

**An Instructional Guide
to**

New Hampshire
**FORESTS
FOREVER**



Interactive Forestry Tour



An Instructional Guide to

New Hampshire FORESTS FOREVER

An Instructional Guide to New Hampshire Forests Forever is available online at <ftp://ceftp.unh.edu/AIGTNHFF.pdf>. Hard copies are available from the NH Fish and Game Department.

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UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION

Project Partners

NEW HAMPSHIRE PROJECT LEARNING TREE, WWW.NHPLT.ORG

New Hampshire Project Learning Tree is a statewide environmental education program. Our primary purpose is to provide meaningful professional development for educators, with a focus on the natural wonder of our state. Crafted to meet state and national standards, the PLT supplemental curriculum provides all the tools educators need to bring the environment into their classrooms – and their students into the environment.

NEW HAMPSHIRE FISH AND GAME DEPARTMENT, WWW.WILDLIFE.STATE.NH.US

The New Hampshire Fish and Game Department is the guardian of the state's fish, wildlife, and marine resources. It works in partnership with the public to conserve, manage, and protect these natural resources and their habitats; inform and educate the public about the resources; and provide the public with opportunities to use and appreciate them.

UNH COOPERATIVE EXTENSION, WWW.CEINFO.UNH.EDU

The University of New Hampshire Cooperative Extension provides New Hampshire residents with research-based information, enhancing their ability to make informed decisions that strengthen youth and families, sustain natural resources, and improve the economy.

NEW HAMPSHIRE TIMBERLAND OWNERS ASSOCIATION, WWW.NHTOA.ORG

The New Hampshire Timberland Owners Association is a nonprofit organization of forest owners and users working together to promote better forest management and a healthy wood products industry. Founded in 1911, the NHTOA began as a small group of landowners concerned with forest fire detection and prevention. Today, NHTOA is a statewide coalition of over 1,500 landowners, foresters, loggers, truckers, and forest industries, working together to ensure that the working forest remains part of New Hampshire's future.

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MINIMUM SYSTEM REQUIREMENTS

IBM-Compatible

Pentium 90 or higher processor
32 MB of RAM, 4x ROM drive
16-bit sound card
High color (16 bit)
640 x 480 monitor resolution
Windows 95 or higher

Macintosh

Power PC, 604e processor
32 MB of RAM, 4x CD-ROM drive
Thousands of colors
640 x 480 monitor resolution
System 7.5

INSTALLATION INSTRUCTIONS

Windows 95 or higher

Insert the disc into the CD-ROM drive. If the installer does not automatically appear on your screen within 30 seconds, begin installation by selecting "Run" from the Start Menu. Using the "Browse" feature, locate the CD-ROM drive (generally "D"). Select "install.exe", click "Open" and click "OK."

When the installation is complete, double-click the "New Hampshire Forests Forever" icon placed on your desktop during installation. The program may also be run by double-clicking on the "NewHampshireFF.exe" file on the CD-ROM drive.

Macintosh

Insert the disc into the CD-ROM drive and start the New Hampshire Forests Forever program by double-clicking the "New Hampshire Forests Forever" icon.

To exit the program at any point, press the "Esc" key on your computer.


Quicktime

Install the recommended version of QuickTime when prompted during installation, to ensure proper operation of the program.



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Welcome to New Hampshire's Forest

More goes on in a New Hampshire forest than you may realize. Our forests are complex, living systems and each one is unique. They are valuable, too, in several ways. Forests help clean our water and air, and they provide wildlife habitat, spectacular scenery, and recreation. Our forests make New Hampshire one of the most beautiful states in the country. In addition, our forests provide more than 5,000 products that we use and depend on every day.

So how do we balance all these needs and still maintain a healthy forest environment? The key is sustainable forest management. This CD will help you understand what forest management is and how forestry professionals and landowners in New Hampshire practice it every day. Enjoy!

Purpose

The New Hampshire Forests Forever CD is 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 the following:

- animals that live in the forest,
- ecological benefits provided by the forest,
- products derived from trees,
- recreational uses of the forests, and
- the balance that must be struck for continued forest health.

This guide offers educators a framework for using the New Hampshire Forests Forever CD in their classroom. It contains the script from the CD, divided into the four major sections of Environment, Products, Recreation, and Balance. It provides the pre- and post-tests to assess student understanding about our forests and their management. It recommends effective project-based activities to prepare students for using the CD and extending their learning. Finally, the appendix offers a glossary of terms and list of children's literature. While this guide and CD are intended for use in grades 5-8, they can be adjusted for other grades.



Recommended Activities

Project Learning Tree and Project WILD offer excellent supplemental environmental education curricula. Several of their activities support and reinforce the themes of the CD. The activities are interdisciplinary and meet the state curriculum frameworks in English Language Arts, Mathematics, Science, and Social Studies. Refer to Figure 1 for a subject matrix of the referenced activities and Figure 2 for alignment with New Hampshire's state curriculum standards.

