



Teacher's Guide

Autumn 2006

Northern Woodlands Goes To School,

Welcome to the Autumn 2006 edition of *Northern Woodlands* magazine. Turn its pages and learn how bears leave their mark in the forest, and why. Discover what scientists know about why ruffed grouse populations can fluctuate so greatly from year to year. This issue is packed with articles that will stimulate learning, both in and out of the classroom, on subjects ranging from the basics of tree identification to the complexities of managing a successful wood products business.

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 5,000 students throughout the Northeast are able to participate in Northern Woodlands Goes to School this year. The sponsors are: Fountain Forestry, Inc., Frank and Brinna Sands Foundation, French Foundation, International Paper, Maine TREE Foundation, Merchants Bank, New England Forestry Foundation, Northeastern Lumber Manufacturers Assoc., Twinflower Farm, 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, just call or email Anne Margolis at (802) 439-6292 (email: anne@northernwoodlands.org). Visit our *Northern Woodlands Goes to School* website at www.northernwoodlands.org/goes_to_school.php, where you can also download each quarter's teacher's guide.

Noteworthy News

***The Greatest Good* curriculum materials** are now available online. Last spring, *Northern Woodlands* reviewed *The Greatest Good*, a documentary that explores the history of the United States Forest Service. Since then, The Forest History Society has created extensive curriculum materials for K-12 students that build upon the ideas in *The Greatest Good*. Materials include lesson plans on subjects ranging from fire ecology to the role of wood in the American Industrial Revolution. Check them out at www.lib.duke.edu/forest/Education/TGG/Teacher%20Guide.htm.

The Place You Call Home: A Guide to Caring for Your Land in the Upper Valley.

When you buy a car or a refrigerator, you receive an owner's manual. But when you buy a piece of land, you're on your own. Until now. Northern Woodlands has created a new publication that provides landowners in the Upper Valley region of Vermont and New

Hampshire with essential information about carefully stewarding their land. An excellent teaching reference no matter where you live in the Northern Forest, the guide is available for \$5 (or free to teachers within the Upper Valley region) and can purchased online at www.northernwoodlands.org.

Suggested Activities

1. Exploring Autumn Trees

The Opposite of Alternate is Opposite, by John Wiggin (page 15)
Timing is Everything: How Long Should a Tree Keep its Leaves? by Bernd Heinrich (page 46)

There's no better way to begin your autumn studies of the Northern Forest than by getting to know its most obvious community members—the trees. Wiggin's article will help students begin the process of tree identification. While students can easily feel overwhelmed by the prospect of differentiating the dozens of forest tree species, the MADCap mnemonic device helps them make useful, broad-brush identifications that begin to illuminate forest biodiversity. Use one or both of the excellent field guides below to hone in on particular species.

Have students read Heinrich's article and note the timing of autumn foliage changes for different tree species. Have them create and keep a forest journal in which they sketch and write about their forest discoveries. Encourage them to make the journal as creative and colorful as they like. They can collect and press forest leaves and flowers and affix them in their journal, or use colored pencils or watercolors to accent their sketches. Consider having students choose a forested spot in which to sit quietly and journal each week, noting the seasonal changes in the woods.

Books: *Tree Finder*, by May Theilgaard Watts. Nature Study Guild Publishers: 1991. This guide is inexpensive (buy in bulk for approximately \$3.00 apiece), compact, and straightforward.

Tree Identification Book, by George W. Symonds and Stephen V. Chelminski, 1972. Excellent for identification by bark, twigs, and leaves.

Keeping a Nature Journal: Discover a Whole New Way of Seeing the World Around You, by Clare Walker Leslie. 2000: Storey Publishing.

Website: For information and curriculum materials on pressing and mounting wildflowers, visit www.kidsgardening.com/growingideas/projects/june03/pg1.html

PLT	Adopt a Forest (<i>Forest Ecology</i> High School Module) Cast of Thousands (<i>Forest Ecology</i> High School Module)
ME	Science and Technology B, J Visual and Performing Arts A English Language Arts E
NH	Science 1a, 2a, 3a English Language Arts 2
NY	MST 1 Scientific Inquiry MST 4 The Living Environment ART 1 Visual Arts ELA 2 Speaking and Writing
VT	1.12 Personal Essays 5.28 Artistic Proficiency 5.29 Visual Arts 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

2. Wildlife Population Dynamics

Good Year, Bad Year: Ruffed Grouse Populations Ride a Roller Coaster, by Tovar Cerulli. (page 34)

To understand the population fluctuations of a given wildlife species, students must understand the habitat needs, behavior, and physiology of that species and how the animal interacts with the natural community in which it lives. In his article, Cerulli states, "*Habitat in the Northeast is shifting from ideal grouse habitat to ideal turkey habitat.*" In making forest management choices, a landowner may improve habitat for one species while unwittingly degrading habitat for other species.

