

A Working Forest - A Dynamic Landscape

The Forest Discovery Trail

A Curriculum for Grades K through 4

Including correlations with state standards for NH and ME, lesson plans, and worksheets

Welcome to the Forest Discovery Trail



A working forest in miniature

This 1.5-mile trail will open your eyes to the inner workings of a managed forest. When you reach the end, you will have a better understanding of how all the parts of this ecosystem are interdependent.

Managing the Forest

Resource managers must meet people's needs for wood, water, wildlife, clean air, and recreation while maintaining a healthy, changing, and productive forest ecosystem. We call this a working forest.



Many examples of how the White Mountain National Forest is managed as part of an ever-changing landscape – including tree harvesting – can be seen here.

Self-guided tour

1 The web of life: forest ecosystems
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3 One, two, tree by tree
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6 Patches of sunlight spark new growth
7 A fresh start
8 Streambanks and salamanders: the riparian zone
9 Openings in the forest
10 Forest roads: where do they lead
11 Old-growth mature hardwood forests

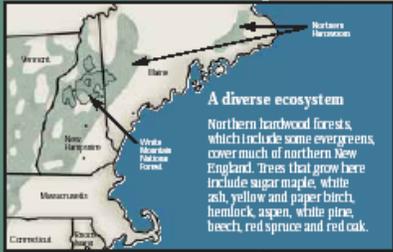
Glacial erratic
Kancamagus Scenic Byway
Levinson
Cannery

A Working Partnership

The construction of the Forest Discovery Trail was made possible by an innovative partnership among the U.S. Department of Agriculture Forest Service, the National Forest Foundation, and other generous sponsors.

This ongoing educational program is made possible through the support of the Society of American Foresters, the North Country Resource Conservation and Development District, and the USDA Forest Service.

Where is the Northern Hardwood Ecosystem?



A diverse ecosystem

Northern hardwood forests, which include some evergreens, cover much of northern New England. Trees that grow here include sugar maple, white ash, yellow and paper birch, hemlock, aspen, white pine, beech, red spruce and red oak.

Map Legend

- Forest Discovery Trail
- Interpretive point

100 50 0 50 100 feet

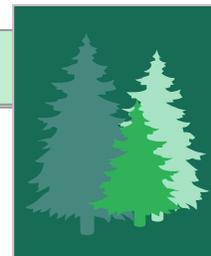


White Mountain National Forest

Developed and produced in cooperation with
North Country Resource Conservation & Development



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Acknowledgements

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Partners

National Forest Foundation
North Country Resource Development & Conservation Area Council
North Star Photography

Local Stewardship Team

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Curriculum Development

Project Leader: Susan Mathison, USDA Forest Service, White Mountain National Forest
Project Partners: North Country Resource Conservation & Development Area Council
Sponsors: US Forest Service, Granite State Chapter, Society of American Foresters, National Forest Foundation
Curriculum Development: Alexandra Murphy

**United States Department of Agriculture
Forest Service**



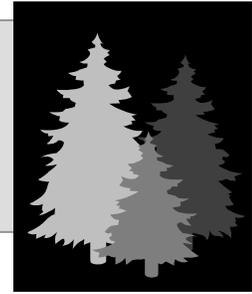
Motto: *Caring for the Land and Serving People*

Mission: to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

The Forest Service's mission includes:

- Promoting the health, productivity, diversity, and beauty of forests.
- Listening to people and responding to their diverse needs in making decisions.
- Protecting and managing the National Forests for sustainability and multiple-use. .
- Helping states and communities to wisely use the forests to promote rural economic development and a quality rural environment.
- Developing and providing scientific and technical knowledge aimed at improving our capability to protect, manage, and use forests and rangelands.

Forest Discovery Trail Curriculum for Grades K-4



INTRODUCTION

To many residents of New Hampshire and Maine, working forests are sources of jobs and forest products, and serve as an anchor for the region’s culture and heritage. To others, the forest provides cherished opportunities for recreation, including camping, snow sports, fishing, and hiking. To some people, the sights and sounds of logging operations are contrary to their idea of the “northern forest.” The Forest Service, working with dedicated partners, created the Forest Discovery Trail to help close this gap of perception and to build understanding for the intricacies of managing a working forest – a forest that provides jobs and forest products as well as recreation opportunities, clean water, air and healthy habitats for fish and wildlife.

Although students depend on forest products in every facet of their lives, few understand the journey from forest community to storefront, and the myriad management decisions required to facilitate that journey. The Forest Discovery Trail—a 1.5 mile trail punctuated with interpretive panels—teaches them about the complexity of managing a forest well and maintaining its health while extracting materials for our own use.

Purpose of the Forest Discovery Trail

- To describe the northern forest ecosystem, including scientific, economic, and social components.
- To develop understanding of the multiple use mission of the White Mountain National Forest in local, regional, and national contexts.
- To display a microcosm of a “working forest” and a sample of the strategies utilized by resource managers to meet a wide array of often-competing objectives.

Purpose of the *Forest Discovery Trail Curriculum*

- To increase students’ understanding of forest ecology and management.
- To increase students’ understanding of the surrounding National Forests, and of the management objectives and practices affecting them.
- To increase students’ understanding of the methods resource managers use to manage a forest.
- To provide pre-visit, on-site, and follow-up activities and resources for exploring the Forest Discovery Trail and the standards and frameworks it addresses within your classroom curriculum.

How to Make the Most of the Forest Discovery Trail

- Contact the White Mountain National Forest, Conservation Education Program Leader at (603) 528-8707 or cclong@fs.fed.us. Resource managers may be able to help you with your planning, visit your classroom, and/or accompany you on your trip to the Discovery Trail
- Review the curriculum, its exercises, and standards correlations.
- Take this curriculum with you to the trail. Enjoy!

Introduction to the Curriculum

The *Forest Discovery Trail Curriculum* will help you guide students through these three forest management steps, offering pre-visit, on-site, and follow-up activities and related teaching resources. The curriculum also provides supplementary teacher's materials and student worksheets, and offers learning standards correlations for all activities.

The Forest Discovery Trail introduces three key steps in forest management.

1. *Researching forest ecology*

Before creating a management plan and carrying out forest management, resource managers must first know what they are managing. Managers study the forest to understand the natural processes at work on the land, in the air and water, assess the area's biodiversity, and map natural communities, cover types, and natural features.

2. *Establishing management objectives*

Once resource managers have mapped and inventoried the forest lands they manage, they then begin the task of setting management priorities for those lands. The National Forest follows a multiple-use mandate that stipulates that they manage for a wide range of objectives, including conservation of forest health, habitat improvement and protection, timber harvest and productivity, a variety of recreation opportunities, aesthetics, and harvest of non-timber forest products.



3. *Determining management strategies*

Once resource managers determine the management objectives for a given forest, they then choose the management strategies that will help them reach those objectives. It is very important for students to realize that forestry is an art as well as a science. Forests are managed for a variety of objectives; sometimes these objectives can be achieved simultaneously and sometimes objectives are mutually exclusive. There are innumerable management options that will achieve a desired objective—the forester will balance all of these to determine the most appropriate course of management.

A Note about Grade Levels

This curriculum packet is designed for students in grades K-4. In most cases, activities are geared toward students in grades 2-4, but can be simplified quite easily to suit Kindergarten and first-grade students. When appropriate, the curriculum offers variations to suit younger students.

Learning Standards

The *Forest Discovery Trail Curriculum* is aligned with state learning standards for New Hampshire and Maine. On the following page, you will find a chart correlating curriculum activities with state learning standards.

Correlations to New Hampshire and Maine Learning Standards, Forest Discovery Trail Curriculum, Grades K-4

Activity		New Hampshire				Maine					
		Language Arts	Social Studies	Science	Mathematics	Language Arts	Science	Economics	Geography	Visual & Performing Arts	Mathematics
Pre-visit											
	Nature Journaling	2		1a, 3a		E	B			A	
	Survey Your School Grounds			1a, 2a, 3a			B, J				
	From the Forest to You		5, 9	4c				A			
	Create your own School Grounds management plan	2, 6	9, 10, 15	1a, 2a, 4c		E, H	B, J, L		A		
On-Site						Physical Education A					
	Panel 2: Forest Change role play			3a			B			A	
	Panel 3: Which Floor?			1a, 3a			B				
	Field Journaling	2		1a,3a		E	B			A	
	Panel 4: Single tree selection role play			3a			B			A	
	Panel 5: <i>What's My Habitat?</i> survey	2		1a, 3a, 3b, 4c		E	B, J				
	Panel 6: Tree ring survey			1a, 3a	4c		B, J				F
	Panel 7: <i>What's My Habitat?</i> survey	2		1a, 3a, 3b, 4c		E	B, J				
	Panel 8: Clearcut ecology	2		1a, 3a			B, J				
	Panel 9: Riparian exploration			1a			B, J				
	Panel 10: <i>Trees of Many Sizes</i> survey			1a, 2a, 2b, 6d	4a, 4c	E	J				E, F
	Panel 12: <i>What's my Habitat?</i> survey	2		1a, 3a, 4c		E	B, J				
Follow-up						E, H					
	Forest Discoveries mural	2, 6		3a, 4c			B, L			A	
	Apple as Earth activity		10,12, 15	3a			B		A		

Recommended Supplemental Resources

There is a wealth of excellent teaching material related to (or adaptable to) the Northern Forest. Below, you'll find our recommendations of appropriate resources that will help you and your students deepen your study of forestry concepts.

Forestry-Related Curricula

- **Project Learning Tree.** Project Learning Tree (PLT) is a nationwide program of the American Forest Foundation and the Council for Environmental Education. PLT provides both elementary and secondary curriculum materials focused on forests and forest issues. These materials are free of charge to teachers who take a low-cost, one-day training course. *We highly recommend taking part in this training program to access the excellent materials PLT provides.* Contact your state's PLT coordinator to find out about up-coming workshops.

New Hampshire PLT: 603-226-0160, info@nhplt.org.

Maine PLT: 207-626-7990, meplt@zwi.net.

PLT coordinators in New Hampshire and Maine have created supplemental materials that provide forest information specific to those states. *The Educator's Guide to New Hampshire Forests* is a series of fact sheets designed to help educators teach about New Hampshire's forests.

We have enclosed *The Educator's Guide to New Hampshire Forests* in this curriculum packet. These materials are also available on-line at <http://www.nhplt.org/guide.html>.

You can also download the supplementary PLT materials for Maine forests, *Maine Forest Facts*, at www.maintreefoundation.org/programs/plt.html.

