The Winter Wildland:

ANIMAL ADAPTATIONS IN WINTER

Respect Rule: Look, Listen, Learn, and Leave Alone (until instructed).

Overview

Because winter can be a very harsh environment for animals, they have evolved to change their bodies and behavior to survive. By reading and observing what animals do to survive in winter, the students will understand the world of animals in winter.

Background

Adaptation is the way animals change in their behavior and/or their bodies. They must fit in with the environmental conditions which occur in its habitat. Adaptation can be either physical or behavioral.A physical adaptation is some change made to a part of the body.A behavioral adaptation is something an animal does.

Physical Adaptations: As winter comes, animals may grow new, thicker fur in the fall to keep warm.Weasels and snowshoe rabbits grow new white fur to hide in the snow or what is called camouflage.

Hibernation (physical adaptation): Animals hibernate to escape the extreme cold or they die. True Hibernation is when an animal appears to be dead. The animal's body temperature drops to almost the same temperature as the outside and its heartbeat and breathing slow down. There is no movement and the animal uses very little energy. A yellow-bellied marmot (woodchuck) is a true hibernator. Its temperature drops from 98º to 40º. Its heartbeat slows from 80 beats per minute to just 4.

Since waking up is difficult for a true hibernator, it is easy for predators to attack. As a result, *true hibernators* must find a safe place to sleep, such as a hole in a tree, under a log, or in a cave.

In the late summer and fall, when days grow shorter and temperatures cool, hibernating animals eat more food than usual. They put on a lot of extra weight. This added body fat gives them the energy needed to stay alive over winter. If there is a shortage of food in the fall, the animal might not live until spring, when it can find food once again.

Torpor (physical adaptation): is a type of hibernation, a dormancy strategy, in which the animal sleeps for a short time. The heart rate slows down and the body temperature drops, but the animal is able to wake up and move around for short periods. The purpose is to conserve calories during the winter months when food is scarce. Scientists believe these animals must wake up every few weeks throughout their dormancy to exercise the brain to keep everything in working order and to prevent muscle atrophy.

Migration (a behavioral adaptation): is the traveling to other places where the weather is warmer and/or there is more food. Many birds migrate in the fall, and because the trip can be dangerous, some travel in large flocks. Birds can fly very long distances, but most birds migrate shorter distances. They seem to navigate like sailors once did using the sun, moon, and stars for direction. They also seem to have a compass in their brain for using the Earth's magnetic field. Other animals migrate, like bats, mule deer, mountain lions (which usually follow the deer), fish, and whales.

Insects, such as butterflies and moths, also migrate. Although most insects migrate short distances, monarch butterflies spend the summer in Canada and northern United States and migrate as far south as Mexico for the winter. The earthworm migrates deeper into the ground, some as far as six feet below the surface.

Other Behavioral Adaptations: Some animals gather extra food in the fall and store it to eat later. Some eat different kinds of food as the seasons change. The red fox eats fruit and insects in the spring, summer and fall. In the winter, it cannot find these things, so it eats small rodents. Some animals find winter shelter in holes in trees or logs, under rocks or leaves, or underground, while other animals like squirrels and mice huddle close together in their dens.

Objectives
Students will learn how animals survive the rigors of winter life in the Sierra Nevada Mountains; students will observe and record nature in winter.

Grade Levels
K–6

Adult/Student Ratio
1 adult to 5 students

Where
A snow-covered trail or road. The students snowshoe on the trail to a meadow or pond or along a creek.

Skills
Analyzing, classifying, categorizing, comparing, contrasting, composing, concluding, discussing, identifying attributes and components, observing

Key Words
Hibernation
Torpor
Adaptation
Migration
Brown fat

Before-the-Field-Trip Activities

Activity 1: How Do Animals Survive Winter
Time: 45 minutes
Materials: Story: *Winter is Coming*, Student Study Sheet: *How Animals of the Sierra Nevada Mountains Survive Winter*; Student Study Sheet: *Survival Strategies for Animals in Winter*, Student Worksheet: *How Animals Survive in Winter*

1. Read or tell the story *Winter is Coming*.
2. Discuss the ways the students change when winter comes and write the ways on the board.
3. After explaining adaptation, physical adaptations, hibernation, torpor, migration, and other behavioral adaptations, prepare a four-column chart on the board with headings: Hibernation, Other Physical Adaptations, Migration, and Other Behavioral Adaptations.
4. Can any of the previous student answers be placed into one of the four categories? (migrate to warmer states in motor home or winter home; gather wood and stay inside; bundle up and go out in the snow and cold) Write the student's response under the appropriate column.
5. Next ask for ways animals survive the winter.
6. Have students study the Student Study Sheet: *Survival Strategies for Animals in Winter* and Student Study Sheet for *How Animals of the Sierra Nevada Mountains Survive Winter*.
7. Have students complete the Student Worksheet: *How Animals Survive in Winter*.

