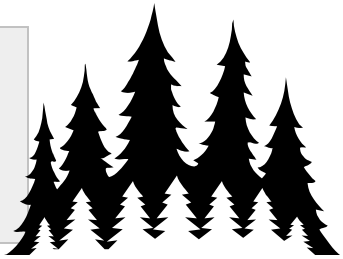
After Your Visit to the Forest Discovery Trail: Post-visit Information and Activities



Students will learn most from the *Forest Discovery Trail* if they reinforce the key concepts after returning from their visit to the trail.

Key concepts/themes to reinforce

1. Plants are physiological systems that are responsible for growth and reproduction.
2. Ecosystems are composed of many interrelationships.
3. Humans are involved in the management and conservation of natural resources.

Post-visit activities for students

PLT Activities

The following pages list PLT activities that help teach the core themes addressed at the Forest Discovery Trail. PLT materials are free of charge to teachers who take a low-cost, one-day training course. Contact your state's PLT coordinator to find out about upcoming workshops.

New Hampshire PLT:

- Phone: 603-226-0160
- Toll-free: 800-677-1499
- Email: info@nhplt.org
- Website: www.nhplt.org
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Maine PLT

- Phone: 207-626-7990
- Email: meplt@gwi.net
- Website: http://www.mainetreefoundation.org/programs/plt.html

Forest Discoveries Mural

While visiting the Forest Discovery Trail, students learned about the forest community – a group of all organisms in a particular habitat that are bound together by interrelationships. Using *Forest Discoveries Mural* worksheet, guide students through the creation of forest community murals.

Correlations to NH Frameworks of Learning:

English Language Arts: Writing 2.
English Language Uses 6.
Science: Life Science 3a.
Earth/Space Science 4c.

Correlations to ME Learning Results:
Science & Technology: B. Ecology.
L. Communication.
Visual & Performing Arts: A. Creative Expression.

What's My Habitat?

Take students to a forested site near your school. Using the *What's My Habitat?* worksheet and the *Optimal Regeneration Conditions for Selected Tree Species* chart, help students to explore the factors that influence the tree species growing on your site. Pay particular attention to the composition of the forest (the forest layers, species present, etc.), to the wildlife sign in the forest, and to the light conditions.

Correlations to NH Frameworks of Learning:
Language Arts: Writing 2.
Science: Science as Inquiry 1a.
Life Science 3a.
Life Science 3b.
Earth/Space Science 4c.
Correlations to ME Learning Results:
Language Arts: E. Processes of Writing and Speaking.
Science & Technology: B. Ecology.
J. Inquiry and Problem Solving.

Written Down in Wood: The Story of Tree Rings

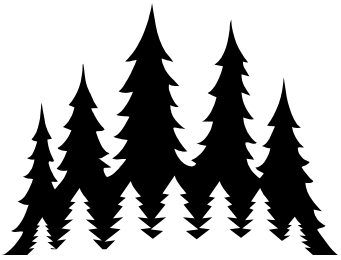
This activity will help students learn how tree rings can be used to age a tree, determine the tree's rate of growth, and "read" the life history of the tree. (Note: This ties well to PLT Activity #76: Tree Cookies.)

Correlations to NH Frameworks of Learning:
Science: Science as Inquiry 1a.
Life Science 3a.
Mathematics: Geometry, Measurement & Trigonometry 4c.
Correlations to ME Learning Results:
Science & Technology: B. Ecology.
J. Inquiry and Problem Solving.

Evaluation Questions

Use the *Evaluation Questions* worksheet to assess your students' understanding of the major concepts addressed by the *Forest Discovery Trail.* Included in this section are the evaluation questions and the answers to each question.

Recommended Post-visit PLT Activities
Grades 5 through 8



Each recommended activity is correlated to the NH Curriculum Frameworks and the ME Learning Results. Abbreviated correlations are listed below. The full listing is available online at http://www.plt.org.

NOTE: The following abbreviations have been used in noting correlations.

Correlations to NH Frameworks of Learning:

Abbreviation: Science: Life Science 3b
Framework: Science: Life Science: Students will demonstrate an increasing ability to understand how environmental factors affect all living things (i.e. individuals, community, biome, the biosphere) as well as species interactions.

Abbreviation: Social Studies:Geography 14.
Framework: Social Studies: Geography: Students will demonstrate an understanding of the connections between Earth's physical and human systems; the consequences of the interaction between human and physical systems; and changes in the meaning, use, distribution, and importance of resources.

