

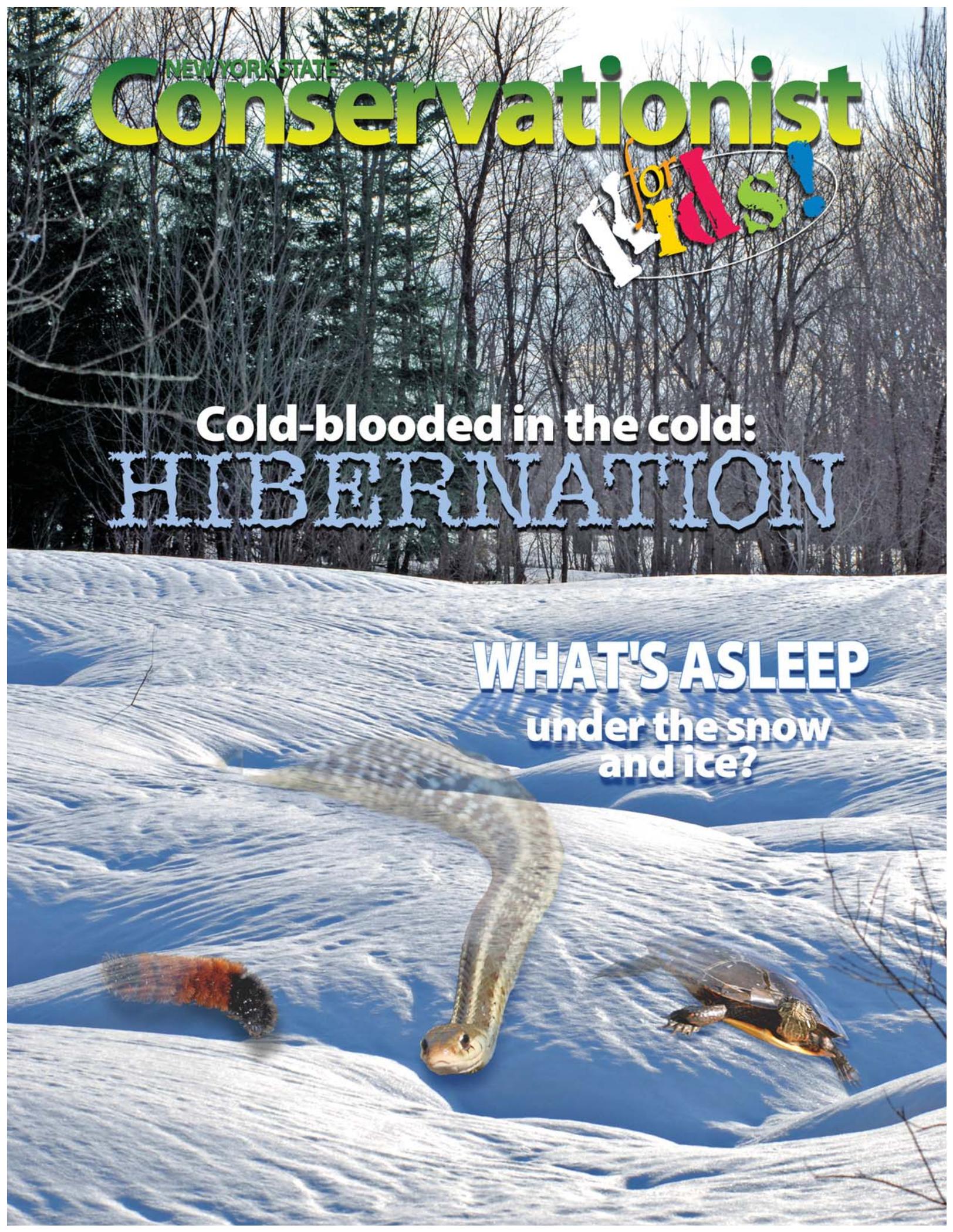
NEW YORK STATE

Conservationist

for Kids!

Cold-blooded in the cold: HIBERNATION

WHAT'S ASLEEP under the snow and ice?



Welcome to
NEW YORK STATE

Conservationist

for
Kids!

Here's Jen, bundled up against the cold for a climb to the top of Algonquin Mountain in the Adirondacks. (She sent us this photo.) But what if you couldn't bundle up and be active in the cold weather?