- **Great Northern Forest: From Science to Stewardship.** Created by the Fairbanks Museum and Planetarium in St. Johnsbury, Vermont, this excellent resource is designed for middle school students, but gives detailed background information on Northern Forest issues and ecology and ideas for classroom instruction for younger students. Available on-line at www.fairbanksmuseum.org/education_teachers.cfm.
- **Audubon Adventures** curriculum. *Biodiversity, Classification, and Conservation* offers good activities for 3-6 graders in basic ecological concepts. Order by calling 800-813-5037, or order on-line at www.audubon.org.

Books

- *Exploring Forest Habitats*, by Patti Siefert. Mondo Pub., 1995.
- *The Field Guide to the Wildlife Habitats of the Eastern United States*, by Janine Benyus
- *Forestry*, by Ann Love, and Jane Drake. An introduction to the people, tools, and practices of forestry.

- *Hands-on Nature: Information and activities for exploring the environment with children*, by Jenepher Lingelbach, (Vermont Institute of Natural Science. www.vinsweb.org).
- *In the Forest*, by Pierre de Hugo. A wonderful introduction to natural science—with foldout pages to “look-and-learn” about trees, birds, insects, snakes, bears, and more wildlife of the forest.
- *The Life of the Forest*, by Jack McCormick.
- *Peterson’s First Guides: Forests*, by John Kricher. Houghton Mifflin, 1999.
- *What is a Forest?* by Bobbie Kalman, and Kathryn Smithyman. Introduces students to types of forests, the elements of a forest ecosystem, the range of plants and animals that live there, and the importance of forests to the rest of the earth.
- *WoodsWalk*, by Henry Art and Michael Robbins. Helps students learn how to “read” the woods for signs of the presence of animals, interpret sounds, and identify odors.

Organizations

- **The American Forest and Paper Association.** Information about recycling and sustainable forestry, www.afandpa.org
- **Environmental Protection Agency.** <http://www.epa.gov/owow/monitoring/vol.html>. The EPA hosts webpages on volunteer water-quality monitoring, including how-to manuals and a national directory of environmental monitoring programs, listed by state.
- **New Hampshire Timberland Owners Association.** Nonprofit organization of forest owners and users working together to promote better resource management and a healthy wood products industry. (603) 224-9699, www.nhtoa.org.
- **NH Division of Forest and Lands.** Information about resource management. 603-271-2214, www.nhdfl.org.
- **NH Fish and Game.** 603-271-3122, www.wildlife.state.nh.us.
- **Society for the Protection of NH Forests.** Statewide forest conservation group. 603/224-9945, www.spnhf.org.
- **UNH Cooperative Extension Service.** Visit their website, www.ceinfo.unh.edu, for a listing of the extension office in your area.

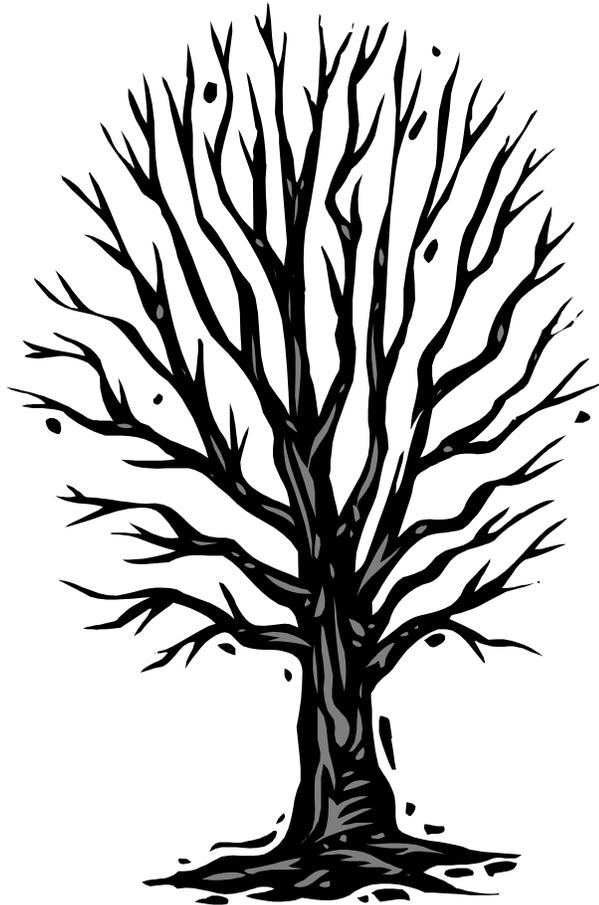
Audio-Visual Resources

- *New Hampshire Forests Forever CD-ROM* is a free, interactive CD designed to teach middle school students about use and management of the forests in our state. By using the CD, students will deepen their understanding of animals that live in the forest, ecological benefits provided by the forest, products derived from trees, recreational uses of the forests, and the balance management objectives for continued forest health. Teacher’s guide available. CDs are available through both New Hampshire Project Learning Tree and New Hampshire Fish and Game Department.

New Hampshire Fish and Game: 603-271-3122, info@wildlife.state.nh.us.

New Hampshire Project Learning Tree: 603-226-0160, info@nhplt.org.

- *Maine Forests Forever*. Available free of charge through Maine Project Learning Tree Coordinator Pat Maloney, P.O. Box 344, Augusta, ME 04332. 207-626-7990, meplt@zwi.net.
- The New Hampshire Department of Fish and Wildlife offers an extensive audio-visual lending library, including such videos as *Biodiversity of New Hampshire*, which gives an overview of New Hampshire's diverse natural resources, and reasons why we should maintain habitat diversity. Visit their website, http://www.wildlife.state.nh.us/Education/ed_audio_visual.htm, for a full listing.



Before you visit the Forest Discovery Trail:

PRE-VISIT INFORMATION AND ACTIVITIES



For additional assistance in planning your trip to the Forest Discovery Trail, please contact the Conservation Education Program Leader, White Mountain National Forest, at (603) 528-8707 or at cclong@fs.fed.us. Resource specialists or forest interpreters may be available to accompany your group.

Students will learn most from the Forest Discovery Trail if they become familiar with some basic forestry concepts before visiting the trail.

Key concepts to introduce

- Many different plants and animals make up a forest community.
- We use and depend on forest products every day.
- By studying a forest community and planning carefully, a forest manager can keep the forest community healthy *and* harvest trees for people to use.

Introductory ideas for students

To care for something well, you have to learn a lot about it. For example, when taking care of a new pet or farm animal, you learn what it eats and how much, where it likes to sleep, what illnesses it sometimes gets and how to avoid and treat them, and so on.

Taking care of a forest is similar, though much more complex, since hundreds of species of plants and animals live there, each with different needs. A forest is a community, much like your own community, in which different people have different roles that help them meet their basic needs (food, clothing, water, and shelter). A community of people is made up of doctors, farmers, carpenters, resource managers, bakers, loggers, engineers, artists, teachers, firemen, and so on. What would happen if there were no more farmers? Every job is important and contributes to the balance of the community.

In a forest community, each plant and animal likewise has its own role, or **niche**. A healthy forest is very good at taking care of itself. When resource managers study the forest community carefully, they can learn what lives there, what forest community members need to survive, and how different members interact and balance one another. Based on this careful study, resource managers do their best to ensure that, when they make changes to the forest, they keep all the parts of the community intact so the forest remains healthy.

Why might resource managers need to make changes to the forest? One big reason is that people depend on a variety of forest resources and amenities from forests, including trees and their wood byproducts. Every day, all day long, we use products made from trees, and these trees came from our forest communities. When resource managers manage a forest well, they harvest trees carefully, in a way that provides wood for people to use, creates jobs, and maintains the forest's health. New trees replace cut ones, and the forest community continues on.

The following activities will help prepare your students for the concepts they will encounter during their visit to the Forest Discovery Trail:

Forest Biodiversity and Ecology

1. Have students create **nature journals** and make regular (daily or every-other-day) entries in them to help them begin noticing details and differences in nature. (see [My Nature Journal](#) worksheet for an idea of how to structure the entries).

Resource: *Nature Journaling: Learning to Observe and Connect with the World Around You*, by Clare Walker Leslie and Charles Edmund Roth. Storey Books, 1998.

2. **Survey your school grounds**, looking at different kinds of habitats (field, forest, edge, riparian) and the kinds of plants and animals found there. Project Learning Tree offers several excellent habitat activities, listed below.

PLT *Picture This!*
Habitat Pen Pals
The Forest of S.T. Shrew
Planet of Plenty
School Yard Safari

Managing Forests

- a. **From the Forest to You.** Have students brainstorm a list of all the things that forests provide for people. (wood, clean water, paper, maple syrup, Christmas trees, clothing, furniture, fish and wildlife habitat, places to recreate, solitude, skiing, snowmobiling, cross-country skiing, hiking, camping, beauty, shade, and so on.). Cut out pictures of these forest products from magazines and create a “*Once Upon a Forest*” collage.
- b. **Create your own school grounds management plan**
 1. **Map the school grounds.** Have students work together in small groups to develop a map of your school grounds. (If time is limited, you can provide a base map to each group.) Have them color the map, using different colors to indicate different habitats—mowed lawn, open meadow, shrubs, wetlands, stream or river corridors, forest.
 2. **Determine management priorities.** Each group should decide what their priorities are for the school grounds. Some examples include recreation (playing fields, walking trails) animal

habitat, clean water, beauty, wood for a school building project, and so on). They can then brainstorm ways to manage the grounds to meet these goals.

Discuss as a group how these priorities can conflict with one another. For example, creating larger playing fields may require cutting down trees at the edge of their woodland, decreasing forest animal habitat. Increasing meadow habitat might require allowing portions of mowed lawn to grow up, decreasing playing field size. Building a new classroom addition or library to accommodate more students will take up outdoor playing field space. Resource managers try to find the optimal balance that best satisfies management goals.

3. **Carry out management.** Have students choose an objective that they might be able to carry out. Perhaps they want to create animal habitat—they might plant native, fruit-bearing plants, or designate a corner of a field to be unmowed, creating meadow habitat. Perhaps they'd like to be able to produce maple syrup from the school's sugar maples. Have them write up a management plan for implementing their idea to present to school officials.

Variation for younger students: Provide students with the school grounds map to color (You can either draw this yourself, or get a copy from school records). Then, rather than having students determine management priorities (step 2), ask them to think of the benefits of each habitat area on their map and to think of something they might do to make enhance those benefits (plant trees or shrubs, trim branches along a walking trail). Then, with school permission, carry out the action they determine.

