



Spring 2009 Northern Woodlands Goes To School

Welcome to the Spring 2009 edition of *Northern Woodlands* magazine. In it, you'll find articles that will inspire you and your students to explore the greening springtime forest. Does sugar maple sap vary significantly from tree to tree in its sugar content? How do the flowers of forest trees become pollinated? Is genetic engineering an ethical means for bringing back the American chestnut? Your students can delve into these and countless other questions as they read through this season's issue of *Northern Woodlands*.

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 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, or if you need more (or fewer) copies of the magazine for your students, just call or email Dave Mance III at (802) 439-6292 (email: dave@northernwoodlands.org).

Noteworthy News

New Reptile and Amphibian DVD. Filmmaker Vince Franke and herpetologist Jim Andrews have teamed up to create the *Rattlers, Peepers & Snappers* DVD. It's chock-full of great information on northeastern reptiles and amphibians, including captivating field footage and interactive quizzes. You and your students can get a taste of the DVD by downloading a sample segment of it at www.rpsdvd.com. You'll find a review of the DVD on page 18 of this *Northern Woodlands* issue, as well as a related educational activity below.

Starting a School Garden. The Center for Ecoliteracy in Berkeley, California, offers an excellent guidebook to creating a school garden to use as an outdoor classroom. Called *Getting Started*, it's available free to schools nationwide for a limited time—until February 15, 2009, according to their website. So order yours now at www.ecoliteracy.org/publications/getting-started.html.

1. Forest Certification

Forestry's Big Idea Comes to Small Parcels, by Tovar Cerulli (pg. 26)
Tovar Cerulli's article highlights the complexities of forest certification and the many new developments in that field. Cerulli notes that certification has yet to offer a real payback to non-industrial private landowners. So why do so many landowners choose to spend the time and money certifying their forests? The reason, as evidenced by the landowners in Cerulli's article, is that family forest owners want to do right by their forests, to conserve the land's health and beauty. Creating a certified forest management plan is one way of acting upon that desire.

What does ecological forestry look like in practice? What constitutes a healthy forest? How can landowners act in the best interest of their forest? Foresters and ecologists have been pondering these questions for decades. To provide an engaging background for this discussion, have students read two classic essays written by forester and ecologist Aldo Leopold: "The Farmer as Conservationist," written in 1939 and "The Land Ethic," published in 1949, after Leopold's death. The latter essay contains many gems that underpin ecological thinking today, such as "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." and "Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity." Leopold identified four indicators of land health: native biological diversity, water quality, soil stability and fertility, and the absence of exotic species. These indicators guide ecological forestry practices today.

Invite a forester familiar with certifying forests to lead your students on a walk through a certified forest in your area. (Or if there isn't one nearby, walk through a non-certified forest and have the forester explain where the forest does and does not meet certification standards.) Ask the forester to point out the management practices underway in this forest that safeguard Leopold's four health indicators. Then have students integrate their learning by writing an essay on what constitutes a healthy forest.

Books: "The Farmer as Conservationist." From *For the Health of the Land*, by Aldo Leopold. Island Press: 1999.

"The Land Ethic." From *A Sand County Almanac*, by Aldo Leopold. Ballantine Books: 1970.

Website: **Vermont Family Forests Checklist of Forest Management Practices.** www.familyforests.org/ecoforestry/documents/ForestManagementChecklist_000.pdf. This checklist describes 40 management practices that meet or exceed Forest Stewardship Council certification standards.

Forest Stewardship Council. www.fscus.org.

PLT	400-acre Wood Tree Lifecycle Adopt-a Forest (<i>Forest Ecology</i> High School Module) Cast of Thousands (<i>Forest Ecology</i> High School Module)
WILD	Checks and Balances
ME	English Language Arts A, E Science and Technology B, J
NH	English Language Arts 1,2 Science 3a
NY	ELA 1 Listening & Reading ELA 3 Speaking and Writing MST 1 MST 4 The Living Environment
VT	1.7 Responses to Literature 1.11 Persuasive Writing 4.6 Understanding Place 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence 7.16 Natural Resources and Agriculture

