Teacher's Guide
Spring 2010

Northern Woodlands Goes to School Spring 2010

Welcome to the Spring 2010 edition of *Northern Woodlands* magazine. After the long winter, your students are likely itching to get outside and explore the greening world. In this issue of *Northern Woodlands*, you'll find many articles on wide-ranging subjects—from the art and economics of maple sugaring to the ecological ramifications of creating vernal pools—that will spur you on to investigate the forest.

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 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 Maine TREE foundation, Alexander Host Foundation, and Ghostwriters Communications for their support of this project. As a result of their generosity, over 5,000 students throughout the Northeast are able to participate in Northern Woodlands Goes to School this year.

We would love to know your thoughts about our teacher's guide. If you have comments or suggestions, just call or email Dave Mance III at (802) 439-6292 (email: dave@northernwoodlands.org).

Noteworthy News

Located in Shelburne, Vermont, on a 1400-acre working farm and forest on Lake Champlain, Shelburne Farms has built a reputation for excellent teacher training in environmental education. Check out Shelburne Farm's slate of workshops for Summer 2010, including Principles & Promising Practices of Place-based Education, Education for Sustainability (EFS) Institute, and Project Seasons training. http://www.shelburnefarms.org/educationprograms/index.shtm.

Springtime is gardening time. The National Wildlife Federation's Schoolyard Habitats program provides information, lesson plans, and resources for creating a wildlife habitat garden at your school www.nwf.org.

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1. The Poetry of Ecology

Webs, by Laurie DiCesare (pg. 65)

What's going on in this poem? What is a mud dauber? And what is its relationship with the spider? In just three poetic phrases, DiCesare has taken a complex ecological relationship, whittled it down to its essence, and left us with lingering images of the intimate connection between wasp and spider, and of life relationships in general. Discuss the poem as a class—from DiCesare's use of alliteration and metaphor to her choice of words to build tension, action, and clarity.

DiCesare's poem calls to mind the poems of Pulitzer Prize-winning poet Mary Oliver. Have each student select a Mary Oliver poem that focuses on the natural world (not all of them do) to read and explore. Ask the students to answer some basic questions about the poem: What is happening in this poem? What part of nature does the poem describe? What metaphors does Oliver use in the poem? What larger issues do you think she is exploring in this poem? Do you like the poem? Why? Have students read their Mary Oliver poems aloud in class.

Then have them select a plant or wildlife species to observe—one that's not too difficult to observe in your area in spring. Have them observe it and create a journal entry of their observations of it. Then have them write a poem based on those observations. Often, for students who are unfamiliar or uncomfortable with poetry writing, a poem that uses a precise structure—like haiku, haibun, pantoum, and so on—helps loosen their creativity. *Poetry Everywhere* can guide you through the process of helping your students create poems.

PLT	Poet-Tree
WILD	Animal Poetry
ME	English Language Arts A, E Science and Technology B, J
NH	English Language Arts 1, 2 Science 1a, 2a, 3a
NY	ELA 1 Listening & Reading ELA 2 Speaking & Writing MST 1 Scientific Inquiry MST 4 The Living Environment
VT	1.7 Responses to Literature 1.23 Poetry 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Books: *Poetry Everywhere: Teaching Poetry Writing in School and in the Community,* by Jack Collom and Sheryl Noethe. Teachers & Writers Collaborative: 2005.

New and Selected Poems, by Mary Oliver. Beacon Press: 1992.

Owls and Other Fantasies, by Mary Oliver. Beacon Press: 2003.

Website: www.unm.edu/~abqteach/l&e/00-04-04.pdf. Rudiments of Ecology Through Literature and the Environment. Offers one educator's approach to integrating literature and life science, including the reading and discussion of a Mary Oliver poem.

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2. Digging into Soil
Why Trees Grow Where They Do in Northeast Forests (pg. 46)

Looking at soil profiles in books can be a pretty dry endeavor. But give your students shovels, hand lenses, some Ziploc bags, and a pH kit, and the process becomes an adventure. (Note: in the article, the author doesn't mention testing pH, but it's a great way to learn about the soil's "sweetness," which affects the species of plants that can grow there). Invite your county forester or local NRCS soil scientist to join you and your students in the forest. Ask him or her to bring soil maps of the forest you'll be exploring. Have your invited guest demonstrate to the whole class how to dig and assess a soil test pit. Then divide students into groups of three or four. Walk through the section of forest you're interested in studying and select sites for digging test pits, trying to choose sites that seem different from one another, in terms of species growing there, slope, wetness, and so on. Your aim is to get a variety of soil profiles.