Related Curriculum Resources

PLT *Tree Treasures*
We All Need Trees

A Few of My Favorite Things
Pass The Plants, Please

At the Forest Discovery Trail:

ORIENTATION INFORMATION



Before beginning your exploration of the Forest Discovery Trail, please share with your students the following trail rules:

Please~

Go lightly and leave no trace of your passing.

Stay with your group.

Respect the plants and animals that call this trail home.

Walk on the trail.

Respect the needs of other forest visitors.

Take home only memories—leave plants, rocks, and other natural objects here for others to enjoy.

Be sure to “Pack it Out!” – there are no trash receptacles along the trail. Please take your trash with you and dispose of it properly.

Remember that the only bathrooms are at the trailhead, near the parking lot.

The trail is gently graded along its 1.5-mile length. While the trail meets standards for wheelchair accessibility, because of environmental conditions (freezing and thawing, sun and shade, leaf litter, ice and snow), the surface material, and the length of the trail, we highly recommend that all wheelchair visitors have capable assistance throughout the duration of their visits.

Materials and Tools to Bring

1. ***What’s My Habitat* worksheets:** Along the trail, we recommend completing the *What’s My Habitat* worksheet at three different locations. Bring enough copies of the worksheet for students working in groups of two or three to complete at these three sites. (For younger students, you may wish to bring just one copy to discuss questions and answers aloud as a group.)
2. ***Field Study* worksheets for Insects, Leaves, and Birds.**
3. **Trees of Many Sizes worksheets.** Bring enough copies for students to work in groups of two or three.
4. Clipboards or other writing surfaces (enough for each work group to have one)
5. Pencils (enough for each work group to have one)
6. Measuring tape (more than one, if you have them) or 6-foot lengths of string marked in 6” increments

Key Concepts

- Disturbance, in a variety of scales and from a variety of sources, is part of the forest ecosystem.
- Forestry is an art, as well as a biological, economic, and social science, so there is no single “right” way to manage a forest.
- We use forest products every day, and these products come from forests like this one.

Welcome to the Forest Discovery Trail



A working forest in miniature

This 1.5-mile trail will open your eyes to the inner workings of a managed forest. When you reach the end, you will have a better understanding of how all the parts of this ecosystem are interdependent.

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Many examples of how the White Mountain National Forest is managed as part of an ever-changing landscape – including tree harvesting – can be seen here.



Where is the Northern Hardwood Ecosystem?



A diverse ecosystem
Northern hardwood forests, which include some evergreens, cover much of northern New England. Trees that grow here include sugar maple, white ash, yellow and paper birch, hemlock, aspen, white pine, beech, red spruce and red oak.

Self-guided tour



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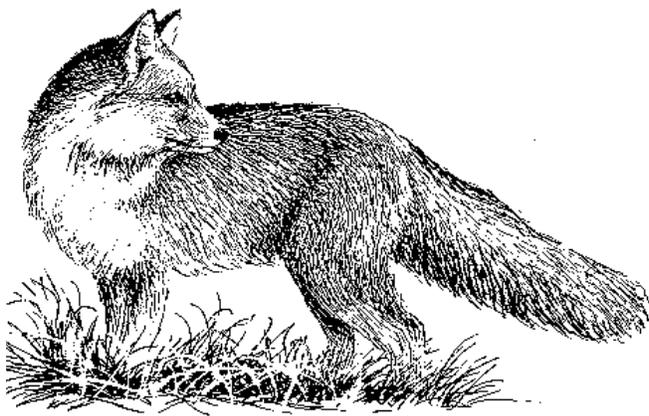
Panel 1: Welcome to The Forest Discovery Trail

This introductory interpretive panel, which includes a detailed site map, will orient you to the trail. You'll also find a map of the trail in the rear pocket of this curriculum packet.

The trail is gently graded along its 1.5-mile length. While the trail meets standards for wheelchair accessibility, because of environmental conditions (freezing and thawing, sun and shade, leaf litter, ice and snow), the surface material, and the length of the trail, we highly recommend that all wheelchair visitors have capable assistance throughout the duration of their visits.

Before you start out, remind students that, on this trail, they'll be looking at the forest from a forester's perspective, noticing things that are important to resource managers, looking at some of the techniques resource managers have used to manage this forest. Resource managers use these same techniques on publicly-owned and privately-owned forests throughout New England and the rest of the United States.

We encourage your students to carefully explore the forest away from the trail. Please remind them that, while doing so, they should respect the plants and animals that make this forest their home.

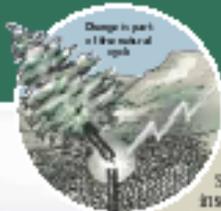
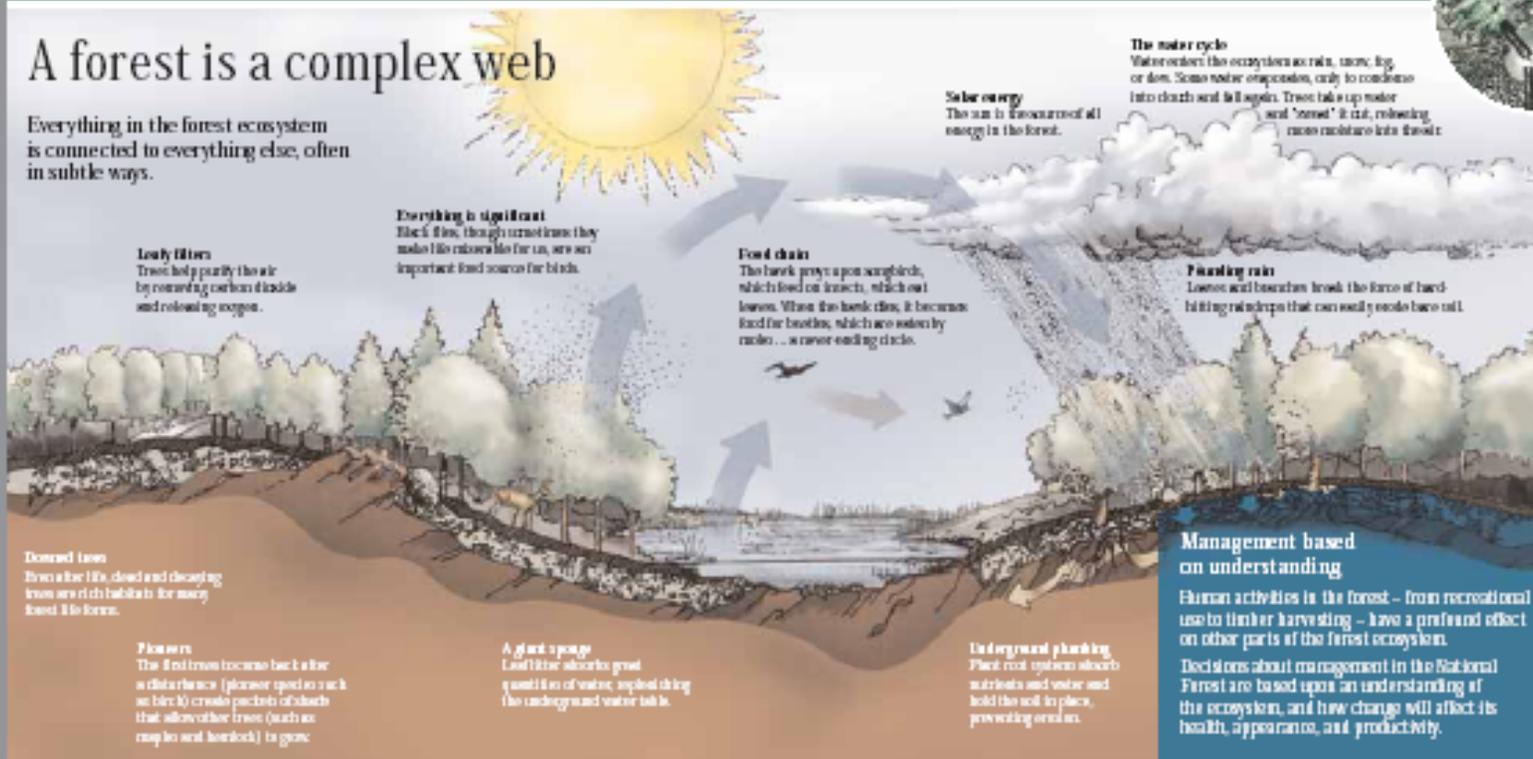


The web of life: forest ecosystems



A forest is a complex web

Everything in the forest ecosystem is connected to everything else, often in subtle ways.



Panel 2: The Web of Life: Forest Ecosystems

Change is a natural part of forest communities. The following role-playing activity can help students integrate this idea.

Activity: *Forest Change Role Play*

1. Have students pretend they are forest trees, arms outstretched overhead, like branches.
2. Introduce a disturbance (windstorm, fire, beaver activity, insect infestation). Depending on the disturbance, a number of “trees” die and eventually decay into soil (have those students squat down, transformed into fallen logs).
3. In the openings created when those trees died, new shrubs and saplings grow (have squatting students slowly grow from crouching to standing.)



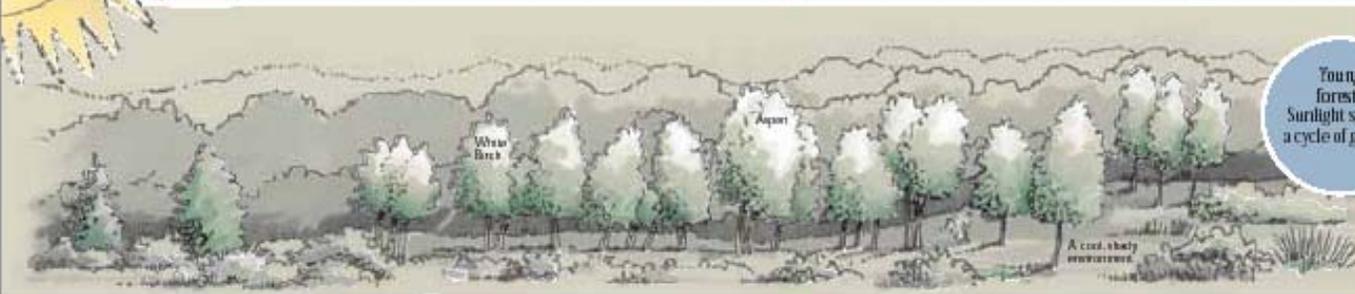
Have students repeat the role-play, this time introducing a different disturbance. Does the change created by this new disturbance look the same or different from the first role-play?