In this issue:

we'll learn about some of the animals that hibernate to survive our northern winters. You've probably already read a lot about mammals like bears and bats sleeping through the winter. We're going to focus on the animals we don't hear about as much: insects, reptiles and amphibians. Welcome to **"cold-blooded in the cold!"**

Send us a photo of yourself enjoying the outdoors.

Contact us at
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625 Broadway, 2nd Floor
Albany, NY 12233-4500

or e-mail us at
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Visit

www.dec.ny.gov for links to lots of information about the outdoors. Check out DEC's online newsletter for families, *Outdoor Discovery*. Every two weeks readers receive articles about nature with fun activities for kids, plus lists of upcoming events at nature centers near you. Go to www.dec.ny.gov/public/43355.html to sign up and have it e-mailed directly to you.

cover photo by Sue Shafer, photomontage DEC

WHY HIBERNATE?

It takes energy to stay active and warm. Energy comes from food, which is often difficult to find in the winter. Some animals have adapted to survive the cold by going through a long period of dormancy. During this special time, their body functions like heart rate and breathing slow way down. By hibernating, they conserve energy and improve their chances for surviving until warmer weather returns in the spring, along with more plentiful food.

MAMMALS are warm-blooded. When they're active, their body temperature stays pretty much the same. When mammals hibernate, their body temperature drops, breathing and heartbeat slow down, and they don't need as much food as when they're active. Depending upon the species, body fat put on in the late summer and fall may be enough to carry them through the winter, or they may wake periodically for a snack from food they've stored in their burrow.



Groundhog
Sue Shafer, DEC

Blue-spotted salamander



Jean Gawalt

REPTILES and AMPHIBIANS

are cold-blooded. Their body temperature goes up and down with the temperature of their surroundings. They will not survive out in the snow and ice. If you know where they hibernate, you'll know where to start looking for them when spring arrives.

INSECTS

Insects can't be active during the deep freeze, but that doesn't mean you won't see them. Depending upon the species, they may spend the winter as eggs, larvae and pupae, and occasionally as adults.



Frost-covered egg case
Dave Spier



Praying mantis

Sue Shafer, DEC





Put on your pajamas, have a little bedtime snack*, crawl into bed and pull up the covers.

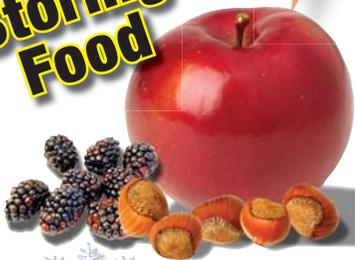
Nighty-night, see you in the morning!

But what if “bedtime” is fall, and the time to wake is spring?

For animals that hibernate, bedtime preparations are not like yours. The clock doesn't signal bedtime. Instead, shorter days, colder temperatures and less available food may work together to trigger hibernation.



Storing Food



*That bedtime snack is actually weeks, possibly months, of eating lots of food to put on body fat. The hibernating animal will then rely on this stored fat as food. (Some smaller mammals wake up for short periods during hibernation and eat from food stored in their underground burrows, in addition to using up body fat.)

A Cozy Bed

For frogs and turtles, the mud at the bottom of the pond is a cozy winter spot. It's even above freezing, since the water temperature may remain around 40 degrees, insulated from the cold air above by a layer of ice.

If the pond bottom isn't a good option, how about underground? Many mammals, plus snakes, toads, and salamanders, spend the winter underground in rocky crevices, burrows, or under logs and leaves on the forest floor. Bats go underground in caves. If they go far enough underground, animals can get below the “frost line,” below where the ground is frozen and the earth is still soft. Pile a blanket of snow on top for extra cover, and it's pretty cozy. Tucked away in a cocoon, many insects provide their own blanket.

Wayne Trimm

ICE LAYER

40°

FROGS

TURTLE



INSECTS

Tent caterpillar egg mass

Some INSECTS spend winter as **eggs.**

Herbert A. "Joe" Pase III, Texas Forest Service, Bugwood.org

Others overwinter as **larvae,** wrapped in a cozy cocoon for the season.

Polyphemus moth cocoon

Lacy L. Hyché, Auburn University, Bugwood.org

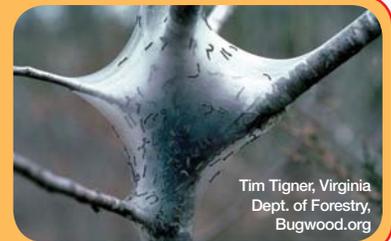
And some spend winter as adults.

