project WEB

Fall 2010

Connecting Projects WILD, WET and Learning Tree in New Hampshire

# Exploring Ecosystems

Ecosystem, community and habitat: even those working in the biological field are often confused as to the difference between these biological terms. Biologically, a community is a group of species – plant or animal – that occur together in a particular area. An ecosystem is a community of different species, plant and animal, interacting with each other and the physical or "abiotic" environment, which includes the soil, geology and climate. It is largely the physical factors of an area that set the stage for which collection of plants will be successful growing there.

Each specific collection of plants that grow in areas with similar physical characteristics is referred to as a plant community. Examples of naturally occurring plant communities in New Hampshire include spruce-fir forests, northern hardwood forests, coastal sand dunes and alpine bogs. New Hampshire has a healthy diversity of ecosystems, largely due to its diverse geological features and landscapes, including seacoast, river valleys, alpine zones, lakes and glacial remnants such as kettle holes and drumlins.

In much the same way that physical characteristics determine which plant community will naturally

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"When one tugs at a single thing in nature, he finds it attached to the rest of the world."

*~ John Muir*

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# Great Bay Estuary as an Ecosystem

***By Sheila Roberge***

Great Bay Estuary is a multifaceted convergence zone – a place where the ocean and rivers, land and water, and people and nature meet. It lies at the confluence of tidally driven seawater from the Gulf of Maine and fresh water from seven major river systems.

The flow of energy, nutrient cycles, seasons, tides, daylight and darkness, helps to define the Great Bay Estuary. The tides within Great Bay Estuary dominate the system and are a strong influence on animal and plant survival. The ebb and flow of tidal waters create a fluctuating salt content within the estuary, where freshwater inflow averages about 2% of the volume of water depending on the season. When high tides flood the estuary, the water surface of Great Bay extends 8.9 square miles, while at low tide, more than 50% of the bay is exposed as mudflat. Exposure and flooding of the bay bottom at low and high tides have conditioned animals to daily cycles of behavior to survive these dry and wet events.

Between the water's edge and the upper watershed, a rich mosaic of habitats sustains many species.

PHOTO © NHFG/VICTOR YOUNG

*Between the water's edge and the upper watershed, a rich mosaic of habitats sustains many species.*

Great Bay Estuary includes five major water dominated habitats: eelgrass, mudflats, saltmarsh, channel bottom, and rocky intertidal zone. These are rich and

*GREAT BAY continued on page 2*

*GREAT BAY continued from page 1*

PHOTO © NHFG/VICTOR YOUNG

*A healthy ecosystem sustains the horseshoe crab, an iconic symbol of the Great Bay Estuary.*

diverse habitats that are home to a variety of species, including oysters that sit firmly attached to the underwater substrate, fish that swim through tidal waters and migratory birds that arrive to feed for the winter. Some species are rarely seen or noticed, like the small invertebrates that burrow in the mudflats, but others, like the horseshoe crab, are iconic symbols of the estuary itself. It is especially important to remember that all life in estuaries like Great Bay depends upon the plants and animals that live on and in the mud at the bay bottom.

The interactions among the species that inhabit Great Bay are as important as the physical conditions to which all of the species adapt and respond. These interactions can take many forms, but feeding relationships may be the most widely recognized. Ospreys time their spring return to Great Bay to coincide with strong runs of river herring entering the estuary to spawn. During the summer, predatory fish move into the estuary to feast on abundant prey. In winter, waterfowl descend on the estuary to feed, and the calories they consume from eelgrass roots and mudflat invertebrates provide energy they need for reproduction and migration. These feeding interactions not only drive the rhythms of life in the estuary, but also ensure the survival of species that thrive in the Great Bay Estuary.

*Sheila Roberge is the volunteer coordinator at the New Hampshire Fish and Game Department's Great Bay Discovery Center in Greenland, N.H.*

*ECOSYSTEMS continued from page 1*

occur in a given area, it is largely the plant community that determines which wildlife are found there. Over time, wildlife species have adapted both physiologically and behaviorally to meeting their needs for survival within the plant community in which they have evolved. Habitat is that area in which food, water, shelter and space are found in the appropriate arrangement for meeting a plant or animal's needs. Some wildlife species have very specific habitat needs, which can all be met within one type of plant community; some need a specific variety of plant communities to meet changing seasonal needs; while others have more general needs and survive well in a variety of communities.

