



Spring, 2003

## Calling All Student Scientists !

We will publish students' scientific projects and other forest-related endeavors on the *Northern Woodlands* website, [www.northernwoodlands.org](http://www.northernwoodlands.org). Encourage your students to dig into a science project, write up their findings, and send them to us, along with a photo or two, if possible. For more information, contact Anne Margolis at [anne@northernwoodlands.org](mailto:anne@northernwoodlands.org) or 802-439-6292.

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## NORTHERN WOODLANDS MAGAZINE

802-439-6292

[www.northernwoodlands.org](http://www.northernwoodlands.org)

### Editorial Mission

To inspire landowners' sense of stewardship by increasing their awareness of natural history and the principles of conservation and forestry that are directly related to their land.

To encourage loggers, foresters and purchasers of raw materials to continually improve the standards by which they utilize the forest's resources.

To increase the public's awareness and appreciation of the social, economic and environmental benefits of a working forest.

To raise the level of discussion about environmental and natural resource issues.

To educate a new generation of forest stewards.

Please allow your students to keep their copy of each edition of the magazine, and encourage them to share what they have learned with their families.

# Teacher's Guide

## A Note to Teachers

Welcome to the Spring 2003 edition of *Northern Woodlands* magazine. Snow is melting, birds are returning by the thousands from their wintering homes, the gray-brown woods are softening with hues of red, gold, and green as buds swell and unfurl. In this edition of the magazine, you and your students can read a host of articles that will have your students itching to explore the natural world outside their school door—articles that will help inspire them to learn bird songs, identify lichens, and improve wildlife habitat in their schoolyard and community.

This teacher's guide serves as a companion to *Northern Woodlands* magazine. In it are several in-class and outdoor activities that expand upon ideas presented in some of the magazine's articles. For each activity, we offer recommendations of related publications, contacts, and websites, as well as Project WILD and Project Learning Tree activities that build upon each activity theme. We also indicate the state curriculum standards each activity fulfills.

We'd like to extend special thanks to the sponsors of this project. As a result of their support, over 7,000 students throughout the Northeast receive four issues of *Northern Woodlands* each school year. The sponsors are: Judith Buechner, Davis Conservation Foundation, Freeman Foundation, Gorham Savings Bank, Warren & Barry King, Ledyard National Bank, Maine TREE Foundation, Mill River Lumber, Northeast Lumber Manufacturers Assoc., Anne and Pete Silberfarb, Wellborn Ecology Fund, and Wells River Savings Bank.

We would love to know your thoughts about our teacher's guide. If you have comments or suggestions, or if you need more (or fewer) copies of the magazine for your students or would like additional copies of this guide, just call or e-mail Tim Wolfe at (802) 439-6292 (email: [tim@northernwoodlands.org](mailto:tim@northernwoodlands.org)). Visit our *Northern Woodlands Goes To School* website at [www.northernwoodlands.org/goestoschool.html](http://www.northernwoodlands.org/goestoschool.html).

## Noteworthy News:

**Northern Forest curriculum:** Check out the Fairbanks Museum's excellent curriculum, *The Great Northern Forest: From Science to Stewardship*. Their guide offers teaching materials for 37 subjects—from nocturnal forest creatures to soil studies, from sawmills to weather patterns—and includes background information, suggested activities, resources, and related standards for each subject area. The curriculum is available to educators on-line at [www.fairbanksmuseum.org](http://www.fairbanksmuseum.org). A hard copy of the curriculum is also available for \$65 from the museum.

**Science website:** You may find the National Science Teachers Association website helpful in planning and supporting your curriculum. Their e-newsletter offers links to current environmental news stories, as well as suggested teaching activities, and their sciLinks site offers web resources to complement many current school textbooks. <http://science.nsta.org>

**Planting seeds:** The National Gardening Association, based in Burlington, Vermont, sponsors [www.kidsgardening.com](http://www.kidsgardening.com), a website loaded with information and resource links for educators interested in incorporating gardening into their curriculum.