2. Sugaring Season

Sugar Content, by Dave Mance III (pg. 17)

Maple sugaring offers fabulous (and delicious) educational opportunities. After reading Mance's article on sugar content, have your students conduct their own experiments in maple sap sugar content. If there are sugar maples in the immediate vicinity of your school, tap 4 or 5 of them during sugaring season (you can likely borrow buckets, spiles, covers, and a hand drill from a local sugarmaker). Collect the sap and measure its sugar content, using a refractometer (you can borrow this from a local sugarmaker or from your

county forester). Calculate the average sugar content of the trees you select. Have students taste the various saps and see if they can distinguish the differences in sugar content. Then compare the sugar content of sugar maple sap with that of other maple species. If nearby sugar maples aren't available, make plans to visit a local sugarbush with your class and conduct the experiments with the aid of the sugarmaker.

Boil down the sap you collect from your schoolyard maples (or get a gallon or two from the sugaring operation you visit). If you or your students have a backyard sugaring set-up already, then you're all set for boiling. If not, you can easily build a simple outdoor boiler with the help of *Backyard Sugarin'* (see below). Or you can boil down a small quantity (a few gallons of sap) on a wood cook stove. Be sure to follow the instructions for tapping and boiling maple syrup by the Maine Cooperative Extension below. As you and your students enjoy eating the fruits of your labors, you can compare the sugar content of raw sap with finished syrup!

Have students create a display that explains the process of creating maple syrup—from the biology of tree sap flow to the art of boiling.

Website: **Maple sugaring middle/high school curriculum:** www.stevesauter.com/Maple_Syrup_Lesson_Plan.html. Offers a good timeline of maple sugaring practices, from pre-settlement to the present.

How to Tap Maple Trees and Make Maple Syrup. An on-line PDF by Maine Cooperative Extension. www.umext.maine.edu/onlinepubs/PDFpubs/7036.pdf

Book: *Backyard Sugarin': A Complete How-to Guide.* by Rink Mann. 3rd Edition, Countryman Press: 2006.

ME	Science and Technology B, J, L, M English Language Arts E, H Visual and Performing Arts A
NH	Science 1a, 2a, 2c, 3a, 4c, 6c English Language Arts 2, 6 Visual Arts 1, 6
NY	MST 1 Scientific Inquiry MST 6 Patterns of Change MST 6 Models ART 1 Visual Arts
VT	1.22 Simulation and modeling 5.29 Visual Arts 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence 7.16 Natural Resources and Agriculture

3. Love is in the Air

Spring Comes to the Turkey Woods, by Dave Mance III (pg. 34)

Fireworks, by Bryan Pfeiffer (pg. 23)

Spring is mating season for many animals, particularly birds. While many of their courtship rituals may seem curious or amusing to us, they serve a clear evolutionary purpose. Have each student choose a bird to study and report on its courtship rituals, including song, plumage displays (like the kinglet's red crown or the turkey's fanned tail and dropped wing tips), and so on. How does the male court the female? Where do they nest? Who builds the nest? Who incubates eggs and raises young? Do they mate for life or just for one season? What evolutionary purpose do the species' mating rituals serve? Have students create a captivating display for their bird species, with photos and/or illustrations, vivid text, and any other visual or audio supports.

Book: *The Sibley Guide to Bird Life and Behavior*, edited by Chris Elphick, John B. Dunning, Jr. and David Allen Sibley. Alfred A. Knopf: 2001. You'll find a good general account of bird reproductive behavior in the beginning of the book, plus specifics on various species throughout.

Website: Your students will love this clip from the excellent DVD series Planet Earth, available on YouTube, in which a male Bird of Paradise uses a stunning plumage display to attract a female. A fun way to introduce the idea of courtship displays. www.youtube.com/watch?v=nS1tEnfkk6M&feature=related.