PLT's *Environmental Education Activity Guide for Pre K-8* and Project WILD's *K-12 Curriculum and Activity Guide* are available through professional development workshops. For more information, contact the program coordinators directly at:

- Project Learning Tree, info@nhplt.org, 603-226-0160
- Project WILD, jsilverberg@wildlife.state.nh.us, 603-271-3211



Figure 1. Subject Matrix for Activities	Visual Arts	Language Arts	Math	Phys. Ed.	Science	Social Studies	Expressive Arts
Project Learning Tree Activities							
Trees as Habitat	✓		✓		✓	✓	
The Fallen Log	✓				✓		
Web of Life	✓	✓			✓		
Make Your Own Paper	✓	✓			✓	✓	
We All Need Trees	✓				✓	✓	
Every Tree For Itself			✓		✓		
Nothing Succeeds Like Succession	✓	✓	✓		✓		
Who Works In This Forest?					✓	✓	
A Forest of Many Uses					✓	✓	
Loving It Too Much		✓			✓	✓	
Earth Manners	✓	✓			✓	✓	
Project WILD Activities							
Rainfall and The Forest					✓	✓	
How Many Bears Can Live In The Forest?			✓		✓		
Tracks!					✓		✓
What Did Your Lunch Cost Wildlife?		✓			✓	✓	
Pay To Play					✓	✓	
The Hunter						✓	
Habitat Rummy					✓		
Ecosystem Facelift		✓			✓	✓	
Time Lapse					✓		✓
For Your Eyes Only		✓					

Figure 2. Alignment with State Curriculum Frameworks	English Language Arts	Math	Science	Social Studies
Project Learning Tree Activities				
Trees as Habitat	3, 6, 7	2b, 5a	2b, 3b	14
The Fallen Log	3, 6, 7		2b, 3b	
Web of Life	3, 6, 7		3a, 3b, 3c, 6a, 6c	
Make Your Own Paper	3, 6, 7		14	2d, 4c, 5c, 6a
We All Need Trees	3, 6, 7		2d, 2e	14
Every Tree For Itself		2b, 3c	3b	
Nothing Succeeds Like Succession	3, 6, 7	2b, 4c, 5a	3b, 3d, 6b	
Who Works In This Forest?			2f, 3b, 4c	14, 15
A Forest of Many Uses			3b, 4c	14
Loving It Too Much	3, 6, 7		2c, 2e, 4c	14, 15
Earth Manners	3, 6, 7		3b	1, 14
Project WILD Activities				
Rainfall and The Forest			3a, 3b	13, 14, 15
How Many Bears Can Live In The Forest?		3c, 6a	3b	
Tracks!			3b	
What Did Your Lunch Cost Wildlife?	5, 6		2a, 2b, 3a, 3b	13, 14
Pay To Play	6		3b	14
The Hunter	5, 6		3a, 3b	13, 14
Habitat Rummy	5, 6		3b, 3c	
Ecosystem Facelift	3, 5, 6		3b	14
Time Lapse	3		3a, 3b	
For Your Eyes Only	6			



NH Forests Forever CD Pre and Post Test

1. One acre of trees can provide enough daily oxygen for you and how many friends?

- a) 3
- b) 9
- c) 17
- d) 24

2. How much of the state is covered with forests?

- a) 27%
- b) 43%
- c) 62%
- d) 84%

3. Which of the following products is not made from trees?

- a) ice cream
- b) hair spray
- c) paint
- d) soda can

4. A tree can cool the surrounding area by how many degrees?

- a) 3 degrees
- b) 10 degrees
- c) 20 degrees
- d) 30 degrees

5. What is the greatest cause of forest loss in the state?

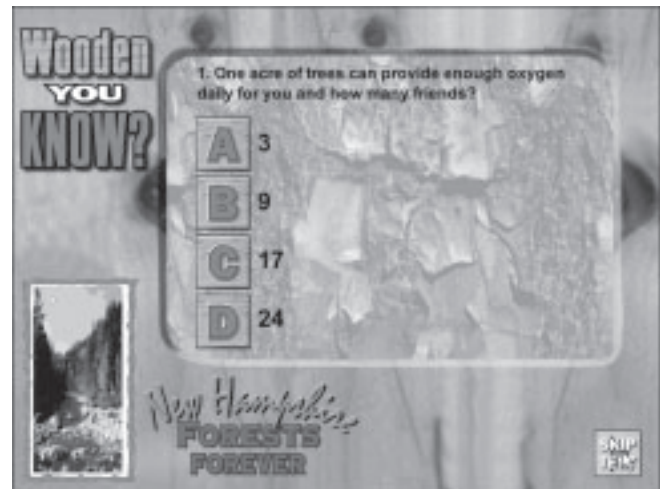
- a) building restaurants, shopping malls, and highways
- b) cutting trees for wood products
- c) infection by insects and disease
- d) clearing land for fields and agriculture

6. Who planted all the trees in our forests?

- a) the Native Americans
- b) the Pilgrims
- c) your grandparents
- d) no one, the trees in the forest grow by themselves

7. How many different types of animals live in New Hampshire's forests?

- a) 1,000
- b) 4,000
- c) 15,000
- d) 22,000



8. When are you most likely to see wildlife moving in the forest?

- a) early morning and evening
- b) lunch time
- c) late at night
- d) anytime

9. What is the most important job of professional foresters?

- a) watching for forest fires
- b) cutting trees for more forest products
- c) making trails for hiking, biking, and other recreation
- d) balancing the need for forest products with wild life, recreation, and water quality

10. How do trees clean the air we breathe?

- a) by pulling in carbon dioxide and producing oxygen
- b) by creating wind in their leaves
- c) by growing tall and shading the ground

Correct answers: 1. c; 2. d; 3. d; 4. b; 5. a; 6. d; 7. c; 8. a; 9. a; 10. a.



