

Survivor: Minnesota Winter



In a Nutshell



Students will explore a variety of techniques Minnesota animals use to cope with harsh winter conditions. Students will participate in an outdoor hike to search for signs of these winter survival techniques.

Grade	K - 2
Season	Winter
Location	Bloomington Visitor Center & Rapids Lake Education Center

Learning Objectives

After participating in this activity, students will be able to:

- Explain that Minnesota wildlife survive winter conditions in different ways.
- Name the three main winter survival strategies of wildlife: Hibernate, Migrate, and Adapted to the cold.
- Give at least one reason why some wildlife can adapt to the cold in Minnesota winters: their food is available all year, they have a body covering that keeps them warm, and/or they are adapted for traveling in the snow.

Literature Connections

- ***Dear Rebecca, Winter is Here*** by Jean Craighead George
- ***Animals in Winter*** Henrietta Bancroft and Richard Van Gelder
- ***What do Animals Do In Winter?*** by Melvin and Gelda Berger
- ***The Animal's Winter Sleep*** by Lynda Graham-Barber
- ***Someone Walks By*** by Polly Carlson-Voiles
- ***Welcome, Brown Bird*** by Mary Lyn Ray
- ***Luck*** by Jean Craighead George
- ***Sunshine Makes the Seasons*** by Franklyn Branley
- ***The Reasons for Seasons*** by Gail Gibbons

Pre-Activities

Prior to the activity, encourage students to bring in a variety of animal pictures or have some prepared for the activity. Students will discuss possible techniques animals use to survive winter conditions. Based on the discussion, students will organize the pictures into one of three categories: hibernate, migrate, or are adapted to the cold. Students will tape their picture under the correct category, followed with a class discussion about the animals they taped up for each survival strategy.



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On-site Activities

Students will discuss various techniques animals use to survive a winter in Minnesota using mystery boxes with clues about how that animal survives winter. Students will then hike in search of signs that refuge wildlife hibernate, migrate or are adapted to the cold in order to survive winter conditions. Weather permitting, students will use snowshoes for the hike. ***There must be at least 6 inches of snow in order to use snowshoes for the hike.***

Classroom Connection

Research a Refuge Animal

Ask students to research how an animal found in Minnesota Valley National Wildlife Refuge is able to survive winter conditions. What does their animal eat? How does it stay warm during the winter? Ask students to illustrate the report.

Create A Simple Nature Calendar

Introduce students to the science of phenology: the observation of nature's patterns and rhythms. Through a phenology calendar, students can monitor and record changes in nature. They might choose to record the animal signs they notice each week or changes in the weather. Teachers can create a class list of events, organized by the season, for students to observe. For example:

- **Winter:** The date ice first appears on the edges of nearby lakes. The last day students notice it is comfortable to wear shorts and sandals. The first snowflake big enough for a student to catch on his/her tongue. The first goldfinch students see dressed in the dull yellow and black feathers of their winter plumage.
- **Spring:** The first sighting of returning robins, monarchs, hummingbirds and orioles. The first hibernating turtles and groundhogs again basking in the warm, spring sunshine. The day ice no longer appears on nearby lakes. The first chorus of frog calls heard. The date the first brood of goslings is seen paddling behind mom.
- **Summer:** The date goldenrod and aster flowers begin blooming on the prairie. The first day the grasshoppers, katydids, and crickets begin calling to each other.
- **Fall:** The day the first flock of geese are noticed flying overhead. The first day maple leaves begin to change color. The date the last leaf falls off of a nearby maple tree.

Students may choose to record their observations with drawings, words, or a combination of both. For more ideas and examples on keeping a phenology calendar, download the Young Naturalists article, *Nature's Calendar*, from the DNR website at www.dnr.state.mn.us/young_naturalists/phenology

Teacher Resources

- ***Nature's Calendar***, Conservation Volunteer Magazine
 - Teacher's guide www.dnr.state.mn.us/young_naturalists/phenology
- ***Minnesota Nature Notes*** by Jim Gilbert



Survivor: Minnesota Winter Pre-Activity

Materials

- Wildlife pictures for students to categorize into one of the three survival techniques
- Key for categorizing wildlife pictures
- White board space or three pieces of butcher paper for students to tape their pictures onto under each heading (*Hibernator, Migrator, and Adapted to the Cold*)
- Earth ball to represent the earth (*w/ hand pump to blow it up*)
- Flashlight to represent the sun
- Tape

Introduction

(20 min)

Lead students in a discussion of the natural history of winter. How does the weather change? How do plants respond to winter weather changes? What happens to bodies of water? How does the length of day and night change? Using the earth ball to represent the earth, and the flashlight to represent the sun, demonstrate how and why we experience seasons.