WILD	Bird Song Survey
ME	English Language Arts A, D, H Science and Technology B Visual and Performing Arts A
NH	English Language Arts 1, 2, 5, 6 Science 3a Visual Arts 1, 6
NY	CDOS 3 managing Information MST 1 Scientific Inquiry MST 4 The Living Environment MST 7 Strategies ART 1 Visual Arts
VT	1.18 Information Technology 1.19 Research 6.2 Uses of Evidence and Data 7.13 Organisms, Evolution, and Interdependence 5.29 Visual Arts

4. Biotechnology Ethics

Reviving a Fallen Giant, by Robin Respaut (pg. 40)

In her article, Respaut describes attempts to develop a blight-resistant American Chestnut through genetic modification. This article offers a perfect window into the ethical debate surrounding genetic engineering, a branch of science in which scientists create new varieties of plants, animals, and micro-organisms by manipulating genes in ways that do not occur naturally. Have your students choose and research a current issue in genetic modification. (They'll find many, many possible topics when they search the internet, as genetic modification of food crops and laboratory animals is frequently in the news.) Have them write a report on their topic, then engage in a debate on the subject as a class. What are the pros and cons of genetically modified organisms (GMOs)? Is genetic modification an ethical practice? What about in the specific case of the American Chestnut?

Website: Students will find many websites that either condemn or support genetic engineering. If they search "genetic engineering pros and cons," they'll come up with several sites that offer a somewhat balanced assessment of this branch of science. But they should be aware of underlying biases, depending on what organization or individuals are hosting the website.

PLT	Home Sweet Home (<i>Forest Ecology</i> High School Module)
ME	English Language Arts A, D, E, H Science and Technology B, M
NH	English Language Arts 1, 2, 3, 5, 6 Science 3b
NY	CDOS 3 Managing Information ELA 3 Listening and Speaking ELA 3 Speaking and Writing MST 7 Strategies MST 4 The Living Environment
VT	1.8 Reports 1.11 Persuasive Writing 1.18 Information Technology 1.19 Research 1.21 Selection 6.2 Uses of Evidence and Data 6.3 Analyzing Knowledge 6.14 Forces of Unity and Disunity 6.18 Nature of Conflict 7.13 Organisms, Evolution, and Interdependence

5. Fun with Fungi

Growing Shiitake Mushrooms, by Angela Cannon-Crothers (pg. 49)

While Cannon-Crothers' article describes the how-to's of outdoor growing of shiitake mushrooms, you can take the process indoors for a fun and delicious unit on the fungus kingdom. Fungi play a critical role in Earth's ecosystems, cycling nutrients for plants, animals, and bacteria. Many land plants grow symbiotically with fungus species that protect them from disease and help in the absorption of nutrients from the soil.

Grow fungi in the classroom with a mushroom-growing kit. While the one listed below is specifically for educators, you can find many edible mushroom kits on-line. Have students record in words and pictures the life cycle of their classroom mushrooms in a journal—from inoculated wood to mushroom growth and harvest. Be sure to leave a few mushrooms unharvested to see how they age and decay. Sauté your edible mushrooms in butter and garlic for a classroom treat!

Website: www.gmushrooms.com/POTS.HTM. Educator's Mushroom Kit, with curriculum materials for K-12 (indicate your grade level when you order the kit).

PLT	The Fallen Log Pass the Plants, Please Adopt-a-Forest (<i>Forest Ecology</i> High School Module)
ME	English Language Arts E, H Science and Technology B, J Visual and Performing Arts A
NH	English Language Arts 2, 6 Science 1a, 2a, 3a Visual Arts 1, 6
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 7 Strategies ART 1 Visual Arts
VT	1.5 Writing Dimensions 3.9 Sustainability 5.29 Visual Arts 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

6. Pollination Strategies

Why Are Some Trees Pollinated by Wind And Some by Insects? by Michael Snyder (pg. 25)

Take a walk in the spring woods with your students and see what pollination strategies are underway in the trees and shrubs. Snyder's article offers a general list of which trees have wind-dispersed pollen and which have animal-dispersed pollen. Bring the list with you and see what tree species are in bloom and what their flowers look like. Bring a forester or naturalist along if you'd like a hand with tree and flower identification. Have students examine various tree flowers, photograph and/or sketch them. Do they notice physical differences between animal-pollinated and wind-pollinated flowers? Did the flowers open before the leaves or after? Do they see any animal pollinators around the trees?