PLT	Soil Stories Nature's Recyclers The Fallen Log
ME	Science and Technology B, J, L Geography A
NH	Science 1a, 2a, 3a, 6c Social Studies 10, 15
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 6 Models CDOS 3 Thinking Skills
VT	1.22 Simulation and Modeling 4.6 Understanding Place 6.7 Geographical Knowledge 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Have each group of students dig a soil test pit, identify and measure the thickness of each soil layer, test the pH of each layer, and draw a profile of their pit. Be sure to tell students to remove the soil layers carefully, so that they can return the site to as close to its undisturbed condition as possible when their work is complete. When each group is finished, take the entire class on a tour of the test pits. Along the way, the class members who created each pit will explain their findings to the rest of the class.

Do their findings agree with the published soil maps? These maps are often quite general in nature and miss the immense variations in soil type that actually exist in a given forest.

Websites: http://soils.usda.gov/education/resources/lessons/index.html. This Natural Resources Conservation Service (NRCS) website offers lesson plans for middle school and high school students. One entitled "A soil profile" would make a good companion to the activity of digging a soil pit.

ftp://ftp-fc.sc.egov.usda.gov/NSSC/Educational_Resources/surdown.pdf. This extensive PDF created by the NRCS, entitled, "From the Surface Down," offers great background information on soil formation, profiles, and more.

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3. Welcome to the (Natural) Community!
Red Maple Jumps to an Early Lead, by Todd McLeish (pg. 54)
Why Trees Grow Where They Do in Northeast Forests (pg. 46)

PLT	Cast of Thousands (*Forest Ecology* high school module)
ME	English Language Arts A, D, H Science and Technology B, J
NH	English Language Arts 1, 5 Science 1a, 2a, 3a
NY	CDOS 3 Managing Information MST 1 Scientific Inquiry MST 4 The Living Environment
VT	1.19 Research 4.6 Understanding Place 6.3 Analyzing Knowledge 7.13 Organisms, Evolution, and Interdependence

You can carry out this activity on its own or in tandem with the preceding soil activity, with which it is closely related. As the *Why Trees Grow* article points out, different soils support different assemblages of plants. Soil is not the only factor that determines the plant species that grow in a certain locale—slope, aspect, climate, elevation, drainage, and so on all contribute to determining the species mix. The interacting assemblage of plants, animals, their physical environment, and the natural processes that affect them is known as a natural community. In Vermont alone, ecologists have identified 80 distinct natural communities across the state.

Your students can learn about natural communities first-hand by inventorying the plants (for this activity, you'll focus on tree species) that grow on different sites in the forest. You might invite your county forester or a local naturalist to help you identify tree species, but you and your students can also figure out the species on your own with the help of field guides (see below). As in the soil study above, demonstrate the process with the entire class. From a given point, circle out and identify the trees you find around you, and record them. Then use the book *Wetland, Woodland, Wildland* to identify the natural community that comprises those species.

Next, divide the students into small groups. Walk through the section of forest you're interested in studying and have students select sites for their assessments, making an effort to choose sites that seem different from one another, in terms of species growing there, slope, wetness, and so on. Your aim is to assess a variety of natural communities. When students have completed their assessments, walk as a class from site to site. When you reach a particular study site, the students who assessed that site should describe the plants they found there and suggest what natural community they might be in.

McLeish's article on the effects of logging on regrowth of red maples and oaks in Pennsylvania provides insights into the many factors that can skew your findings in the field. A forest area that's actively managed for maple sugaring, for instance, will have an inordinately high proportion of sugar maples to other species, and land managers may even have largely eliminated certain species from the forest in their efforts to nurture sugar maples. Students should look for evidence of logging in their study area, which might have altered the site's species composition.

Books: *Wetland, Woodland, Wildland,* by Elizabeth Thompson and Eric Sorenson. Vermont Department of Fish and Wildlife and the Nature Conservancy: 2000. Also available on line at the Vermont Fish and Wildlife Department website. www.vtfishandwildlife.com/books.cfm?libbase_=Wetland,Woodland,Wildland.

