



Teacher's Guide

Winter 2006

Northern Woodlands Goes to School

Welcome to the Winter 2006 edition of *Northern Woodlands* magazine. In it, you'll find articles to warm your students' winter hours, on subjects ranging from woodstove efficiency to the ethical complexities of hunting. They'll learn how to identify conifers from a distance and how to tell if an area has been overbrowsed by moose. Whether you're studying the Northern Forest community in the classroom or in the field, these stories will help bring your explorations to life.

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:

Hot off the press! **The Outside Story: Local writers explore the nature of New Hampshire and Vermont.** October, 2006. \$20 post-paid. 224 pgs. To order, call Northern Woodlands at 1 (800) 290-5232. Northern Woodlands presents *The Outside Story*, an anthology of new essays contributed by more than two dozen local writers, including Ted Levin, Willem Lange, and Michael Caduto. These essays explore a broad range of topics, from acid rain to garter snake mating, native fish to exotic ladybugs, deeryards to deer hunting—all written by and for a local audience and organized in an easy-to-browse, monthly format. Most of the essays are equally relevant in Maine, New York, and other northeastern states.

If your students would like to take part in the **2007 Envirothon**, it's time to begin planning for this national competition. The Envirothon's mission is to develop knowledgeable, dedicated citizens willing to work towards achieving and maintaining a balance between quality of life and quality of the environment. Team members in grades 9-12 collaborate to develop an understanding of the ecology and management of soils, forests, wildlife, and aquatics. They also practice dealing with complex resource management decisions as they develop an oral presentation focused on a particular current environmental issue (the 2007 issue is alternative/renewable energy). If your students get involved, they will compete, usually in May, with other teams from your state. The winner of each state's Envirothon competes in the national Envirothon, held July 29-August 4, 2007 at Hobart and William Smith Colleges in Geneva, NY. Visit www.envirothon.org/competition/Canon2007/ for information about the 2007 competition, and visit www.envirothon.org/programs/index.php to find contact information for your state's Envirothon coordinator.

Suggested Activities

1. Adaptations for Surviving Winter

Hold that Embryo, by Anne Margolis (pg. 14)

Delayed implantation, via facultative or obligate diapause (delayed implantation of the embryo) is one adaptation for survival among animals of the Northern Forest. In her article, Margolis lists several mammals that experience delayed implantation. Have your students choose one of these animals and research the specifics of its delayed implantation, as well as its other adaptations for surviving northeastern winters. Have each student create a display of his or her animal, highlighting its winter survival adaptations.

Books: *Life in the Cold*, by Peter J. Marchand. University Press of New England: Hanover. 1991. Best for older students. Excellent discussion of the adaptations of plants, animals, and indigenous human populations to life in the cold.

A Guide to Nature in Winter, by Donald W. Stokes. Little, Brown & Co.: USA. 1976.

WILD	I'm Thirsty Quick-Frozen Critters
ME	Visual and Performing Arts A Science and Technology B English Language Arts A, D, E, H
NH	Science 3a English Language Arts 1, 2, 5, 6
NY	ART 1 Visual Arts MST 1, Scientific Inquiry, MST 4 The Living Environment, MST 7 Strategies CDOS 3 Managing Information
VT	1.5 Writing Dimensions 1.8 Reports 1.19 Research 1.21 Selection 5.29 Visual Arts 6.2 Uses of Evidence and Data 6.3 Analyzing Knowledge 7.13 Organisms, Evolution, and Interdependence

2. Ripple Effects

New England's Walnut, by Charles Fergus (pg. 46)

According to Fergus's article, butternut canker was first discovered in North America in 1967. In the last 40 years, it has wiped out virtually all North American butternuts, which historically ranged from Maine to Minnesota and from Canada to North Carolina. Because of that, few of your students will be familiar with the butternut and its importance to the forest community, including humans. Which animals depended on butternuts for food? Besides food, what did people use butternuts for? Whenever someone dies in the human community, it has ripple effects throughout the community.

Butternuts have nearly vanished from the landscape—what is the impact on the forest community? Many invasive exotic plants and animals have rocked the ecology of the Northern Forest. Have each student select an invasive exotic to research and have them work together to create a time line of the introduction of these organisms into North America and the progression of their spread up to the present.