Activity 2: Slowing Down
Time: 45 minutes
Materials: stopwatches (or second hand on a clock)

1. Review with the students the meaning of hibernation and torpor: What is hibernation? How does an animal change when it is hibernation? Name some animals that hibernate. What is torpor? How does it differ from deep hibernation?
2. Explain that a black bear normally has 40–70 heartbeats per minute and only 8–12 when it is in the torpor state; a California Ground Squirrel normally has 500–600 heartbeats each minute and in winter, it slows its metabolism down to 25 heartbeats per minute.
3. With a stopwatch have the students measure their own pulse—the number of heart beats per minute. There are two methods to feel a heartbeat:
   Method 1: Place the index and middle finger of left (right) hand directly under the left (right) ear, then slide the fingers down until they are directly under the jawbone, pressing lightly.
   Method 2: Place the index and middle fingers over the outside of the opposite wrist, just below the base of the thumb.
4. Write down the students' heart rate at their desks.
5. Compare with the black bear and ground squirrel heart rates: Who has the fastest heart rate? Who has the slowest heart rate?
6. Optional: Find the average student heart rate.
7. Now have students lie down on the floor and count how many times they breathe per minute. Have them imagine what it would be like to breathe only once or twice per minute.

Activity 3: Animal Charades
Time: 45 minutes
Materials: *Animal and Survival Information Cards*, 8 ½" x 11" cards with the words Migration, Hibernation, Other Physical Adaptations, and Other Behavioral Adaptations

1. Give each student an animal card that has the animal's strategies for winter survival.
2. Using the four cards, have students sort themselves by one of their animal's survival strategy into the four categories of Hibernation, Migration, and Other Physical Adaptations and Other Behavioral Adaptations.
3. Give each student a turn to act out his or her animal using similar rules of the traditional charade game. (The game does not need to be timed.) Students can guess other strategies for this particular animal.
4. The class can be divided into teams and a student can keep score.

Activity 4: The Warmth of Fat
Time: 45 minutes
Materials: 2 gallon size Ziploc baggies, box of disposable gloves, shortening, 1 dishpan tub, ice, a butter knife, cold water

1. Fill tub with cold water and ice.
2. Have student put gloves on.
3. Have a partner spread the shortening on one gloved hand.
4. Place a baggie over the shortening-covered hand and seal the top.
5. Place the other baggie over the plain gloved hand and seal the top.
6. Plunge both of the hands into the tub.
7. Ask the student which hand stayed warmer. Why?

Activity 5: Be Prepared for the Snow Hike
Time: 45 minutes
Materials: *Be Prepared for the Snow Hike* (enough copies for all students)

1. Check the weather forecast on the internet 24–48 hours in advance.
2. Discuss with students what to wear:
   - **A**nything **B**ut **C**otton (ABC). When cotton gets wet it losses the ability to provide warmth and actually drains heat from wet bodies. Wool and synthetics, worn in layers, take away dampness and provide warmth when one is active.
   - The outer layer, such as jacket and pants, should be waterproof or water resistant.
   - Extremities get cold faster than the core body, so boots, gloves and a warm hat are essential ingredients to avoid hypothermia and even frostbite.
3. Discuss with students what items they might bring for survival. Make a list. Now discuss the following list:
   - Extra layer of clothing
   - Drinking water
   - An energy bar
   - Rope
   - Large garbage bag
   - Map
   - Compass
   - Whistle
   - Small flashlight
   - Mirror
   - Cell phone
   - First Aid Kit
4. Tell someone where you are going. Give exact name of trailhead, a map of how you will get there, where you plan on going, date of departure, and expected time and date of return. Leave your cell phone number, car license number, and names of closest relatives with this person.
5. Discuss what students could do if they get lost. Make a list. Now discuss STOP.
   - **S** = ***Stop*** where you are. Do not wander. Calm down for a minute. Hug a tree.
   - **T** = ***Think*** about where you are, what resources you have and what you need to do.
   - **O** = ***Observe*** your surroundings. Take note of the terrain, snow depths and conditions, weather, time of day, tracks and trails and anything else that might help you with the final step.
   - **P** = ***Plan*** what to do:
     - *Shelter*—use clothing, garbage bag, branches from trees, a snow cave or anything else that will protect the person from wind and wet and cold.
     - *Fire*—start a small fire from low branches from a tree or downed wood. Add more wood slowly and keep it going.
     - *Signal*—Use a whistle, smoke, a mirror, bright colored jacket or SOS stomped in the snow to increase visibility. Try using a cell phone even if it says no service.
     - *Water*—Drink water to avoid dehydration. Eat snow sparingly. Melted snow is better.
6. Make copies of the *Be Prepared for the Snow Hike* and send home with students to read to their parents.