This panel introduces students to the role forests play in providing clean air. Air pollution threatens the health of humans and other animals and plants. A variety of human activities, including driving our cars and heating our homes, contribute to this global concern. Students can use the word search found in the front pocket of this curriculum packet to encourage their awareness of this important concept. The following website provides a comprehensive air pollution curriculum for elementary grades:

http://www.tnrcc.state.tx.us/exec/sbea/education/terrell/EnvAwareCurriculumTerrell_ISD.html

The forest: where change is the only constant



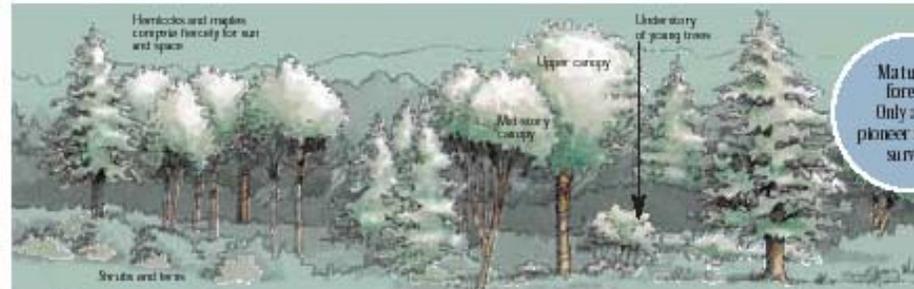
Young forests
Sunlight sparks
a cycle of growth

The first to move back in

After a major disturbance, the first trees to gain a foothold are the quick growing pioneer species – such as aspen, pin cherry, and white birch. This initial flush of growth provides a cool, shady environment favored by the next generation.

Forest Architecture

As you walk through the Forest Discovery Trail, note the various layers and niches: shrubs and ferns under foot, the understory of young trees, the mid-story canopy overhead, and the upper canopy that reaches the sky. Each of these places is home to different plant and animal species.



Maturing forests
Only a few
pioneer species
survive

Strong competitors up top

As the forest matures, the shorter-lived pioneers, such as aspen and white birch, will die out. Hardwood species like maples and beech begin an intense competition for sunlight and space. Trees seem to have their own "law of the jungle": shade or be shaded out and die.



Older forests
Less light reaches
the forest floor

The cycle continues

As the forest continues to mature, less and less light reaches the forest floor. Eventually, the older, dominant trees start to die, creating openings in the canopy. Shafts of sunlight touch the earth, renewing the cycle of growth.

Panel 3: The Forest: Where change is the only constant

For many students, the idea that forests are many-layered and constantly evolving is very new—isn't a forest just a collection of big trees? New openings continually appear in the forest, and in those openings, seeds of herbaceous plants, shrubs, and trees sprout (exactly which species reproduce depends on such factors as amount of available light, soil moisture, and availability of seeds). Some of these saplings grow into young trees, and on to maturity, until they, too, fall and create an opening. Thus, the forest is filled with plants of many ages, sizes, and species. The following activity helps students notice the many layers of the forest community.

Activity: Which Floor?

1. Suggest to students that a forest is like an apartment building—it has many “floors,” or layers, and different plants and animals find food, water, and shelter in these layers. Using the list below to guide you, have students point out the forest’s various “floors” in the vicinity of this panel site.
2. Then ask them to name plants and animals that live in this forest. **On which “floor” does each live?**

It's important for students to understand that most plants and animals live on different levels at different times in their lives. A maple seed, for example, starts out on the first floor and, as it grows, moves up through the floors until it reaches the sixth floor. White pines may poke out onto the seventh floor.

A bear lives much of its life on the first floor, where it roots for grubs, tubers, and insects, but eats grass and herbaceous plants from the second floor, forages for berries on the third floor, and climbs to the fifth and sixth floors to eat beech nuts, black cherries, mountain ash berries, and acorns. It depends for its winter hibernation on hollows created by upturned root balls and downed logs of fallen trees. This information is critical for resource managers, who are trying to maintain the forest community's health. To maintain or improve bear habitat, for example, resource managers need to consider the health of several forest layers.

*Floor one: **the forest floor, with its absorbent, nutrient-filled humus.** Note that, just like in an apartment building, this “ground floor” is the foundation from which all the other floors grow, which is why it's so important to take good care of forest soils.*

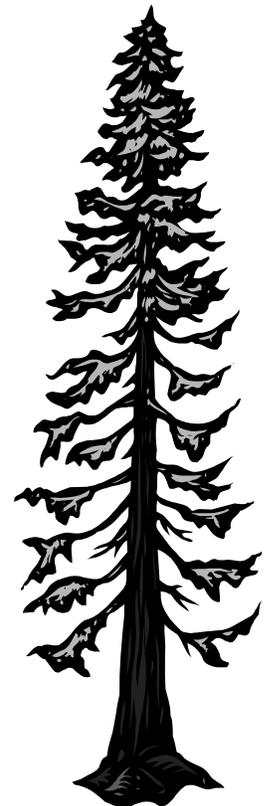
*Floor two: **ferns, flowers, grasses***

*Floor three: **shrubs***

*Floor four: **understory***

*Floor five: **mid-story***

*Floor six: **canopy***



Students may select several forest specimens to document on the Field Journal sheets (for leaves, insects and birds) included in the front pocket of this curriculum packet. The Field Journal allows students who are tactile learners to manipulate and draw different specimens. Students can then share their Field Journal entries to observe similarities and differences between species and specimen. This is an good introduction to biological classification and categories, how dichotomous identification keys work, etc.

Teacher Discussion for Leaves Field Journal:

Let's go on a leaf hunt! Think of some places near your home where you might be able to find some leaves.

Try to find at least three different leaves and draw a picture of each one. (You can look at leaves that are on the ground or ones that are still attached to their trees.) As you are drawing, you might want to think about these questions:

- Where did you find these leaves?
- How would you describe this leaf?
- Are parts of your leaf pointy?
- Are parts of your leaf smooth?
- Can you find the tree that this leaf came from? What kind of tree do you think that is?
- How are the leaves on the ground different from the leaves that are still in the tree?

When you are finished, look at all of your pictures. How are these leaves the same? How are they different?

Teacher Discussion for Insects Field Journal:

Let's go on an insect hunt! Think of some places near your home where you might be able to find some insects. Try to find at least three different insects and draw a picture of each one.

Before you go too close to an insect, ask your adult helper if it is okay, remember not all insects are friendly. Most insects can move very quickly so once you see an interesting one, you might want to spend some time watching it and then draw it from memory. As you are drawing, you might want to think about these questions:

- Where did you find these insects?
- How would you describe this insect using words?
- How would you describe its body? legs? wings?
- Are there other insects like this one nearby?
- Do you think this insect can carry things? How?
- How do you think this insect protects itself?
- What kind of insect do you think this is?

When you are finished, look at all of your pictures. How are these insects the same? How are they different?

Teacher Discussion for Birds Field Journal:

Let's go bird watching! Choose a spot where you think you will see a lot of different birds.

When you get a good look at an interesting bird, draw a picture of it and then try to describe it. As you are drawing, you might want to think about these questions:

- What colors did you see on the bird?
- What shape was its beak?
- Could you see its feet?
- How could you draw the bird's feathers on your picture?

When you are finished, look at all of your pictures. How are the birds the same? How are they different?

Water, Water, Everywhere!



Though there is an interpretive panel further along the trail specifically devoted to discussing water, this site, with its description of the water cycle and of the forest's sponge-like properties, is a good place to remind students of the key role forests play in providing clean water. In creating this trail, the Forest Service paid a great deal of attention to water flow, carefully channeling it to avoid erosion that strips soil nutrients and lowers water quality when those sediments enter streams and rivers. Encourage students to notice the flow of water through this forest—they may be surprised to see just how much water trickles through this forest, channeling water through the forest community, much like the blood vessels in a human body channel life-giving blood.

Railroad Remnants

Between Panels 3 and 4, in the woods to our left, have students look for a raised berm running roughly parallel to the trail. This is what remains of the railroad bed used more than a century ago to carry logs from the forests here to local mills. J.E. Henry build this railroad system in 1892. With more than 50 miles of track, this network was the largest of more than twenty such railroad logging systems in the Northeast. Train cars carried the logs to the sawmill and pulp mill in nearby Lincoln, NH.



Historian Bill Gove has written several books on the subject, including one devoted entirely to this particular railroad logging system, J.E. Henry's Logging Railroads. To order the book, contact Bill Gove at 802- 433-9878.

One, two . . . tree by tree



Hairy Woodpecker

A process that mimics nature

A forest is a community of individual trees of all ages, sizes, and species. When a single tree dies, it creates room for a few new ones to grow.

In a harvesting method called "single tree selection," foresters maintain the diversity of the forest by taking out individual trees of all ages and sizes – in a way that imitates nature. The forest around you has been harvested using this method.

With this type of harvesting, little additional sunlight reaches the understory and forest floor because so few trees are removed. This favors the regeneration of shade-tolerant trees like sugar maple and beech, while discouraging certain sun-loving trees such as paper birch and white pine.



Nature
Trees die naturally from disease, old age, and other disturbances, leaving small openings in the forest.

Used to protect views

Single tree selection can be the least noticeable of all the harvesting methods used in the White Mountain National Forest. Because the canopy remains largely intact, this method is often used near recreation areas, main travel routes, and other visually sensitive places.



Imitating Nature
Single tree selection harvest creates small openings in the forest.

Winter food
Saplings grow in small woodland openings, providing abundant food for deer during winter months.

Panel 4: One, two...tree by tree

What kind of natural process does this harvest mimic? Cutting a tree here and there in the forest mimics the aging and dying of individual trees. Have children notice how the forest feels here. Though trees have been harvested here, the forest still feels sheltered and unaffected by the removal of trees. Each harvested area along the trail has a different feel to it, related to the number of trees removed and the configuration of the harvest area.

Role-play: As a follow up to the role-play at Panel 2, have students role-play single tree selection. Have them stand with their arms outstretched above them, like trees—close by, but not crowding each other. As the tree harvester, you enter their forest and select two or three to remove (tap them on the shoulder). The selected children leave the forest. Note the small openings created, still largely shaded by surrounding trees.