Books: *The Original Vermonters*, by William A. Haviland and Marjory W. Power. University of New England Press: Hanover. 1994. This excellent book, appropriate for high school students, details Abenaki life, including their use of butternuts.

Website: For good, basic information on butternut ecology, visit www.laconline.com/Extension_Notes_English/pdf/bttrnt.pdf

PLT	Home Sweet Home (<i>Forest Ecology</i> high school module) Saga of the Gypsy Moth (<i>Forest Ecology</i> high school module)
ME	English Language Arts A, D, H Science and Technology B, M History B
NH	English Language Arts 1, 5 Science 3a Social Studies 13, 14, 17
NY	CDOS 3 Managing Information MST 1 Scientific Inquiry, MST 4 The Living Environment, MST 7 Strategies SS 1
VT	1.19 Research 1.21 Selection 4.6 Understanding Place 6.2 Uses of Evidence and Data 6.3 Analyzing Knowledge 6.4 Historical Connections 7.13 Organisms, Evolution, and Interdependence

3. Woodstoves and Fuelwood Efficiency

Woodstoves Get Greener, by Craig Idlebrook (pg. 28)

In the last paragraph of his article, Idlebrook hits on a key idea: that maximizing BTU output is not just an issue of an excellent woodstove design. It requires maximizing efficiency at every step of the process from standing tree to woodstove—cutting, transportation, processing, curing, storing, and even house design and efficiency.

First, ask your students if they use wood to partly or fully heat their house. You're sure to have at least a few who do, and you can use their situations as examples for the wood energy study. Does their family purchase the wood from someone, or do they cut it themselves? How far is the wood transported between forest and fireplace? Is it split with a mechanical wood splitter or by hand? Is it stored under cover or exposed to rain and snow? Is it fully cured by the time it's burned? Improperly cured and stored wood means wasted BTUs. What is their chimney design and how does that affect the overall heating efficiency? Is the house airtight and energy efficient? How can they measure this? Students can craft a diagram showing energy usage and production in various firewood heating situations. Older students can calculate net BTU output. Younger students can simply observe how different scenarios yield vastly different net energy production.

Website: www.woodheat.org. Lots of great information about heating with wood.

The United States Department of Energy devotes part of its website to renewable energy, including wood heating and home energy audits.
www.eere.energy.gov/consumer/renewable_energy/.

ME	Science and Technology J, L Economics A
NH	Science 1a, 2c, 4c, 6c Social Studies 5, 9
NY	MST 1 Scientific Inquiry, MST 5 Engineering Design, MST 6 Models SS 3, SS 4
VT	1.22 Simulation and modeling 3.9 Sustainability 6.15 Knowledge of Economic Systems 7.16 Natural Resources

4. Appreciating Conifers

Conifers from a Distance, by Peter Marchand (pg. 16)

Winter is an excellent time to explore conifers. Peter Marchand's article offers guidance for recognizing conifers from a distance by form and silhouette. Have students, on their way to and from school, and in their neighborhoods, start to notice the different species of conifers in the landscape around them. How many species can the class document? Then have them deepen their study. A tree's overall shape is one way to identify it—now have students look at bark, needles, buds, and branch structure. What habitat does each species prefer? Conifers have remarkable adaptations for life in the far North. E.C. Pielou's book below is filled with fascinating information about the ecology of conifers and is appropriate for both middle school and high school students.

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

Have students select a conifer they particularly like. Ask them to draw it from many different perspectives (sitting beneath the tree and looking up into the branches, sitting far away from the tree, and so on) and sketch needles, twigs, bark, and any other distinctive features. They can annotate these field sketches with personal observations and notes about the tree's ecology.

Books: *North Woods: An Inside Look at the Nature of Forests in the Northeast* by Peter J. Marchand. AMC Books: 1987.

The World of Northern Evergreens, by E. C. Pielou. Comstock Publishing Associates: 1988.