**National Arbor Day Poster Contest:** Have your students put their artistic talents to work for the annual Arbor Day Poster Contest. Each state holds its own contest, and state winners are submitted to a national contest. Though state deadlines vary, submissions are generally due in early March, with the national winner chosen on April 25. The National Arbor Day website gives full details and contact information for your state's contest. <http://www.arborday.org/programs/postercontest/2003.html>.



The Framework identifies fields of knowledge considered necessary in the public school curricula of Maine, New Hampshire, and Vermont.



Project WILD is a national conservation education program designed to prepare students to make decisions affecting people, wildlife, and their shared home, Earth. Project WILD is administered by your state's fish and wildlife department.



Project Learning Tree (PLT) is a program of the American Forest Foundation and the Council for Environmental Education. PLT provides a series of educational activities focused around forests and forest issues. Contact your state forester's office for more information on PLT activities.



Websites are increasingly critical as a research tool. The Teacher's Guide includes web addresses that we hope will help to increase your students' learning opportunities.



Suggested books and readings are also included in the Teacher's Guide to help teachers and students get the most benefit from each edition of the magazine. These references focus on enhancing the concepts featured in the activities.



Where applicable, the Teacher's Guide offers helpful information or resources to supplement activities.


# Suggested Activities

## 1. The Other Spring Flowers (field study)

*Beaked Hazelnut, Corylus cornuta* (page 29)

*Why do some trees fruit in spring while most do it in fall?* by Michael Snyder (page 21)

In spring, when the forest is flush with the beautiful displays of wildflowers, from trilliums to trout lilies, it's easy to overlook the more subtle flowers of trees. Survey the trees on your school ground and chart their annual unfoldings—flowers, leaves, and developing fruits. Have each student “adopt” a tree or shrub species found on the school grounds and chronicle its springtime activity. Which came first, flowers or leaves? Why might this be a useful reproductive strategy? What do the flowers look like? Students can draw or photograph their tree's spring progression.

 “Ten Trees of the Northern Forest,” *The Great Northern Forest: From Science to Stewardship*. Curriculum for middle school students produced by the Fairbanks Museum and Planetarium, [www.fairbanksmuseum.org](http://www.fairbanksmuseum.org).



*The Tree Identification Book*, by George W.D. Symonds and Stephen V. Chelminsky. William Morrow & Co. 1973. Excellent reference with photos of flowers, fruits, leaves, and twigs.



Have Seeds Will Travel  
Germinating Giants  
Tree Lifecycle



Science & Technology B, J  
Visual & Performing Arts A



Science 1a, 2a, 3a



5.29 Visual Arts  
7.2 Investigation  
7.12 Organisms, Evolution, & Interdependence

## 2. Acid Rain and Thrushes (current events, field study)

*Data Show Wood Thrush Harmed by Acid Rain* (page 45)

This article is an excellent example of how research continually broadens and changes our understanding of natural processes and the effects of human activities upon them. Public officials make policies based on

available scientific findings, which are often incomplete, and on political motivations. The laws resulting from this evolving mix of science and politics may fall far short of mitigating environmental degradation.

- Your students can study the science of acid rain through a number of good curricula available online (see resources below).
- They can also investigate the politics behind public policy decisions by conducting a mock public forum, using the information from the thrush article as a launching point. Students choose different roles: coal plant operator; politician from a coal producing state, politician from a state affected by acid rain, ecologist, ornithologist, moderator, community activist in state affected by acid rain, and so on. Students should research and brainstorm their character's motivations, concerns, and perspectives regarding acid rain. They can write and act out a play or hold a classroom debate. (If they act out a play, they can personify such non-human characters as thrushes, trees, even nitrogen oxide and calcium molecules!)



“Acid Precipitation” and “Northern Forest Birds: Signs of Hope and Trouble,” *The Great Northern Forest: From Science to Stewardship*. Curriculum for middle school students produced by the Fairbanks Museum, [www.fairbanksmuseum.org](http://www.fairbanksmuseum.org).