Have students work together to create management recommendations for a local property (a nearby municipal forest would be ideal) that enhance wildlife habitat—not just for grouse, but for a multitude of species. If your state has a Coverts program (as described in Cerulli’s article), invite a representative to lead a site visit to the forest and offer recommendations. With them, you can assess the current condition of the forest, which wildlife species you’d like to manage for, and what management strategies you could employ to benefit them.

In the article, Cerulli also writes, “In the past year, Wildlife Action Plans were issued by New York and each New England state; every state except Maine listed ruffed grouse as a ‘Species of Greatest Conservation Need.’” These action plans detail the threats to your state’s wildlife populations and will help guide management over the next several years. Check out your state’s Wildlife Action Plan (either a summary or the full text) at the Teaming with Wildlife website below.

Website: www.teaming.com/state_wildlife_strategies.htm. Students can read a summary of their state’s Wildlife Action Plan, or the unabridged text.

Audubon Vermont offers a Bird-Friendly Management Practices publication as part of their Forest Bird Initiative, available online at www.vt.audubon.org/sciCon_ForestBirdFactSheets.html.

The Ruffed Grouse Society website, www.ruffedgrousesociety.org, has information about ruffed grouse ecology and grouse-friendly forest management.

Book: *Landowner’s Guide to Wildlife Habitat: Forest Management for the New England Region*, by Mariko Yamasaki et al. Dartmouth College Press: 2005.

PLT	400-Acre Wood
WILD	Improving Wildlife Habitat in the Community
ME	Science and Technology B, J
NH	Geography 15
NY	Science 3b, 4c MST 4 The Living Environment SS 3 CDOS Thinking Skills
VT	2.2 Problem Solving 2.10 Abstract Thinking 2.14 Planning/Organization 3.9 Sustainability 3.19 Environment 4.6 Understanding Place 7.13 Organisms, Evolution, and Interdependence 7.16 Natural Resources

3. Historic Waterways

The Last Log Drive, by Marc Johnson (page 40)

Before railroads and automobiles, rivers were the commerce thoroughfares for northeastern communities. Your students can learn much about your region’s history by researching past uses of rivers in your area. Were there log drives, mills, dams? Where?

Have students map the sites of old mills, dams, log drive staging areas, and so on. Head into the field and scout out remnants of those sites. Your local historical society will likely have photographs and perhaps publications that document these sites. Students can interview community elders with knowledge of historic river uses. How did these historic uses impact the river? How have human uses of the rivers in your area changed over time? What are the most common uses today? Have students document their findings in a colorful multi-media display at your local library or town office.

If the river could tell its story, what would it tell? What stories—of flooding, of season migrations, of human dramas—are held in its meanders and in local lore? Students can write a first-person narrative from the river’s perspective—illuminating a day, a season, a year or more of its history.

ME	Geography A Science and Technology J English Language Arts B, E, G, H History B
NH	Social Studies 10, 15, 17 Science 2c English Language Arts 2, 3, 6
NY	CDOS Thinking Skills MST 6 Models MST 7, Strategies SS 1, 3 ELA 1 Listening and Reading ELA 2 Speaking and Writing
VT	1.8 Reports 1.12 Personal Essays 1.13 Clarification and Restatement 1.17 Notation and Representation 1.20 Communication of Data 4.6 Understanding Place 6.4 Historical Connections 6.6 Being a Historian 6.7 Geographical Knowledge 6.8 Movements and Settlements

Looking for Bear Signs

Bear Bites and Birches, by Susan C. Morse (page 21)

Take your students into the autumn woods to look for animal signs. Contact a local hunting club or state wildlife department for recommendations of an experienced tracker to accompany you. Have students bring their journals and record their discoveries. When you find markings on trees, record the tree species (see activity #1 in this teacher's guide) and type of sign (hair, bites, claw marks, scat). Draw a sketch of the markings, and have students make best guesses, using the resources listed below, to identify the animal that created each marking. Bring a map of the area and record animal sign sightings on it. Students can use GIS equipment or make records freehand on a topographic map.