Introductory Section

We're fortunate in New Hampshire to have a landscape that's a blend of working forests, natural areas, and scenic vistas. Hi, I'm Jane Difley from the Society for the Protection of New Hampshire Forests. The tour you're about to take shows how good forestry contributes to that rich, natural heritage. I hope you'll enjoy this CD and I know you'll learn something. So come along.



You know, we're so used to having trees around us everyday that we take them for granted. But man, we'd sure miss them if they were gone. And I'm not just talking about the wood that comes from trees – the stuff we make into hockey sticks, furniture, and railroad ties – I'm talking about trees. Trees give wildlife like deer, snakes, and birds a place to live. They also give us oxygen, clean our water, and fight soil erosion. And there's nothing like resting under a shady tree on a hot day. We need to take care of them! Trees don't just keep us cool; they are cool!

Talk about cool! Check out this autographed baseball bat, this sports drink, this electric guitar. Know what they have in common? They're all made from trees.

Foresters grow timber like farmers grow food. Like any other crop, trees have to be cared for so that you can have a good harvest – which is important to be able to make all the different things we use every day – things you wouldn't even think come from trees. The sap is

used in paint, the cellophane is made from pulp, and some cancer-fighting drugs are made from bark. Every part of the tree can be used! Trees are so much a part of our lives that it's important to take care of them.

We need to take care of our forests! Did you know that just one acre of trees ...

- can give you and nine of your friends 1,000 comics books each?
- or can give you and 17 of your friends enough air to breathe for a day? (*pre/post test, #1c*)

So how do we use trees to make the good things we need, and at the same time, still have forests for all the things they do for us?

The key is forest management. The goal of professional foresters and landowners is to make sure that we have New Hampshire forests forever. By nurturing, growing, harvesting, and helping trees regenerate – while maintaining a diverse forest ecosystem – we can enjoy a healthy environment, the great outdoors, and the forest products we all depend on.

See for yourself the importance of the environment, the value of wood products, and the need for balance.



Environment Section

It's an air conditioner, a water purifier, an air filter, a zoo! It's a New Hampshire forest. It's pretty tough to describe all the things trees do for our environment. The shade that trees give can cool the surrounding area by almost 10 degrees (*pre/post test, #4b*). Their root systems hold together the forest floor and purify our drinking water. The trees themselves pull in carbon dioxide that we exhale, and produce the oxygen we inhale – air, clean air, that we all need to breathe (*pre/post test, #10a*). The forest provides habitat for thousands of different creatures, including a number of endangered species. Each does their part to continue the forest life cycle. Professional foresters understand the complexity of ecosystems and are committed to maintaining balanced forests.

New Hampshire has a fascinating and complex diversity of over 130 natural communities – spruce/fir forests, bogs, sand dunes, and oak/white pine forests – each supporting a wide variety of wildlife. Over 15,000 different kinds of organisms live at least a portion of their life in the state (*pre/post test, #7c*), including 60 kinds of mammals, 18 different reptiles, 22 different



kinds of amphibians, over 220 different birds, 65 kinds of fish and over 11,000 varieties of insects. Each one plays an important role.

Click and drag your mouse to find as many as you can, then click on the ones you'd like to learn more about.

MOOSE

The moose is the largest hoofed mammal in North America. Often weighing 1200 pounds or more, about 10,000 moose roam throughout the state. Even though they symbolize wilderness, moose are frequently seen near cities like Concord, Keene, and Rochester. Moose are browsers, eating leaves, twigs, and shrubs throughout the year. During summer months, they wade deep into ponds to eat tasty underwater plants.

BLACK BEAR

A male black bear can weigh up to 400 pounds, with females averaging a weight of 175 pounds. Black bears are considerably smaller than polar and grizzly bears found in other parts of North America. Despite what people think, black bears feed mostly on berries, beechnuts, insects, and carrion (that's dead meat) as they roam their home ranges of up to 15 square miles. Black bears can and do wake up during their long winter sleep.

WHITE-TAILED DEER

White-tailed deer are found throughout New Hampshire. They feed mainly on leaves, twigs, buds, and grasses. Softwood forests with hemlock or spruce and fir trees provide important deer yards or deer wintering areas. Under the softwoods, the snow is not as deep and the deer are somewhat protected from high winds and low nighttime temperatures.

WOOD TURTLE

This colorful native turtle leads a double life, spending equal amounts of time on land and in water. They eat everything from berries, grubs, mushrooms, and worms in clearcuts and along forest edges, to fish, snails, and aquatic insects in slow-moving rivers and streams. In the summer, this turtle may be found in fields and woods. In the fall, they return to streams where they hibernate in muddy banks for the winter.

SPOTTED SALAMANDER

Found in moist woods, along stream banks, and beneath rocks and logs, these strikingly colored salamanders prefer forests with small shallow ponds or marshy pools for breeding. On evenings in late March and early April, they emerge from their underground wintering areas to migrate to these forest ponds to breed and lay their eggs. Yellow-spotted salamanders are active at night and are only seen above ground when migrating to and from their breeding pools. They spend the summer eating worms, slugs, insects, spiders, and beetles.

WILD TURKEY

These large ground birds love to eat acorns, beechnuts, corn, grains, and insects found in hardwood forests and agricultural fields. If you catch a glimpse of them flying, you will be impressed by their six-foot wingspan. Eliminated from New Hampshire by the 1800s because of over-hunting and loss of habitat, wild turkeys were successfully reintroduced to the state in the mid-1970s and now number in the thousands.