Correlations to ME Learning Results:

Abbreviation: Social Studies: Geography: A. Skills and Tools. MG (5-8). 1.
Learning Result: Social Studies. Geography.
A. Skills and Tools.
Middle Grades 5-8.
1. Visualize the globe and construct maps of the world and its sub-regions to identify patterns of human settlement, major physical features, and political divisions.

Abbreviation: English Language Arts: D. Informational Texts. MG (5-8). 6.
Learning Result: English Language Arts.
D. Informational Texts.
Middle Grades (5-8).
6. Describe new knowledge presented in informational texts and how it can be used.

Theme: Plants are physiological systems that are responsible for growth and reproduction.

#42: Sunlight & Shades of Green

This activity introduces students to photosynthesis, the process that enables trees and other green plants to use sunlight to manufacture their own food.

Correlations to NH Frameworks of Learning:

Science: Life Science 3b, 3c.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 6, 7.

Correlations to ME Learning Results:

Science and Technology: K. Scientific Reasoning

#43: Have Seeds, Will Travel

A plant is a biological system. Its processes and components enable it to grow and reproduce. This activity will introduce your students to one aspect of a plant's reproductive system: its seeds.

Correlations to NH Frameworks of Learning:

Science: Science as Inquiry 1a.
Life Science 3a, 3b.
Unifying Themes and Concepts 6c.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 6, 7.

Correlations to ME Learning Results:

Science and Technology: B. Ecology. MG (5-8). 5.

#76: Tree Cookies

One way to learn about tree growth is to look at annual rings. Tree rings show patterns of change in the tree's life as well as changes in the area where it grows. In this activity, students will trace environmental and historical changes using a cross section of a tree, or "tree cookie".

Correlations to NH Frameworks of Learning:

Science: Science as Inquiry 1a.
Science, Technology & Society 2b.
Life Science 3a.
Life Science 3b.
Life Science 3d.
Unifying Themes and Concepts 6a.
Unifying Themes and Concepts 6b.
Social Studies: Geography 12.
Geography 14.
History 16.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 5.
English Language Uses 6.
English Language Uses 7.

Correlations to ME Learning Results:
English/Language Arts: H. Research-Related Writing and Speaking
Science and Technology: K. Scientific Reasoning
Social Studies: History: A. Chronology

Theme: Ecosystems are composed of many interrelationships.

#29: Rain Reasons

Rainfall, sunlight and temperature are important factors influencing where plants can grow and, in turn, where animals can live. In this activity, students will design experiments to see how these climatic factors influence the growth and lives of plants. They will use the learned principles to explore how varying climate conditions have resulted in an astounding variety of forest types in Puerto Rico.

Correlations to NH Frameworks of Learning:
Science: Science as Inquiry 1a.
Science, Technology & Society 2a.
Life Science 3b.
Unifying Themes and Concepts 6d.
Social Studies: Geography 11, 12.
Mathematics: Communication & Connections 2b.
Geometry, Measurement & Trigonometry 4c.
Data Analysis, Statistics & Probability 5a.
Correlations to ME Learning Results:
Mathematics: C. Data Analysis and Statistics. MG (5-8). 3.
Science and Technology: J. Inquiry and Problem Solving. MG (5-8). 2.
K. Scientific Reasoning. MG (5-8). 9.
Social Studies: Geography: A. Skills And Tools. MG (5-8). 2.

#44: Water Wonders

The water cycle is the system by which Earth's fixed amount of water is collected, purified, and distributed from the environment to living things and back to the environment. Plants play a large part in the cycle by absorbing water with their roots and transpiring it as vapor through their leaves. This activity will introduce students to the various steps of the water cycle and to the various paths water can take. They will also make connections between the water cycle and all living things.

Correlations to NH Frameworks of Learning:
Science: Science as Inquiry 1a.
Life Science 3c.
Earth/Space Science 4b, 4c.
Unifying Themes & Concepts 6a, 6c.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 6, 7.

Correlations to ME Learning Results:
English/Language Arts: Language and Images. MG (5-8). 4.
G. Stylistic and Rhetorical Aspects of Writing and Speaking. MG (5-8). 7.
Social Studies: Geography: A. Skills And Tools. MG (5-8). 2.

#45: Web of Life (mural)
In this activity, students will take a close look at one particular ecosystem (a forest) and will discover the ways that plants and animals are connected to each other.