## Activities Related to Articles in this Issue

### Project WET suggests:

In *Piece it Together*, students analyze and plot global temperature and precipitation distributions to determine climate patterns and how they influence human lifestyles.

Students identify plants and animals and their habitats by analyzing clues that describe water-related adaptations of aquatic and terrestrial organisms in *Water Address*.

In *Salt Marsh Players*, students role-play how organisms adapt to life in a salt marsh – a coastal, marine habitat that is alternately flooded and drained by tides.

### Project Learning Tree suggests:

In *Our Changing World*, students see how changing one aspect of our world affects others and then research a global issue to gain an understanding of some of the challenges facing us today as a global society.

PLT has created a special version of the activity *Environemntal Exchange Box* to help celebrate the 2011 Year of Forests. To celebrate, students prepare an environmental exchange box to learn more about their local forests, forests across the country, and forests around the globe. This new version of Activity 20 is available online at ***www.plt.org***, under Curriculum > PreK-8 Guide.

In *Field, Forest and Stream*, students conduct field studies of three different environments. Through comparison, students will begin to consider how nonliving elements influence living elements in an ecosystem.

### Project WILD suggests:

In *Ecosystem Facelift*, middle school students simulate the restoration of a working ecosystem on the site of an abandoned shopping center or on an island in a river near an urban area.

While researching and then playing an identification game using posters and cards in *Who Fits Here?*, students learn about the characteristic life forms in ecosystems.

In *Move Over Rover*, students play a game in which the object is to identify characteristic animals found in several ecosystems and to match those animals to the environment in which they live.

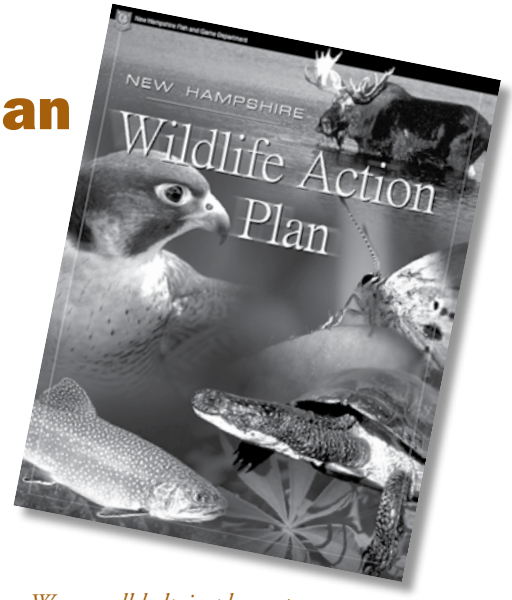
## Spotlight on...

## *Taking Action for Wildlife!*

# New Hampshire Wildlife Action Plan

The New Hampshire Fish and Game Department has worked with partners in the conservation community to create the state's first Wildlife Action Plan (WAP). Mandated and funded by the federal government through the State Wildlife Grants Program, the WAP was completed in 2005. It provides land use planners with conservation tools and strategies to identify significant wildlife habitats and natural resources in every community throughout the state and to maintain species and habitats of concern statewide.

Since the publishing of the plan, Fish and Game has developed many tools to encourage the public to help implement some of the 72 strategies listed. These include "how-to" information for local land use planning to protect habitat, profiles on some of the common and rare species of N.H., maps of wildlife habitat and how well it might support wildlife species and an expansion of the online wildlife sightings database where citizens can report their sightings. These tools, and the full text of the N.H. Wildlife Action Plan, are available on the Fish and Game website at ***www.wildnh.com***. Also listed on the website are a variety of free workshops presented by Fish and Game and UNH Cooperative Extension staffs, which are designed to introduce the WAP and train folks as to how best use it to support wildlife conservation in the state.




*We can all help implement the N.H. Wildlife Action Plan.*

# Where Have all the Fields Gone?

Grasslands are an increasingly rare sight in New Hampshire. For wildlife, that's not good news, as more than seventy different species use the open areas of fields and wildflowers to meet their needs for food, cover or breeding.

The most common grassland habitats in the state are agricultural fields, such a hayfields, pastures and fallow fields. Other grasslands include airports, capped landfills, military installations and wet meadows. Vegetation growing in grasslands may be tall, over four feet, shorter than six inches, or a combination. Vegetation height plays an important role in determining which wildlife species will use the habitat. A common trait of all grassland habitats is that they contain few, if any, trees or shrubs.