Sibley Guide to Trees, by David Allan Sibley. Alfred A. Knopf, 2009. Reviewed in this issue of *Northern Woodlands*, on page 64.

The Tree Identification Book, by George W. Symonds. Harper Paperbacks: 1973.

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4. Celebrating Bats

Bats on the Brink, by Madeline Bodin (pg. 38)

Bodin's article starkly illuminates the fact that entire species within the forest communities we inhabit are at risk. Help students more fully comprehend the nature of this loss by celebrating bats. Have students divide into nine groups, and have each group select one of the nine species of bats that lives in your region. Within their groups, each student should research a different aspect of their bat's natural history. Students will work together to create an exhibit that celebrates their bat and then give an in-class presentation. Place the student exhibits on display in the school library or in a public venue in your community, along with an additional display, created by the class as a whole, as to the impact of white-nose syndrome on these bats.

Though the outlook for many northeastern bat species is grim, students can supplement habitat for bats by building bat houses. Penn State provides a PDF that provides instructions for building bat houses, as well as plenty of background information on bats (see website listing below.)

WILD	Habitat Lap Sit
ME	English Language Arts A, D, E, H Visual and Performing Arts A Science and Technology B
NH	English Language Arts 1, 2, 5, 6 Visual Arts 1, 6 Science 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 7 Strategies CDOS 3 Managing Information ART 1 Visual Arts
VT	1.5 Writing Dimensions 1.8 Reports 1.19 Research 4.6 Understanding Place 5.29 Visual Arts 6.3 Analyzing Knowledge 7.13 Organisms, Evolution, and Interdependence

Website: www.pubs.cas.psu.edu/FreePubs/pdfs/uh081.pdf. Penn State offers an on-line publication, "Homeowner's Guide to Northeastern Bats and Bat Problems," which provides information on bats and instructions for building bat houses.

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5. The Economics of Sugaring

To Tap or Not to Tap, by Andrew Fast and Steve Roberge (pg. 34)
When Tapping, Don't Disregard Red Maple, by Tim Wilmot (pg. 9)
Place in Mind, by Catherine Tudish (pg. 72)

Fast and Roberge's article offers students insights into the economics of maple sugaring, helping them understand why a gallon of syrup costs upwards of $45 dollars today. Wilmot's article adds to the story, suggesting an avenue (tapping red maples) that can increase sap yield, and Tudish's article gives the flavor of the sugaring experience.

Visit two sugaring operations in your community with your students. If possible, one should be a large-scale operation that utilizes vacuum, reverse osmosis, steam recovery devices, and other state-of-the-art technologies. The other should be a small-scale operation, utilizing more traditional technologies—buckets, hand- or horse-drawn transport, wood-fired evaporator. Before visiting, students should prepare questions for whomever is in charge of the sugaring operations—questions that delve into the finances, aesthetics, philosophy, and so on of their sugaring operation. Then have each student compare and contrast the two in an

PLT	Personal Places (*Places We Live* high school module)
ME	Economics A Science and Technology B
NH	Social Studies 5, 9 Science 3a, 4c
NY	MST 4 The Living Environment SS3 SS 4
VT	3.9 Sustainability 4.6 Understanding Place 6.15 Knowledge of Economic Systems 6.19 Identity and Interdependence 7.13 Organisms, Evolution, and Interdependence 7.16 Natural Resources & Agriculture

essay, addressing such issues as efficiency, economy of scale, time commitment, net profits (or losses), and more.

As always, don't miss the chance to do a bit of sugaring with your students—even a single bucket on a schoolyard tree, boiled down on a parent's woodstove and served up with pancakes made on an electric griddle in the classroom, can celebrate this age-old rite of spring.

Website: http://www.massmaple.org. Massachusetts Maple Producers Association website has lots of interesting information about maple sugaring, including information on economics. Likewise every other state in the Northeast has its own Maple Producers Association. Simply search "maple producers" on the internet, and you'll come up with a full listing.

Book: *Backyard Sugarin': A Complete How-to Guide, Third Edition*, by Rick Mann. Countryside Press: 2003. For thirty years, this book has provided guidance for the home sugarer and can help you and your students tap and boil successfully.

