Teacher's Guide
Spring 2011

Northern Woodlands Goes to School Spring 2011
Welcome to the Spring 2011 edition of *Northern Woodlands* magazine. The articles in this issue will prompt plenty of discussion and explorations, both in the classroom and in the field. Did you know that there's a flower in our Northern Forest that opens with the speed of a rifle shot? Or that white pine needles contain an organic acid that's a key ingredient in anti-flu medication? Your students can discover these and many other great stories in this latest edition of *Northern Woodlands*.

This teacher's guide serves as a companion to *Northern Woodlands* magazine. In it are several indoor and outdoor activities that expand upon ideas presented in some of the magazine's articles. For each activity, we recommend related readings 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.

Noteworthy News

This edition of the Teacher's Guide will be our last. After conducting a thorough review of the Northern Woodlands Goes to School program, we've recognized that a lot has changed in the classroom since this program began over 14 years ago. We're currently exploring new ways of reaching educators and students.

Although we are discontinuing the teacher's guide, educators can still receive a complimentary copy of *Northern Woodlands* magazine. To take advantage of this offer, please email Emily@northernwoodlands.org and indicate the name of your school, the grade level you teach, and how you will use the magazine in your teaching. With your email address, we can also keep you posted on our plans.

We welcome your ideas on how *Northern Woodlands* can serve educators. Thank you for being a part of the Northern Woodlands Goes to School program.

Walter Medwid, Executive Director
Center for Northern Woodlands Education

1. Invertebrates Beneath Your Feet

Under the Microscope: Forest Spiders, by Virginia Barlow (pg. 71)

This article provides a great launching point for exploring the diversity of invertebrates in your nearby woods. You won't need an extensive wooded area for this survey, so you can make use of any small woodland on your school grounds. Using the resources below to guide you, have students create several pitfall traps to capture, observe, and release woodland invertebrates. Pitfall traps offer an easy-to-create, low-tech, but highly effective means of performing a survey of ground-dwelling invertebrates. Bury traps in varied habitats (ie, hemlock forest, deciduous forest, early successional forest, mature forest, field).

Have students refer to the methodology in the Colby Hill Ecological Project invertebrates study (listed below) to develop scientific methods for conducting the research. Then have them create data collection sheets and develop a hypothesis of what they expect to find in their studies. Though students will not be able to make detailed species identification of the invertebrates they trap, they can use their observation skills and a basic invertebrate identification key to identify general classifications of invertebrates. Have each student write a report summarizing their findings.

PLT	Nature's Recyclers (K-6) Cast of Thousands (*Forest Ecology* high school module)
WILD	Which Niche?
ME	English Language Arts A, D, E, H Science and Technology B, J
NH	English Language Arts 1, 2, 5, 6 Science 2b, 3a, 6d
NY	CDOS 3 Managing Information MST 1 Scientific Inquiry MST 4 The Living Environment MST 7 Strategies
VT	1.8 Reports 1.19 Research 6.2 Uses of Evidence and Data 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Websites:

www.ecostudies.org/images/education/ecosystem_explorations/ecoblitz_protocols.pdf. This webpage provides instructions for making pitfall traps, plus instructions for a bunch of other great low-tech monitoring protocols, from coverboards for monitoring reptiles and amphibians to track plates for capturing the tracks of small animals.

Students can read Vermont-based research studies of terrestrial invertebrates that utilized pitfall traps by visiting the Colby Hill Ecological Project web pages on the Vermont Family Forests website, www.familyforests.org/research/researchers-new.shtml. In the researcher table, click on the 2000 and 2001 research projects for Jeffrey Collins, Mark Ward, and Susan Young.

Biokids Invertebrate Identification Guide, www.biokids.umich.edu/files/28578/InvertIDGuide2004.pdf.

Terrestrial Invertebrate Identification. Succinct, two-page ID guide, www.docstoc.com/docs/19588917/Terrestrial-Invertebrate-Identification.

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2. Legislating Conservation

Current Use: The Unsung Hero of Land Conservation in the Northeast U.S., by Charles Levesque (pg. 41)

Charles Levesque's article on Current Use tax programs in the Northeast spotlights one of the many legislative acts that have encouraged conservation of land and natural resources in the Northeast. After students have read the article and discussed it together in class, have each student choose a piece of state or federal environmental legislation that impacts your community—from the federal Water Pollution Control Act to state legislation like Vermont's Act 250. Each student should research his or her legislative act and write a brief report about it. Students should also prepare a 3-4 minute summary of their act and its impact on your region to present to classmates.