Correlations to NH Frameworks of Learning:
Science: Science, Technology & Society 2b.
Life Science 3a, 3b, 3c.
Unifying Themes & Concepts 6a, 6c.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 6, 7.
Correlations to ME Learning Results:
English/Language Arts: E. Processes of Writing and Speaking. MG (5-8). 3.
H. Research-Related Writing and Speaking. MG (5-8). 6.
Science and Technology: B. Ecology. MG (5-8). 1.
Visual and Performing Arts: A. Creative Expression. MG (5-8). 1.

#70: Soil Stories
Students often wonder why certain plants grow in some places and not in others. Climatic factors such as temperature, moisture, and sunlight keep palm trees in Florida and fir trees in Oregon, but subtle differences in soil allow an oak to compete more successfully in one area and a maple in another. In this activity, students will explore differences in soil types and what they mean to us.

Correlations to NH Frameworks of Learning:
Science: Science as Inquiry 1a.
Science, Technology & Society 2a, 2b.
Life Science 3b.
Earth/Space Science 4b.
Physical Science 5a.
Unifying Themes & Concepts 6d.
Social Studies: Geography 11, 14.
Mathematics: Communication & Connections 2b.
Numbers, Numeration & Number Theory 3c, 3d.
Geometry, Measurement & Trigonometry 4c.
Data Analysis, Statistics & Probability 5a.
Correlations to ME Learning Results:
Mathematics: A. Numbers and Number Sense. MG (5-8). 3.
F. Measurement. MG (5-8). 3.
G. Patterns, Relations, Functions. MG (5-8). 1.
Science and Technology: F. The Earth. MG (5-8). 2.
J. Inquiry and Problem Solving. MG (5-8). 1.

J. Inquiry and Problem Solving. MG (5-8). 2.
J. Inquiry and Problem Solving. MG (5-8). 3.
L. Communication. MG (5-8). 1.
Social Studies: Geography: A. Skills And Tools. MG (5-8). 1.

Theme: Humans are involved in the management and conservation of natural resources.

#33: Forest Consequences

Few issues, if any, have simple solutions – and resolving them usually involves compromise. In this activity, your students will learn about some of the effects that human activities can have on a forest. They will explore some of the trade-offs involved in working out a land-use issue.

Correlations to NH Frameworks of Learning:
Science: Science, Technology & Society 2e, 2f.
Earth/Space Science 4c.
English Language Arts: Speaking, Listening & Viewing 3.
English Language Uses 6, 7.
Social Studies: Economics 9.
Geography 14, 15.
Correlations to ME Learning Results:
English/Language Arts: A. Process of Reading. MG (5-8). 1.
A. Process of Reading. MG (5-8). 2.
A. Process of Reading. MG (5-8). 4.
A. Process of Reading. MG (5-8). 6.
A. Process of Reading. MG (5-8). 7.
A. Process of Reading. MG (5-8). 8.
A. Process of Reading. MG (5-8). 9.
A. Process of Reading. MG (5-8). 10.
A. Process of Reading. MG (5-8). 11.
B. Literature and Culture. MG (5-8). 1.
B. Literature and Culture. MG (5-8). 9.
C. Language and Images. MG (5-8). 5.
E. Processes of Writing and Speaking. MG (5-8). 3
Science and Technology: K. Scientific Reasoning. MG (5-8). 8.
Social Studies: Civics & Gvt: A. Rights, Responsibilities, & Participation. MG (5-8). 2.

#50: 400-Acre Wood

In this activity, students will play the roles of managers of a 400-acre (162-hectare) piece of public forest. Through these roles, students will begin to understand the complex considerations that influence management decisions about forest lands.

Correlations to NH Frameworks of Learning:
Science: Science, Technology & Society 2e.
Earth/Space Science 4c.
Unifying Themes & Concepts 6b.

Social Studies: Economics 5, 9.
Geography 10, 12, 14, 15.
Mathematics: Problem Solving & Reasoning 1a, 1b.
Communication & Connections 2b.
Numbers, Numeration, Operations & Number Theory 3c.

Correlations to ME Learning Results:
Mathematics: A. Numbers and Number Sense. MG (5-8). 1.
A. Numbers and Number Sense. MG (5-8). 2.
B. Computation. MG (5-8). 1.
G. Patterns, Relations, Functions. MG (5-8). 2.
K. Mathematical Communication. MG (5-8). 2.
Science and Technology: K. Scientific Reasoning. MG (5-8). 6.
K. Scientific Reasoning. MG (5-8). 8.
L. Communication. MG (5-8). 2.
Social Studies: Geography: A. Skills And Tools. MG (5-8). 2.
Visual and Performing Arts: A. Creative Expression. MG (5-8). 4.

