution and identify its origins in both urban and rural settings. They will learn how to conduct their own NPS survey in their community and watershed. Additionally, they will learn about NPS mitigation strategies, which encompass actions at both the individual level - such as conservation, recycling, and responsible consumption - and the community level, including watershed planning, best management practices, nature-based solutions, water quality testing, and litter prevention initiatives.

The 2026 Current Issue Envirothon Resources are available online at
https://envirothon.org/wp-content/uploads/2025/09/2026-Current-Issues-Part-A.pdf
2026-Current-Issues-Part-A.pdf