The *Birds in Forested Landscapes* program of the Cornell University Lab of Ornithology hosts a website that offers several media reports—from the BBC to the Washington Post—about the thrush study, [http://birds.cornell.edu/bfl/results\\_pubs/resultspubs.html](http://birds.cornell.edu/bfl/results_pubs/resultspubs.html).



Planning the Ideal Community  
Improve Your Place



English Language Arts A, D, H  
Science & Technology B  
Visual and Performing Arts A



Science 3a  
English Language Arts 1, 3, 5



1.16 Artistic Dimensions  
1.19 Research  
5.8 Artistic Proficiency  
6.2 Uses of Evidence & Data  
6.3 Analyzing Knowledge  
6.14 Forces of Unity & Disunity  
6.18 Nature of Conflict  
7.13 Organisms, Evolution, & Interdependence

## CAREER

## CONNECTION

*In the Field and Studio with Wildlife Artist Barry Van Dusen* (page 62)

By Todd McLeish

McLeish describes how Van Dusen has managed to combine his passions for biology and art into a rich career of painting wildlife.

- Have your students uncover the artists and artisans in your community/region who find their inspiration and subject matter in the natural world. Students can work individually or in pairs to interview the artist of their choice—learning about their relationship with the natural world, their reasons for choosing their career, their dreams and disappointments, and so on. Have them create a presentation about that artist and his or her work, using such media as video footage, sound recordings, and photographs. Their compiled presentations could be displayed at your local library or community center, celebrating the community's artistic voice.
- Invite a landscape artist or your school's art teacher to your classroom to teach your students outdoor observation and sketching techniques.



View Van Dusen's artwork at [www.barryvandusen.com](http://www.barryvandusen.com).



Drawing on Nature  
Appendix: Guidelines for  
Interviewing People



English Language Arts E, G, H  
Career Preparation A  
Visual & Performing Arts A



English Language Arts 2, 3, 6



1.5 Writing Dimensions  
1.8 Reports  
1.13 Clarification & Restatement  
3.15 Career Choices  
5.28 Artistic Proficiency  
5.29 Visual Arts

# Suggested Activities


## 3. Bilingual with Birds (field study)

*Learning Another Language* by Gayle Goddard-Taylor (page 46)


Walking through a forest in springtime without knowing how to identify birdsongs is like visiting a foreign country when you don't speak the language. Learn just a handful of songs and suddenly your relationship with the forest's inhabitants changes and deepens. Give your students the opportunity to acquaint themselves with some of their avian neighbors by taking them on a birding expedition to identify birds by song.

Invite a volunteer from your local Audubon Society to join or lead your class on a bird-song survey of your school grounds or nearby forestlands.


This study makes an excellent lead-in to many fascinating subjects: why do birds sing, and when? How do they sing (avian anatomy)? What's the difference between a song and a call? Do black-capped chickadees in Maine sound different than those in Maryland? Have students develop a question about birdsong that intrigues them and research the answer.


 "Northern Forest Birds: Signs of Hope and Trouble." The Great Northern Forest: From Science to Stewardship. Curriculum for middle school students produced by the Fairbanks Museum, [www.fairbanksmuseum.org](http://www.fairbanksmuseum.org).


<http://sssp.fws.gov/index.cfm>. Take part in the Fish and Wildlife Service's Shorebird Sister Schools Pen Pal Exchange. Search their "Educators" page for information on how your students can partner with students in Central America with whom they can share field observations of migratory species found in both locations.

 Goddard-Taylor recommends the *Birding by Ear* instructional recordings by Richard Walton and Robert Lawson (part of the Peterson Field Guide series).

