Understanding biological wealth in our forests

No resources about the value of forests would be complete without addressing the issue of biodiversity. *Biodiver*sity, a term used interchangeably with *biological diversity,* is often confusing and sometimes controversial. In general, biodiversity refers to the richness or variety of animal, plant, and other life in a given area, from the tiniest snail or moss to the largest predator. More comprehensively, biodiversity encompasses not only the species themselves, but also the complex interactions between species and the natural communities and ecosystems that they form. These interacting plant and animal species are like strands of a spider web, each adding to the delicate balance that fosters environmental stability. This rich and complex composite of life is our biological wealth, for it forms the living part of the natural resource base upon which humans depend and of which humans are an integral part. As new technology allows us to exert more and more control over our environments to suit our needs, it is important to keep this connection in mind. (see box at right.) On a global level, the way we manage our biological diversity may, in the long run, determine our biological destiny. It is not likely that the actions of any one individual will cause a large- scale environmental catastrophe. But it is possible that the collective actions of people across the world will effect a gradual erosion of environmental stability and hence create an environment in which humans, among other species, would be unable to survive. To some, this view might seem alarmist, but it is important to see how individual actions contribute to the whole. The management section of this publication focuses on the need for individuals to make environmentally responsible decisions in the area in which they live or own land. It also provides suggestions on how biodiversity can be incorporated into long- range management planning.

UNDERSTANDING BIODIVERSITY

Because individual life-forms do not exist in a vacuum, we need to expand our concept of diversity to include more than just numbers of particular species. By examining the interactions between species at various levels, we can learn more about how natural communities function. In turn, we can learn how to influence these processes so that we can meet our growing needs in sustainable ways. Because the idea of biodiversity is so complex, it is useful to ask ourselves about this variety of animal and plant life, and why we are managing for it. The variety of biological diversity includes genetic diversity, species diversity, and ecosystem diversity.

GENETIC DIVERSITY

This is the level of biodiversity most people have difficulty understanding. Each individual organism is a unique chemical and genetic factory unlike any other of its species. No two humans are alike, for example. This reservoir of information has taken centuries to develop; it cannot be duplicated or retrieved once it has been lost. A diverse or varied gene pool provides a hedge against an unknown future. It allows a species to adapt to constantly changing environmental conditions.

SPECIES DIVERSITY

This is the level of biodiversity that usually receives the most attention. It is the many different kinds or varieties of plants, fungi, fish, amphibians, reptiles, mammals, birds, and other organisms that make up the living world around us. Pennsylvania has 186 native tree species, 288 shrub species, 64 native mammal species, 278 native birds, and more than 150 kinds of fish. An important part of species diversity comes with understanding how species change from place to place, and how they change over time in the same place.

ECOSYSTEM DIVERSITY

This kind of diversity involves the various species living in an area, the ecological processes that link them together, and the soil, air, and water that support the living organisms constituting the ecosystem. Many different kinds of ecosystems occur in different physical settings, and within each ecosystem many tiers exist that support additional diversity. We know ecosystems as a hardwood forest, a wetland, a prairie, a cave, or a stream, to name just a few. The multiple layers of plant growth in a hardwood forest, from herbaceous to shrub to the forest canopy, are an example of the tiers within an ecosystem. All these components of biodiversity—genetic, species, and ecosystem diversity—are interconnected. As we begin to better understand the complex processes that occur at these different levels, we need to consider how our management decisions affect each of these biodiversity components. Since ecosystems rarely, if ever, follow management boundaries or property lines, the issue of scale becomes especially important in this process.

Understanding biological wealth in our forests

Figure 1. Levels of biodiversity

Genetic Diversity
The variation in genetic composition of individuals within and among species (e.g., variation within a population of rabbits).

Species Diversity
The variety of different species found in an area (e.g., the variety of species found in a prairie).

Ecosystem Diversity
The variety of physical environments and biotic communities over a landscape (e.g., the variety of forests, grasslands, wetlands, and aquatic systems over a region).

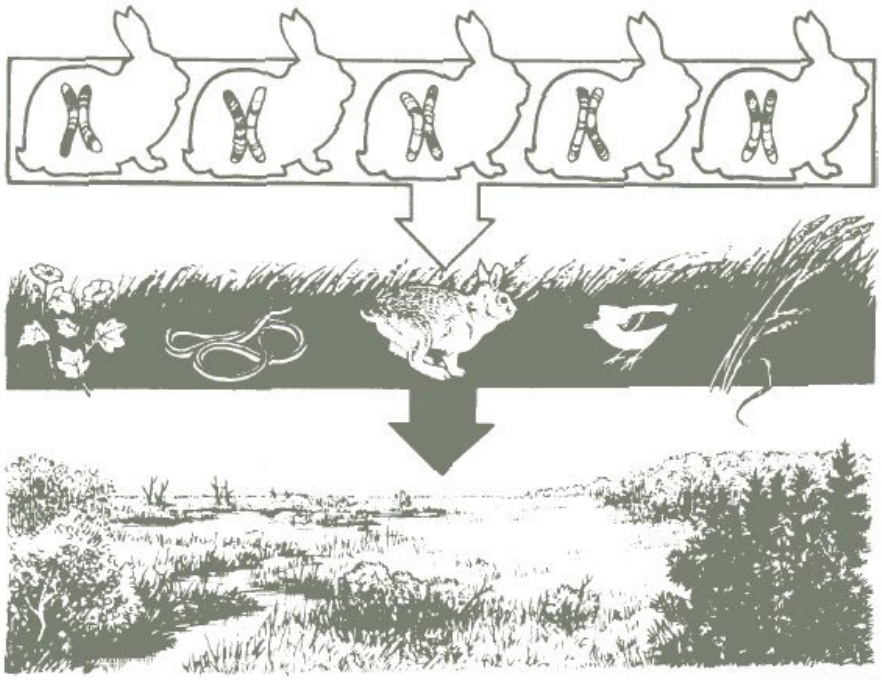

Table 2. A look at species diversity in Pennsylvania (1994)

SPECIES OR GROUP	NATIVE SPECIES	ENDANGERED OR THREATENED	EXTINCT OR EXTIRPATED	% NATIVE SPECIES LOST OR IN JEOPARDY
Mammals	63	6	12	28
Birds	203	14	6	10
Amphibians	36	3	1	11
Reptiles	37	5	2	19
Fish	159	18	27	28
Invertebrates	10,000+/-	?	68	?
Mussels (unionids)	65	2	20	34
Vascular plants	2139	306	107	19
Bryophytes and lichen	916+/-	?	?	?
Protists and fungi	?	?	?	?

Table adapted from information provided by the Pennsylvania Biological Survey and the US Fish and Wildlife Service