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6. **Exploring Tree Phenology**

Flower Show in the Woods, by Dave Mance III (pg. 24)

This article offers a great opportunity for you and your students to step out into the greening forests, learn about tree flowers, and collect data that contribute to real scientific investigations in phenology. Phenology is the study of the relationship between climate and periodic biological phenomena—in this case, the flowering of forest trees and shrubs. Scientists have become particularly interested in plant phenology in recent years because it provides a means for assessing the ecological impacts of global climate change.

PLT	Bursting Buds
ME	Science and Technology B, J
NH	Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 6 Patterns of Change CDOS Managing Information
VT	1.19 Research 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Take your students into the forest—preferably once a week if possible— to observe the phenology of forest plants. Have each student select a particular specimen to track throughout the spring, and mark it with forester's flagging on which the student can write his name. In a field journal, the student should make observations, in writing and sketches (and photographs, if they wish) of the tree's spring unfolding. If possible, the student should follow the plant from bud swelling through seed production and dispersal.

In the article, Mance provides a link to the USA National Phenology Network, which is seeking volunteers to help them monitor some 200 plant species found across the United States, everything from lilacs to red maples. Get your students involved in this impressive nationwide monitoring program, so they learn the process of collecting data for a real scientific research project. The website offers clear, concise written instructions and training videos to guide your students through the process.

Websites: www.amnh.org/learn/biodiversity_counts/read_select/hs/fieldjnl.htm. The American Museum of Natural History has a good information page on keeping a science field journal, which will be helpful to your students.

The Field Museum also has a great page on field journaling, which includes a video of a scientist explaining what he includes in his journal. www.fieldmuseum.org/undergroundadventure/teachers/field_journal.shtml#.

Wildlife Connection

Birds in Focus, by Bryan Pfeiffer (pg. 23)

There's no time like springtime to get your students out in the woods, looking at and listening to birds. Birdwatching helps students learn how to see—how to notice details that transform a "little brown bird" into an ovenbird, Lincoln's sparrow, or American pipit. Pfeiffer's brief article gives great instruction on what to focus on in those brief moments when a bird lingers long enough for a few quick, key observations.

Invite a few members from your local Audubon Society chapter to accompany you and your students into the woods to look for birds. The more volunteers you have, the smaller the bird-watching groups will need to be. Encourage your volunteers to teach students ***how*** to identify the birds they see, both by sound and sight, not to simply tell students what they are. Have students record their findings in their field journals, including not only the bird's name, but also the habitat in which they saw it and a brief description of what it seemed to be doing. Compare the findings of each birding group to generate a species list for the day.

As follow-up, students should select one of the bird species they identified in the field, research it, and write a brief report, with accompanying graphics, on the bird. Have students share their findings with the rest of the class.

WILD	Bird Song Survey
ME	English Language Arts A, D, E, H Science and Technology B, J
NH	English Language Arts 1, 2, 5, 6 Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 6 Patterns of Change MST 7 Strategies CDOS 3 Managing Information
VT	1.8 Reports 1.19 Research 4.6 Understanding Place 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Book: There are many good bird field guides, but one excellent one is *The Sibley Field Guide to Birds of Eastern North America,* by David Allen Sibley and Rick Cech. Knopf: 2003.

Calendar Connection

Creating a Vernal Pool, by Solon Rhode (pg. 20)

Rhode's short article describes his efforts to create a very particular and important wildlife habitat—vernal pools. This article is a good lead-in for students to learn about what vernal pools are and why they are important to so many wildlife species, particularly amphibians. Springtime is, of course, the time to investigate vernal pools in the wild. Consult your county forester for suggestions of forest sites to visit where you'll see vernal pools (Combine this with your Wildlife Connection birding outing, if possible!). Be sure to have students record any amphibian sightings they make. All northeastern states offer a citizen monitoring program for amphibians—your students can gather data for your state's program. The excellent DVD, "Rattlers, Peepers, and Snappers," produced by Vermont Reptile and Amphibian Atlas director Jim Andrews and Peregrine Productions, gives students great background on both amphibians and reptiles of the northeast.