WILD	Tracks! (gr. 5-8)
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 the Environment

Book: *Tracking and the Art of Seeing*, by Paul Rezendes. 1999: HarperCollins.

Mammal Tracks: Life-size Tracking Guide, by Lynn Levine and Martha Mitchell. Heartwood Press: 2001.

4. Living in a Changing Forest

The Ripeness of Deadwood, by Robert Kimber (page 57)

Though the central story in Kimber's essay is about firewood and preparing for winter in the Northern Forest, it touches upon a key element of Northern Forest ecology—the changes wrought by invasive exotic organisms. Three diseases have transformed hardwood forests of the Northeast during the past century—Dutch elm disease, butternut canker, and chestnut blight. Many other exotic diseases and pests threaten these forests, from gypsy moths and hemlock woolly adelgids to Asian longhorned beetles and emerald ash borers.

PLT	Home Sweet Home <i>Forest Ecology</i> high school module
	Saga of the Gypsy Moth (<i>Forest Ecology</i> high school module)

Ask your students to select an exotic tree pest to research. Ask them to document, in an engaging display, its life cycle, effect on the individual tree, and cumulative effect on the forest community. Have each student give a brief presentation to the class.

Website: *Three American Tragedies: Chestnut Blight, Butternut Canker, and Dutch Elm Disease*, by Scott E. Schlarbaum et al. www.invasive.org/symposium/schlarba.html. This scientific paper describes the changes wrought by these diseases and on-going efforts to develop disease-resistant trees of each species.

The U.S. Forest Service maintains a Forest Health Protection website that provides information about many tree diseases and pests, www.na.fs.fed.us/fhp/.

5. Responding to Acid Rain

Extra Calcium Boosts Maple Health, by Anne Margolis (page 51)

Acid rain depletes soil of certain minerals, including calcium, that are important for healthy tree growth. This article describes a project in which researchers fertilized a large forested region with calcium pellets and assessed changes in forest health. Have your students read about and discuss the scientific findings. Is it sustainable to combat acid rain by air-dropping calcium onto the hardwood forests of the Northeast? What about your favorite maple trees around your schoolyard and at home?

Study acid rain, its causes and effects on northeastern forests. The EPA's website provides extensive curriculum materials for indoor and outdoor experiments, ranging from measuring the pH of natural water to observing the influence of acid rain on plant growth. If your school grounds are planted with sugar maples, consider having students fertilize one or two highly visible trees with calcium, then create an interpretive display to place near the tree that explains why they've done so.

Book: *Environmental Interpretation: A Practical Guide*, by Sam Ham. North American Press: 1992. For information on creating inexpensive, effective interpretive displays.

Website: General acid rain information: www.epa.gov/docs/acidrain
Outline of pollutants released into your community: www.scorecard.org

WILD	Flip the Switch for Wildlife
ME	English Language Arts A, D, E, H Science and Technology J
NH	English Language Arts 1, 2, 3, 5, 7 Science 1a, 2a
NY	MST 1 Scientific Inquiry MST 7 Strategies ELA Speaking and Writing CDOS 3 Thinking Skills CDOS 4 Human and Public Services
VT	1.11 Persuasive Writing 1.19 Research 2.2 Problem Solving 4.6 Understanding Place 6.3 Analyzing Knowledge 7.2 Investigation

Wildlife Connection

Living with Beavers, by Madeline Bodin (page 22)

Use Bodin's engaging article to delve into beaver ecology, life cycle, habits, folklore, and so on. Like humans, beavers are highly skilled at manipulating their environment to suit their needs. Sometimes those manipulations impact humans in ways we don't like, as when beaver dams flood areas we'd prefer not to have flooded. Bodin describes Skip Lisle's approach to resolving these conflicts, an approach that provides a lesson in how humans can live harmoniously with wildlife in the natural communities of which they are a part. Are there active beaver ponds in your area? Take your students out to visit one, and explore not only the skilled logging and construction work of the beavers but also the diverse wetland their work created.