BALD EAGLE

Boasting a seven-foot wingspan, these huge birds of prey require large mature trees along or near the edges of lakes, rivers, or the coast. The trees are used as supports for their nests, which they return to year after year, and as perches while they scout for and eat their prey—mostly fish, but also ducks, small mammals, and carrion (that's dead animals!). In winter, eagles require areas of open water, so they are often found perched below dams or along the Great Bay estuary. Eagles were once eliminated from New Hampshire, but with protection, habitat preservation, and restoration efforts, their numbers in the state are once again increasing.

BEAVER

This is the only mammal that can create its own habitat by building a dam across a stream, backing the water up, and making a pond and wetland area called a flowage. Beavers use sticks, twigs, and mud to build their dams and lodges (or houses). They feed on bark and buds of poplar, alder, willow, birch, and maple trees. In the summertime, they also feed on aquatic vegetation. Between 1800 and 1900, there were no beaver in New Hampshire; however, beaver today have become so numerous they are considered a nuisance in some areas, flooding woodlots, roads, and fields.

COMMON LOON

The haunting cry of the loon is often heard over remote lakes and large ponds. Primarily fish eaters, loons also eat crayfish, frogs, and even freshwater mussels. They make their own nests on the edges of lakes or on islands, raising only one or two young a year. Loons are sometimes poisoned by lead fishing sinkers, which they swallow while feeding along lake bottoms. We can prevent this by using non-lead weights when we fish.

GRAY TREE FROG

Gray tree frogs are found in forested regions with trees, shrubs, and bushes nearby or in shallow water. They breed in temporary pools or permanent waters, such as swamps, bogs, and ponds. During the summer, they are commonly found in moist areas under loose bark or in rotted logs. In winter they hibernate under tree roots and leaves. Gray tree frogs are able to change color from gray to green. They are most active in the evening and are easiest to find during the breeding period.

CHESTNUT-SIDED WARBLER

Chestnut-sided warblers are summer visitors. They make their annual journey to and from the tropics, coming here to lay their eggs and raise their young. They prefer early successional habitat with shrubby, brushy woodlands and are often found in old clearcuts and abandoned fields. They hop along branches and glean the foliage, looking for beetles, caterpillars, leafhoppers, ants, and spiders. Male chestnut-sided warblers make a call that sounds like they are saying, "please, pleased to meetcha". Well, you get the idea.

Related Activities

PROJECT LEARNING TREE

Trees as Habitat

Objectives: Students will: 1) take inventory of the plants and animals that live on, in, and around trees; 2) identify ways those animals and plants depend on trees for survival and, in turn, influence the trees; and 3) investigate how buildings provide a habitat for plants, animals, and people.

Grade level: 3-8

Time requirements: 50 minutes

The Fallen Log

Objectives: Students will 1) identify some of the organisms that live in, on, and under fallen logs and explain how those organisms depend on the dead wood for survival; and 2) describe the process of decomposition.

Grade level: 4-8

Time requirements: 50 minutes

Web of Life

Objectives: Students will 1) collect information about various organisms in an ecosystem, 2) create a mural that depicts the interdependence of various organisms with other components in an ecosystem; and 3) create a simulated web of life using a ball of string.

Grade level: 4-8

Time requirements: Two 50-minute periods

PROJECT WILD

How Many Bears Can Live In This Forest?

Objectives: Students will 1) define a limiting factor; and 2) describe how limiting factors affect animal populations.

Grade level: 5-8

Time requirements: One 20- to 45-minute period

Tracks!

Objectives: Students will identify common animal tracks.

Grade level: 5-8

Time requirements: Two 45-minute periods

Rainfall and The Forest

Objectives: Students will 1) correlate rainfall data with vegetative communities; 2) correlate vegetative communities with animal life; 3) recognize interrelationships between living and nonliving elements of the environment; and 4) suggest ways that environments affect life forms that occupy them.

Grade level: 5-8

Time requirements: One to three 1-hour periods

Essay question

Describe an animal with which we share the natural environment in New Hampshire. What role does this animal play in the forest ecosystem? How does the forest benefit from this animal's role? What benefits does the animal receive from the forest?

These are just a few of the animals that you find in New Hampshire's forests. Let's see what else the forest has to offer.



Products Section

This is the main reason we harvest trees, right? To make houses, furniture, pencils. Well, that's only part of the story, because lumber is only part of the tree. There are so many different parts to trees that we can make over 5,000 different products from them. And we can use every part of the tree—the solid wood, the wood pulp, the bark, sugars, and cellulose. The usefulness of a tree doesn't stop there. Many wood products are recovered, recycled, and reused everyday. In fact, many egg cartons and cereal boxes are made entirely out of recycled fiber. So you see, we can get more out of a tree than just wood!

Welcome contestants to "I Wood if I Could," the game show that dares to ask, "Can you find the products that aren't forest products?" Take a look at these items; then click on the ones that don't come from trees (pre/post test, #3d). Ready? Begin!