WILD Aquatic	Puddle Wonders
ME	Science and Technology B, J
NH	Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 6 Patterns of Change CDOS Managing Information
VT	1.19 Research 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Websites: www.rpsdvd.com. For information on ordering the "Rattlers, Peepers, and Snappers" DVD.

www.community.middlebury.edu/~herpatlas/herp_index.htm. Complete instructions and data collection sheets for participating in the Vermont Reptile and Amphibian Atlas.

www.maineaudubon.org/conserve/citsci/mamp.shtml. Maine Amphibian Monitoring Program information.

www.cfb.unh.edu/programs/LLMP/nhllmp.htm. New Hampshire Lakes Lay Monitoring Program.

www.dec.ny.gov/animals/50247.html. New York State's frog and toad citizen monitoring program

Career Connection
What Is Forest Stand Structure and How Is It Measured? by Michael Snyder (pg. 15)

In his article, forester Michael Snyder describes how his work as county forester has evolved as scientific understanding of forest ecology has evolved. Invite your local county forester into the woods with you and your students to study forest structure and learn about how he or she interacts with and experiences the forest in the course of his or her work as county forester.

As Snyder points out, forest stand structure is interconnected with biodiversity. The more complex the stand structure, the more habitat niches are available for living organisms. If possible visit a forest that has within it examples of simple and complex forest structure. An example of a forested area with a very simple stand structure would be a pine or spruce plantation. Have students explore such an area and record the plants and animal species (or signs of wildlife species) they observe there. Compare that to the species list you generate in a nearby forest stand which has well developed herbaceous, shrub, and canopy layers, plus standing and downed dead trees. In which would you expect to find greater diversity? What are your findings? Have students create a display (with images and text) that illustrates the interconnection between stand structure and biological diversity.

Website: Penn State's Sustainable Forestry Teacher Resource Center offers many forestry-related lesson plans, including this plan on sustainable forestry, which explores the importance of retaining stand structure during timber harvests. www.sftrc.cas.psu.edu/LessonPlans/Forestry/SustainableForestry.html.

PLT	Trees as Habitat Field, Forest, and Stream
WILD	Which Niche?
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 MST 6 Patterns of Change
VT	5.29 Visual Arts 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

HANDOUTS

Writing from the Land
Place in Mind, by Catherine Tudish (pg. 72)

Tudish's essay vividly describes one of her favorite rites of spring—taking part in neighborhood sugaring. What is one of your favorite springtime activities or rituals? Describe it in detail, drawing from specific past experiences. Use your words to evoke the smells, sounds, tastes, and textures of the experience.

Crossword Puzzle

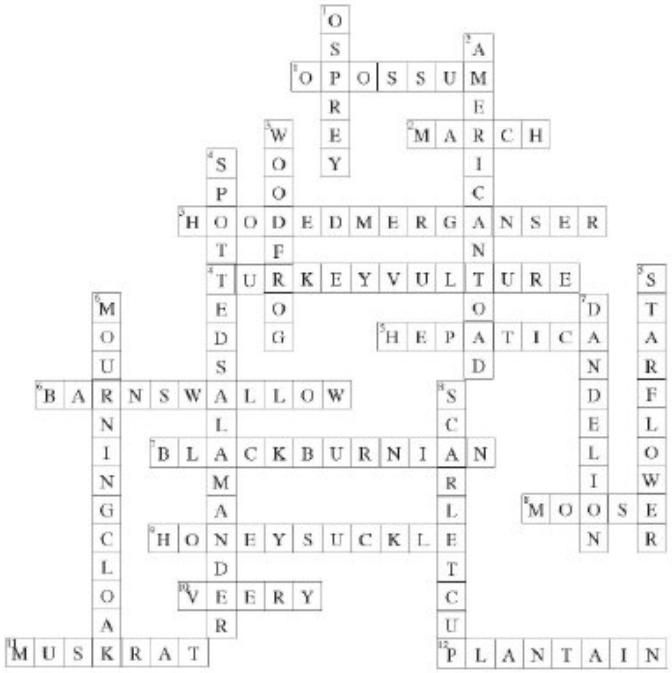
Use the *Spring Calendar* (pg. 4) to help you answer the following clues:

ACROSS

1. The young of this mammal spend their first 60 days in their mother's pouch. OPOSSUM
2. Saturn will be at its closest to Earth during this month. MARCH
3. This migratory waterfowl species returns to its breeding ponds once ice melts (two words). HOODED MERGANSER
4. As it migrates north, this bird species rides on storm fronts, sometimes as much as four miles above the ground (two words). TURKEY VULTURE
5. You may find this wildflower blooming at the base of trees as soon as snows melt. HEPATICA
6. This bird species now migrates back to the Northeast somewhat earlier than it did 20 years ago (two words). BARN SWALLOW
7. One of several warbler species to return in May. BLACKBURNIAN
8. Because they shed their heavy winter coats in spring, you may find ragged clumps of this mammal's hair this time of year. MOOSE
9. The pale green leaves of this invasive plant are visible in the forest before those of most other shrubs. HONEYSUCKLE
10. The nest this bird builds incorporates dead leaves into its base and is very large compared to the size of the bird. VEERY
11. This aquatic mammal gives birth to up to eight babies in a litter, each weighing less than an ounce. MUSKRAT
12. The very young leaves of this weed are good in salads. PLANTAIN

DOWN

1. You may see this large bird of prey along big rivers in springtime. OSPREY
2. Melanin helps protect this amphibian's eggs from overexposure to ultraviolet light (two words). AMERICAN TOAD
3. One to two weeks after laying its eggs in a pond, this amphibian returns to the forest (two words). WOOD FROG
4. The female of this amphibian deposits her eggs in large spherical masses (two words). SPOTTED SALAMANDER
5. This spring wildflower is found in the north all around the globe. STARFLOWER
6. On cold spring days, this butterfly species basks on a dark surface to warm its flight muscles (two words). MOURNING CLOAK
7. You can eat the flowers of this lawn weed. DANDELION
8. You'll find this bright red fungus on fallen hardwood branches (two words). SCARLET CUP



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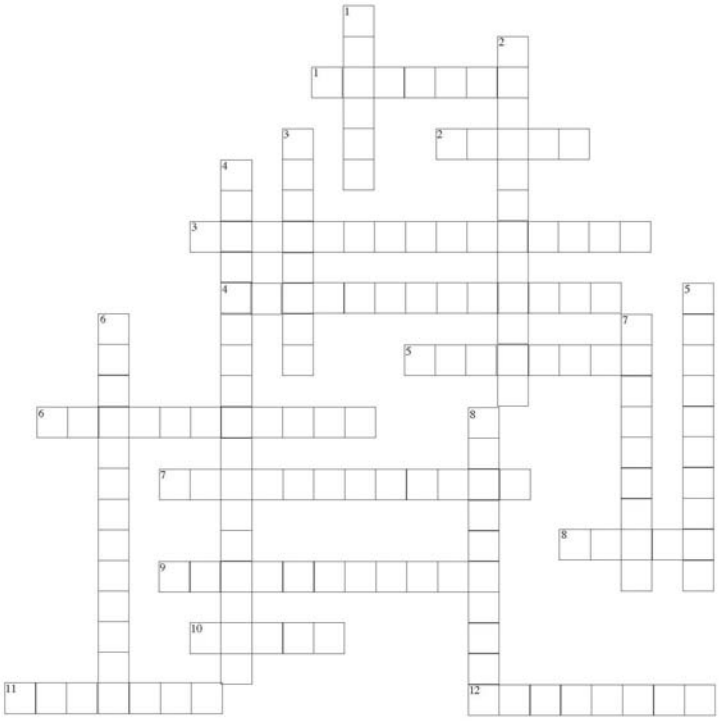

WORD SEARCH

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 insect looks very similar to the Asian longhorned beetle, though it has a white spot at the top of its wing covers, which the Asian beetle lacks (three words). WHITE-SPOTTED SAWYER
2. Scientists believe that the return of these migratory mammals may be synchronized with the first moth hatches of spring (two words). TREE BATS
3. This colorful migratory bird returns to the northeast in early March. BLUEBIRD
4. The fur of this mammal turns white in winter (three words). SHORT-TAILED WEASEL
5. Wetlands provide an important springtime feeding habitat for this large mammal. BEAR
6. This mammal gives birth to just one offspring each year, usually in a tree cavity or rock fissure. PORCUPINE
7. This small mammal breeds year-round, having 4-10 litters each year (two words). MEADOW VOLE
8. This vocal songbird makes its nest among the roots of overturned trees (two words). WINTER WREN
9. This species of duck is among the first to return to the Northeast (two words). GREATER SCAUP
10. This songbird nests in tree cavities and abandoned woodpecker holes. CHICKADEE

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