 Bird Song Survey

 Science & Technology B, J

 Science 1a, 2a, 3a

 7.2 Investigation  
7.13 Organisms, Evolution, and Interdependence

## 4. A Win-Win Situation (field study)

*Rock Walls and Lichens* by Roger Monthey (page 52)

In symbiotic relationships, everybody involved comes out ahead, and lichens are prime examples of symbiosis. Take a survey of your local lichens by conducting a field study of your school grounds or local natural area. Bring Monthey's photo guide along, as it may help you identify some of the more common lichens. Since there are hundreds of lichen species in the Northeast, you'll likely spot species that aren't in Monthey's guide. Have students take copious notes (site location, size and spread, color, and so on), and if the school has a digital camera, take pictures of the lichens you find. The Lichenland website (listed below) offers information about lichen ecology, as well as an on-line key system that can help identify any mystery lichens.



Lichenland:  
<http://mgd.nacse.org/hyperSQL/lichenland/index.html>. Be sure to visit the Lichenland Lite page for a tutorial on using Lichenland's key for lichen identification.



Are Vacant Lots Really Vacant?  
The Fallen Log

Science & Technology B, J

Science 1a, 2a, 3a

7.2 Investigation

7.13 Organisms, Evolution, and Interdependence

## 5. Making Way for Ducklings (field study, hand crafting)

*How to Build, Place, and Maintain a Wood Duck Box* (page 61)

Celebrate spring by enhancing wood duck habitat in your watershed. Work with your school's woodworking department to construct wood duck boxes as described in the article, or invite a local woodworker to help your students construct boxes on their own. Contact your local Audubon chapter or state wildlife agency for suggestions on where in your community to place the

## CALENDAR

### Spring Migration

Excerpt from *In Season: A Natural History of the New England Year* by Nona Estrin and Charles Johnson (page 75)

*Calendar* (page 4)

Explore the wonders of migration with your students. Scientists are still unraveling the mysteries of how birds migrate hundreds, even thousands of miles to their breeding and wintering grounds. Birds are not the only animals that migrate however—many species of fish, whales, caribou, butterflies, and amphibians make equally amazing annual travels. Have students select a migratory species to research in depth. Their presentation to the class might include scientific research; cultural myths; firsthand descriptions from interviews with biologists, birdwatchers, and other experts; their own observations; photographs; drawings; and maps.



U.S. Fish and Wildlife Service Division of Bird Migration maintains an extensive list of websites that offer information and/or curricula for studying bird migration, <http://migratory-birds.fws.gov/edulinks.html>.

"Animals on the Move," *The Great Northern Forest: From Science to Stewardship*. Curriculum for middle school students produced by the Fairbanks Museum, [www.fairbanksmuseum.org](http://www.fairbanksmuseum.org).

May 10th is International Migratory Bird Day. Learn about ways to celebrate migratory birds, including scheduled events in your area, at the offi-

## CONNECTION

cial event site:  
<http://birds.fws.gov/imbd/>.

Migration Barriers



ME

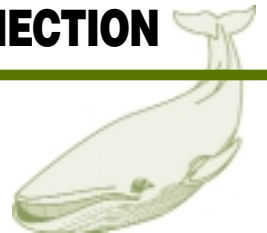
English Language Arts A, D, E, H  
Geography A  
Science & Technology B

NH

English Language Arts 1, 2, 5, 6  
Social Studies 10, 15  
Science 3a


VT


1.8 Reports  
1.9 Research  
4.6 Understanding Place  
6.2 Uses of Evidence and Data  
6.3 Analyzing Knowledge  
6.7 Geographical Knowledge  
7.13 Organisms, Evolution, & Interdependence




# Suggested Activities

boxes and how to go about doing it. If making an off-schoolgrounds field trip to good wood duck habitat doesn't fit into your class schedule, consider constructing blue-bird boxes for the school grounds instead. With either project, students will, in the process, learn much about bird ecology, habitat requirements, habits, and predators.


 Ducks Unlimited offers extensive student manuals and teacher's guides to wetlands habitat conservation for students in grades 4-12, [http://www.greenwing.org/dueducator/noncssdu\\_educator.html](http://www.greenwing.org/dueducator/noncssdu_educator.html).