The Reasons for the Seasons

The earth spins in space two ways. One way creates the day and night cycle and the other is the reason for the seasonal cycle. Ask students to share their ideas about how or why these cycles occurs. Demonstrate each cycle using the earth ball as described below:

- Show students the location of Minnesota on the ball
 - Ask a student volunteer to stand next to you and hold the sun (flashlight). Turn the ball so that Minnesota faces the sun. Explain to students that this represents daytime.
 - Spin the ball so that Minnesota faces toward outer space. Explain to students that this represents nighttime. When it is nighttime in Minnesota it is day time on the other side of the world.
 - Ask students how long it takes the earth to make one complete turn? (Students should answer 24 hours.)
- Orbiting around the sun is the second way the earth spins in space.
 - Demonstrate the slight tilt of the earth as it rotates through a 24 hour period.
 - To better explain the seasonal cycle, use the earth ball to illustrate the axis (an imaginary line that passes through the northern most part (the North Pole) and the southern most part (the South Pole) of earth.
 - Next draw an imaginary line with your finger to divide the northern hemisphere from the southern hemisphere. Explain to students that this imaginary line is called the equator.
 - Slowly walk around the sun, keeping the earth tilted. Show how the position of the hemispheres in relation to the sun change as the earth orbits the sun.

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- This tilt in combination with the orbit is what creates the seasons. When the northern hemisphere, where Minnesota is located, is directed toward the sun we experience summer. At the same time the southern hemisphere is tilted away from the sun and is experiencing winter.
- Move the ball through an entire orbit cycle to test if students can interpret Minnesota seasons.
- Add the 24-hour cycle into the demonstration at the same time. How long does it take the earth to make one complete orbit around the sun? (12 months or 1 complete year).

How do animals respond to all of these seasonal changes?

It depends on the animal, the preferred food of the animal, and the animal's preferred habitat. Introduce to students the terms **Hibernate**, **Migrate** and **Adapted to the Cold**.

Background Information for teachers

Hibernators: There are several different types of hibernation. Some animals that hibernate have warm fur, a thick layer of fat, and sometimes a way to store food deep underground for a mid-winter meal. These types of hibernators spend much of the winter sleeping, occasionally waking up to urinate, eat, and drink. Other types of hibernators might lack fur and a thick layer of body fat to stay warm.

Note: Are All Winter Sleepers “Hibernating”?

Hibernation is a tricky concept. Over the years, biologists have redefined the term and revised the list of wildlife considered to be true hibernators. Today, animals that “sleep” through the winter may be true hibernators or simply entering a state of temporary sleep called torpor. Biologists look at biological changes that take place within an animal’s body to determine whether or not it truly hibernates.

True Hibernation

True hibernators may appear at first glance to be dead as they “sleep”. Their body temperature lowers and their heart beat slows down. Some become stiff and hard as if they are frozen. Loud noises, movement and touch do not immediately “wake” them up. True hibernators include many Minnesota reptiles and amphibians: **snakes, lizards, frogs, toads and some turtles**. Some Minnesota mammals considered true hibernators are **ground squirrels, groundhogs, and chipmunks**.

Torpor

Torpor is a state of deep, temporary sleep with alert stages for eating, drinking and going to the bathroom. Animals that spend parts of the winter in torpor might wake up and move around on a warm winter day, if disturbed, or if especially hungry. Animals that spend much of their winter in torpor are **skunks, raccoons and badgers**. Many **birds** that are active during a Minnesota winter day may spend the coldest, nighttime hours in a state of torpor.

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Migrators: This group of animals typically has a warm body covering; however, it is unable to obtain food in a frozen climate or has no method to store food. Most migrators have wings and can travel to other areas in the world where food can be found.

Exception: If a bird is able to find food, despite the cold weather, it will not migrate and its feathers will keep it warm.

- Example: robins, mallards, Canada geese, eagles

Adapted to the Cold: This group of animals is able to find the food needed to survive all year long, has a body covering that keeps it warm, and is able to move around its habitat. These animals do not need to stash food or leave (migrate) to find the food necessary to survive.

Which is it – Hibernator, Migrator, Adapted to the Cold?

Pass out one picture to each student. Ask them to decide whether their picture is an animal that hibernates, migrates, or has adapted to the cold.