PLT	Take Action! (*Focus on Forests* high school module) Far-reaching Decisions (*Places We Live* high school module)
WILD	Know Your Legislation: What's in It for Wildlife? Can Do! Planning for People and Wildlife
ME	Civics and Government A English Language Arts A, D, E, H
NH	English Language Arts 1, 5 Social Studies 4
NY	MST 7 Strategies SS 5
VT	1.8 Reports 1.19 Research 4.2 Democratic Process

Website: www.classes.colgate.edu/core114/legislation/. This Colgate University website provides information on pending federal legislation that impacts the environment. The site organizes the bills by topic area, from energy to toxic wastes. Purdue University offers a similar website, www.purdue.edu/dp/envirosoft/grants/src/laws.htm.

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3. Light Pollution at Your School
Lights, Action! By Todd McLeish (pg. 55)
Light pollution occurs when outdoor lighting shines upward into the night sky. It reflects off air particles, creating a glowing haze that washes out the starry view, wastes electricity, and, as the *Lights, Action!* story suggests, alters wildlife behavior. Light pollution is a problem with simple and energy-efficient solutions, like installing shielded outdoor fixtures and using lower wattage bulbs. Have your students assess your school's outdoor lighting. Do existing fixtures create light pollution or mitigate it? The International Dark-Sky Association (IDA) has plentiful information about IDA-approved fixtures on their website (see below). The website also offers many lesson plans related to dark skies and light pollution.

Have students create a report that assesses the school's contribution to light pollution through outdoor lighting and offers recommendations for improvement. Report should include a cost analysis of installing dark-sky-friendly light fixtures. Students should present their findings to the school board.

Website: International Dark Sky Association, www.darksky.org.

PLT	Improve Your Place A Vision for the Future (*Places We Live* high school module)
WILD	Flip the Switch for Wildlife Can Do!
ME	Civics and Government A English Language Arts A, D, E, H Science and Technology B, J
NH	English Language Arts 1, 2, 5, 6 Science 3a SS 9
NY	CDOS 3 Managing Information MST 4 The Living Environment MST 7 Strategies SS 4, 5
VT	1.8 Reports 1.19 Research 2.2 Problem Solving 3.9 Sustainability 3.13 Roles and Responsibility 6.2 uses of Evidence and Data 7.13 Organisms, Evolution, and Interdependence

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4. Wildlife Management Success Stories
Bobcats on a Comeback, by Dave Mance III (pg. 42)
Of Trout and Trees, by Nat Tripp (pg. 24)

The two feature articles above tell hopeful stories in wildlife management—the recovery of New Hampshire's bobcat population and the restoration of brook trout habitat. The articles offer a perfect segue into a study of wildlife population dynamics and wildlife management. Excellent curriculum materials abound on these subjects, including the PLT and Project WILD activities listed below.

Nat Tripp's article describes the art and craft of restoring waterways degraded by human activity. Streambank restoration is a process that lends itself well to student involvement. Contact your local Natural Resources Conservation Service or state natural resources agency to find out how you and your students can get involved in a local stream rehabilitation project.

Websites: Be sure to have students watch the fascinating video of UNH researchers radio-collaring a trapped bobcat at http://vimeo.com/10801715. Derek Broman, the graduate student featured in the 5-minute video, is a great role model for students interested in pursuing careers related to wildlife management.

PLT	Improve Your Place Green Space (*Places We Live* high school module)
WILD	Checks and Balances Wildwork Improving Wildlife habitat in the Community Can Do!
ME	Civics and Government A Science and Technology B
NH	Science 3a Social Studies 4
NY	MST 4 The Living Environment SS 5
VT	3.6 Sustainability 3.13 Roles and Responsibilities 4.6 Understanding Place 7.13 Organisms, Evolution, and Interdependence

Introduction to Streamside Buffer Zones. This pdf offers an excellent overview of the functions and values of streamside forested buffers, www.miamiconservancy.org/flood/pdfs/riparian_buffers.pdf.

Streambank Stabilization. This pdf, produced by the Connecticut River Joint Commissions, offers detailed descriptions of various streambank stabilization techniques, as well as numerous references for additional information, www.crjc.org/pdffiles/streamstab.pdf.

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5. Hands-on Air Pollution Monitoring

Student Scientists Say White Pine Getting Healthier, by Kristen Fountain (pg. 16)

Get your students involved in a real-life scientific research project. The Forest Watch program (coordinated by UNH's Institute for the Study of Earth, Oceans, and Space) offers K-12 teachers and students the opportunity to participate in long-term monitoring of the effects of air pollution on tree health. Specifically, students learn how to monitor ground-level ozone damage on the needles of eastern white pine. More than 360 elementary, middle, and high schools in the Northeast currently participate.

Check out Kristen Fountain's article and visit the Forest Watch website, www.forestwatch.sr.unh.edu, to see how you and your students can get involved.