 A Bird's Home: [www.abirdshome.com/store/wdnbox.htm](http://www.abirdshome.com/store/wdnbox.htm). This site explains "egg dumping" (wherein several female wood ducks lay eggs in a single box, leading to incubation failure) and how to avoid it through proper site choice.

 Watch on Wetlands  
Improving Wildlife Habitat in the Community

 Improve Your Place

 Science & Technology B, J  
Civics & Government A

 Science 1a, 2a, 3a  
Social Studies 4

 2.13 Produce/Service  
3.13 Roles and Responsibilities  
6.9 Meaning of Citizenship  
7.13 Organisms, Evolution, & Interdependence


## 6. Understanding Groundwater (current events)

*Haunted by Waters* by William Shutkin (page 37)

Groundwater is a slippery subject to understand because it's invisible to the eye. While students can see how watersheds work—small streams flow into bigger ones and on into rivers and eventually to the ocean—the movement of water into the water table and the effects of human activities upon those subterranean waters is unknown territory for most students.


- Why does a well like Shutkin's run dry? Why, in a drought, do some residents' wells run dry and others don't? How do streams continue to flow even when there is an extended drought? Students can find the answers in groundwater. Use the EPA's curriculum guides (see below) to help students map groundwater flow, study the effects of development upon groundwater supplies, and learn ways to protect groundwater from contamination.

- How much water does your school use and where does it come from? Do taps and faucets leak? How could your school better conserve water? How clean is your school's drinking water? Contact your state's water quality division for information on how to test your school's water for contaminants. Have students create a public awareness program for the school community to encourage water conservation. This could include posters in bathrooms, announcements over the public address system, or articles in the school newspaper. Students can also perform storm drain stenciling—painted messages reminding people not to dump chemicals into storm drains—on the school grounds.

 For information on how to take part in storm drain stenciling with your students, <http://cleanoceanaction.org/Stenciling/StormDrains.html#SDSinfo>.


Groundwater curriculum resources on-line from the University of Wisconsin, <http://www.uwsp.edu/water/portage/teach/curric.htm>.


The EPA offers a very good groundwater curriculum for grades K-12, called the Magnificent Groundwater Connection. The grade 7-12 curriculum includes an excellent introduction to groundwater ("New England's Groundwater Resources: Getting up to Speed") and detailed activities on groundwater usage, hydrology, and contamination. The web page includes several lessons plans for grades K-12, <http://www.epa.gov/region01/students/teacher/groundw.html>.

 Renewable or Not?  
Pollution Search  
Water Wonders

 Sustainability: Then, Now, Later

 Science & Technology B, J

 Social Studies 11, 12  
Science 3a, 4c

 4.9 Sustainability  
4.6 Understanding Place  
7.2 Investigation  
7.13 Organisms, Evolution, & Interdependence  
7.16 Natural Resources


## WILDLIFE

## CONNECTION

*New Census of Featherless Fliers* (page 15)

Book Review, *Discovering Moths: Nighttime Jewels in Your Own Backyard* (page 64)


- Through local volunteer research efforts, your students can gather useful information for statewide surveys of butterflies, dragonflies, and damselflies. The *New Census* article (page 15) lists contact information for volunteer survey programs in several states. If your state doesn't have such a program, conduct your own schoolyard survey. Contact the Vermont Butterfly Survey for information about conducting your own survey.
- Attract butterflies to your school grounds by having your students plan (create an annotated map of the garden site) and plant a butterfly-friendly garden. The American Museum of Natural History hosts an excellent website to help get you started. Also, consult your local Cooperative Extension service for a listing of Master Gardener volunteers in your area who could help with the project.


 American Museum of Natural History butterfly garden website, <http://www.amnh.org/exhibitions/butterflies/garden.html>. Vermont Butterfly Survey, <http://www.uvm.edu/~vbap/>.