Ask students to think about the following questions when deciding which technique survival their animal uses:

1. **Can this animal find what it needs to eat during the winter season?**
2. **Can this animal move around in an icy, frozen habitat?**
3. **Does this animal have a body covering (such as fur or feathers) to help keep it warm during the cold winter?**

Once everyone in the class has made a decision for their animal, have them (by tables/groups) come up to the white board or paper with the migrate, hibernate, adapted to the cold options. Have them tape their animal picture under the correct heading. *(Refer to key below for which animals go under each type of survival technique if needed)*

Discuss each option for how animals respond to winter. Ask for student volunteers that want to share their ideas about why they labeled their animal with one of the survival techniques.

Wrap-Up

Discuss with students the importance for dressing appropriately for the upcoming winter fieldtrip to the Refuge. If there is sufficient snow, students will hike using snowshoes. Remind them that snow boots are required for snowshoes to fit properly.

Key for Migrate vs. Hibernate vs. Adapted to the Cold

ADAPTED TO THE COLD:

- White-tailed Deer
- Black-capped Chickadee
- Coyote
- Eastern Cottontail
- Gray Squirrel
- Meadow Vole
- Beaver
- Red-tailed Hawk
- Great-horned Owl
- Short-tailed Weasel
- Northern Cardinal
- American River Otter
- Red Fox

MIGRATE:

- Baltimore Oriole
- Eastern Bluebird
- Ruby-throated Hummingbird
- Sandhill Crane
- Monarch Butterfly
- Loon
- Cloudless Sulphur Butterfly
- American Kestrel
- Green Darner Dragonfly

HIBERNATE:

- Little Brown Bat
- Northern Leopard Frog
- Garter Snake
- Bumblebee (Queens hibernate)
- Wood Frog
- Painted Turtle
- Ladybird Beetle (aka a Ladybug)
- Chipmunk
- Black Bear

Survivor: Minnesota Winter On-Site Activities

Materials

- Minnesota Wildlife Mystery Boxes that include items such as: turtle shells, snake skins, deer antlers, assortment of feathers, pelts, skulls, scat replicas, laminated wildlife pictures, and examples of wildlife foods:
 - Hibernators: beaver (#7), turtle/snake (#4)
 - Migrators: hummingbird/monarch butterfly (#3)
 - Adapted to the Cold: rabbit (#6), woodpecker (#2), deer (#1), turkey (#5)
- PPT on zip drive OR laminated copy in bin for mystery box wrap up
- Laminated journal pages (1-2 per group for hike)

Introduction

How people adapt to the cold

Ask students to share what they do, eat or wear during the winter that is different from summer. For example:

- **How do you dress differently?** (*sandals to boots, t-shirts to coats, adding mittens and hats*)
- **What food do you eat when it is cold, that you may not eat when the weather is warm?** (*hot cocoa, soup, oatmeal*)
- **How do you move around or play in the winter that is different from summer?** (*examples: ski/snowboard instead of riding bikes, snowshoeing instead of hiking, sledding and ice skating instead of rollerblading*)

How Wildlife has Adapted to Winter

While people are able to “adapt” to changes in weather, animals either are or are not designed for the cold. Review the 3 main ways Minnesota wildlife have adapted to winter conditions that were introduced to the class during the pre-activity: *hibernate, migrate, and adapted to the cold.*

Minnesota Wildlife Mystery Boxes

Discuss with students the challenges animals face in the winter (*cold, lack of food*). Divide the class into teams equal to the number of Minnesota Wildlife Mystery Boxes available. Make sure there is at least one adult leader (teacher, chaperone, refuge staff or volunteer) to work with each team. Explain to adult leaders and students that each kit contains pictures and clues to help them determine what the animal eats, how the animal stays warm, and the animal’s preferred habitat and shelter. Provide each team with enough time to explore the items in their kit to determine the answers to the following three questions:

1. **Can this animal find what it needs to eat during the winter season?**
2. **Can this animal move around in an icy, frozen habitat?**
3. **Does this animal have a body covering (such as fur or feathers) to help keep it warm during the cold winter?**

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Each mystery box comes with a description of the items in the box to assist the adult leaders in discussing with the students whether the animal represented in the kit migrates, hibernates, or has adapted to the cold. If time, students can rotate through more than one kit, or they can be left out in the classroom for groups to look through once they've returned from their hikes.

Before the outside hike, take time to facilitate a class wrap-up using the PPT or laminated copy. Encourage student groups to use the artifacts in their kits to explain their conclusions. Give each team an opportunity to answer: Does this animal migrate, hibernate or has it adapted to the cold? Ask the entire class if they agree with the team's conclusion before moving on.

