

# FOREST BIODIVERSITY

**Understanding  
Biological Health  
in Our Forests**

PENNSSTATE



College of Agricultural Sciences  
Agricultural Research and Cooperative  
Extension

**P**ennsylvania's Sustainable Forestry Initiative (SFI) program encourages forest-management activities that conserve native biodiversity. This brochure provides an introduction to biodiversity's importance and suggests resources for learning more.

## What Is Biodiversity?

The decline of forest habitat and the related loss of biodiversity is a worldwide environmental issue. Biodiversity refers to the richness or variety of animal, plant, and other life in a given area, from the tiniest snail or plant to the largest predator. Biodiversity encompasses not only the species themselves, but the complex interactions among species and the natural communities and ecosystems they form.

It is useful to think of biodiversity on three levels: genetic diversity, species diversity, and ecosystem diversity.

- **Genetic diversity**—each individual organism is unique, even among their own species. Species uniqueness is slow to develop and cannot be duplicated or retrieved once it is lost. A diverse gene pool increases a species' ability to adapt to changing environmental conditions.
- **Species diversity**—the variety of different species.
- **Ecosystem diversity**—the variety of physical environments and biotic communities over a landscape.

Genetic, species, and ecosystem diversity all interconnect. As we understand the processes that occur at different biodiversity levels, considering the effect management decisions have on species and their environment is important.

### Wood thrush





## Strategies for Conserving Forest Biodiversity

Many factors contribute to biodiversity decline or loss. Often, these factors are indirect and involve complex ecological interactions. A few indirect causes include habitat loss and fragmentation, introduced species, pollution, and poor management practices. The following strategies to help conserve forest biodiversity are important:

- **Protect habitat:** One strategy for conserving forest biodiversity is to provide and protect a variety of habitats for plants and animals. Diverse habitat types ensure the potential for a wide range of plants and animals.
- **Reduce fragmentation:** When a large habitat is broken into smaller fragments, certain plant and animal species cannot spread easily. Three species groups affected by habitat fragmentation are:
  - species with large home ranges (e.g., bears and large carnivores);

- species unable to disperse easily (e.g., many amphibian and reptile species);
- habitat-interior species (e.g., forest songbirds).

Some species easily survive habitat fragmentation. Deer and raccoon are generalists and often benefit from fragmentation.

● **Control introduced animals or plants:** Introduced species may outcompete native species and have detrimental effects on the forest ecosystem. Gypsy moths are an example of an introduced species.

● **Reduce pollution:** Pollution has negative effects on forest ecosystem productivity and may make certain species more prone to damage from insects and disease.

● **Using sustainable harvesting practices:** Sustainable harvesting practices protect the environment by conserving soil, controlling stream sedimentation, protecting residual trees from damage, and promoting desired regeneration.

Practicing these strategies can maintain, or perhaps increase, biodiversity in forest ecosystems.

## **The Role of Private Forests**

Private forestland owners help conserve biological wealth, simply because they own most of Pennsylvania's forestland. If you are a forest landowner, we encourage you to learn about the





PHOTO CREDIT: JOSH JOHNSON

Indiana or social bat

values your land has to offer, and to manage it to meet as many of your objectives as possible. The following are benefits of maintaining biodiversity in our forest ecosystems:

- **Economic:** Species contribute many known and unknown values to forest health. Humans benefit greatly from a few cultivated species. A wealth of information is awaiting discovery. For instance, snails and other mollusks might seem expendable. However, scientists recently discovered that certain mollusks do not get cancer. Scientists are searching for the chemicals that produce this natural immunity.
- **Environmental:** Biodiversity is the basis for life-sustaining ecological services such as nutrient cycling, photosynthesis, decomposition, soil creation, climate regulation, removal of pollutants, and insect control. These processes contribute to the stability of the Earth's ecosystems and contribute to higher quality air, water, and food.
- **Personal values:** Many people support biodiversity because it satisfies personal values. These personal values are as varied as the people who hold them. Most people agree that we have a responsibility to ensure that future generations have all the pieces to sustain life on Earth.