Forest Discoveries Mural

Tell students they are going to create a forest community mural in small teams. Each team will then share their mural with the class.

Talk with students about the forest community – a group of all organisms in a particular habitat that are bound together by interrelationships. Remind them that a forest isn't just trees. Forests contains openings, snags, downed logs, clear streams, etc. Forests have layers (the understory, canopy, etc.) Animals occupy a variety of types of habitats within a forest.

Have each group of students brainstorm the plants, trees and abiotic factors (nonliving features such as soil, rocks, water, etc.) they could include in their forest community, including as many natural and man-made habitats as possible.

Using their brainstormed lists, have students sketch and paint the forest.

Next, have each student select a forest-dwelling animal and research the animal's needs. Do they live in dense hardwood forests? Do they live near fields? Do they need fallen logs to den in? Within the forest they've drawn, where would this animal live?

Once students have determined which animals could live in their forest, have them 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 their mural in its' appropriate habitat. If the animal is not normally visible (for example, living under logs, inside bark, or under the ground), have students create a life-up flap to show the animal where it would realistically be.

If no one has already selected a human as their animal, add a human to your mural, discussing as a class our habitat requirements and dependence on the forest community.

Once the murals are complete, have each group of students lead a tour of their forest, sharing their animals, and giving a short presentation about the animal and it's habitat.

What's My Habitat?

1. Sketch the forest layers present in this forest site. Be sure to note snags (standing dead trees) and downed logs if you see them.

2. In this forest site, is the forest floor shaded or sunlit for most of the day? What kinds of trees would you expect to sprout under these conditions?

3. Which wildlife species might use this site? Why? What signs might you look for to determine which species are using the site?

What's My Habitat?

4. If this habitat had the following light and soil moisture conditions, what tree species might you find? (Use the chart, "Optimal Regeneration Conditions for Selected Tree Species.") How might specific wildlife species use the site (i.e. food source, den site, corridor between two habitat types)?

   i. Moist soil, partial shade

   ii. Moist soil, direct sun

   iii. Dry soil, partial shade

   iv. Dry soil, direct sun

Optimal Regeneration Conditions for Selected Tree Species*

This chart lists the conditions under which the seeds of certain tree species will most readily germinate and grow.

Tree Species	Light Level	Soil Moisture Level
White pine	Partial shade	Dry to moist
Red pine	Partial shade to full light	Dry to moist
Pitch pine	Full light	Dry to wet
Hemlock	Partial to full shade	Moist to wet
Balsam fir	Partial shade	Moist
Red spruce	Partial shade	Moist
White spruce	Partial shade	Moist
Atlantic white cedar	Partial shade	Moist
Northern white cedar	Partial to full shade	Moist to wet
Eastern red cedar	Full light to light shade	Dry to moist
Larch	Full light	Moist to wet
Red maple	Not critical	Dry to wet
Sugar maple	Partial shade	Moist
Silver maple	Full light	Moist to wet
Paper birch	Full light	Moist
Black birch	Partial shade	Moist
Yellow birch	Partial shade	Moist
Beech	Partial to full shade	Moist
Ash	Full light to light shade	Moist to moderately wet
Basswood	Partial shade	Moist
Black cherry	Partial shade	Moist
Butternut	Full light to light shade	Moist
Red oak	Partial shade to full light	Moist
Black oak	Partial shade to full light	Dry to moist
Scarlet oak	Partial shade to full light	Dry to moist
Chestnut oak	Partial shade to full light	Dry to moist
White oak	Partial shade to full light	Dry to moist
Shagbark hickory	Partial shade	Moderately moist
Other hickories	Full light	Dry to moist
Yellow poplar	Light shade	Moist
Aspen; poplars	Full light	Moist
Elm	Partial shade	Moist

* Adapted from Table 14, “Optimal Conditions for Regeneration of Major Tree Species.” Working With Your Woodland, by Mollie Beattie, Charles Thompson, and Lynn Levine. University Press of New England: 1983. pp 142-3.

Written Down in Wood:
The Story of Tree Rings

This activity will help you learn how tree rings can be used to age a tree, determine the tree's rate of growth, and "read" the life history of the tree. Working in groups of two or three, choose a tree stump (or tree cookie) at least 12 inches in diameter.

Tools needed: Ruler

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1. Sketch your stump, noting the location of the center, any significant changes in ring width, old branch scars, the width of the bark, and any other features you find.

2. Starting at the center of the stump, count the number of annual growth rings. Each ring has two parts – a wide, light part (early wood) and a narrow, dark part (late wood). When counting rings, be sure to only count the dark rings or only count the light rings. How old is your tree?