Diapause (die-a-paws) is the name given to the special kind of dormancy insects go through. During diapause growth is put "on hold." It can begin well before conditions get bad and can last long after conditions have improved. Insects develop glycerol, a sugary alcohol that acts like antifreeze, as winter approaches. This keeps them from freezing to death, even though they're above the frost line. The glycerol breaks down when the weather warms, and normal growth begins again.

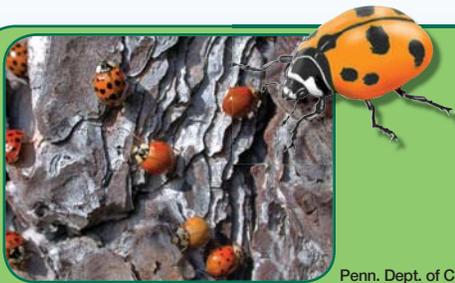
TENT CATERPILLARS

Where are **TENT CATERPILLARS** in winter?

A close look at trees and shrubs along the forest edge may reveal a hard, shiny, brown material wrapped around the twigs: an egg mass. When spring arrives, watch for tiny caterpillars to hatch out and begin feasting on the buds and leaves. Look especially on black cherry, apple, and sugar maple trees.



Tim Tigner, Virginia Dept. of Forestry, Bugwood.org



Penn. Dept. of Conservation & Natural Resources-Forestry Archive, Bugwood.org

Adult **LADYBUGS**, also known as ladybird beetles, hibernate under the bark of a tree or in the leaf litter near the tree's roots. Sometimes they're even found hibernating in clusters inside people's homes. Don't worry. They won't harm your home and they'll leave in the spring!

WOOLLY BEAR CATERPILLARS,

larvae of the Isabella tiger moth, spend the winter curled up in a sheltered place—under a log, or perhaps under some loose bark. In spring they'll spin their cocoon and pupate into adult moths.



Patricia Kernan

Jean Gwalt

MOURNING CLOAK BUTTERFLIES

are sometimes spotted on the first warm days of spring. Why are they out so early? They spent the winter tucked under crevices of bark. When the warm spring sun shines on the bark it warms them, too. They'll return to their sheltered hideaway before the cold settles in again as the sun goes down.



Peter Bryant

REPTILES and

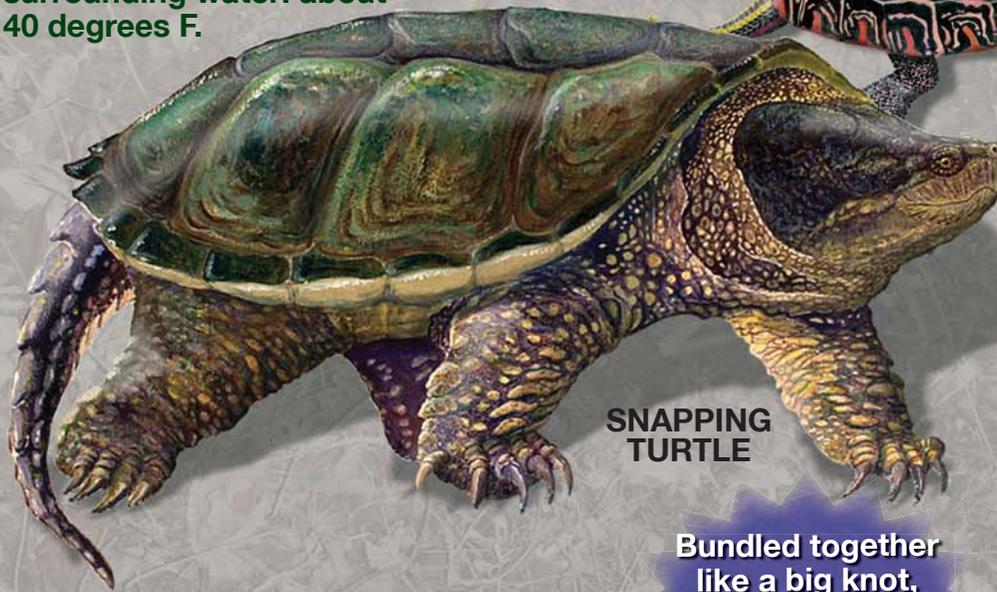
When air temperature falls, so does the body temperature, heart rate and digestion of these animals. They need to get underground below the frost line, or into a sheltered area where temperatures will not dip below freezing.