PLT	The Nature of Plants (<i>Forest Ecology</i> High School Module)
ME	Science and Technology B, J
NH	Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment
VT	7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Book: *The Tree Identification Book*, by George W. Symonds and Stephen V. Chelminski. Collins Living: 1973. Take this classic and easy-to-use tree ID book into the woods with you, and have students key out the trees they see.

Career Connection

Len Reitsma: At work with Canada Warblers, by James Jukosky (pg. 38)
This article will give your students insights not only into the population ecology of Canada warblers, but also into some of the career choices of an accomplished ornithologist. Reitsma exemplifies the possibility of combining one's avocation and vocation, one's passion and career. Invite an ornithologist or other life science biologist into your classroom or, far better, accompany them into the field to learn the specifics of what they do in their profession, hear about their research, and watch them in action. The nature programs students see on television can give a misleading impression of biological fieldwork, since they distill the long hours of field research into a few key moments of exciting footage. Encourage your invited guest to give an honest assessment of the highs and lows of his or her profession.

PLT	Who Works in this Forest?
WILD	Wildwork Wildlife Research
ME	Career Preparation A
NH	Career Learning 7
NY	CDOS 1 HPHE 3 Home Economics
VT	3.15 Career Choices

Wildlife Connection

Rattlers, Peepers & Snappers, DVD review by Steve Faccio (pg. 18)
Spring's a wonderful time to get out in the woods to look for reptiles and amphibians. *Rattlers, Peepers & Snappers* is a three-hour DVD that will help you and your students do just that. Created by filmmaker Vince Franke and herpetologist Jim Andrews, the DVD includes several useful segments, including identification information on the 52 species of reptiles and amphibians in the Northeast and species identification quizzes. The *Field Adventures* section includes several captivating segments in which students can watch biologists studying reptiles and amphibians in the field.

Invite a local naturalist with knowledge of reptiles and amphibians to help you lead your students on a spring exploration of nearby seeps and wetlands to look for egg masses, tadpoles, and other evidence of springtime activity. Record your findings, using the data sheets provided by the Vermont Reptile and Amphibian Atlas, created by Jim Andrews. If you live in

PLT	Adopt-a-Forest (<i>Forest Ecology</i> High School Module)
ME	Science and Technology B, J
NH	Science 1a, 2a, 3a
NY	MST 1 Scientific Inquiry MST 4 The Living Environment
VT	4.6 Understanding Place 7.1 Scientific Method 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Vermont, you can submit your findings electronically to the Atlas project, helping chart reptile and amphibian populations in the state. Other states offer different citizen research projects, listed below.

Websites: www.rpsdvd.com. Order a copy of the *Rattlers, Peepers & Snappers* DVD here. Or download a sample track from the DVD, featuring herpetologist Jim Andrews and several northeastern snake species.

Vermont Reptile and Amphibian Atlas. www.community.middlebury.edu/~herpatlas. This is a very useful site, even if you don't live in Vermont. You'll find data collection sheets, identification sheets for amphibian and reptile species, and specific information for educators. Vermont teachers will find instructions for uploading to the atlas site any reptile and amphibian species data your class collects. On the site, you'll also see four posters you can order of regional frogs and toads, salamanders, turtles, and snakes and lizards.

Maine Amphibian Monitoring Program. www.maineaudubon.org/conservation/citsci/mamp_about.shtml. Established in 1997. MAMP is a joint effort between Maine Audubon and the Maine Department of Inland Fisheries and Wildlife. It is also part of a larger national effort, the North American Amphibian Monitoring Program (NAAMP), which coordinates similar surveys in more than 25 states.

North American Amphibian Monitoring Program. <http://www.pwrc.usgs.gov/naamp/>. NAAMP volunteers contribute their time to help states and USGS to assess frog and toad population trends. Data are collected using a calling survey technique, in which volunteers identify local amphibian species by their unique breeding vocalizations or calls.

New Hampshire Fish and Game Department's Reptile and Amphibian Reporting Program. www.wildlife.state.nh.us/Wildlife/Nongame/reptiles_amphibians.htm. Through RAARP, volunteers report sightings of reptiles and amphibians, from spring peepers to snapping turtles. For information visit their website or call 603-271-5859.