1. **Ice Cream.** Sorry, but ice cream is made with cellulose, and that comes from trees.
2. **Maple syrup and pancake mix.** Wrong and Wrong! Not only does pancake mix use wood products, maple syrup comes from the maple tree!
3. **Chewing gum.** Chew on this! Gum gets its elasticity from chicle, which comes from the sapodilla tree.
4. **Cereals.** Ooh, nice try. But that cereal uses torula yeast, a wood sugar.
5. **Orange drink.** Orange you disappointed you picked this one? Many orange-flavored drinks contain ester gum, which comes from wood rosin.
6. **Charcoal.** Throw another wrong answer on the bar-b! Charcoal is a solid wood product.
7. **Coffee filters.** This is grounds for a wrong answer. Coffee filters are made with wood pulp.
8. **Disposable diapers.** No, babies aren't made from wood! But the paper in the disposable diapers comes from cellulose and cellulose comes from trees.
9. **Postage stamps.** We got you licked! Stamps are paper products made from trees. The glue comes from a tree by-product, too.
10. **Hawaiian shirt.** Tacky! Didn't you know the fabric rayon is made from cellulose, which comes from trees?
11. **Toothpaste.** Better brush up on your tree facts. Toothpaste uses cellulose, which comes from, you guessed it, trees.

12. **Football helmet.** Couldn't tackle the easy problems, huh? Football helmets are made with cellulose, a tree product.
13. **Sandwich bags.** If you thought the answer was air tight, think again! Sandwich bags are made from cellulose, which comes from trees.
14. **Hair spray.** This is a hair-don't! Hair spray contains lignosulfates, a by-product of pulp processing.
15. **Shoe polish.** Better polish up on your tree knowledge. Shoe polish is made with tree bark!
16. **Cosmetics.** Don't blush, but cosmetics are made from processed wood material.

All of these products are forest products. Many of the things we use everyday are made from trees. In fact, it's hard to find things that aren't. Goodbye, everybody!

Related Activities

PROJECT LEARNING TREE

Make Your Own Paper

Objectives: Students will 1) make recycled paper from scrap paper; 2) describe the steps of the papermaking process and identify the elements and outputs of the process; and 3) compare making paper by hand to the process used in factories.

Grade level: 1-8

Time requirements: Two 50-minute periods

We All Need Trees

Objectives: Students will 1) examine various products and determine which ones are made from trees; 2) describe ways that trees are used to make products and ways that these products can be conserved; and 3) explore methods for recycling and reusing products.

Grade level: 4-6

Time requirements: Two 50-minute periods

PROJECT WILD

What Did Your Lunch Cost Wildlife?

Objectives: Students will 1) trace some foods from their source to the consumer; 2) identify the impacts these foods and their processing have on wildlife and the environment in general; and 3) recommend, with explanations, some food habits that could benefit wildlife and the rest of the environment.

Grade level: 5-8

Time requirements: One to three 45-minute periods

Essay question

Choose a product you use everyday that comes from trees. Could this product be made without trees? How would your life be different if trees weren't harvested to make products such as this one?



Balance Section

About 84% of New Hampshire is covered with trees (pre/post test #2d).

That's more than 4.8 million acres. On average, each forest acre can eventually grow about 200 fully grown trees. That figures out to a staggering 960 million mature trees, plus more seedlings and saplings!

With so many trees, why should we worry about protecting and managing them? Over the years, things like urban encroachment – you know, building restaurants, shopping centers, and highways – have replaced thousands of acres of valuable woodlands and wildlife habitat (*pre/post test, #5a*). As these forests disappear, it becomes more important than ever to take care of the trees that remain. That's what we call “forest management.”

Foresters are trained to understand how trees grow in New Hampshire and what can affect their health. And that's a tough job. The state has 74 native tree species.

They know that some trees need direct sunlight, while others can survive for decades in very shady spots. Some trees don't mind growing on wet soils, while others can grow on very dry soil. Some trees are high on the menu for marauding insects. Others can catch a disease very easily. Of course, all trees can burn if it gets very dry and windy.

Look, trees are a renewable resource, right? That means there is virtually an unlimited supply of them if we take care of our forests. By practicing proper forestry, we can maintain healthy ecosystems and provide a steady supply of products we all need and use.

Foresters work with New Hampshire landowners and loggers to provide clean air and water, forest products, wildlife habitats, great places to visit, and natural beauty. They do this while protecting the state's biodiversity and natural and cultural heritage.

Here are just a few ways professional foresters manage the forests in New Hampshire.

Forests are harvested over many years. While new trees are growing in one part of the woods, another area is cut. New growth quickly springs up from the cut areas and provides food and cover for wildlife.

Some forests are managed to grow sawlogs that are cut into high quality lumber. The straightest, most valuable trees are left to grow the longest, while the less valuable are weeded out. In other forests, foresters grow trees that are good for making paper by cutting all the trees in an area, and regenerating new seedlings best suited for making paper. Some forests are managed for



wildlife, and some are managed to protect water quality. Still others are managed for recreation.

Most manage the forest for multiple uses, balancing the needs for products, wildlife habitat, recreation, and water quality with each other (*pre/post test, #9d*).

With responsible forest practices, we enjoy the balance of environmental benefits that forests provide.

If you study an abandoned field or harvested area, you can record when certain plants and animals appear and when they go away. This natural pattern of change, which takes place over time, is called “succession.” When trees are removed – whether by natural causes such as fire or wind, or by human intervention – the forest regenerates in a predictable order (*pre/post test #6d*). Each state of succession provides different habitat for a variety of plants and animals as well as the raw materials for many different products. Click and drag on the knob at the top of the wheel to cycle through these stages.

Stage One, 0-20 year old trees



In the earliest stage of forest growth, annual and then perennial grasses, herbs and wildflowers are the first plants to appear. Within 7-10 years, tree seedlings become the dominant vegetation. The tree canopy is mostly open, allowing sunlight to reach the forest floor. This stage provides browse, brushy cover, and fruit bearing plants for a variety of wildlife.