PLT	Pollution Search Improve Your Place
ME	Science and Technology B, J
NH	Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment
VT	7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

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6. Reading the Landscape

A Place for Wolf Trees by Michael Gaige (pg. 28)

The wolf trees that Michael Gaige describes are but one of the many signs of evolving land use that you can see when you look carefully during a walk in the woods. In his book, *Reading the Forested Landscape,* Tom Wessels devotes a chapter ("Of Junipers and Weird Apples") to just this kind of woodland cue to land use history. Have your students read that chapter of Wessel's book, along with Gaige's article. Then ask your county forester or local naturalist (check with your local Audubon chapter for recommendations) to accompany you and your students on a walk through a nearby woodland to "read" the plentiful ecological signs in the forest that tell fascinating stories about the forest's history.

PLT	Did You Notice? Mapping Your Community Through Time (*Places We Live* high school module)
WILD	Changing the Land
ME	Science and Technology B
NH	Science 3a
NY	CDOS Managing Information MST 4 The Living Environment
VT	6.2 Uses of Evidence and Data 7.13 Organisms, Evolution, and Interdependence

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Career Connection:

At Work Tracking Insects with Melissa Fierke, by Heather Engelman (pg. 50)
Under the Microscope: Forest Spiders, by Virginia Barlow (pg. 71)
Upcountry, by Robert Kimber (pg. 63)

Invertebrates and entymologists figure prominently in the Spring 2011 *Northern Woodlands* issue. Invite an entymologist from your state's department of natural resources to visit with your students and explore the career of entymology. If possible, combine this with Activity #1 above. The entymologist can guide your students in designing the best pitfall traps, creating scientifically rigorous study methods, developing comprehensive data collection sheets, and so on.

PLT	Who Works in This Forest?
WILD	Wildwork
ME	Career Preparation A
NH	Career Learning 7
NY	CDOS 1 HPHE 3
VT	3.15 Career Choices

Calendar Connection

Exploding flowers by Virginia Barlow (pg. 19)

The bunchberry flower is just one of the many blossoms unfolding in the Northern Forest this spring. Take your students for a walk in the spring woods to study flowers. Bring a camera, and have students photograph all the flowers you see. Though herbaceous plants, from trilliums to lady's slippers, may have showiest flowers, don't forget that the trees and shrubs will be flowering too. Back in the classroom, review the photos and have students select one of the flowers you saw in the field to research. Their research can include its mode of pollination, medicinal uses, folklore, habitat, and more. Have students create a display featuring their flower, and encourage them to bring as much art and creativity into the project as possible.

PLT	How Plants Grow
ME	Science and Technology B, J Visual and Performing Arts A
NH	Science 1a, 2a, 3a Visual Arts 1, 6
NY	ART 1 Visual Arts MST 1 Scientific Inquiry MST 4 The Living Environment
VT	5.29 Visual Arts 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Consider having your students take part in a study of flower phenology. (Phenology is the study of the relationship between climate and periodic biological phenomena.) Information gained from phenology studies can help scientists correlate insect emergence and pest control, design orchards for optimal pollination, predict global climate change trends, and more. Project BudBurst is a national phenology study in which your students can participate (See web link below).

Websites: You'll find two great videos of the Bunchberry explosion on the Oberlin College website, www.oberlin.edu/news-info/05may/expflower.html.

For information on the process and applications of wildflower phenology studies, visit http://attra.ncat.org/attra-pub/phenology.html.

The Project BudBurst website provides information on taking part in a national flower phenology study, http://neoninc.org/budburst/.

Wildlife Connection

Calling in the Mob, by Bryan Pfeiffer (pg. 53)

Play a corporate jingle for your student, and chances are they'll instantly know what company it's advertising. But play a bird song, and you'll likely meet a roomful of blank faces. Cultivate songbird literacy among your students. Start simply, with the song and call of the black-capped chickadee, the focal species in *Calling in the Mob.* Teach your students to identify at least ten common songbirds of your area.

WILD	Bird Song Survey
ME	Science and Technology B
NH	Science 3a
NY	MST 4 The Living Environment
VT	7.13 Organisms, Evolution, and Interdependence

Website: Cornell University's All About Birds website, www.allaboutbirds.org, is a great source for bird songs, plus information about physical characteristics, habitat, behavior, and more.

CD: *Birding by Ear* and *More Birding by Ear*, by Richard K. Walton and Robert W. Lawson are CD sets that offer in-depth bird song identification tips for students that really want to dive into the world of bird songs.

Writing from the Land

Seeds of Hope (pg. 34)

Every day, the news is filled with stories of fear, unrest, and conflict. Yet all around us lie the seeds of hope, reasons for optimism and celebration. The *Seeds of Hope* feature article offers perspectives on hope from several Northern Forest residents from various walks of life. After you read the article, write your own essay on what makes you hopeful. What seeds of hope do you see in the world around you?