ME	Science and Technology B
NH	Science 3a
NY	MST The Living Environment
VT	7.13 Organisms, Evolution, and Interdependence

Career Connection

Lumber, Chips, and Sawdust: For Sawmills, There’s No Such Thing as Waste, by Stephen Long. (page 28)

Stephen Long’s article touches on a host of hot issues in the forest products industry—immigration, mechanization in the work force, stabilizing business by diversifying output, maintaining a steady wood supply. After reading the article, have students research the economic situation among mills in your region. Encourage them to interview mill owners about their workforce, products, profitability, challenges, opportunities, and plans for the future (business strategy). Visit a local mill and see how it operates.

As they read the article, students will likely encounter words and concepts they don’t understand: SFI, lumber grades, light-on-the-land forestry. The article raises questions: Why is it so difficult to find reliable workers? Why is there such a time delay between purchase and harvest of National Forest timber? Why is new timber equipment “lighter on the land?” Ask each student to identify a concept or question they’d like to learn more about, then research the subject and present their findings to the class.

PLT	Who Works in this Forest?
ME	English Language Arts A, D, E, G, H Economics A
NH	English Language Arts 1, 2, 3, 5, 6 Social Studies 5, 9
NY	ELA 1 Listening and Reading SS 4 CDOS Managing Information MST 7 Strategies
VT	1.8 Reports 1.13 Clarification and Restatement 1.19 Research 3.9 Sustainability 4.6 Understanding Place 6.3 Uses of Evidence and Data 6.15 Knowledge of Economic Systems

Calendar Connection

“Ways of the Woods” Hits the Road, by Anne Margolis (page 17)

Don’t miss the *Ways of the Woods* place-based education program as it travels through Northern Forest communities this autumn. Filled with exhibits about the human and natural history of this region and equipped with a tent for outdoor displays and performances, this mobile museum—housed in an 18-wheel truck—offers students opportunities to both learn and teach. The Northern Forest Center, which created the traveling exhibit, invites schools to exhibit or perform at *Ways of the Woods* stops. Check the calendar to see when it’s visiting a site near you. Visit with your students, and arrange to display your students’ forest-related exhibits there (see activities #3 and #5 in this teacher’s guide). Read the *Ways of the Woods* article on page 17 for more information.

ME	Science and Technology B
NH	Science 3a
NY	MST The Living Environment
VT	4.6 Understanding Place 7.13 Organisms, Evolution, and Interdependence

Crossword Puzzle: Autumn Calendar (page 4)