5. Contemplating a Land Ethic

Life and Death, by Tovar Cerulli (pg. 9)

In his essay, Tovar Cerulli notes that the hunter's *approach* to hunting is as important as the physical act of hunting itself. At its best, he notes, that approach includes respect for the animal, for the land, and for the other creatures, including humans, that inhabit that land. In essence, he is speaking of the necessity of a strong land ethic. Fifty-five years ago, in his essay, *The Land Ethic*, Aldo Leopold wrote, "In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it." After students read Cerulli's essay, have them read Leopold's *The Land Ethic* and ponder, in an essay of their own, their ethical relationship with the natural world. What are the responsibilities and privileges of citizenship in the "land-community"? Are these responsibilities, privileges, and ethical considerations the same for all species? Why or why not? Do your students hunt? Why or why not? Do they eat meat? How does that fit into their ethical framework?

WILD	The Hunter Ethi-Reasoning Enviro-Ethics
ME	English Language Arts A, E Science and Technology B
NH	English Language Arts 1, 2 Science 3a
NY	ELA 1 Listening and Reading, ELA 2, Speaking and Writing MST 4 The Living Environment
VT	1.7 Responses to Literature 1.12 Personal Essays 7.13 Organisms, Evolution, and Interdependence

Books: *Heart and Blood: Living with Deer in America*, by Richard Nelson. Vintage: 1998. Cerulli recommends this book to hunters, non-hunters, and anti-hunters alike.

A Sand County Almanac, by Aldo Leopold. Particularly the essays, "Arizona and New Mexico," "Goose Music," and "The Land Ethic." Ballantine: 1949.

6. Landscape Level Management for Biodiversity

A Patchwork Quilt of Plants, by Carrie Chandler (pg. 50)

The research study described in Carrie Chandler's article lends scientific proof to the hypothesis that underlies much of conservation biology—that landscape corridors help prevent species loss due to habitat fragmentation. Does your community maintain habitat corridors for wildlife? Obtain an aerial orthophoto map of your community from your regional planning commission. Ask them to include as many useful GIS layers as possible, (streams, elevation contours, critical wildlife habitat, wetlands, and ownership parcels, for starters).

What did your community's landscape look like, pre-settlement? How has the landscape, and the associated wildlife habitat, changed since then? With the aid of someone skilled in reading such maps (like your county forester or a representative from your state's department of natural resources), have students assess habitat fragmentation in your community. Has the community done a good job of maintaining habitat corridors? How do the impacts of development differ for different species? (For example, a road through a wetland area presents a significant fragmenting feature for frogs and salamanders, but not for many bird species.) Where are the critical corridors for wildlife in your community?

Because habitat corridors usually extend over multiple property boundaries, maintaining habitat corridors requires community collaboration and landscape-level conservation strategies. What long-term conservation strategies might your community put in place to conserve these corridors? Has the community articulated a conservation strategy in its town plan? If not, have your students develop recommendations for the town that might help mitigate habitat fragmentation by encouraging the creation or conservation of habitat corridors.

WILD	Improving Wildlife Habitat in the Community Can Do! Planning for People and Wildlife
ME	Science and Technology B, M Geography A English Language Arts B History B
NH	Science 3a Social Studies 10, 13, 14, 15, 17
NY	MST 4 The Living Environment CDOS 3 Thinking Skills ELA 1 Listening and Reading SS 1, SS 3
VT	4.6 Understanding Place 6.4 Historical Connections 6.7 Geographical Knowledge 7.13 Organisms, Evolution, and Interdependence

Career Connection

At Work with Timber Framer Dave Bowman, by Susan Campbell (pg. 42)

Dave Bowman's work embodies the ideal of building a strong local economy and supporting healthy forests through local value-adding. He makes his living by crafting beautiful, finely wrought timber frames that utilize the broad range of tree species that the Northern Forest has to offer. Who are the exemplary value-adders in your community? Furniture makers, boat builders, home builders, farmers, sugarers—once you and your students start to look, you're bound to uncover many. Have students each choose a local value-adder, visit them on their land or in their workshop, interview them, and take photographs. Then have each student create a display celebrating that person's contributions to your community, and exhibit the displays in your library or other public venue.