At this point, there can be thousands of seedlings and saplings growing on an acre – far too many to live and grow together for very long. They compete for water, sunlight, and nutrients and most die naturally. Foresters may thin and release them to help remaining trees grow more quickly, much like a gardener weeds a garden to grow healthy vegetables.



Stage Two, 20-60 year old trees



In this stage, the forest canopy is more closed. The growing trees crowd out smaller plants reducing plant diversity, but they supply travel corridors between habitats, cover, nesting, and tree cavity sites for many birds and animals. They produce seeds in the form of berries and nuts that are used for food.

Professional foresters thin out unhealthy, deformed, or crowded trees, using them to make forest products. The trees left behind grow more quickly and more sunlight reaches the forest floor, allowing a variety of plants to grow.

Stage Three, 60-100 year old trees



The forest continues to mature. There are fewer trees, but with more room to grow, they produce more wood for forest products and more seeds to regenerate the forest. Wildlife also feed on the seeds and live in nests in large treetops and in holes in their trunks.

Professional foresters harvest some of these trees to make high quality forest products. In the openings, the forest regenerates and provides some of the wildlife benefits we see in the early stage: browse, brushy cover, and fruit bearing plants.

Stage Four, over 100 year old trees



The trees in the forest at this stage can be quite large. Some of the older trees are dying from the inside out, becoming hollow, and creating cavities for birds and animals that den in trees. Branches are dying and falling to the ground, providing cover and food for other animals. They also rot and return nutrients to the soil.

Foresters may harvest some of these trees to make high quality forest products or they may leave them to age and create more and different habitats for animals and plants.

Remember, proper forest management is the key to a diverse and productive forest. Through activities such as thinning and harvesting, New Hampshire's professional foresters simulate the natural patterns of disturbance and succession and provide the balance necessary for the environmental benefits that the forests bring and the products that trees provide.

Related Activities

PROJECT LEARNING TREE

Every Tree For Itself

Objectives: Students will 1) simulate how trees compete for their essential needs; and 2) describe how varying amounts of light, water, and nutrients affect a tree's growth.

Grade level: K-8

Time requirements: 50 minutes

Nothing Succeeds Like Succession

Objectives: Students will 1) explore basic relationships between species diversity and ecosystem stability; 2) identify successional stages in ecosystems based on plant and animal species; and 3) draw conclusions about the process of succession based on study test plots in different stages of succession.

Grade level: 4-8

Time requirements: Part A: 50 minutes; Part B: One or two 50-minute periods; Part C: Small intervals of time over the course of the year

Who Works In This Forest?

Objectives: Students will 1) explore a variety of jobs that are directly related to forest resources; and 2) describe how various professionals work together to care for forests.

Grade level: 3-6

Time requirements: 50 minutes

PROJECT WILD

Habitat Rummy

Objectives: Students will 1) identify components of habitat as food, water, shelter, and space in a suitable arrangement; and 2) apply knowledge of these components to habitat requirements of various species of animals.

Grade level: 5-8

Time requirements: Two 40-minute periods

Ecosystem Facelift

Objectives: Students will 1) describe interactions or interdependency of organisms within an ecosystem; 2) articulate that managing an ecosystem as a whole, and not just for one or a few species, is essential for ensuring ecosystem diversity; and 3) relate the increase of wildlife populations to the improvement of habitats.

Grade level: 7-8

Time requirements: Two or three 45-minute periods

Time Lapse

Objectives: Students will 1) describe successional changes in an ecosystem and the factors that affect these changes; and 2) relate species diversity to successional habitat changes.

Grade level: 5-8

Time requirements: 45 minutes

For Your Eyes Only

Objectives: Students will 1) observe the environment in which they live; 2) express environmental attitudes; 3) analyze viewpoints on the environment; and 4) listen to and respect the right of others to maintain different environmental attitudes.

Grade level: 5-8

Time requirements: Four 40-minute periods

Essay question

At what stage of succession is the forest outside your school or home? Where nearby can you find forests at different stages of succession? How are they similar to or different from the stages described on the CD? How would New Hampshire's landscape be different if all of the trees in the state were the same age?



Recreation Section

Just about any outdoor recreational activity that you want to try can be done in a New Hampshire forest.

Whether you are watching a browsing moose, viewing a variety of New Hampshire's other abundant interesting wildlife, skiing or hiking along forested mountain trails, canoeing a river, fishing a remote pond, or cruising any of the more than 6,000 miles of snowmobile trails across the state, New Hampshire's public and privately-owned forest lands provide a wealth of outstanding recreational opportunities. Wildlife viewing, hunting, camping, and swimming are just some of the activities enjoyed throughout New Hampshire's forests.

Wildlife, from the scarce Atlantic salmon to the goofy looking moose, call the forest home. The woods of New Hampshire are never far from the people who live here, either. In fact, New Hampshire's forests are largely responsible for our famous quality of life.

Click on any one of the buttons to see some of the fun things people do in New Hampshire forests.

MOUNTAIN BIKING

Be courteous to other recreationists—hikers, horseback riders, and bird watchers. Let them know when you are approaching them.

CAMPING

Carry in and carry out. Help keep our park and forest lands clean.

FISHING

Take a Let's Go Fishing Course. Learn how to identify your fish, how to catch them, and the rules and regulations about catching them.