TURTLES

Instead of breathing with their lungs, as they do during summer, turtles get the oxygen they need by absorbing it through their skin. Sometimes turtles may be seen swimming under the ice. Their bodies will be the temperature of the surrounding water: about 40 degrees F.



PAINTED TURTLE



SNAPPING TURTLE

Turtles are usually snuggled into the mud at the bottom of the pond for the winter.

SNAKES

Snakes, like this garter snake, gather in crevices in rocky places and underground holes. When spring comes, the ground warms. They leave the confined space and begin sunning themselves to warm up.

Bundled together like a big knot, snakes share body heat—just enough to keep them from freezing.



GARTER SNAKE



Look for large numbers of snakes in the spring as they "wake up" and emerge over a few days.

AMPHIBIANS

Eating plenty of food through summer and fall will make certain they have enough stored body fat for winter. This body fat will provide all the food they will need until spring when food is plentiful once again.

FROGS & TOADS

Most frogs hibernate buried in the mud at the bottom of the pond. Instead of breathing with their lungs, as they would in the summer, they get the oxygen they need by absorbing it through their skin from the surrounding mud. Toads and some frogs hibernate under logs and leaf litter on the forest floor. A blanket of snow will help to keep them warm enough to survive the winter.

BULLFROG



AMERICAN TOAD



SPRING PEEPER



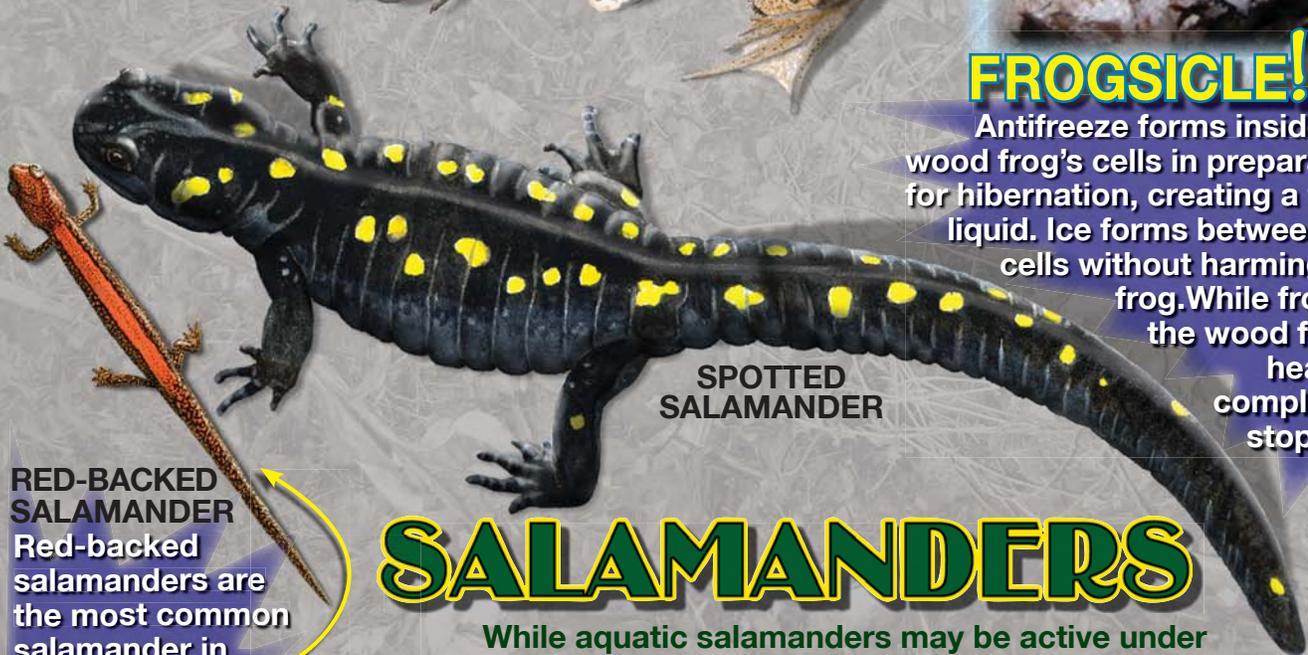
WOOD FROG



FROGSICLE! ↑

Antifreeze forms inside the wood frog's cells in preparation for hibernation, creating a thick liquid. Ice forms between the cells without harming the frog. While frozen, the wood frog's heart is completely stopped.