Fields in the forest: wildlife openings



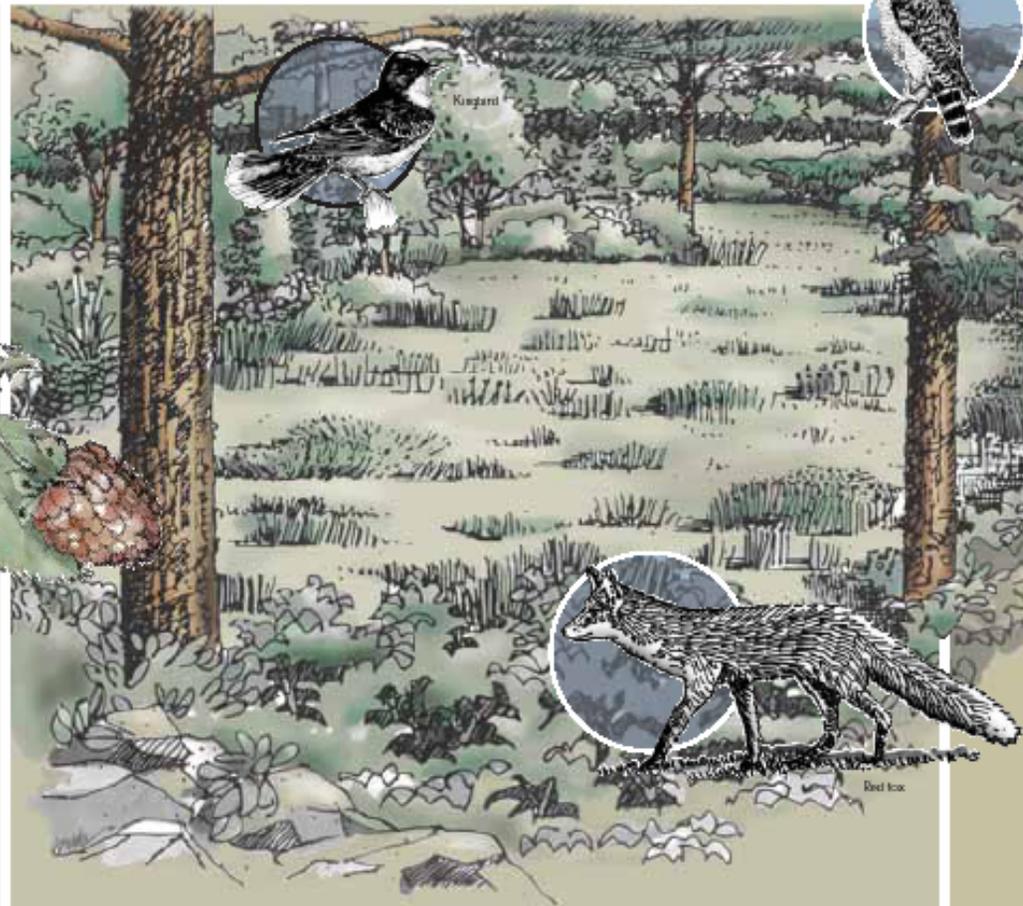
Created meadows

In carefully selected places throughout the forest, one- to six-acre patches of trees are harvested – or abandoned farm fields are kept open – to create special habitats for certain species of wildlife and to open scenic vistas.



A fruitful bounty

In meadows, the snow melts earlier in the spring, providing lush new growth for wildlife impoverished after a long winter. In late summer, the openings produce an abundance of wild berries – a favorite of the black bear. With the arrival of fall, seed-eating birds seek out these places like roadside diners during their fall migration.



Red shouldered hawk

Keeping the fields open for wildlife

Forest openings are carpeted with grasses and shrubs that are used by many animals for food and shelter. The fields may be mowed or burned every few years to keep them open.

Living at the edge

Wildlife openings also create edges where the forest meets the fields. These habitat junctions support a highly diverse wildlife population, and are favored by predators in search of prey.

Panel 5: Fields in the Forest

Conduct a habitat survey. You can use the *What's My Habitat* worksheet in many ways. With younger students, you may simply want to ask students the questions on the sheet and talk about the answers. You may want to record the answers to compare with other survey sites further along the trail. With older students, you may want them to work in small groups to answer the questions, then compare results with other groups.

Questions and Answers for the *What's My Habitat?* worksheet:

1. How did resource managers create this habitat?

By harvesting all the trees in this small area.

2. Why do you think they created an opening like this?

To harvest wood for people to use.

To create habitat for a diversity of animals.

To encourage the growth of diverse food sources, including berries and grasses, for wildlife.

To provide "edge" so animals can gradually move from the safety of the forest to the feeding areas in the opening.

To mimic natural processes, so as to keep the forest healthy.

3. What kind of natural disturbance might make this kind of habitat?

Windstorms, lightning strikes, insect attacks.

4. What animals and plants might live in this habitat?

Bluebirds, grasshoppers, deer, grouse, rabbits, and bears would all forage here. Any edge between two habitats—in this case, forest and field—is especially rich in diversity, because, in addition to animals that require forest habitat and those that require field habitat, the area attracts those that make use of both habitats (like bluebirds, which nest in tree holes at the forest edge of such a clearing, but forage for insects in the opening itself.) Note that the opening will change as natural succession of forest plant species occurs—as the field gives way to young forest, animals that need field habitat (like bluebirds) will no longer live there.

Encourage students to listen to the sounds in the opening. Often they will hear crickets and other insects not hear in the cooler, more protected forest cover.

Different plant species thrive in open areas, particularly berry bushes and grasses. These are important food sources for wildlife.

5. What do you think this habitat will look like in 10 years?

This depends on subsequent management. Managers could maintain the opening with fire or mechanical clearing, or the opening could be allowed to revegetate, closing in and returning the opening to a forest cover type. So, encourage students to imagine more than one possible scenario.

More and taller trees, less open space.

6. In 50 years?

Same as above – it depends on management practices during the ensuing 50 years. Here, resource managers intend to maintain the opening long-term through fire or mechanical clearing. If left to reforest, it would include a great variety of tree species, similar to forest you've just passed through. Sun-loving tree species will have created good habitat for shade-tolerant tree species like beech, sugar maple, yellow birch, and balsam fir, (see the chart, Preferred Growing Conditions for Selected Tree Species, for a more extensive list), so those suited to this site will become more prevalent.



Sorbus scopulina
Mountain Ash

The sheltering woods

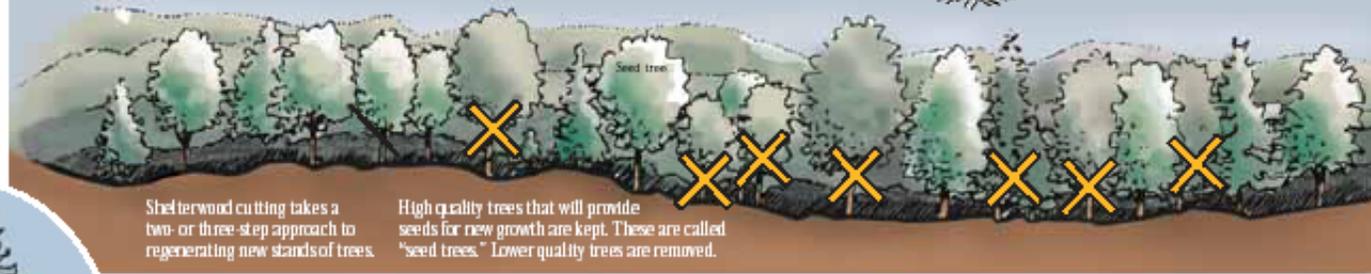


Learning from nature

Natural disturbances are rarely uniform in the changes they inflict on the landscape. After a windstorm or devastating fire, it is not uncommon to find a few strong trees standing. The open spaces between them encourage new growth.



Nature's survivors
The forest around you has been harvested by the shelterwood cutting method, which imitates a natural pattern of disturbance and survival.



Shelterwood cutting takes a two- or three- step approach to regenerating new stands of trees.

High quality trees that will provide seeds for new growth are kept. These are called "seed trees." Lower quality trees are removed.

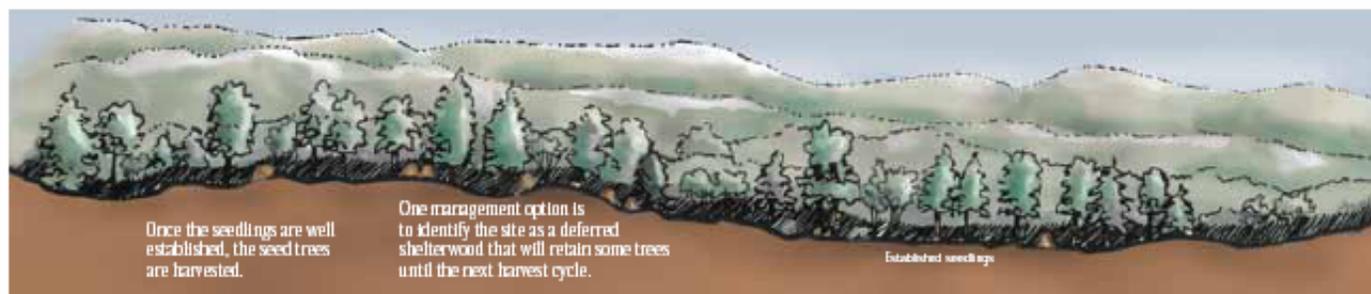


Regeneration is off to a fast start as young seedlings thrive in the partial shade of the older trees.

The seed trees have responded to increased light and space by putting on substantial new growth.

Why use the shelterwood method?

Shelterwood cutting provides a good environment for regrowth of species like red oak, sugar maple, yellow birch, and hemlock, which need shade to become established. This practice also provides a soft visual transition from cut to uncut forests.



Once the seedlings are well established, the seed trees are harvested.

One management option is to identify the site as a deferred shelterwood that will retain some trees until the next harvest cycle.

Panel 6. The sheltering woods...a nursery for trees

As the panel suggests, one good reason for performing a shelterwood cut is to promote vigorous growth among the trees that remain after the initial cut. By the time the remaining trees are cut 10-15 years later, they have added substantially to their girth, increasing their timber value.

Examining tree rings gives students the opportunity to “see” a tree’s growth over its life from seedling to felled tree. Every growth season, a tree adds a new layer of wood to its trunk. Each ring has two parts: a wide, light part (early wood) and a narrow, dark part (late wood). The early wood grows during the wet, spring growing season. During the transition from the drier summer to fall and winter, growth slows and the late wood forms. The rings provide clues about the climate, of the area over time and evidence of disturbance to and around the tree, such as fires and floods, earthquakes, drought, etc..

Tree Rings Tell a Story

- Each year, trees produce a new layer of wood in the cambium layer just under the bark. Counting the rings will reveal a tree’s age.
- Wider rings result from better growing conditions, including more sunlight, moisture, and nutrients.
- "Logs of Straw: Dendrochronology" offers an excellent lesson on tree rings, dendrochronology, and timelines. This exercise will also provide a great opportunity to correlate with science/environmental science and social studies curricula. The handouts from the website and a description of the activity are included in the front pocket of this curriculum folder. You’ll also find it on-line: http://interactive2.usgs.gov/learningweb/teachers/globalchange_time_lesson.htm

Take a look at a stump with your students and see if you can count the growth rings to tell how old the tree is. With older students, you can then have students work in groups of two or three and have each group find a stump and determine their tree’s age.