Historically, Native Americans and beavers were the primary forces responsible for creating and maintaining grassland habitats in New England. Native Americans created grasslands when they burned the land for agriculture and to improve forage for game species such as white-tailed deer. At the same time, ponds above abandoned beaver dams grew into grassy meadows after the water drained and the nutrient-rich soil was exposed to sunlight.

More recently, fire suppression and limits to where beavers are allowed to build dams has meant that grasslands are restricted to agricultural areas. The peak of agricultural clearing in the state occurred in the mid-1800s. Since then, New England has been losing grassland habitats, which have grown back into forest. With their well-drained soils, treeless fields, and ample road frontage, agricultural lands also offer attractive sites for development. Today, most grasslands in New Hampshire require maintenance, primarily by periodic mowing. If left alone, they grow back to forest through the natural process of succession.

Bird species that depend on grasslands have declined faster than any other group of birds in New England. Most grassland-nesting birds are "area sensitive," which means they won't nest in fields smaller than a certain size. Eastern meadowlarks, for example, require fields larger than fifteen acres, with tall grasses and a mix of wildflowers typical of fields that have gone unmowed for up to five years. Bobolink is the most common grassland-nesting bird found in New Hampshire. Ideal bobolink habitat is a lush hayfield larger than five acres that is mowed once a year in September. Several state-endangered and threatened species that depend on grassland habitats include the Eastern hognose snake, Blanding's turtle, upland sandpiper, northern leopard frog, grasshopper sparrow and Northern harrier.

©NHFG STAFF PHOTO

*Agricultural fields provide critical habitat for wildlife.*

*Excerpted from Grasslands, Habitat Stewardship Series, N.H. Wildlife Action Plan*

# *Who Goes There?*
# A Gilmanton Ecosystem Explored

***By Nicholas Waring, Sierra Juneau, Haleigh Patch and Dylan Tiede***

On September 2 and 3, the seventh grade students at Gilmanton School worked on a project on the Cogswell Mountain Conservation Area (CMCA) trail. The project was called "Who Goes There?" and was a good way to practice becoming field scientists and to explore the ecosystem that exists across the street from the school. There were three groups investigating three different questions that had to do with the CMCA. The investigations included:

- What evidence is there that humans have used this area?
- What evidence is there that animals have used this area?
- What do the trees and the lay of the land tell us about CMCA's past?

Each group had one of these investigations and had to find evidence along either the Beaver Pond Trail (0.3 miles) or trail leading to the summit (1.6 miles) to help answer it. When the group found evidence to support its investigation, one person would use the GPS to mark the spot and provide the longitude and latitude, so that someone else could find the spot again. Another person would take a picture of the clue while someone else sketched it just in case the photo was lost. Another person would then record data on a piece of paper describing the evidence being observed, its physical location, as well as the camera that was used and the number of the picture.

Reporters from each class – Sierra Juneau, Nicholas Waring, Haleigh Patch and Dylan Tiede – asked students from each group about the investigation they were working on. One of the questions students were asked was, "Have you seen anything interesting?" Over the course of time, the three groups discovered some very interesting clues, such as a horse hoofprint; several types of scat, including moose and dog; a beaver lodge; and a clump of fur on a rock. The ground was very dry, and so there were not many animal tracks seen. The "human use" group discovered trees and a rock that had been grazed over by a snowmobile, as well as old rock walls that were once used to keep the cattle in the pasture and mark the land boundaries. Now the rock walls that were used so long ago are surrounded by trees and forest land. That became evidence of the land changing. These are just some of the clues that the groups found along the trails.

PHOTOS BY ERIN HOLLINGSWORTH

*RIGHT: Students work together to mark and document evidence of land change.*
*BELOW: Students enjoy their field study of a conservation property close to the school: (L-R) Corrina Marengo, Drouin Brullotte, Jessica Ladd, Alexis Jakubens and Jordan Drew.*

Some of the evidence collected through this project may be used in the future to teach CMCA visitors about the ecosystem of the CMCA and how humans are a part of that ecosystem, too. The lands that compose the CMCA (about 519 acres) are owned by four different landowners. They are conserved by conservation easements held by the Town of Gilmanton acting through its Conservation Commission, and the Society for the Protection of New Hampshire Forests. The CMCA also has a new kiosk and map at the beginning of the trail where some of these clues may be displayed and changed throughout the year.