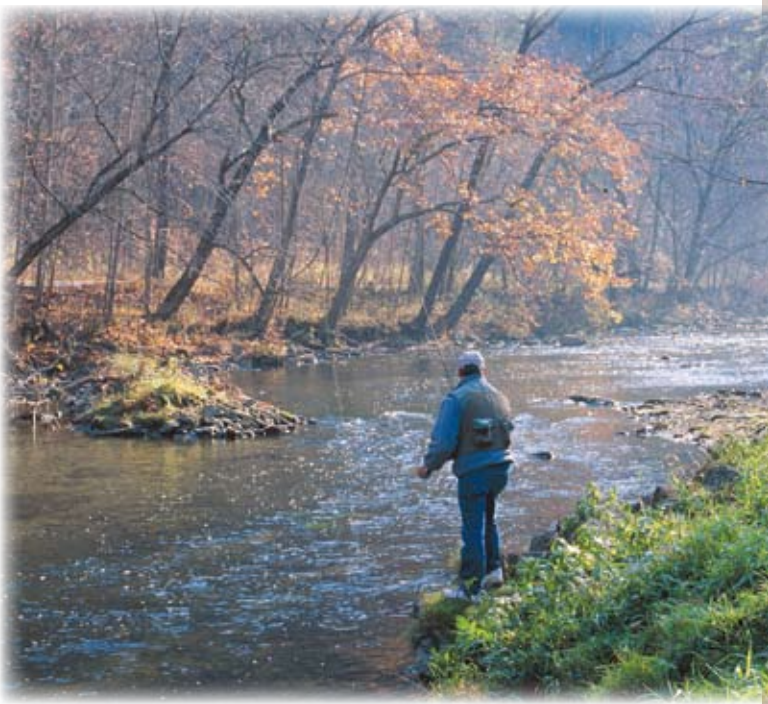
- **Personal enjoyment:** Biodiversity contributes to our enjoyment of natural beauty, outdoor recreation, and peace of mind.

## **Pennsylvania Species of Concern**

As a good steward of the land, it is important to be aware of plant and animal species and ecological communities of concern designated as imperiled, critically imperiled, threatened, or endangered and how management activities in your forest may affect these species.

“Critically imperiled” (G1) or “imperiled” (G2) species or ecological communities are globally rare or, because of certain factor(s), especially vulnerable to extinction. Nongovernmental organizations such as NatureServe and Natural Heritage Programs, or the World Conservation Organization (IUCN) designate G1 and G2 species or communities.

For Pennsylvania, G1 species include several freshwater mussels. G2 species potentially affected by forest management activities include the Indiana or social bat and the small-whorled pogonia. Both of these species, where they occur, are sensitive to forest-management activities.



## What Can You Do to Conserve Biodiversity?

In managing your forest, think about how your activities can improve important habitat features. As you conduct harvesting activities, consider the following:

1. Retain some tall and short trees as well as a mix of species when harvesting timber, even when clearcutting.
2. Increase the number of potential snags (i.e., standing dead and dying trees) and large downed trees. Be aware that snags can be a safety risk when logging.
3. Protect and retain important wildlife habitat features.
4. Conserve native tree and plant communities.
5. Retain and promote mast production for wildlife.
6. Protect and manage aquatic and riparian areas.
7. Work with neighbors and hunters to control deer numbers since white-tailed deer have been proven to adversely affect tree regeneration, wildflower diversity, and habitat for other wildlife species.
8. When harvesting trees, use Best Management Practices for Pennsylvania, which is a guide for promoting forest stewardship. Copies are available from SFI, Penn State's College of Agricultural Sciences, and the DCNR Bureau of Forestry. The publication is also available online at <http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf>.

To learn more about conserving biodiversity as you plan or conduct forest management, contact any one of the following organizations:

### **Pennsylvania's Sustainable Forestry Initiative (PA SFI®)**

315 S. Allen Street, Suite 418  
State College, PA 16801  
Phone: 888-734-9366

**E-mail: [sfi@penn.com](mailto:sfi@penn.com)**  
<http://www.sfiofpa.org/>

### **Penn State Natural Resources Extension**

320 Forest Resources Building  
University Park, PA 16802  
Phone: 800-235-9473  
<http://rnnext.cas.psu.edu/>



## **Pennsylvania Department of Conservation and Natural Resources (PA DCNR)**

Rachel Carson State Office Building  
P.O. Box 8767  
400 Market Street  
Harrisburg, PA 17105-8767  
<http://www.dcnr.state.pa.us/>

## **The Pennsylvania Bureau of Forestry**

Rachel Carson State Office Building  
P.O. Box 8552  
Harrisburg, PA 17105-8552  
Phone: 814-364-5150  
<http://www.dcnr.state.pa.us/forestry>

## **Pennsylvania Natural Heritage Program**

<http://www.naturalheritage.state.pa.us/>

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