The shelterwood harvest method removes roughly half the trees in the harvest area.

Ask students:

- What effect does this harvest have on the remaining trees?

Gives them more sunlight, and less competition for water and nutrients.

- Do you think the new annual growth rings in the remaining trees would be wider or narrower after such a harvest? Why?

Wider, because the tree takes advantage of increased sunlight and more available nutrients/food and therefore grows more quickly

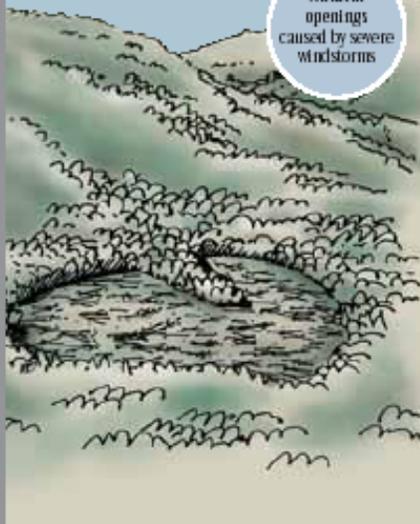


Patches of sunlight spark new growth

A flush of new growth

Every time nature creates an opening, sunlight hitting the forest floor sparks a flush of new growth. Over time, a patchwork effect is created by groups of trees of various ages.

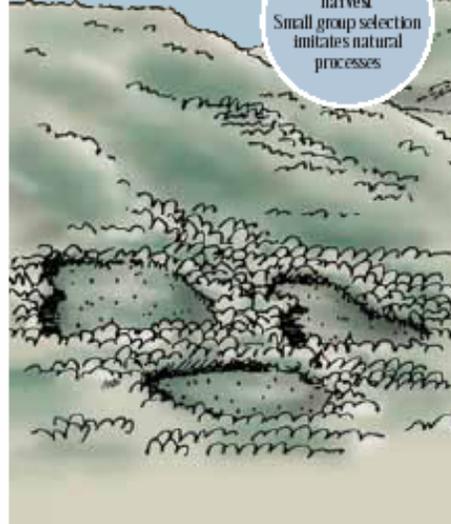
Natural openings caused by severe windstorms



Group cuts renew the forest

Resource managers design group selections to imitate nature by harvesting small groups of trees – usually in "bites" of less than half an acre – to allow sunlight to reach the forest floor.

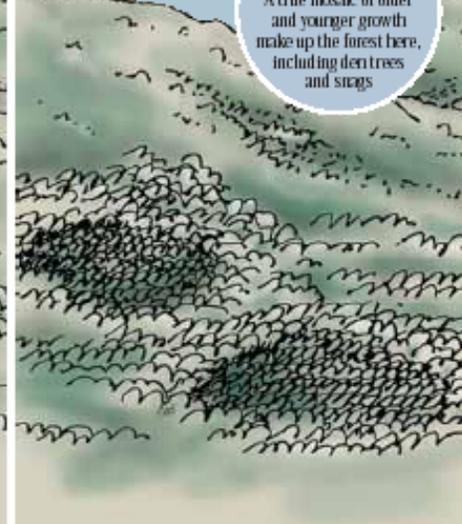
Small group harvest
Small group selection imitates natural processes



Twenty years later

With time, these small-harvested areas grow back. The hillside soon becomes an unbroken landscape of forest with a natural appearance

A forest of many species and ages
A true mosaic of older and younger growth make up the forest here, including den trees and snags



Planning for a true forest mosaic

Resource managers deliberately use this method to create a multi-layered composition of different-aged trees that includes many species. Shade-loving sugar maple and beech thrive not far from sun-loving birch and white ash. This biologically and visually diverse environment, a true forest mosaic, provides a rich habitat for birds and mammals – from forest floor to canopy.

Panel 7: Patches of sunlight spark new growth

This is another excellent site for completing the *What's My Habitat* worksheet. Compare your students' answers here to the ones students developed at the open site.

Questions and Answers for the *What's My Habitat?* worksheet:

1. How did resource managers create this habitat?

By harvesting all the trees in each small area.

2. Why do you think they would create an opening like this?

To harvest wood for people to use.

To create habitat for a diversity of animals.

To mimic natural processes, so as to keep the forest healthy

3. What kind of natural disturbance might make this kind of habitat?

Windstorms, lightning strikes, insect attacks.

4. What animals might live in this habitat?

The forest that results from group selection is multi-aged, diverse in tree species, and layered across the opening. It supports a wide variety of forest-dwelling animals and, when the openings are new, animals that like openings. Many animals, like bluebirds, inhabit the region between forest and opening—finding shelter in the forest and food in the opening.

5. What do you think this habitat will look like in 10 years?

More and taller trees—openings will blend more with uncut areas.

6. In 50 years?

Maturing, diverse, multi-layered forest.



A fresh start



Setting the stage for a new forest

Large-scale disturbances in the forest, including windstorms, fires, or clearcut harvest, initiate the cycle of growth. A burst of new sunlight hitting the forest floor allows a new generation of trees to take hold. This site was clearcut in 1895 and again in 2001.

The green reserves

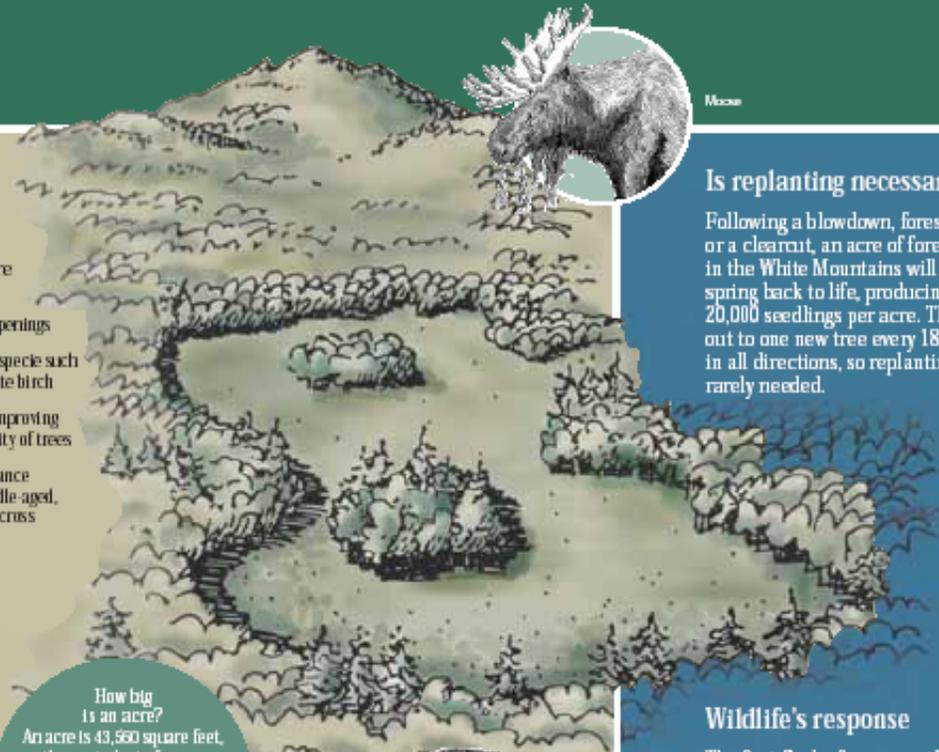
Resource managers design clearcuts that leave only scattered clumps of standing trees, including those that contain nesting cavities or provide perches for hawks and owls that like to hunt in the new growth.

Where cuts are visible from roads or trails, forest managers design the shape and edges to appear as natural as possible.

Used with care

Clearcuts of 5 to 30 acres in size are used to imitate large-scale natural disturbances. Clearcuts are used under certain conditions to:

- Create temporary openings
- Encourage pioneer species such as pin cherry or white birch
- Renew a forest by improving the health and quality of trees
- Establish a rich balance of new-growth, middle-aged, and older forests across the landscape



Moose

Is replanting necessary?

Following a blowdown, forest fire, or a clearcut, an acre of forestland in the White Mountains will naturally spring back to life, producing up to 20,000 seedlings per acre. This works out to one new tree every 18 inches in all directions, so replanting is rarely needed.

How big is an acre?
An acre is 43,560 square feet, or the equivalent of a square approximately 208 feet on each side. It is easy to remember that an acre is about the same size as a football field. There are 640 acres in a square mile.

Wildlife's response

The first flush of new growth offers a welcome food supply for moose, bear, and deer. Low brush also makes a home for migratory songbirds and attracts grouse and woodcock, which raise their young in the protective cover of brambles and berries. Resource managers often leave trees in clearcuts to provide for wildlife needs. Can you spot the trees left for bears in this clearcut?



Bear

Panel 8: A fresh start

Each management practice you've see so far has involved clearing trees in varying configurations and intensity. At a few of the sites you've passed, you've seen small group selections in which all trees were removed, as they have been in this clearcut. It is the size of the area treated that determines whether it's considered a group selection or a clearcut. The Forest Service defines a clearcut as a clearing of at least 10 acres. This harvest area is about 5 acres, but gives a sense of how a clearcut area would look and feel.

This forest was cut in 1895 and then again in 2001.

How old were the oldest trees in the forest when the forest was cut in 2001?

106 years old

Why might resource managers create a clearcut rather than several small group selections?

One reason is that a clearcut not only generates a larger volume of timber, but also encourages regeneration of different species than does a small group selection. Sun-loving species (aspen, white birch) will grow in this wide-open clearcut, whereas a small group selection will regenerate shade-loving species, because of the shading given by surrounding trees.

As can be the case with major natural disturbances like hurricanes and wildfires, clearcutting this area returned it to an early *successional* stage. If students are not familiar with the idea of forest succession, this site is a good place to discuss it. The Project Learning Tree *How Old is Our Forest?* fact sheet, included in this curriculum packet, give a good introduction to New Hampshire's forest succession.

What do you imagine the forest looked like just before it was cut?

A maturing, mixed-age northern hardwood forest, predominated by hardwood trees like beech, birch, and maple). Invite students to observe the adjacent stand of trees.

Encourage students to leave the trail and find out what's growing in the cleared area. **What do you see?**

They'll see lots of beech saplings sprouting from beech stumps, as well as plenty of pin cherry saplings, grasses and other herbaceous plants.