Everyone interviewed had been on the trail before, but no one had been this far on the trail. There were not a lot of actual animals seen, but groups did see some red-spotted newts and a couple of eastern chipmunks. One group found several geocaches in many different places along the trail. A fun time was had by every student while working on this project!

*The writers are seventh graders at Gilmanton School.*

## *Fall 2010 WEB Resources*

- *New Hampshire's Living Legacy: The Biodiversity of the Granite State*, N.H. Fish and Game Department, Concord, NH, 1999.
- *New England Wildlife: Habitat, Natural History, and Distribution*. DeGraaf, Richard M., Mariko Yamasaki. Hanover: University Press of New England, 2001.
- *New England Wildlife: Management of Forested Habitats.* DeGraaf, Richard M., Mariko Yamasaki, William B. Leak, John W. Lanier. U.S. Department of Agriculture, General Technical Report NE-144, Northeast Forest Experiment Station, Radnor, PA, 1992.
- N.H. Fish and Game Department **www.wildnh.com/Wildlife/Wildlife.htm**
- UNH Cooperative Extension (wildlife and habitat information) **www.extension.unh.edu/Wildlife/Wildlife.htm**
- N.H. Project Learning Tree (field investigation models) **www.nhplt.org/educators**
- Hubbard Brook Experimental Forest (ecosystem research) **www.hubbardbrook.org**

# Home for Woodcock

***By Nanci and Charlie Mitchell***

PHOTO COURTESY NANCI AND CHARLIE MITCHELL

*New woodcock singing area with three-year-old early successional forest between field and larger trees.*

When we purchased a large tract of land in the Lakes Region in 1996, we were delighted with the birds and critters on our land, but didn't know much about their habitat needs. We were especially happy to hear whippoorwills and began to wonder how to keep them, as well as other species of interest. We attended wildlife courses and programs sponsored by the UNH Cooperative Extension and learned the importance of diverse wildlife habitats, including fields, brushy areas, early successional forests and forests of varying heights. Along the way, we became interested in managing a portion of our land for American woodcock. We learned that woodcocks probe for earthworms in damp areas and need early successional forest habitat for protection from predators. The males also require fields of a quarter acre or more for their "peenting" and dramatic aerial displays during mating season.

PHOTO © RICK Y LAYSON

*Woodcock camouflaged in brushy area.*

Early successional forests (young forests) are particularly important to a number of species and are dwindling in New Hampshire as old fields grow up and land development occurs. We decided to manage about fifteen acres of our land as early successional forest. This involves clear-cutting and then cutting again every ten years or so on a rotating basis to provide trees of varying heights. In addition we de-stumped and seeded about an acre in several locations as singing grounds for woodcocks. We received financial assistance from the US Department of Agriculture Wildlife Habitat Incentive Program (WHIP) and the Wildlife Management Institute.

What have the results been? During woodcock mating season, we now hear several male woodcocks doing their aerial display as we walk by the new fields. We have more whippoorwills than ever and are happy that we often hear 3 to 4 calling from different locations on our property, although we sometimes wish they wouldn't wake us up at daybreak. We've also noticed an increase in a number of species, including deer, moose, turkeys, cedar waxwings, chestnut-sided warblers, indigo buntings and about ten additional bird species.

WEB

*Nanci and Charlie Mitchell are owners of conservation land in Gilmanton*

# New Series of Brochures Identify NH Habitats

Do you recognize important wildlife habitat when you see it? The Habitat Stewardship Series brochures are here to help enhance your knowledge of several of the critical habitat types identified in the N.H. Wildlife Action Plan. The UNH Cooperative Extension Service, with support from N.H. Fish and Game, the Sustainable Forestry Initiative and private contributions, has published the series to help landowners learn about and conserve critical habitat found on their land. The colorful series includes brochures on grasslands, vernal pools, peatlands, floodplain forests and several others. Each brochure includes characteristics of the habitat type, provides information about the wildlife species associated with it and identifies major threats to the habitat.

The brochures can be downloaded from the UNH Cooperative Extension website at: ***www.extension.unh.edu/wildlife/Habitat StewardshipSeries.htm***

# An Educator Explores Ecological Research in NH

***By Lisa Lavalley, M.Ed***

Long Term Ecological Research, or LTER as it is known in certain circles, has been taking place at Hubbard Brook Experimental Forest since the 1950s, but did you know that long-term research is also being done at two other sites in New Hampshire? Jeffers Brook and Bartlett Experimental Forest are two other sites actively involved in ecological research. I was involved in research at all three sites this past summer when I participated in a Research Experience for Teachers program (RET), inspired by the active Research Experience for Undergrads (REU) program hosted by the Hubbard Brook Research Foundation.