Animal Clue Hike

Students will hike through refuge habitats with their chaperones in search of wildlife signs including: **nests, dens, feeding, sounds, smells, and tracks**. Ask students to determine whether a clue suggests an animal has adapted to the cold, hibernating, or has migrated. Ask the adult leader to record student observations, including in which habitat (prairie, forest, wetland) on their group's laminated journal page as they explore. The team will use this sheet to help with filling out their own journal pages after the hike.

Wrap-up Management Connection

Back in the classroom pass out the student journal pages. Ask the adult team leaders to help the students in their team review what they discovered and record their observations under the categories Hibernation Clues, Migrations Clues, Animals that have Adapted to the Cold Clues. When the teams are finished, wrap up the lessons with a whole class discussion of what students observed during their hike. List their observations on the white board under the same categories.

Finish up the lesson with an explanation of the term **phenology**: *the seasonal patterns and rhythms of nature*. Explain to the students that when observations, like the ones they made today, are compared from year to year biologists are more likely to notice unusual changes in otherwise predictable cycles. Sometimes, these changes signal a problem that scientists have to address in order to protect a plant or animal species.

Biologists are not the only ones who can help to collect valuable phenology data. Many citizen science programs are now available for anyone interested in learning how to collect and report phenology. Let students know that their teachers can help them log onto websites like Nature's Notebook (the program Minnesota Valley National Wildlife Refuge uses), Feeder Watch (specific to winter birds), and many others to learn more and get involved.

Additional Background Information

More About.....Animals that Hibernate

Hibernators are unable to find the food they need to survive during winter or they are cold-blooded and simply unable to maintain warmth. To adjust, their bodies have been designed to sleep through most of the winter.

For example:

- A woodchuck eats mainly green, leafy vegetation, small grains, and garden plants. It spends most of the summer gorging on these foods to gain a thick layer of fat. During hibernation, the woodchuck is able to reduce its metabolism and utilize the stored fat for up to 6 months.
- Without a thick coat of fur or the ability to regulate body temperature, Minnesota reptiles and amphibians hibernate through the winter. Some reptiles and amphibians, like turtles and frogs, bury into the mud at the bottom of ponds. Forest amphibians, like the spring peeper and the American toad, bury into the forest soil. Some reptiles, like the common garter snake, hibernate in large groups in underground dens dug by other animals.

More About.....Animals that Migrate

Some Minnesota animals must migrate to find the food they need during winter. Perhaps they can't access the food they need for survival or the food is not available during the winter months.

For example:

- Ducks, geese, and loons are unable to reach the food they need when lakes, ponds and wetlands freeze. Ducks eat aquatic plants floating on the water's surface, plants rooted in the shallows and aquatic invertebrates. Geese eat the young shoots of plants growing along wetland edges and banks. Loons dive under the water to hunt and spear fish.
- The American robin is unable to find the earthworms and other insect larvae found in the upper layers of the soil, once frost has set in. Hummingbirds and monarch butterflies, both nectar feeders, are unable to find flowering plants during the winter months. Bluebirds and adult dragonflies rely on flying insects for food which they are unable to find during winter.

More About.....Animals that have Adapted to the Cold

Minnesota animals that stay here and are active through the winter have adapted to the cold weather in winter. Generally, these animals have warm winter coats and eat food that is available all winter.

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For example:

- Thick winter coats: Each hair in a deer's winter coat is hollow like a straw. The air that fills each hair is heated by the animal's body, acting like an electric blanket warming the animal despite winter's coldest temperatures.
- White winter coats: As winter weather approaches, animals like ermine, snowshoe hare and arctic fox begin to grow in a white winter coat. The light-colored fur of the arctic fox, snowshoe hare and ermine help these mammals blend in with their snowy white surroundings. This camouflage helps them hide from predators and to sneak up on their prey. The feathers of the snowy owl are also mostly all white. The white feathers provide better camouflage in the tundra where they live.
- Thick feathers: Birds able to find food all-year, such as woodpeckers, chickadees, cardinals, jays, crows and finches, have an insulating layer of feathers to keep them warm (think of our winter down coats). The largest, most stiff feathers, flight feathers, are used for flying. The second largest feathers, contour feathers, cover and protect the body. The smallest, most fluffy feathers, down feathers, can be compared to wearing long underwear. The fluffy design of down feathers traps heat next to the bird's body.