HIKING

Make sure you have your ten essential items: water, map, compass, flashlight, matches, hat and mittens, knife, cord, first aid kit, and extra clothes for insulation.

HUNTING

Be a safe responsible hunter. Take a Hunter Education Course.

SWIMMING

Learn how to swim. Swim in designated spots and never swim alone.

CANOEING

Wearing your personal flotation device is an important part of being safe in a canoe.

SNOWMOBILING

Learn and obey the rules of the trail, dress for the weather, and be prepared if your machine breaks down.

WATCHABLE WILDLIFE

The best time to look for wildlife is in the early morning or at dusk (*pre/post test, #8a*). The best experiences are when your behavior doesn't change that of the animals you are watching.

Recreation is just one of the benefits of a well-managed forest. Pretty cool, huh? Plan to get outside soon!



Closing Section

Related Activities

PROJECT LEARNING TREE

A Forest of Many Uses

Objectives: Students will 1) identify ways that people use forest resources; 2) explain that forests are managed to satisfy a variety of human needs; and 3) explore how different forest uses can be balanced with each other.

Grade level: 5-8

Time requirements: 50 minutes

Loving It Too Much

Objectives: Students will 1) explain how increased numbers of park visitors and activities outside park boundaries affect ecosystems within national and local parks and 2) offer possible solutions to problems facing national and local parks.

Grade level: 6-8

Time requirements: Two 50-minute periods

Earth Manners

Objectives: Students will express appropriate ways to treat living things and to act in forests, parks, and other natural areas.

Grade level: PreK-4

Time requirements: 50 minutes

PROJECT WILD

Pay To Play

Objectives: Students will 1) distinguish between consumptive and non-consumptive uses of wildlife; 2) describe the sources of funding for wildlife areas; 3) relate usage to increased financial demand on managed wildlife areas; and 4) describe the impact of increased human usage on wildlife habitat.

Grade level: 5-8

Time requirements: Variable

The Hunter

Objectives: Students will 1) describe their feelings about hunting; 2) compare their attitudes to those of other people; and 3) make personal judgments about the appropriateness of hunting.

Grade level: 5-8

Time requirements: 45 minutes

Essay question

What is your favorite outdoor recreational activity? What makes this activity enjoyable to you? Do you need forests to do this activity? How would your ability to do this activity change if there weren't forests in New Hampshire?

Forest management is important to our everyday life. We know that forests provide habitat for wildlife, cool the earth, and give us a great place to have fun. They also provide lumber for new homes, pulp for toilet paper, and cellulose for football helmets. Finding a balance for protecting the environment and providing for society's needs is a tough job. Forest managers and landowners go to great lengths to care for and protect the forests. And with all that forests provide, you can see how they plan to keep New Hampshire forests forever.



The New Hampshire Fish and Game Department receives Federal financial assistance from the US Fish and Wildlife Service. Under Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, The US Department of the Interior and its bureaus prohibit discrimination on the bases of race, color, national origin, age, disability or sex (in educational programs). If you believe that you have been discriminated against in any program, activity, or facility, or if you desire additional information please write to: The US Fish and Wildlife Service, Office for Diversity and Civil Rights Programs – External Affairs, 4040 N. Fairfax Drive, Suite 130, Arlington, VA 22203



Appendix

Glossary

Biodiversity: The full range of living organisms that inhabit a particular ecosystem.

Canopy: The layer formed by the leaves and branches of the tallest trees in the forest.

Carriion: Decaying flesh of a dead animal, eaten by many animals.

Cavities: Hollowed out areas in standing trees, either live or dead. They provide shelter for a variety of animals.

Cellulose: The main part of the plant cell walls that produce fiber.

Coniferous: Trees that bear their seeds in cones. Usually refers to trees with needles.

Conservation: The responsible use, protection, and improvement of natural resources for the present and future.

Deciduous: Trees that periodically lose all their leaves. Most broadleaf trees in New Hampshire are deciduous.

Deer yard: A stand of thick softwood trees that provides shelter for tens and even hundreds of deer, when snow gets too deep for them to travel. Deer yards can range from only a few acres to several hundred acres.

Ecosystem: A community of plant and animal species (or group of communities) and its physical environment, including atmosphere, soil, sunlight, and water.

Endangered species: A species that is in danger of extinction throughout all or a significant portion of its natural range of habitat.

Flowage: Pond or wetland created when a beaver constructs a dam across a stream.

Forester: A person trained in the science of developing, caring for, and cultivating forests.

Forest management: The practical application of scientific, economic, and social principles to the use and care of the forest.

Habitat: An area that provides an animal or plant with adequate food, water, shelter, and living space.

Hardwood: Usually refers to a deciduous tree. Also describes the wood from such trees.

Harvest: The managed removal of trees by partial or complete methods.

Nonrenewable resource: Substances such as oil, coal, gas, copper, and gold, which cannot be replaced once they are used up.

Pulp: Fibrous material prepared from wood by chemical or mechanical processes for use in making paper for cellulose products.

Recreation: The use of forest land for human enjoyment and relaxation.

Regeneration: The renewal of a tree crop. Regeneration can occur naturally (seed trees, sprouts) or artificially (by planting trees).

Renewable resource: A naturally occurring raw material or form of energy, which can replenish itself in your lifetime through sound management practices (sun, trees, water, etc.).

Saplings: Young trees, normally more than 4.5 feet tall and less than 4 inches in diameter.