My headquarters, and where I spent the majority of time working, was at Bartlett Experimental Forest. The original goal was for me to do a research project studying the presence of isopods in young, mid-age, and old forest stands at Bartlett. Because they are environmentally sensitive, requiring calcium as well as nitrogen for survival, they work well as indicator species and fit in well with the current research being done on the cycling of nutrients in the ecosystem. Nitrogen, phosphorus and a mixture of both nutrients are to be added to certain plots at Bartlett next spring. This summer, researchers collected as much data as they could in regard to the allocation and resorption of these nutrients in leaf litter, roots, soil, live leaves – and, we thought, isopods.

Special baskets were made to keep other animals away from the isopods. We placed potatoes (a favorite food of isopods) inside the baskets, then placed 30 baskets in several different plots ranging in stand age (old, mid-age, young). Not one isopod was found. The Principle Investigators decided to nix the research strictly based on time – they didn't want to spend more time on this project with so much other work to be done. So the question remains, why weren't there any isopods? A couple of thoughts come to mind. Perhaps the forest is simply too nutrient poor to sustain isopods. Of the three research forests in the state, Bartlett Experimental Forest is the most nutrient poor. Perhaps the climate is not suitable to isopods (although we found them in the garden at the headquarters), or perhaps it is the altitude. It will be interesting to return in a few years and see if the addition of nutrients will have provided a suitable habitat for the isopods!

*Lisa Lavalley searches for environmentally sensitive isopods in a study plot in Bartlett Experimental Forest.*

*Lisa Lavalley, M.Ed, is a science teacher Pinkerton Academy.*

## ANNOUNCEMENTS

### 2011 Is International Year of Forests

The United Nations General Assembly has designated 2011 as the International Year of Forests. UN observances are used to promote awareness of and action for important political, social, cultural or human rights issues. 2011's "Year of Forests" is intended to promote broader understanding of the importance of forests and bolster global efforts to promote sustainable forest management and conservation, for the benefit of current and future generations. Find more information at ***www.un.org/esa/forests/2011/2011.html***

### Project Learning Tree Materials Win Teachers' Choice℠ Award

For 17 years, the Learning® magazine Teachers' Choice Awards have heralded the very best in classroom-tested, teacher-recommended products. Each year a nationwide panel of teacher-judges names the standouts in books, classroom supplies, educational games, software, websites, and supplemental materials that teachers need for their classroom. After receiving top ratings in rounds of rigorous judging, PLT's Early Childhood Guide and CD won a 17th annual Teachers' Choice Award for supplemental materials.

### NH Environmental Educators Annual Meeting and Workshop

Save the date for the NH Environmental Educators (NHEE) annual meeting and workshop! NHEE will meet on Wednesday, March 9, 2011, at the Harris Center for Conservation Education in Hancock. Visit ***www.nhee.org*** for more information.

### Project WET Materials Update

The Project WET Curriculum and Activity Guide is being updated! New guides are expected to be available by mid-2011. Details will be announced in a few months, so stay tuned.

### Wonders of Wildlife Programs

The deadline to request a free interactive program for your class (grades 3-6) in the spring focusing on wildlife and the environment is February 27. Visit ***www.wildnh.com/Education/for_teachers.htm*** for more info and a program request form.

# ON THE H.O.M.E. FRONT

## Taking an Ecosystems Approach to Schoolyard Landscaping

**by Marilyn Wyzga**

*Choose plants that suit your site's soils, sun, and rainfall and feed the local wildlife. Investigate your schoolyard to find the biotic (living) organisms – like this monarch butterfly – and what they need to thrive.*

Our next round of Homes for Wildlife Action Grants is open, with proposals due by February 1, 2011. One key question asks applicants to explain how their project is suited to the site, specifically: "What evidence have you gathered to demonstrate its value and appropriateness, such as map and inventory of existing vegetation, wildlife, or traffic patterns? How do you know this project suits the type of site and needs of local wildlife?"

In this issue of Project WEB, you've gained valuable information to apply to a schoolyard habitat project. You've read about ecosystems – what they are and how they function – and about the useful tools in the *N.H. Wildlife Action Plan*. Taking an ecosystem approach – using natural ecosystems as a model for creating the managed ecosystem in your schoolyard – will focus and ground your schoolyard project, increasing the potential for success as you enhance the site for wildlife and learning.