Calendar Connection

First on the Nest, by Catherine Tudish (pg. 16)
Spring Calendar (pg. 4)

The hooting of great horned owl pairs in the woods is one sign that spring is on the way. Have your students keep a classroom "Signs of Spring" almanac—rising and setting of the sun, temperature at a set time of day (so students can observe how it changes over the season), and at least two new spring signs each week. The *Northern Woodlands Spring Calendar* will help give students ideas of the kinds of daily changes taking place in the woods. The almanac can take book form, with one page per day, or giant calendar form, with one block per day. Encourage students to include photographs or drawings of their spring sightings.

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
VT	4.6 Understanding of Place 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Websites: **Signs of Spring.** www.learner.org/jnorth/spring/. This excellent website for offers many teaching resources for exploring springtime with your students.

All about Birds. www.birds.cornell.edu/AllAboutBirds/BirdGuide/. Be sure to let students know about this excellent website. The alphabetical search feature is an easy one for students to use. When they look up great horned owl, they can listen to the owls' calls and hear for themselves the difference between male and female calls, as described in Tudish's article.

HANDOUTS

Writing from the Land

Spring, by Georgina Forbes (pg. 75)

Spend some time looking at Georgina Forbes' painting, *Spring*. Then imagine yourself within the painting, experiencing the vista, the landscape, the spring sensations that this painting evokes. What do you see, hear, smell? Is it warm? Cool? Is there evidence of animals in the woods around you? What signs of spring are in the air? Bring this painting to life in your own vividly descriptive words.

CROSSWORD PUZZLE

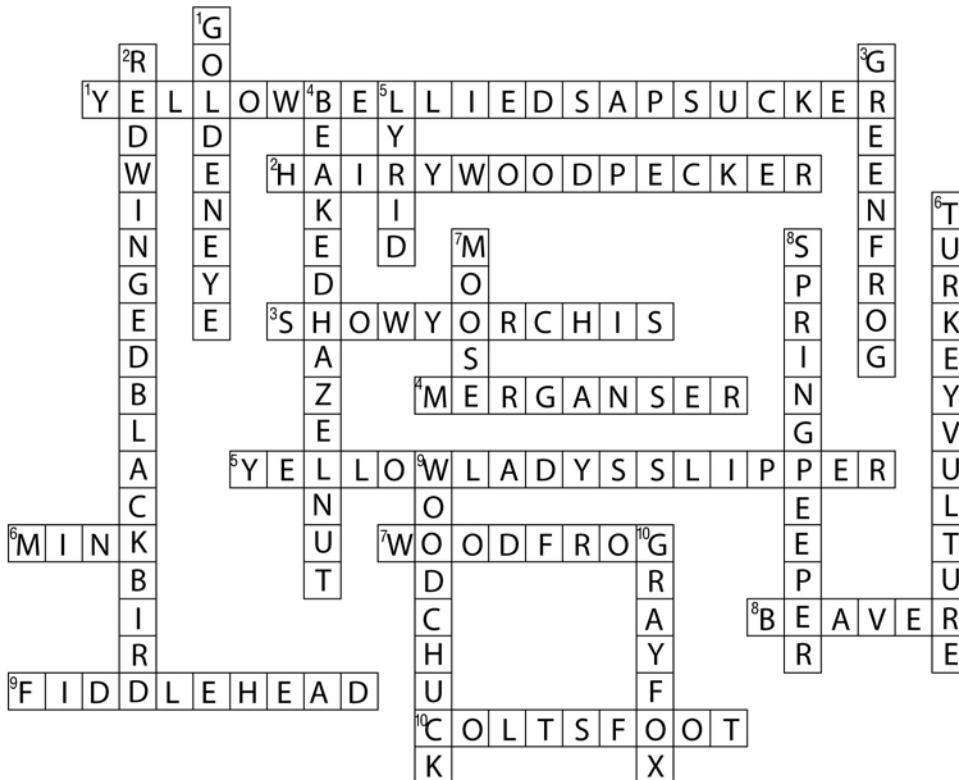
Use the *Spring Calendar* (pg. 4) to help you answer the clues below.