Saw logs: Logs large enough for sawing into lumber.

Seedlings: Young trees grown from a seed up to the size of a small sapling.

Softwood: Usually refers to a coniferous tree. Also can be used to describe the wood from such trees.

Stewardship: The careful management of a resource, such as a forest, to sustain its health, productivity, and continuity.

Succession: The gradual replacement of one plant community by another, through natural processes over time.

Sustainability: The use and growth of natural resources to meet present and future needs.

Thinning: A forest management practice that reduces the number of trees in an area.

Timber: Trees yielding logs that are considered suitable in size and quality for producing lumber or sawn wood.

Urban encroachment: Growth of house lots, shopping malls, corporate parks, and other development on forest and farm land in rural areas.

Watershed: An area of land that drains water from small streams toward a major river, lake, or ocean.

Children's Literature List

A Forest Year. By Carol Lemer, Morrow, 1987. ISBN 068806140. Describes how seasonal changes in a forest affect the plants and animals that live there.

Apple Tree. By Peter Parnall, MacMillan, 1987. ISBN 0027701603. Describes the many ways an apple tree interacts with insects, birds, and other animals during a full year of its development.

Crinkleroot's Guide to Knowing the Birds. By Jim Arnosky, Bradbury Press, 1992. ISBN 0027058573. An introduction to birds one might see in the woods.

Do Not Disturb. By Nancy Tafuri, Greenwillow Books, 1987. ISBN 0688065422. The movements and action of a family camping in the woods cause the forest creatures to also move, scurry, and make noise.

How Leaves Change. By Sylvia A. Johnson, Lerner Publications Company, 1986. ISBN 0822595133. Describes the structure and purpose of leaves, the ways in which they change as part of the natural cycle of the seasons, and the process that creates their autumn colors.

Keepers of the Earth. By Michael Caduto & Joseph Bruchar, Fulcrum, 1991. ISBN 1555910408. A collection of Native American tales and myths focusing on the relationship between man and nature.



Look to the North: A Wolf Pup Diary. By Jean Craighead George, Harper Collins, 1987. ISBN 0060236418. Thoroughly describes the growth and development of a wolf pack. It describes the family life and societal roles each wolf plays throughout the seasons of a year.

Owl Moon. By Jane Yolen, Berkley Publishing Group, 1990. ISBN 0399228721. Describes a winter night under a full moon when a father and child trek into the woods to see a Great Horned Owl.

Saving the Peregrine Falcon. By Caroline Arnold, Carolrhoda, 1985. ISBN 0876142250. Describes the efforts of scientists who are trying to save the peregrine falcon from extinction by taking the fragile eggs that would not survive in the wild, hatching them, raising the chicks, and then releasing the birds into the wild.

Scavengers and Decomposers: The Cleanup Crew. By Pat Hughes, Athenum, 1984. ISBN 0689310323. Describes the characteristics and habitats of various insects, birds, and other animals that clean up waste materials in the environment and thus ensure that life as we know it continues on the earth.

The Blossom on the Bough: A Book of Trees. By Anne Ophelia Dowden, Thomas Y. Crowell Company, 1975. ISBN 0690003846. Discusses the importance of forests, the parts and cycles of trees, the functions of flowers and fruits, the distinctive features of conifers, and the forests of the United States.

The Gift of the Tree. By Alvin Tresselt, Lothrop, Lee & Shepard Books, 1992. ISBN 0688106846. This story traces the life cycle of an oak tree and describes the animals that depend on it for shelter and food.

The Giving Tree. By Shel Silverstein, Harper & Row, 1964. ISBN 0060256656. A story about a boy who befriends a tree. Throughout his life, the tree helps the boy get what he needs to accomplish his dreams.

The Man Who Planted Trees. By Jean Giono, Chelsea Green Publishing Company, 1985. ISBN 0930031024. An account of a man who dedicates his later years in life to planting trees in an area that had lost most of its woods.

Tree Trunk Traffic. By Bianca Lavies, Dutton, 1989. ISBN 0525444955. Text and photographs present the animal life on a seventy-year-old maple tree.

When the Woods Hum. By Joanne Ryder, Mead, 1987. ISBN 0688070574. Jenny experiences the wonder of seeing and hearing the woods fill up with humming cicadas. Seventeen years later she returns with her young son to share that experience.

Poetry

Birches. By Robert Frost, ill. by Ed Young, Holt, Rinehart & Winston, 1998. ISBN 0805005706. This is a highly illustrated version of Frost's classic poem.

Earth Songs. By Myra Cohn Livingston, Holiday House, 1986. ISBN 0823406156. A poetic tribute to the earth, its continents, clay, hills, forests, and seas.

Deer at the Brook. By Jim Arnosky, Lothrop, Lee & Shepard Books, 1986. ISBN 0688040993. A poetic and pictorial portrayal of the things that happen at a brook as a mother deer and her two fawns come down for a drink.

Trees. By Harry Behn, ill. by James Endicott, Holt, 1992. ISBN 080501926X. "Trees are the kindest things I know/They do no harm, they simply grow." This line sets the stage for this wonderful poem about trees.

Art

Sky Tree: Seeing Science through Art. By Thomas Locker with Candace Christiansen, Harper Collins, 1995. ISBN 0060248831. Text by Candace Christiansen accompanies Locker's art of the sky tree, blending art and science in an invaluable resource for educators searching for tools to use in integrated thematic instruction.

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