Audubon Magazine offers a useful, on-line article, "Backyard Gardening for Butterflies," <http://magazine.audubon.org/backyard/backyard.html>.

National Wildlife Federation Schoolyard Habitats® program, <http://www.nwf.org/schoolyardhabitats/>.

 Improving Wildlife Habitat in the Community

 Science & Technology B, J  
Geography A

 Social Studies 10, 15  
Science 1a, 2a, 3a

 2.13 Product/ Service  
2.14 Planning/ Organization  
6.7 Geographical Knowledge  
7.2 Investigation  
7.13 Organisms, Evolution, & Interdependence



# Word Search

## *A Flood of Spring Migrants*

The following bird species are, according to the Northern Woodlands Calendar, just a few of the many species returning to our woods this spring from southern wintering grounds.

- |                  |                       |
|------------------|-----------------------|
| Kestrel          | Bluebird              |
| Grackle          | Belted kingfisher     |
| Canada goose     | Yellow-rumped warbler |
| Red-tailed hawk  | Hermit thrush         |
| Great blue heron | Ruby-crowned kinglet  |
| Brown creeper    | Hummingbird           |
| Tree swallow     | Ovenbird              |

T B K H U M K W A H D E L I A T D E R G G  
 E R E G Z A G D Y C S V R O R R U S T R R  
 L U S L B H C R V O F D V U E H T B H E E  
 G B T K E A B O O E R L P Q P R L N E L E  
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 R E H S I F G N I K D E T L E B B T R L E  
 Y A U U L R R E V B E V C A E H L E Z E L  
 C B M B M R E H K O H A O E R G N P L Y Z

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T	B	K	H	U	M	K	W	A	H	D	E	L	I	A	T	D	E	R	G	G
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C	A	E	L	N	G	E	F	H	A	G	R	E	V	O	C	N	A	E	R	T
Y	A	P	E	O	L	D	H	S	U	R	H	T	T	I	M	R	E	H	W	Z
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U	O	N	E	G	R	B	Y	E	L	L	O	R	Y	C	E	O	G	B	L	Y
R	E	H	S	I	F	G	N	I	K	D	E	T	L	E	B	B	T	R	L	E
Y	A	U	U	L	R	R	E	V	B	E	V	C	A	E	H	L	E	Z	E	L
C	B	M	B	M	R	E	H	K	O	H	A	O	E	R	G	N	P	L	Y	Z



## **Ties that bind—a writing exercise**

Teacher's Note: For students who are uncertain of how to go about writing such an essay, Orion Magazine is another excellent resource for contemplative essays about the relationship between people and nature. The more familiar they become with this form of writing, the more comfortable they may be in trying it. Orion Magazine [http://www.oriononline.org/pages/om/index\\_om.html](http://www.oriononline.org/pages/om/index_om.html).

# Crossword

*Northern Woodlands Calendar* (page 4)

*Porcupine Signs of Spring*, by Susan C. Morse (page 19)

*Rock Walls and Lichens*, by Roger Monthey (page 52 )

## Across

1. Fisher nest site (two words).
2. Pertaining to springtime.
3. This bird camouflages its nest with lichen.
4. Male wild turkey.
5. The organism in lichen that anchors the lichen to the substrate on which it grows.
6. Leaf-eating.
7. Preys upon porcupines.
8. First conifer to open its buds in spring (two words).
9. These emerging fern fronds make good spring eating.
10. Winter food for porcupines.

## Down

1. This infamous insect hatches from rivers and streams in May.
2. First warbler species to return in spring (two words).
3. Used by Native Americans as taps for maple sugaring.
4. This bird nests in a tunnel it excavates in a river bank (two words).
5. In lichens, algae perform this vital, food-producing function.
6. One of the first bird species to return to the Northeast in the spring.
7. Porcupines eat the flowers of this early summer bloomer.
8. The male of this bird species beats its wings to attract females, making a loud drumming noise (two words).
9. Source of sodium for porcupines in winter.
10. Mutually beneficial relationship.