ACROSS

- 1 This woodpecker species drills small holes in trees, then returns to lap the sap (and any insects stuck in the sap) that oozes from the holes (three words). **YELLOW-BELLIED SAPSUCKER**
- 2 This bird species has a hearing range close to that of humans (two words). **HAIRY WOODPECKER**
- 3 This wildflower blooms in rich, deciduous woods (two words). **SHOWY ORCHIS**
- 4 This type of waterfowl (of which there are three species in the Northeast) is an excellent diver that sees well underwater with the use of a transparent eyelid. **MERGANSER**
- 5 This wildflower blooms in moist woods and marshes (three words). **YELLOW LADY'S SLIPPER**
- 6 This small mammal sometimes dens in an old muskrat lodge. **MINK**
- 7 The eggs of this amphibian hatch about a month after being laid (two words). **WOOD FROG**
- 8 This water-dwelling mammal doesn't develop waterproof fur until it is about two months old. **BEAVER**
- 9 This edible plant appears in early May. **FIDDLEHEAD**
- 10 This non-native plant is one of the earliest wildflowers to bloom in the Northern Forest. **COLTSFOOT**

DOWN

- 1 This migratory duck usually arrives after ice melts from local ponds. **GOLDENEYE**
- 2 This migratory songbird fills northeastern wetlands with song in spring (three words). **RED-WINGED BLACKBIRD**
- 3 This amphibian's call sounds like a loose banjo string being plucked (two words). **GREEN FROG**
- 4 This shrub bears tiny, bright-purple flowers (two words). **BEAKED HAZELNUT**
- 5 This meteor shower reaches its peak in the latter part of April. **LYRID**
- 6 This scavenger bird, rarely seen in the Northern Forest before 1960, is now a fairly common sight here (two words). **TURKEY VULTURE**
- 7 In late April, you may find clumps of this mammal's hair in the woods, as it molts its winter coat. **MOOSE**
- 8 This small frog migrates to ponds to mate on rainy spring nights when the temperature is above 41°F (two words). **SPRING PEEPER**
- 9 Grass-eating mammal. **WOODCHUCK**
- 10 This mammal mates between January and April, and its young are born 53 days after mating (two words). **GRAY FOX**