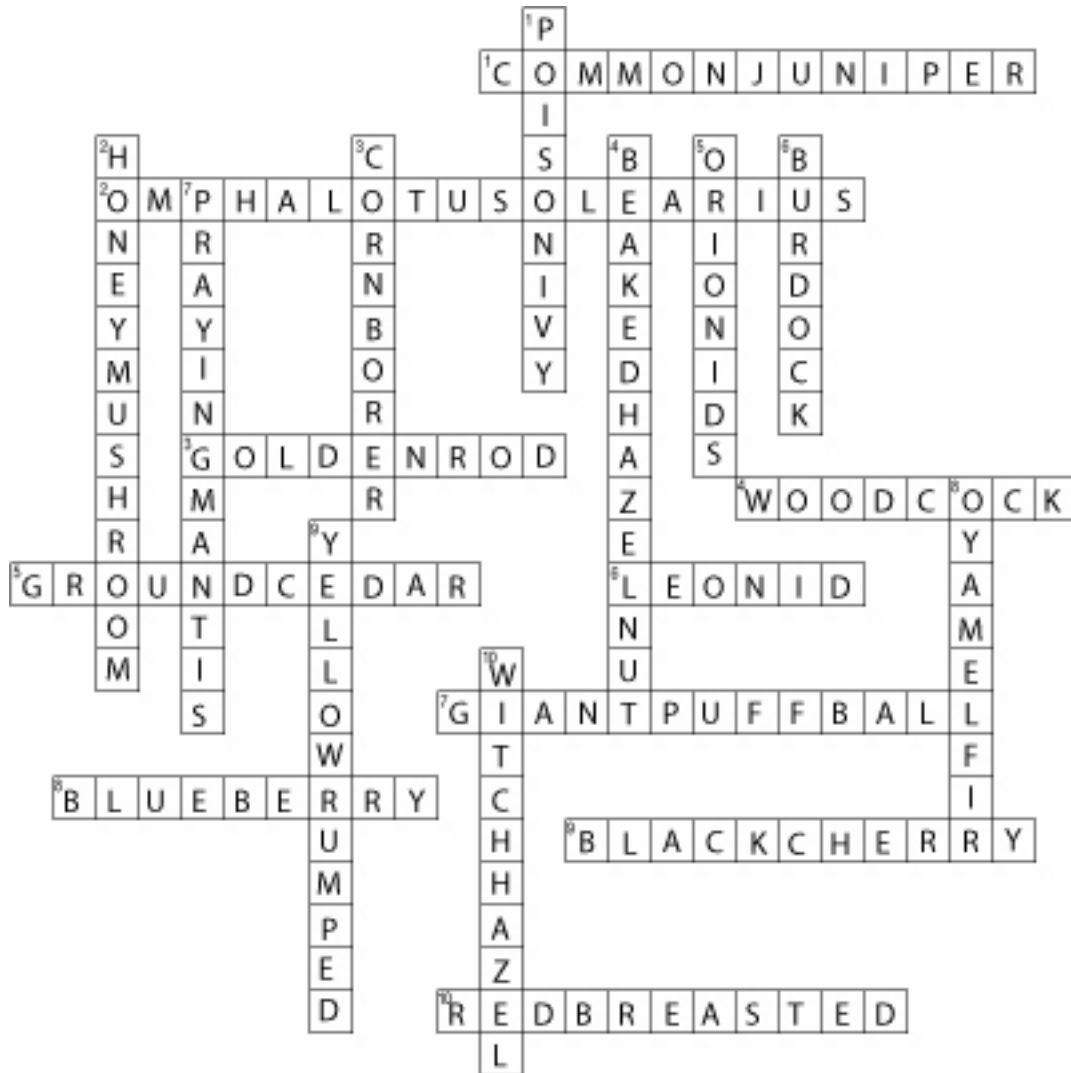
Use the *Autumn Calendar* on page 4 to help you find the answers to the clues below.

Across

1. After three years of growing, these berries are ripe for eating by birds and moose (two words). COMMON JUNIPER
2. The Latin name for this poisonous fungus, which has luminescent gills (two words). OMPHALOTUS OLEARIUS
3. One of the last flowers of autumn. GOLDENROD
4. When the ground freezes and worms become unavailable, this bird heads south. WOODCOCK
5. This creeping plant releases clouds of pollen in November (two words). GROUND CEDAR
6. November meteor shower. LEONID
7. When its flesh is white, this mushroom is edible and tasty (two words). GIANT PUFFBALL
8. The leaves of this berry-producing plant turn bright red in autumn. BLUEBERRY
9. The fermented fruit of this hardwood species can make birds tipsy (two words). BLACK CHERRY
10. You'll most often find this species of nuthatch in softwood trees (two words). RED-BREASTED

Down

1. Birds eat the white berries of this plant (two words). POISON IVY
2. Common name for the fruiting body of shoestring root rot (two words). HONEY MUSHROOM
3. When visiting a corn patch, woodpeckers may feed on this insect. CORNBORER
4. Squirrels and chipmunks feed on the small nuts from this shrub (two words). BEAKED HAZELNUT
5. October meteor shower. ORIONIDS
6. You can eat the taproot of this biennial plant during its second year of growth. BURDOCK
7. This insect lays styrofoam-like egg masses around twigs in autumn (two words). PRAYING MANTIS
8. Monarch butterflies overwinter in this Mexican tree (two words). OYAMEL FIR
9. This warbler species is among the last to migrate south in the fall (two words). YELLOW-RUMPED
10. This shrub blooms in early October (two words). WITCH HAZEL



Crossword Puzzle: *Autumn Calendar* (page 2)