3. On average, how many growth rings does your stump have per inch? (To get the average, count the growth rings per inch at three different places on the stump. Add the three results together and divide by three.)

Written Down in Wood:
The Story of Tree Rings

4. Using the average growth rings per inch, how many years does it take for your tree to increase one inch in diameter? (Careful – think this question through before answering!)

5. Look carefully at your stump's growth rings. Note where rings are tightly spaces and where they spread further apart. Are they closer together on one side of the stump than the other? Why might that be? Write a brief life history of your tree. (For example, tight spacing of tree rings might indicate crowding or shading early in the tree's life. A sudden increase in ring width could mean the tree was released from competition.) Use your imagination to create a believable explanation for your stump's ring configuration.

6. When the first phase of a shelterwood harvest is complete, the remaining trees have much more room, and less competition for light, water and nutrients. If you were to examine the growth rings in the years following a shelterwood cut, what might you see?

7. Foresters measure trees at 4.5 feet off the ground. What differences might you see if you looked at a stump that was 4.5 feet off the ground versus a stump closer to the ground?

8. What else might you learn from studying your stump?

Post-Study Evaluation Questions

1. What are the three steps foresters take in order to decide how to best take care of the White Mountain National Forest?

2. Every forest is made up of many vegetative (plant) layers. Describe the layers, and name an animal that might live in each layer.

3. How does a forester determine the best management practice to use in a given forest stand? Name two practices you witnessed at the Forest Discovery Trail, and briefly describe each.

4. What is succession? What natural and human impacts might affect the rate of succession?

5. Name three naturally occurring disturbances that create openings in the forest.

6. Name 10 ways you use trees in your daily life.

7. What is the USDA Forest Service and what is it's purpose?

8. Give one example of each of the following:
    v. Economic values of the forest
    vi. Ecological values of the forest
    vii. Scientific values of the forest
    viii. Social values of the forest

Post-Study Evaluation Questions
Answers

1. **What are the three steps foresters take in order to decide how to best take care of the White Mountain National Forest?**
   The three steps for sustainable ***forest management***, practiced by the White Mountain National Forest, include 1) Research forest ecology, 2) Establish management objectives, 3) Determine and implement management practices.

2. **Every forest is made up of many vegetative (plant) layers. Describe the layers, and name an animal that might live in each layer.**
   Forest floor – Robins root for insects in the soil.
   Grasses and flowers – Rabbits eat grasses.
   Shrubs – Deer and moose eat buds and new growth.
   Understory – Some birds build nests in the understory.
   Canopy – Bears eat beech nuts from the canopy.

3. **How does a forester determine the best management practice to use in a given forest stand?**
   Consider the scientific research and best management practices, the forest's ecology, and the management objectives. in the case of public lands, such as the White Mountain National Forest, they also consider public needs and values.

   Name two practices you witnessed, and briefly describe each.
   Single-tree selection - cut down several individual trees, rather than large groups of trees.
   Permanent forest opening – clear small area, primarily for wildlife habitat
   Shelterwood cut – cut small patches of trees, leaving a few sturdy ones still standing
   Small group selection harvest – cut down small groups of trees
   Clearcut – cut down large area of trees (>10acres)
   Managing for wilderness qualities – no cutting of trees
   Vegetation buffer – no cutting of trees within a certain area surrounding a stream

4. **What is succession? What natural and human impacts might affect the rate of succession?**
   Succession is the gradual replacement of one community by another (change over time). It can be affected by seasonal changes, windstorms, fires, timber harvest, etc.

5. **Name three naturally occurring disturbances that create openings in the forest.**
   Windstorms, forest fires, succession

6. **Name 10 ways you use trees in your daily life.**
   Lumber, furniture, carpeting, paper products (newspaper, writing paper, magazines, paper towels, etc.), fruits, nuts, spices, syrup, cider, etc.

7. **What is the USDA Forest Service and what is it's purpose?**
   The Forest Service manages public lands in national forests and grasslands. The Forest Service is also the largest forestry research organization in the world, and provides technical and financial assistance to state and private forestry agencies.

Post-Study Evaluation Questions
Answers

8. Give one example of each of the following:

i. Economic values of the forest
Timber harvest and wood products industry
Jobs for loggers and foresters
Income from syrup and fruit sales

ii. Ecological values of the forest
Homes for wildlife and plants
Clean air
Clean water

iii. Scientific values of the forest
Research

iv. **Social values of the forest**
Recreation
Aesthetics
A place to live