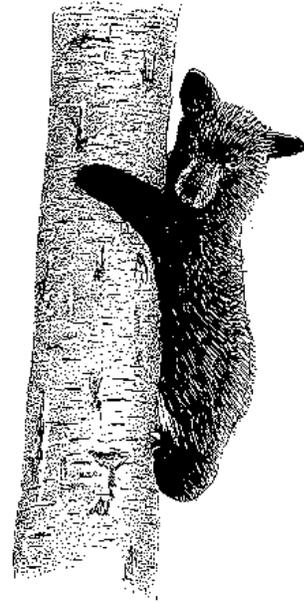
What kinds of food and shelter might animals find here that they wouldn't find in such abundance in the mature forest?

Food: tender sapling buds and shoots, grasses. Blueberries and blackberries also thrive in openings like this.

Shelter: Once saplings and shrubs become established, the clearcut offers low, dense cover for birds and small animals

Banquet Tree

As the trail curves through the lower part of the clearcut, you'll pass a tall, lone beech on your right. Be sure to take a close look with your students. Ask them to figure out what's so special about this tree. If they don't see anything right away, let them know that the tree is chock full of animal signs. The curved rows of black dots you see up the tree's trunk are the marks left by bear claws as a **black bear** climbed this beech to gather beech nuts in its upper branches.



Streambanks and salamanders: the riparian zone



Two-lined salamander

Where the forest meets the stream

The riparian zone is the forest community that exists along the banks of waterways, creating a special habitat for plants and animals of the water and woods.

Trees cool the water

The trees along the stream help keep the water cool and clear while providing shade and shelter for cold-water fish, and food for other aquatic organisms.

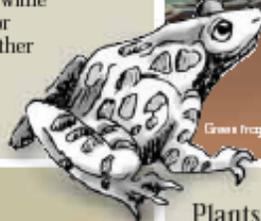


Teeming with life
Up to 90 percent of all animals in the forest come to streambanks like this in search of food, water, and hiding places.

Travelways in winter
During winter, the dense streamside forests offer protection from harsh winds and provide a travel corridor for deer and moose.

The energy cycle
Leaves and insects fall into the stream, providing food for fish and other aquatic animals.

Shelter for trout
Fallen trees create pools for trout and other aquatic organisms. Logs also slow the water flow, causing the stream to hold silt and sediment.



Green frog

A protected corridor

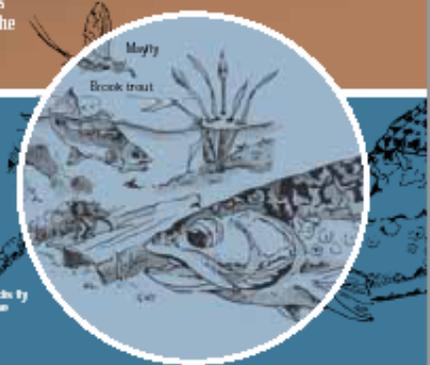
Resource managers understand that the riparian zone is an important niche in the ecosystem. They protect this zone during harvest through the careful location and construction of roads, trails, and bridges.

Plants anchor the soil

Elements that naturally occur in soil, such as phosphorous, are absorbed and used by plants before flowing into the stream. Vegetation anchors the soil in the stream bank, lessening the effects of spring floods and heavy rains.

Canaries of the stream

Some creatures – including trout and caddis fly larvae – can thrive only in clean, clear water. Their presence is often used to gauge the water quality in a stream, much like the canaries once used by coal miners tested air quality in mine shafts.



Mayfly

Brook trout

Caddis fly larvae

Panel 9: Streambanks and salamanders: the riparian zone

Streams like this one are for the forest community what arteries are for your body, delivering clear, clean, highly oxygenated water for both aquatic (water-dwelling) and terrestrial (land-dwelling) animals.



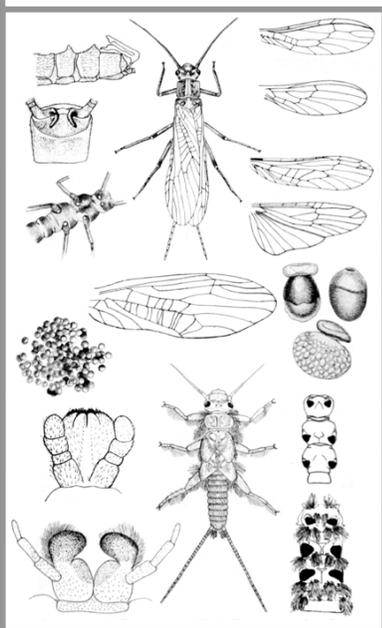
Encourage students to explore the stream's edge. By lifting up submerged stones, they may catch a glimpse of aquatic insects. Are there any signs of minnows dashing through the shallows? Look carefully along the stream's edge—can you spot any tracks of animals stopping by the stream for a drink?

The Forest Service maintains a vegetation **buffer** along riparian corridors like this one. Such a buffer shades the water, protecting aquatic animals from temperature fluctuations. Roots of buffer plants soak up runoff during a storm, preventing siltation of the stream, which would make it difficult for aquatic animals to breathe (much like heavy smog makes it hard for people to breathe). These roots also hold the banks in place, so they don't erode during heavy runoff.

Streamside trees also perform the critical job of shading the water, thereby preventing big temperature fluctuations that can harm aquatic animals, many of which cannot tolerate the high water temperatures that occur in an unshaded stream.

What would happen if resource managers didn't maintain a healthy buffer on either side of this stream—if they cut trees right up to the stream's edge?

Siltation, fluctuating water temperatures, decreased aquatic animal health, streambank erosion.



A healthy macroinvertebrate population is one sign of stream health. **Encourage students to explore the stream's edge. By carefully lifting up submerged stones, they may catch a glimpse of aquatic insects. Remind students to be sure to replace stones where they found them.**

Openings in the forest



Gaps form naturally

Small openings in the forest are created when several trees die from windstorms, lightning strikes, or insect attacks. These smaller openings are more common than those resulting from large-scale disturbances such as forest fires.

The openings around you were deliberately created to mimic these natural occurrences. Using a cutting technique called "group selection," trees are taken out in small bunches.

Northwestern Goshawk



Ten to twenty trees at a time

By harvesting only 10 to 20 trees at a time, the amount of sunlight reaching the floor is limited. If the openings were any larger – allowing more sunlight to hit the forest floor – the more aggressive and faster growing hardwood species would take over.

Blowdowns, lightning strikes or disease
Naturally occurring gaps are common in the forest



Planning for conifers

The size of an opening affects the tree species that regrow. With the small group selection method, openings are small, to encourage shade-loving evergreens.

Small gaps produced by harvest
Sunlight sparks a cycle of growth



Panel 10: Openings in the forest

Resource managers take many measurements in the forest to help plan their management strategies. Use the *Trees of Many Sizes* worksheet to observe and record the differing sizes of trees in the forest. As with the *What's My Habitat?* worksheet, you can use the *Trees of Many Sizes* worksheet in many ways. With younger students, you may simply want to ask students the questions on the sheet and talk about the answers. You may want to record the answers to compare with other survey sites further along the trail. With older students, you may want them to work in small groups to answer the questions, then compare results.

At this site, where students are practicing some of the science of being a forester, it's important to impress upon students that forestry is a balance between art and science. Once resource managers have taken their measurements, they need to decide upon the best actions to take to achieve their goals for that forest stand. Most often, the goal for a forest's management will include both tangible products and outcomes (wood, water, acres of habitat) as well as intangible values (solitude, quiet, beautiful scenery, a sense of "wildness"): There will be a variety of methods of meeting particular objectives. These methods remain flexible to accommodate the results of new scientific research, changing social values, and market conditions.

Materials needed for tree-measuring activity: With older students, you might want to provide a measuring tapes, or pieces of string 6 feet long, marked at 6" intervals. Younger students can measure using their bodies as rulers—measuring tree girth (circumference) with arm-lengths or, in the case of saplings, finger-lengths.

Questions and Answers for the *Trees of Many Sizes* worksheet:

This exercise offers practice in basic geometry concepts for students in grades 2-4. As the sheet reminds them, the circumference of a circle is roughly 3 times bigger than the diameter, so, with just a measuring tape, students can calculate the approximate diameter of the trees around them. Measuring tree diameter is a routine and important part of a forester's work (resource managers use a tool called a Biltmore stick to measure diameter), allowing them—when coupled with measurements of tree height—to calculate the volume of wood in each tree.

How old do you think this tree is? How might you figure that out?

If students don't come up with the idea on their own, suggest that they find a stump of a similar diameter and count its rings.

Which size trees would be best for lumber?

Larger diameter, straight-trunked trees, particularly those trees with moderate, uniform growth rates. Extremely large growth rings result in wood that is less strong; erratic growth results in wood, which is not uniformly strong.

Which would be best for deer and rabbits to browse?

Saplings, since they have tender bark and buds near the ground.

PLT *How Big is Your Tree?* (excellent resource for measuring trees with older student

Forest roads: where do they lead?

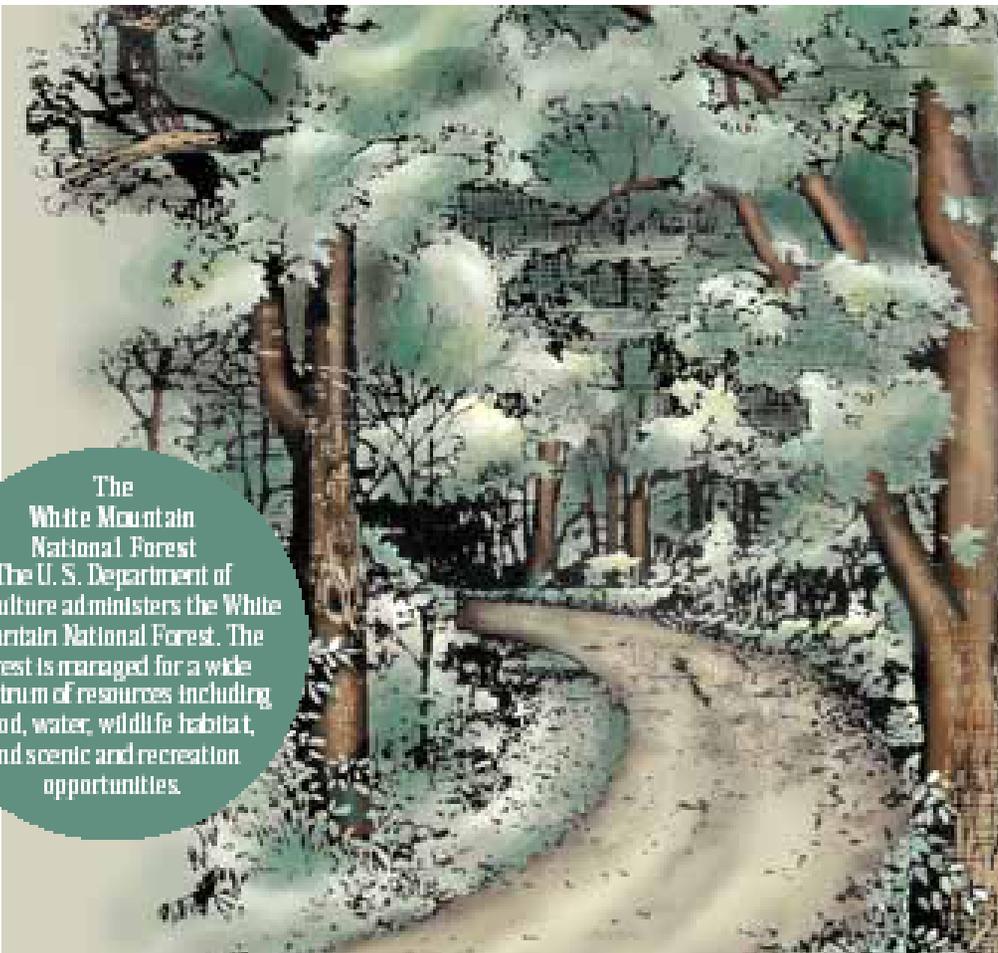


As you examine the forest here, notice the corridor that is Forest Road #397. This haul road was last used in 1971 to remove timber from the adjacent forest.