ME	English Language Arts B, E, G, H History B
NH	English Language Arts 2, 3, 6 Social Studies 17
NY	ELA 1 Listening and Reading SS 1, SS3 MST 7 Strategies
VT	1.8 Reports 1.13 Clarification and Restatement 4.6 Understanding Place 6.4 Historical Connections

Calendar Connection

Spring Begins the Third Week of January, by Hub Vogelmann (pg. 38)

In his article, Hub Vogelmann lists several changes that become noticeable outside in late January—early harbingers of spring. The calls of chickadees and cardinals are subtly shifting in tone. Tree buds and twigs are changing color. Plants and animals are constantly changing as the seasons progress, but too often we overlook the more subtle shifts. Have students monitor for these signs. Once a week, have students spend 10 minutes outside, each monitoring a small (50-100 square foot) plot, listening and watching for animal activity, recording in words and drawings the color, shape, and texture of plant life. What changes do they note as the weeks pass?

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

Wildlife Connection

Seeing the Forest for the Birds, by Chuck Wooster (pg. 22)

Landowners often try to manage forestland to benefit wildlife. But there are so many animal species with such widely ranging needs that comprehensive habitat management can seem like an overwhelming task. By focusing on just 12 of the hundreds of bird species in the Northern Forest, the Audubon Society's Birder's Dozen (you can find all 12 at <http://vt.audubon.org/PDFs/FSFinalBirdersDozen.pdf>) make the process manageable and accessible. Meet the needs of these birds, and you'll satisfy a great diversity of animals. And if you can learn how to identify these birds, you can monitor your woodlands and know if your forestland offers suitable habitat for them.

Does your community or school own forested land? This winter, study the Vermont Birder's Dozen (which are important in all Northern Forest states) and learn to identify them by plumage and song. Learn their habitat preferences. Create a classroom mural illustrating their niches within the forest community. By spring, students will be ready to head into the forest to monitor the presence of the Birder's Dozen in your community forest. Have a volunteer from your local Audubon chapter accompany you on your monitoring visits. Does the forest have a management plan? Have students develop bird-friendly recommendations for the forest's management.

ME	Science and Technology B, J Visual and Performing Arts A
NH	Science 1a, 2a, 2b, 3a, 6d English Language Arts 7
NY	MST 1 Scientific Inquiry MST 4 The Living Environment MST 6 Patterns of Change ART 1 Visual Arts CDOS Thinking Skills CDOS 4 Human and Public Services
VT	2.2 Problem Solving 5.29 Visual Arts 7.2 Investigation 7.13 Organisms, Evolution, and Interdependence

Websites:

www.ebird.org. A wonderful on-line birding resource, eBird allows you to record your birding observations and chart the changes in your forest's bird species over time.

www.birds.cornell.edu/AllAboutBirds/BirdGuide/. Cornell University's Laboratory of Ornithology hosts this excellent website, which offers detailed descriptions and song recordings for North American birds.

Writing from the Land

Place in Mind, by Janisse Ray (pg. 76)

Read the *Place in Mind* essay. Then write your own essay about home. What are the essential ingredients that make a place “home?” Think of a place where you feel most at home and describe, using vivid sensory images (sights, smells, textures, tastes), those qualities and experiences that make it home for you.

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Crossword Puzzle

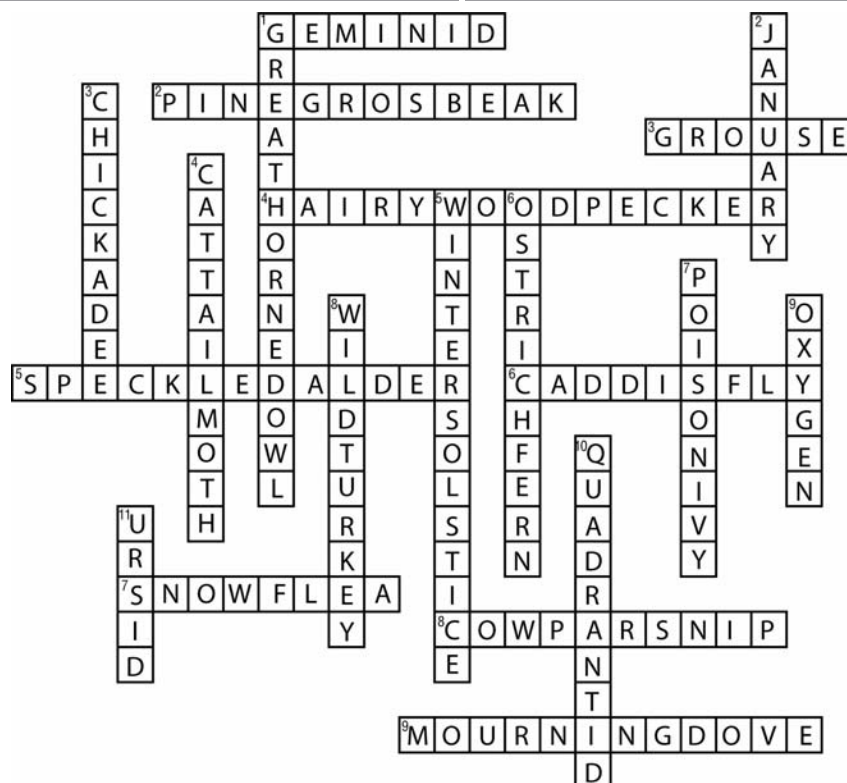
Winter Calendar (Pg. 4)