SPOTTED SALAMANDER



RED-BACKED SALAMANDER

Red-backed salamanders are the most common salamander in New York State. Look for them in wooded areas during warmer months. They go underground for winter.

SALAMANDERS

While aquatic salamanders may be active under the ice through the winter, their land-based cousins are not. Like toads, these salamanders will find shelter and hibernate in underground burrows, under logs and leaf litter on the forest floor, and in rocky crevices.

Ideas for Exploring Outdoors!

Go on a hunt for a really cool winter insect!

Snow Flea Safari

If the weather is warm, look around the base of trees in forested areas for black specs, like freshly ground pepper. Put your hand near them and they'll leap away. Look closely with your magnifying lens and you'll see six tiny legs, a sure sign that this is an insect. Sometimes there are so many in one area that the snow looks black.

Dress warmly, head outside and carry your insect detective kit in your backpack.

Include a magnifying lens, plus a journal and pencil so you can record your findings. Add some field guides, too.

These are adult snow fleas, a type of springtail which overwinters in the leaf litter at the base of trees and emerges on warmer winter days.



Macro photos-Tom Murray

photomontage - NYSDEC

For more information about hibernation:

Animals Hibernating: How Animals Survive Extreme Conditions by Pamela Hickman (Kids Can Press, Tonawanda, New York, 2005)

Animals That Hibernate by Phyllis J. Perry (Scholastic Inc., New York, 2001)

Do Not Disturb: The Mysteries of Animal Hibernation and Sleep by Margery Facklam (Little Brown & Co., Boston, 1989)

"A Long Winter Nap" by Anita Sanchez in *Conservationist*, December 2006, pp 22-23.

www.dec.ny.gov/23.html DEC's New York State Wildlife webpage

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

New York State *CONSERVATIONIST FOR KIDS* Volume 3, Number 2, Winter 2010

David A. Paterson, Governor of New York State



Printed on 100% post-consumer paper, chlorine-free, FSC-manufactured

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Alexander B. Grannis
Commissioner

Conservationist for Kids Supplement for Classroom Teachers “Cold-blooded in the Cold: Hibernation”

Hibernation Highlights

Animals adapt to wintery conditions in variety of ways. Hibernation is a great solution for animals that are unable to migrate, find sufficient food, or regulate their body temperature. Many students are already familiar with hibernation in groundhogs, bats and other mammals, so in this issue of *Conservationist for Kids* (C4K) we have chosen to focus on cold-blooded animals. Information about mammalian hibernation abounds, so only minimal reference is made to it here— simply to help put hibernation in a context students are already familiar with.

Insects, reptiles and amphibians have some fascinating takes on hibernation, sure to excite young minds. From antifreeze to freezing solid, there is great variation. A blanket of snow is also an important factor for the success of hibernating animals to survive extreme cold. Hibernation studies can be extended to include looking at the insulation qualities of snow, as described in this teacher supplement.

MST Curriculum Connections

The activity on The Outside Page of this issue of C4K correlates to the New York State Learning Standards for Math, Science and Technology for fourth grade, as shown below. Connections to other learning standards are also valid.

Snow Flea Safari: MST4. *The Living Environment* 1, 3, 6

Teacher Workshops

For teachers who have participated in a Project Learning Tree or Project WILD workshop, the activity listed below complements the winter 2010 issue of C4K. Visit www.dec.ny.gov/education/1913.html for information about workshops and about how to obtain this curriculum and activity guide.

Project WILD: Interview a Spider (adapt by reporting on species that hibernate)

Conservationist for Kids (C4K) and an accompanying teacher supplement are distributed to public school fourth-grade classes three times each school year (fall, winter, spring). If you would like to be added to or removed from the distribution list, or if your contact information needs to be changed, or if you have questions or comments, please e-mail the editor at cforkids@gw.dec.state.ny.us.

Visit www.dec.ny.gov/education/40248.html. Printable activity sheets and links to other resources are on the website. You will also find back issues of C4K and the activity sheets and teacher supplements associated with each of them.