Resource managers plan road systems to accommodate a variety of uses. Sometimes roads are maintained for long-term vehicular use or for hikers, snowmobilers, cross-country skiers, and mountain bikers.

This road, which has been allowed to reforest naturally with young seedlings and saplings, is in a period of non-use, but it may be used in the future if needed.

The White Mountain National Forest. The U. S. Department of Agriculture administers the White Mountain National Forest. The forest is managed for a wide spectrum of resources including wood, water, wildlife habitat, and scenic and recreation opportunities.



Panel 11: Forest roads: Where do they lead?

Ask students to see if they can spot the grown-over forest road near the panel. If the road was last used in 1971, roughly how old are the trees that have sprouted up in it? In managing a forest, resource managers decide where to place roads to access logging sites. They also decide which roads to leave open and intact after the logging operation is complete and which to close. Sometimes, they tear up logging roads with heavy equipment to rehabilitate the roaded area to its pre-logging condition.

What might be some of the management objectives that influence these decisions?

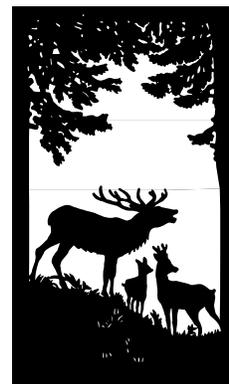
- **Recreation:** *Managers may wish, for example, to increase opportunities for hiking and skiing in an area where they have constructed logging roads, and so choose to leave some of the roads open for those uses. Roads left in place will require maintenance; resource managers must consider these additional costs of keeping forest roads open for recreation objectives.*



- **Logging:** *Managers may plan to log the area again in the near future (as with a shelterwood harvest, in which they will return to the site in 10-15 years).*



- **Wildlife Habitat:** *Roads can create a barrier to travel for some animal species, can increase wildlife mortality due to vehicle collisions, and can increase human disturbance to sensitive wildlife species. Resource managers consider wildlife needs in assessing where they create roads and whether the roads will be temporary or permanent.*



The old timers: mature hardwood forests



Who lives here?

The forest in front of you is a small example of a mature hardwood forest. These mature forests are important to wildlife species including the pileated woodpecker, scarlet tanager, black bear, and flying squirrel.



Black-throated blue warbler

Neotropical migrants
Some migratory birds that winter in the tropics prefer mature forests where they find abundant food sources.

Mature tree top canopy



Downy Woodpecker

Snags are home to many birds and animals

Often in the mature forest, dead or dying trees called "snags" lie scattered throughout the woods.

Cavities in snags provide home and shelter for over 60 species of birds and animals. While these trees may not be particularly attractive to us, snags often teem with wildlife of many forms and sizes.

Resource managers wear many hats

Several of the harvesting techniques demonstrated on the Discovery Trail perpetuate and enhance the mature hardwood forest.

In areas formally designated as Wilderness, forests are reserved from harvest, road building, and related activity in order to provide visitors with solitude and an environment not apparently affected by human intervention. This is an example of the wide spectrum of both tangible and intangible objectives resource managers must balance.



A fall food favorite
Deer, bear, and many other animals eat beech nuts to help build up fat reserves for the long winter.

Fallen log

A mix of young and old

Seventy-five percent of the White Mountain National Forest is over 80 years old, while only five percent has been growing for less than 20 years. Resource managers use a variety of techniques to balance the mix of young and old forest.

Panel 12: The old timers: the mature hardwoods

At this site, students encounter the idea that managing a forest for its wilderness qualities—that is, choosing to allow natural processes to dominate the landscape—is yet another management strategy the forester uses to provide for different human benefits while maintaining the forest’s health. Such forests provide important habitat for animal species that require undisturbed, mature forest.

At this final panel along the trail, have students answer the *What’s my Habitat?* worksheet to compare results with the other two stops along the trail.

For younger students, consider conducting a **forest scavenger hunt**.

Working in groups of three, can you find:

- 3 snags (standing dead trees)—homes for woodpeckers, chickadees, insects, squirrels, fishers, porcupines
- 3 down logs—homes for salamanders, insects, small mammals
- a tree that makes food for animals to eat (just about any tree, but you’ll find many beech trees in the area that make nuts eaten by scores of forest animals.)
- a fern
- a sapling
- a hole in the ground where an animal might live

Notes about the *What’s My Habitat?* worksheet at Panel 12:

How did resource managers create this habitat?

Like the rest of this hillside, this area was clearcut in the late 1800s. Since then, the northern hardwood forest community has regrown. In this area, resource managers have chosen to allow natural processes to dictate the forest’s composition.

Why do you think they created this habitat?

Solitude for people

Lack of disturbance for animals that prefer undisturbed mature forest

This area shows natural processes at work, providing an important study tool for resource managers.

What kind of natural disturbance might make this kind of habitat?

In this mature forest, natural disturbances like windstorm and ice storms may create new openings in the forest. As individual trees die and fall, they create openings that perpetuate the multi-aged forest.

What animals might live in this habitat?

A variety of animals could live here, including animals that prefer undisturbed forest-interior sites, like pine marten, red-shouldered hawk, barred owl, pileated woodpecker, red-eyed vireo, northern parula,

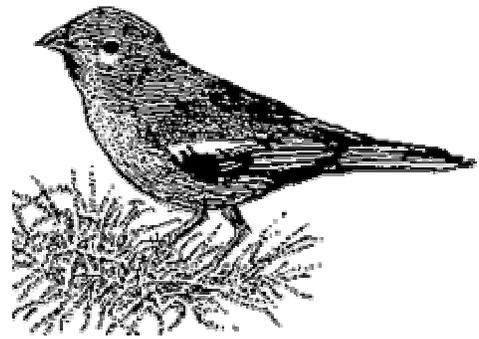
black-and-white warbler, American redstart, prothonotary warbler, ovenbird, hooded warbler, and the scarlet tanager.

What do you think this habitat will look like in 10 years?

Similar, with multi-aged and leveled forest community, including large diameter trees and snags. Small natural disturbances will create openings in which seedlings will sprout.

In 50 years?

Similar, with multi-aged and leveled forest community, including large diameter trees and snags. Small openings will be present, created as trees die and fall, or as wind or ice storms fell trees.



Northern parula warbler

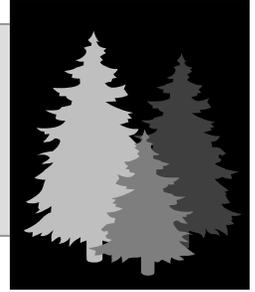
From this final panel, you and your students will loop back to the parking area.

We hope you have enjoyed the Forest Discovery Trail. Please contact the White Mountain National Forest at (603) 528-8707) or at cclong@fs.fed.us to offer feedback about the trail and curriculum materials or to request additional information.

Please encourage your students to return to The Forest Discovery Trail with their families to enjoy the trail throughout the year.

After your visit to the Forest Discovery Trail:

FOLLOW-UP ACTIVITIES



1. Forest Discoveries Mural

Talk with students about the forest community—the assemblages of plants, animals, and people that make up the forests around us—drawing from their experience on the Forest Discovery Trail. Remind them that a forest isn't just trees (it contains openings, snags down logs, clear streams, humus), that forests have layers (understory, canopy, etc), and that animals occupy habitat niches in this complex community. Have students brainstorm features for their forest community, including as many habitats—both naturally occurring and man-made—as possible. They can then sketch and paint the forest on mural paper, leaving out the animal community members.

Have each student select a forest-dwelling animal and, using the handout *Habits and Habitat* as a guide, research that animal's needs and role in the forest community. They can then draw and color a life-size picture of that animal, using as much realistic detail as possible. Have them cut out the animal and place it in the mural in its appropriate habitat. If the animal is not normally visible in the forest (under logs, inside bark, under the ground) create a lift-up flap to show the animal where it would realistically be. Then, if no one has already selected a human as their forest-dwelling animal, add a human to your forest mural, discussing as a class our habitat requirements and niche within and dependant upon the forest community.

When the mural is complete, have students lead a tour of their forest, with each student sharing their animal—giving a short presentation (poem, fictional story, report) about the animal.

2. *Apple as Earth* activity

This exercise help students understand the relative size of different resource areas (ocean, land, fresh water, forest, habitable land, etc.). This (edible) exercise is found in the front pocket of this curriculum guide.

3. What Tree is This?

This website provides an excellent photograph-based tree identification key. This simple key will allow students to identify trees they have found along the Discovery Trail or near their homes or school grounds. <http://www.cnr.vt.edu/dendro/forsite/key/page1.htm>.

POST-STUDY EVALUATION QUESTIONS

1. What is a forest?
2. Every forest is made up of many vegetative (plant) layers, beginning with the leaf litter (humus) and extending up to the tops of the tallest trees (canopy). What are these layers, and what animal might live in them?
3. What kinds of natural disturbances occur in a forest?
4. What do resource managers do?
5. How do they decide how to best take care of a particular forest stand?
6. Describe a forest community and explain three different ways it could be managed.
7. Why do we cut trees?
8. Name 5 ways we use trees in our daily lives.
9. What is the Forest Service and what is its purpose?