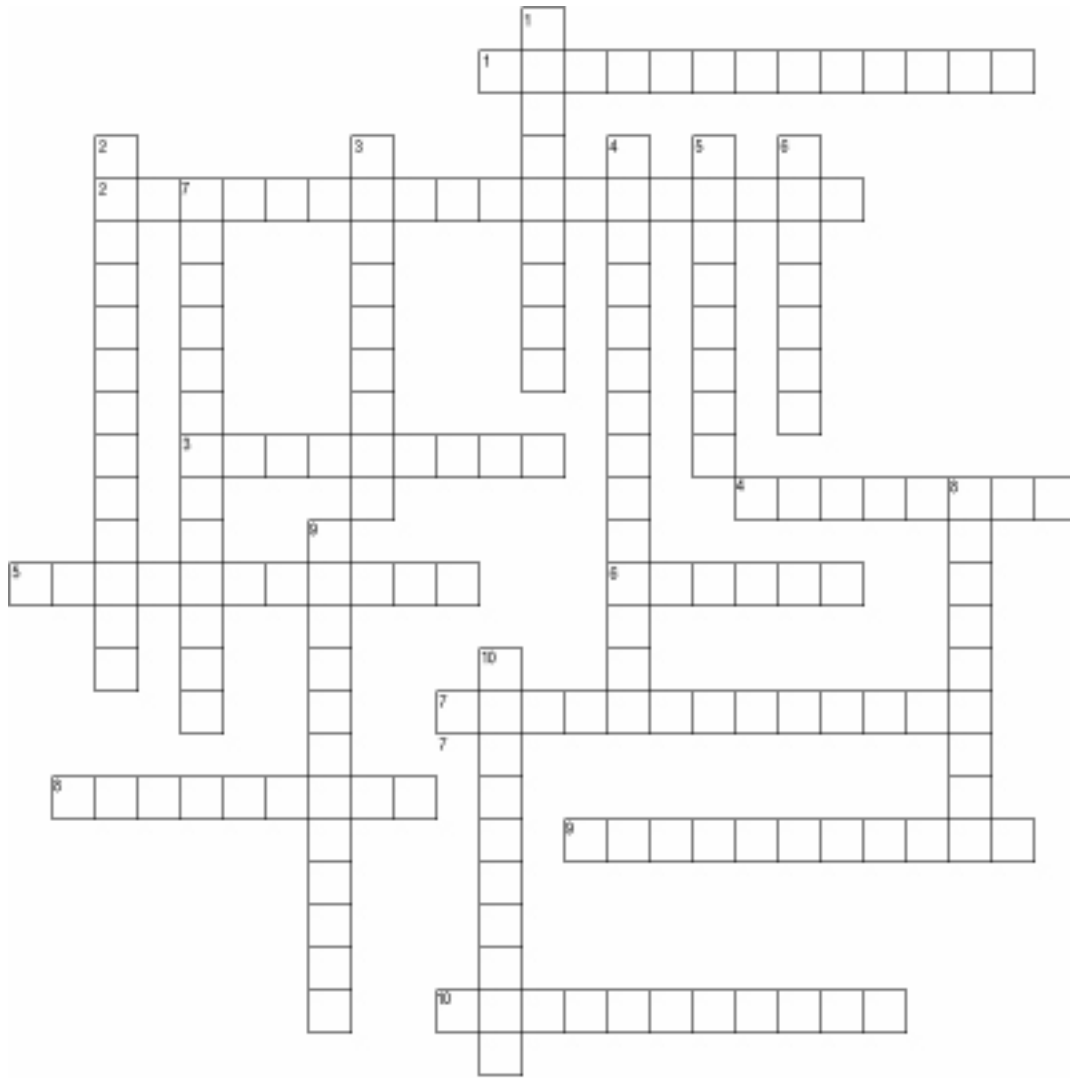
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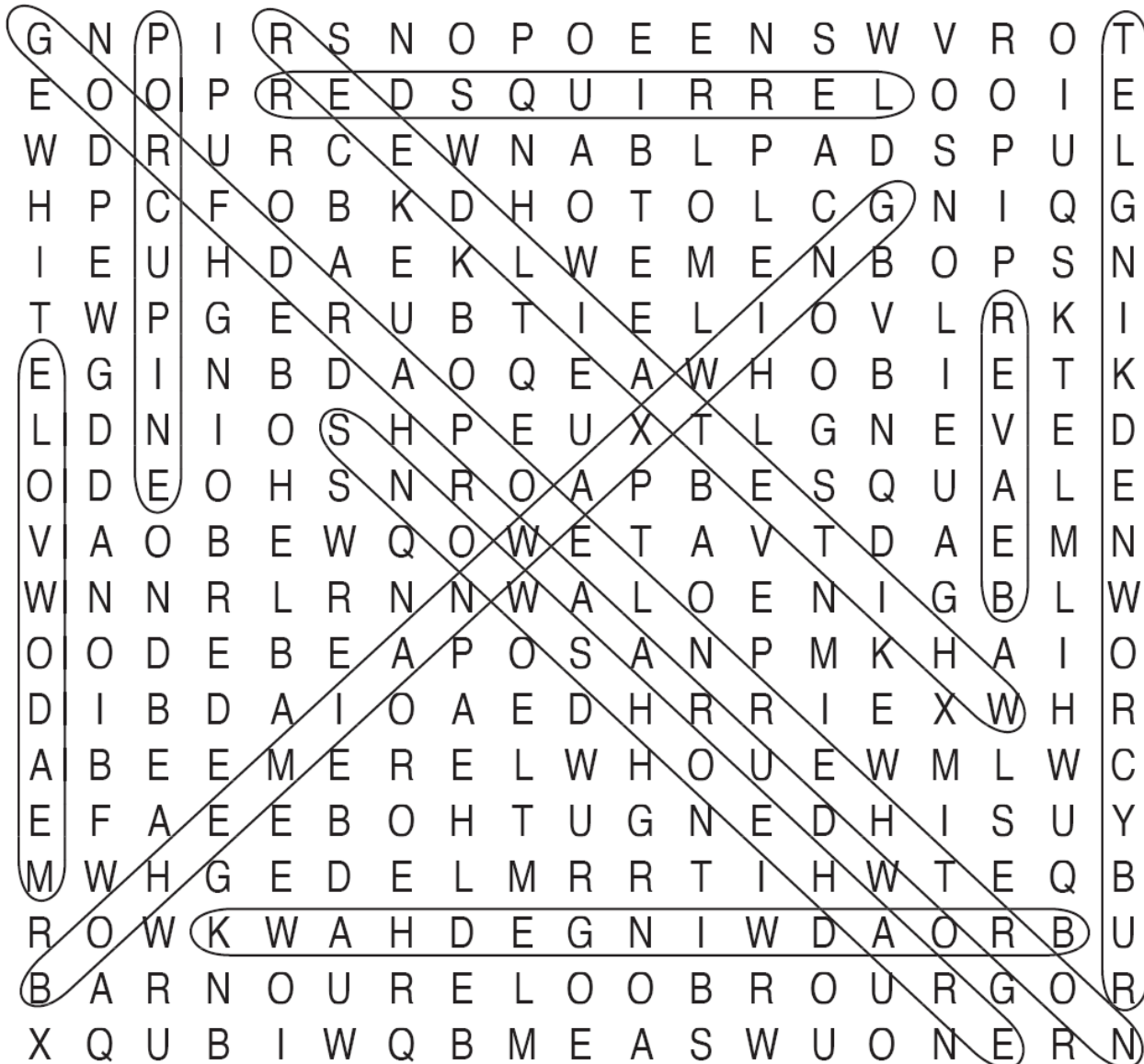


Word Search Answer Page

Autumn Calendar (page 4)

Using the clues below and the *Autumn Calendar*, find and circle ten Northern Forest wildlife species in the word search puzzle.

1. The twigs of sugar maple, aspen, hemlock, and beaked hazelnut are favored winter foods for this mammal (two words). SNOWSHOE HARE
2. Northern saw-whet owls hunt this mammal in open fields (two words). MEADOW VOLE
3. This songbird may feast on crabapples in late fall (two words). BOHEMIAN WAXWING
4. This small songbird migrates south to winter in Connecticut and points south (three words). RUBY-CROWNED KINGLET
5. The gestation period for this mammal is 200 to 210 days (two words). WHITETAIL DEER
6. This mammal stores mushrooms in the crotches of tree branches (two words). RED SQUIRREL
7. This raptor flies south in mid-October and returns in April (three words). BROAD-WINGED HAWK
8. This animal stores branches near its home to eat during the winter. BEAVER
9. One of the many animal species that eats apples. PORCUPINE.
10. This amphibian species hibernates on pond and stream bottoms (three words). NORTHERN LEOPARD FROG



Word Search Puzzle

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