CROSSWORD PUZZLE

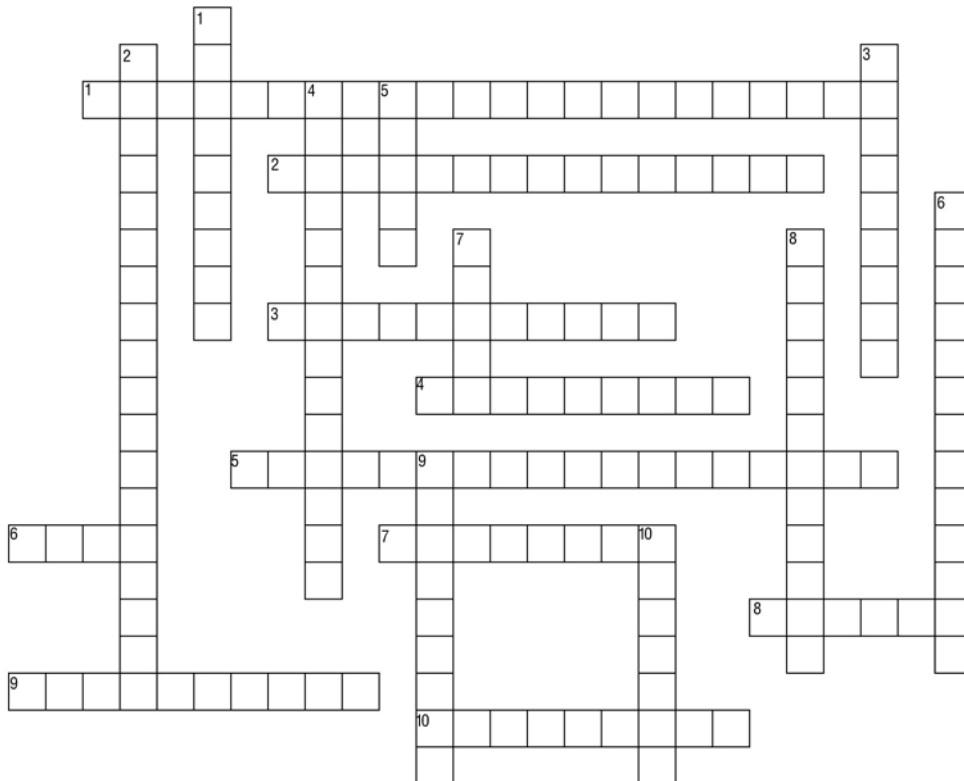
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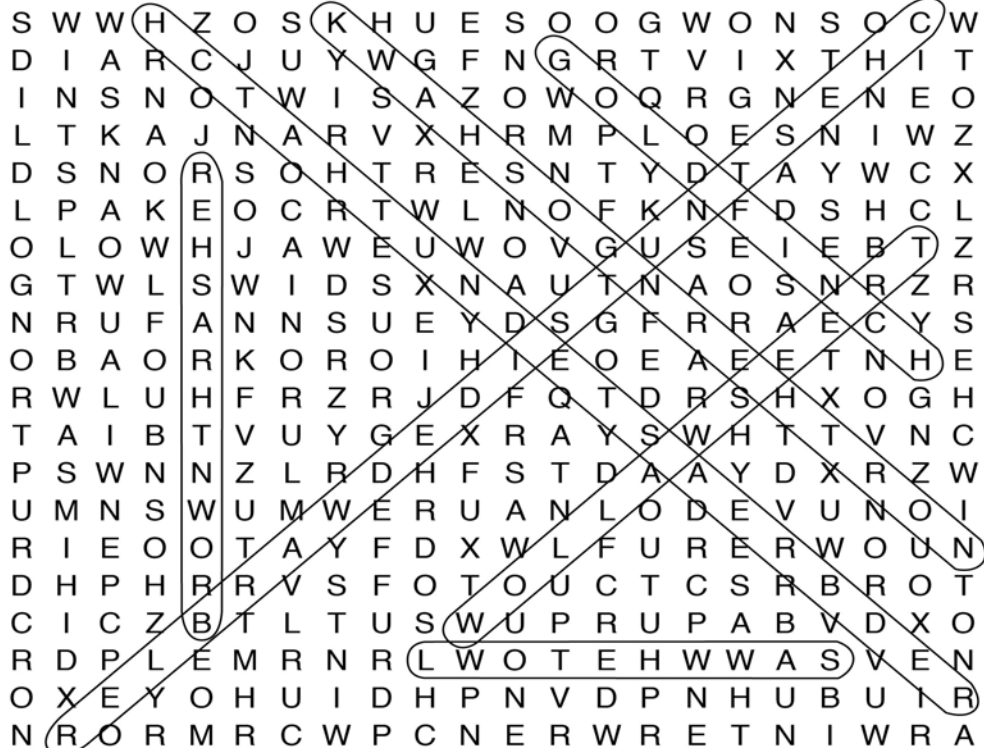


WORD SEARCH

Birds of the Northern Forest

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

1. This bird species sometimes nests in old woodpecker nests (three words). RED-BREASTED NUTHATCH
2. This forest-dwelling raptor eats bluejays and other birds (two words). NORTHERN GOSHAWK
3. A steady “*too, too, too, too*” announces the presence of this nocturnal bird (three words). SAW-WHET OWL
4. This songbird can have as many as 2,000 songs in his repertoire (two words). BROWN THRASHER
5. This bird species will nest in an artificial birdhouse (two words). TREE SWALLOW
6. This songbird sings one of the longest and most complex bird songs known (two words). WINTER WREN
7. This waterfowl species migrates in huge flocks (two words). SNOW GOOSE
8. This woodland bird lays an average of 12 eggs in its clutch (two words). RUFFED GROUSE
9. Bright yellow songbird. GOLDFINCH
10. In May, listen for the “*pleased, pleased, pleased to meetcha*” song of this songbird in shrubby or forest-edge habitat (three words). CHESTNUT-SIDED WARBLER



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