Visit http://lists.dec.state.ny.us/mailman/listinfo/conservationist_for_kids to keep in touch by joining our e-mail list. Members of our e-mail list receive messages from the editor about the magazine, plus supplementary materials for educators using the magazine in classrooms and non-traditional settings. In addition, list members receive notification about resources and training opportunities for connecting youth to the outdoors and to environmental issues.

Supplemental Activities for the Classroom

A Blanket of Snow

If you have at least 12 inches of snow, it can be fascinating to compare the temperature above and below the snow. There are many different ways to demonstrate the insulating quality of snow. Here's one, with internet links for more ideas. *Snow Temperature Gradient*—Divide the class into small groups and give each group a thermometer, a yard stick, a shovel, and a page on which to record their data. (A recording sheet is available for downloading at www.dec.ny.gov/education/40248.html.) Have each group go to a different area of the schoolyard or other open space and record the depth of the snow. At each study site, have the students cut straight down into the snow so they can see the profile, and move away some of the snow so they can reach the ground. Have them measure and record the temperature of the snow at different depths, including at ground level and at the surface. Ask them to consider where they'd rather be on a cold, windy day, and why. Compare notes with other groups and see if different snow conditions (icy and compacted vs. light and fluffy) result in different insulation values. (HINT: They do.)

www.earthgauge.net/wp-content/EG_Snow.pdf Earth Gauge: National Environmental Education Foundation Program "All About Snow"

www.wildeducation.org/programs/below_zero/activity/snowplac.asp Project WILD Below Zero "Snow Place Like Home"

www.vinsweb.org/education/elf/units/sng.html Vermont Institute of Natural Science; see especially "Insulation Investigation"

<http://landtrust.org/EnvironEd/EEPubs/YNNAPJan08.pdf> Little Traverse Conservancy's Young Naturalists Nature Activity page, *Get Outside* (January 2008) "Discover the Warmth of Snow"

Frogsicles!

On page 7 of this issue of C4K, we have a photo of a hibernating wood frog. Close inspection of the image will show ice crystals on the animal. To help your students to better understand this extreme adaptation to winter—freezing solid—it's worth visiting the web site of Dr. Kenneth Storey at Carleton University in Canada. The process wood frogs go through is described, and numerous photos are on the site. Links are provided to other sites with supporting information. Lessons to demonstrate the process wood frogs go through are available from *Scientific American Frontiers* (PBS).

www.carleton.ca/~kbstorey website of Kenneth Storey, at Carleton University in Ottawa, Ontario; see especially "Vertebrate Freeze Tolerance" and "Invertebrate Cold Hardiness"

http://www.pbs.org/safarchive/4_class/45_pguides/pguide_704/4574_froze.html *Scientific American Frontiers* on PBS; curriculum to accompany "Going to Extremes: Frozen Alive" (originally broadcast 1996-97 season)

Print Resources

Animals Hibernating: How Animals Survive Extreme Conditions by Pamela Hickman (Kids Can Press, Tonawanda, New York, 2005)

Animals That Hibernate by Phyllis J. Perry (Scholastic Inc., New York, 2001)

Do Not Disturb: The Mysteries of Animal Hibernation and Sleep by Margery Facklam (Little Brown & Co., Boston, 1989)

"Hibernation and Winter Withdrawal" by Paul M. Kelsey in *Conservationist*, October-November 1968, pp 20-27.

What is Hibernation by John Crossingham and Bobbie Kalman (Crabtree Publishing Co., New York, 2002)

Internet Resources

www.dec.ny.gov/23.html DEC's New York State Wildlife webpage

www.exploratorium.edu/frogs/woodfrog/index.html The Exploratorium, San Francisco, CA "Cold-blooded Solutions to Warm-blooded Problems"

www.bear.org North American Bear Center website (with webcam)

www.pbs.org/wgbh/nova/satoyama/hibernation.html "Secrets of Hibernation" by Peter Tyson (PBS, Nova Online, 2000) (focus is on bears)

www.si.edu/encyclopedia_SI/nmnh/buginfo/winter.htm Smithsonian Institution "Where do Insects Go in the Winter?"

www.taiga.net/yourYukon/col063.html Your Yukon "Insect Antifreeze"

www.exploringnature.org/db/detail.php?dbID=5&detID=2280 Exploring Nature Educational Resource "Adaptations—Where Do Animals Go in Winter?" by Sheri Amsel