### A Matter of Scale

You'll recall that an ecosystem is a group of biotic (living) organisms – mostly plants and animals – functioning and interacting with each other and with the abiotic (non-living) parts of the environment – such as sunlight, water, soil, landforms, temperature, and wind. Your schoolyard is a small ecosystem. At the base is the bedrock, which gives rise to the soil. The soils, in turn, along with temperature, precipitation, contour or slope, and available light, determine the plant communities growing on your site.

All components of ecosystems affect each other and are in a constant state of change. Think of the abiotic parts as the site characteristics and conditions. These influence the plants and animals that live there. In turn, the plants and animals affect site conditions such as soil chemistry, water quality, and even temperature.

### Investigations in the Field

A wildlife landscaping book may recommend winterberry holly or red osier dogwood as a choice plant for bird food, or hemlock as excellent winter cover, but your site may not have the particular conditions to allow those plants to thrive. What you want are plants suited to the local ecosystem. (To learn about local plant communities, see *Natural Communities of New Hampshire* by Daniel Sperduto and William Nichols ***www.nhdfl.org/library/pdf/Natural_Communities2ndweb.pdf***).

Before you and your students make plans to alter your site for wildlife habitat, an outdoor classroom or a natural playground, it's best to know what's already out there. Field investigations and scientific inquiry engage your students with the schoolyard ecosystem through the curriculum. Use mapping and inventory to determine and document the existing components of the ecosystem, their types and abundance. Is your soil sandy or silty? Acidic or neutral? What are the dominant plants in your neighborhood woodland? Is your school located in a zone 4 or 5? Do low-lying areas collect water? Two resources to assist you in the inventory process are *Homes for Wildlife: A Planning Guide for Habitat Enhancement on School Grounds* and *Integrated Landscaping: Following Nature's Lead* (both available from ***www.wildnh.com***).

In your field investigations, you may discover thriving ecosystems – from larger parcels left undisturbed for a few generations, to smaller, recently disturbed fragments along roadsides and unattended woodland borders, in ditch lines, and between your schoolyard and neighboring developed tracts of land – where diversity flourishes and plant communities have built over time. Retain these and use them to inform the design of your managed habitat area.

### Mimic Nature to Make Change

Once you've established what kind of bedrock, soil, plant communities, light, temperature, and slope comprise your school grounds, you can "follow nature's lead" to create and enhance a site that supports a variety of plants and animals. Strive to imitate your area's natural ecosystems, and treat each planted area as a system of plant and animal communities, considering their interrelationships with each other and

*HOME continued on page 8*

*HOME continued from page 7*

their surroundings. For instance, you might simulate a forest by retaining plant litter on the ground, which holds moisture for the trees, promotes healthy soil, and feeds decomposers.

Within a natural plant community – whether field, forest, or transition – you'll usually find plants of various ages and sizes growing in both vertical and horizontal layers, incorporating some combination of trees, shrubs, an herbaceous layer (wildflowers, ferns, grasses and mosses), and a groundcover layer. Over time, these plant communities help establish soil layers. Using this model – layering plants with a variety of forms and habits, ages and sizes – promotes biodiversity. Bring in the nonliving components of the environment – by adding water, rocks and slope as needed – to create conditions in your managed ecosystem that will support a wider array of plants. More diverse plant life supports a more varied array of wildlife, from the billions of microscopic organisms that live in the soil, to a multitude of insects, birds, amphibians, reptiles, and mammals, interacting with each other. (For more about how plant diversity influences wildlife diversity, read Eric Grissell's *Insects and Gardens: In Pursuit of a Garden Ecology*.)

As you work in tandem with nature, mimicking the inherent structure and function of natural ecosystems and combinations found in your managed landscape, you offer year-round habitat and food for wildlife; enhance local ecosystems; create a landscape that resists pollution, pests and drought; and minimize maintenance.

All living things function together in a complex system of food webs and energy cycles. The greater the diversity within these systems, the greater the stability of the whole system. Therefore, it is advantageous to promote the greatest possible diversity of plants and animals appropriate to your site's soils, moisture levels, available sun, and slope. In addition to providing stability and maximizing ecosystem functions, such diversity will enhance your site's aesthetics and foster a wide variety of human experiences within that environment – good for wildlife and for learning.

*Mimic nature by planting in layers – including groundcovers – and leave plant litter in place to promote healthy soils.*

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