Word Search

Using the *Spring Calendar* (pg. 4) to help you answer the following clues, find ten animals of the Northern Forest in the word search puzzle below.

1. This waterfowl species nests in tree cavities and duck boxes (two words). HOODED MERGANSER
2. When members of this amphibian species gather in large groups, their mating calls can be heard a half-mile away (two words). SPRING PEEPER
3. On very warm days in springtime, you may see this reptile sunning itself (two words). GARTER SNAKE
4. This mammal sometimes uses white cedar bark to make its nest (two words). RED SQUIRREL
5. This bird species nests in old hawks' nests or in tree cavities (two words). BARRED OWL
6. This songbird builds its nest about ten feet off the ground, using leaves, moss, grass, mud, and rootlets (two words). WOOD THRUSH
7. This small mammal often girdles small fruit and shade trees in winter (two words). MEADOW VOLE
8. This game bird species lays a clutch of about 12 eggs (two words). RUFFED GROUSE
9. This fish species begins to spawn when water temperatures reach 50°F. PERCH
10. This songbird species has one of the most complex and long-winded bird songs known (two words). WINTER WREN

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

Crossword Puzzle

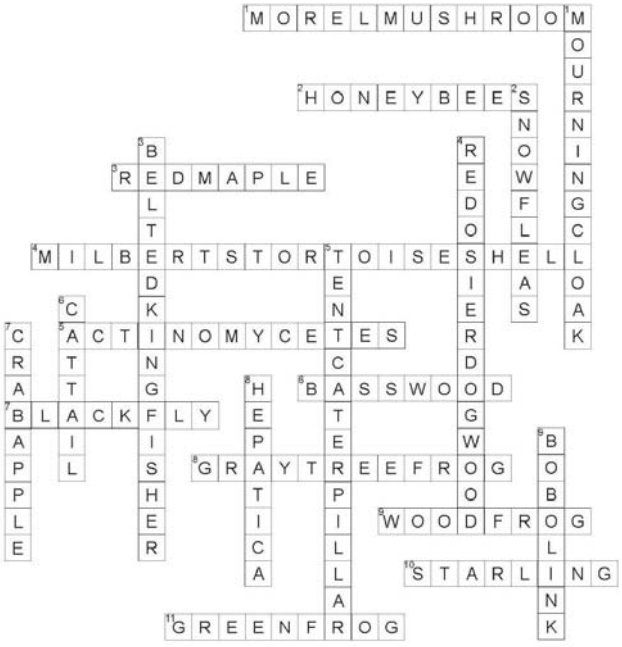
Use the *Spring Calendar* (pg. 4) to help you answer the following clues:

ACROSS

1. When apple blossoms open, it's a good time to hunt for this edible fungus (two words). MOREL MUSHROOM
2. According to folk wisdom, a swarm of these insects is worth a load of hay. HONEYBEES
3. Squirrels, mice, and chipmunks eat the seeds of this hardwood tree (two words). RED MAPLE
4. The adults of this butterfly species feed on sap, rotting fruit, and animal dung in spring (two words). MILBERT'S TORTOISESHELL
5. This bacteria gives soil its characteristic "earthy" smell. ACTINOMYCETES
6. The buds of this hardwood tree are both attractive and edible. BASSWOOD
7. This insect species has been around for 180 million years (two words). BLACK FLY
8. During mating season, this amphibian begins calling during the late afternoon and can continue until after midnight (three words). GRAY TREE FROG
9. A week or two after laying its eggs in a pond, this amphibian returns to the woods to live (two words). WOOD FROG
10. The color of this bird's bill changes from dark brown to bright yellow in spring. STARLING
11. The call of this amphibian sounds like the plucking of a loose banjo string (two words). GREEN FROG

DOWN

1. Individuals of this butterfly species overwinter as adults, so you'll see them flying about on warm spring days (two words). MOURNING CLOAK
2. These little invertebrates appear on the surface of the snow on warm winter days, looking much like flecks of black pepper (two words). SNOW FLEAS
3. You may spot this migratory bird flying along streams and rivers or perching on nearby telephone wires (two words). BELTED KINGFISHER
4. In March, this shrub's twigs are bright red (three words). RED OSIER DOGWOOD
5. The larvae of this insect species hatch from their eggs in late spring, then spin web tents that shelter them as they grow (two words). TENT CATERPILLAR
6. You can peel, cook, and eat the young shoots of this wetland plant. CATTAIL
7. Robins will eat the fruit from this tree in springtime. CRABAPPLE
8. Because of the shape of its leaves, this spring wildflower is also known as liverwort. HEPATICA
9. You may hear this grassland bird stingingly loudly as it flies. BOBOLINK



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