ACROSS

1. A meteor shower that peaks in mid-December. GEMINID
2. When spruce and fir seed production is poor, this bird species moves south for the winter, out of Canada and into northern New England (two words). PINE GROSBELT
3. In winter, this bird roosts in the lower branches of conifers. GROUSE
4. Members of this bird species begin to establish breeding territories in January (two words). HAIRY WOODPECKER
5. This shrub has both male and female catkins in winter (two words). SPECKLED ALDER
6. Stream-dwelling insect larva that builds a protective case of sticks or pebbles around itself and carries the case along as it moves. CADDISFLY
7. When you walk through the woods on warm, late-winter days, look for this tiny insect hopping about on the snow (two words). SNOW FLEA
8. Woodpeckers sometimes excavate the stalks of this tall wildflower, searching for insects (two words). COW PARSNIP
9. Bird species that predominantly eats grass seeds (two words). MOURNING DOVE

DOWN

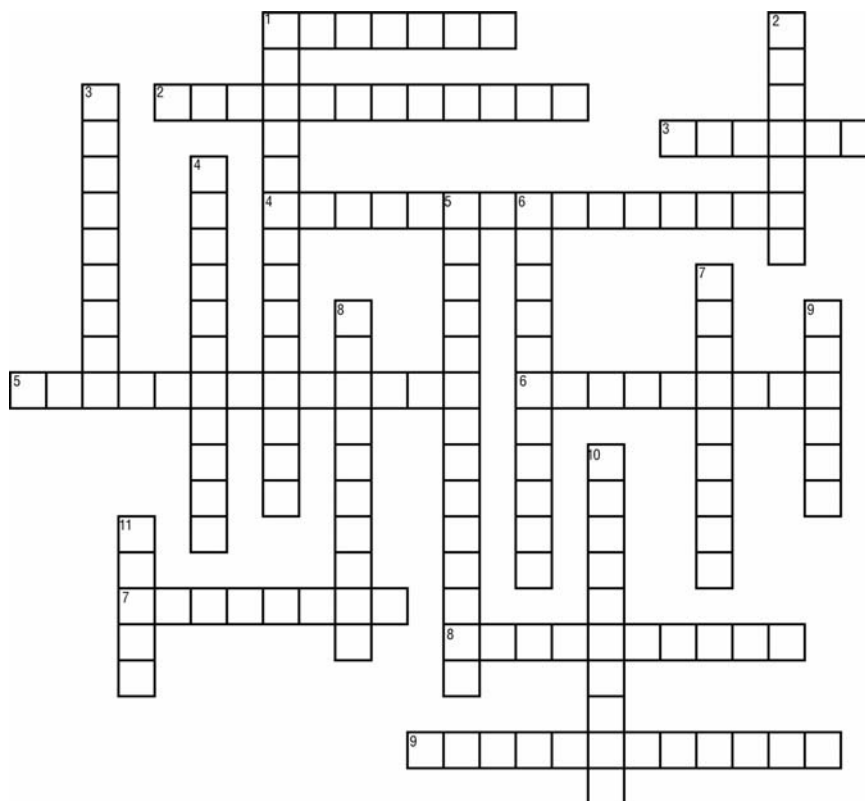
1. The eggs of this bird species hatch in late February (three words). GREAT HORNED OWL
2. In 1998, the Northeast experienced the "Great Ice Storm" during this month. JANUARY
3. In February, you'll start to hear the two-note territorial whistle of this bird species. CHICKADEE
4. Chickadees visit cattails in winter to eat the larvae of this insect (two words). CATTAIL MOTH
5. The longest night of the year (two words). WINTER SOLSTICE
6. This plant yields edible fiddleheads in spring (two words). OSTRICH FERN
7. The white seeds of this vine feed many bird species (two words). POISON IVY
8. This game bird may visit birdfeeders and orchards in search of seeds and fruit (two words). WILD TURKEY
9. Even in mid-winter, some aquatic plants continue to photosynthesize, producing this gas, which is essential to fish and other aquatic organisms. OXYGEN
10. The peak of this January meteor shower lasts only about an hour. QUADRANTID
11. This meteor shower peaks around the time of the winter solstice. URSID



Crossword Puzzle

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4. Members of this bird species begin to establish breeding territories in January (two words).	4. Chickadees visit cattails in winter to eat the larvae of this insect (two words).
5. This shrub has both male and female catkins in winter (two words).	5. The longest night of the year (two words).
6. Stream-dwelling insect larva that builds a protective case of sticks or pebbles around itself and carries the case along as it moves.	6. This plant yields edible fiddleheads in spring (two words).
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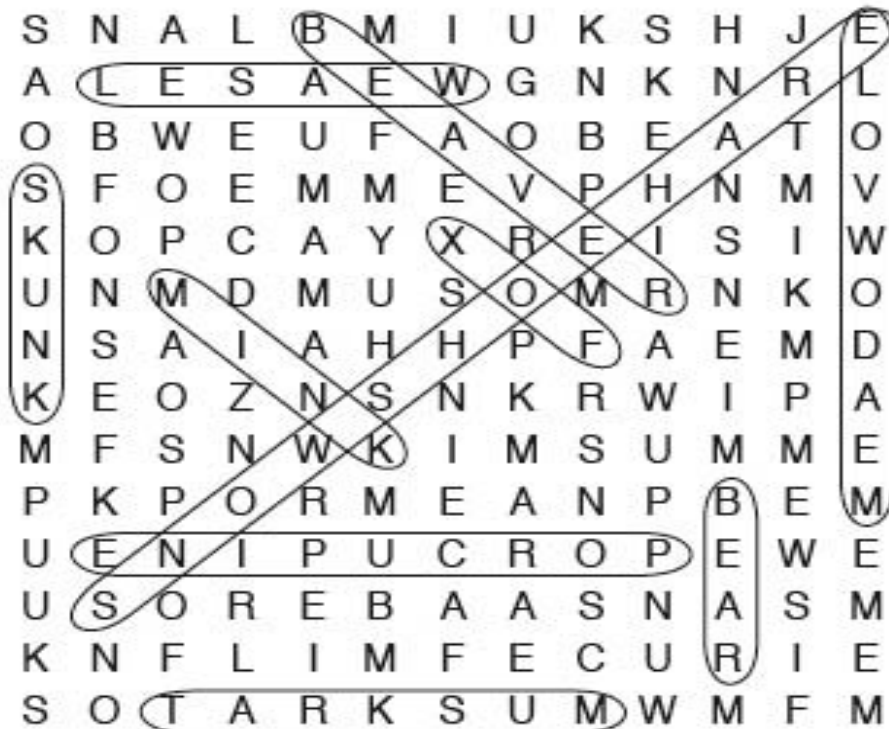
Word Search

Animals in Winter

Winter Calendar (pg. 4)

Use the following clues to find ten mammals of the northern forest in the word search below.

1. This mammal may raise its young in an old woodchuck den. FOX
2. This mammal either dens in a bank burrow or builds a house of cattail stalks and sticks. MUSKRAT
3. This mammal eats stored bark all winter. BEAVER
4. Deep snow allows this mammal to reach twigs and shoots that would otherwise be inaccessible (two words). SNOWSHOE HARE
5. This mammal gives birth in late January. BEAR
6. Early February is breeding season for this mammal. SKUNK
7. A mammal that usually builds its den near water, often in old muskrat or beaver burrows. MINK
8. This mammal travels and breeds in tunnels beneath the snow (two words). MEADOW VOLE
9. This mammal browses hemlock branches. PORCUPINE
10. The white winter coat of this mammal provides better insulation than its dark summer one. WEASEL



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