Field Trip Activities

Activity 1: Who's Been Walking Here
Time: 2 hours
Materials: Animal Tracks Poster, Student Sheets: Animal Tracks (Make copies on card stock and place in plastic sleeves.), and nature journals with pencils

1. Introduce the animal track poster.
2. Ask students what animal tracks they might see on the hike.

3. Help students identify tracks as they hike along using the individual animal track sheets by asking these questions:
   What animals were here?
   Are the tracks closely space or far apart?
   What is its width? (with snow measure at the bottom not at the top of the snow)
   What is its length?
   What is its shape? round? oval? oblong?
   Are claw marks showing? How many? Could the ground be too hard to show claws?
   Explain the difference between wild animal and domestic animal tracks. Wild animals conserve energy by using their same tracks to step in and move in a straighter line. Domestic animals run every which way.
   Are pads showing? How many?
   Are toes showing? How many?
   Were the animals walking or running?
   What is the distance between this track and the other track? (This is known as the animal's gait! Knowing the gait can be very helpful in identifying the species.)
   What is the habitat? Where is the animal going and what is it doing?
   How many different animal tracks can you find?
4. Have students draw the animal track in their nature journals and then check the charts to identify the track. Make notes about the track.

Activity 2: Be On the Lookout
Time: Time of the hike
Materials: nature journals, colored pencils

1. As students snowshoe on the trail, have them be on the lookout for hibernating or dormant insects under logs, rocks, and leaves.
2. Record what they see in their nature journals.
3. When they reach a place for lunch, have the students draw in their nature journals three to four things they observe, showing as much detail as possible. These drawings are not about being pretty, but about observing what the student sees and about writing notes about the observations.

Activity 3: Pick a Tune
Time: in the car or bus on the way home from the hike
Materials: nature journals, pencils

1. Have students pick a tune that he or she knows and make up new lyrics about hibernating animals.
2. Break up into teams of two or three and write down the words.
3. Students present their song the next day in class.

After-the-Field-Trip Activities

Activity 1: My Winter Animal Story (or research paper)
Time: 45 minutes
Materials: paper, pencils, markers, Student Study Sheet: *How Animals of the Sierra Nevada Mountains Survive Winter*

1. Discuss creatures they saw on the field trip. Discuss animals that live in the forest and around their school and home. Make a list on the chalkboard.
2. Review what animals do to survive in the winter using the Student Study Sheet: *How Animals of the Sierra Nevada Mountains Survive Winter*
3. Have students pick a creature they would like to write about. Then have them write down three things the creature does during winter in order to survive.
4. Have the younger students create individual stories beginning with "The day I went to the snow I saw…" Have the older students be creative and write a story from the point of view of the animal surviving winter or write a research paper on an animal, including data, drawings, maps of location and migration paths, etc.
5. Have the students share their story with each other or to students that are younger.

Activity 2: Feed and Observe Winter Birds
Time: 20 minutes
Materials: Pine cones, peanut butter, bird seed, metal teaspoons, string, plastic bags

1. Give each student a pine cone.
2. Have them put peanut butter into the holes of the pine cone using the metal teaspoons.

3. Roll the pine cone in bird seed.
4. Tie the string onto the pine cone.
5. Have the students take their pine cone home in the plastic or paper bag and hang from trees and bushes in sheltered areas where they can see it. (Try hanging a pine cone near the classroom window so the students can observe during the school day.)
6. Make a list of birds that the students see at their bird feeder.

Activity 3: A Winter Mural for the Library or Cafeteria
Time: 2 forty-five minute sessions
Materials: poster paper, paints, paint brushes, pencils, pictures of animals, scissors, glue

1. Have students paint a classroom mural of the forest in the wintertime; include a horizon line, mountains, snow, creek, trees, logs, rocks, etc.
2. Have students draw pictures of animals from different categories, such as animals that hibernate, animals that do not, animals that migrate, and animals that adapt with other behaviors.
3. Paste the animals on the mural in the appropriate place: birds in the sky, an earthworm in the ground, bears in a tree trunk, etc.

Extended Activities

Activity 1: Math and Internet Connections about Hibernation
Time: 30 minutes
Materials: Internet, graph paper, markers

1. Find statistics on different hibernation animals.
2. Create charts, bar graphs, and pictographs.
3. Which animals hibernates the longest? How does the animal's hibernating heartbeat compare to its normal heartbeat? Which animal breathes the slowest? What are some conclusions students can make about all animals that hibernate?

Activity 2: Make a Plaster Animal Track
Time: 2 hours
Materials: STE Animal Track Kit, paint brushes, paint, black marker

1. Follow instructions in kit.
2. Allow for drying time before student takes track home.
3. Paint track and label with animal name on the back of track.

Sources

Keepers of the Earth by Michael J. Caduto and Joseph Bruchac. 1988. Fulcrum, Inc., Golden, CO.

Sierra Nevada Natural History by Tracy I Storer and Robert L. Usinger. 1963. University of California Press, Berkeley, CA.

How Do Animals Spend the Winter by Science Made Simple, http://www.sciencemadesimple.com/animals.html

Hibernation, http://www.saskschools.ca/-gregory/winter/win2.html

Winter Adaptations, http://www.bobpickett.org/winter_adaptations.html

Resources

For the Young Student

Animals That Hibernate by Larry Dane Brimner. 1991. Frank Watts, New York, NY.

A Bed For Winter by Karen Wallace. 2000. Dorling Kindersley Publishing, New York, NY.

Do Lobsters Leap Waterfalls? A Book About Animal Migration by Laura Purdie Lalas. 2006. Capstone Press, Mankato, MN.

Don't Wake Up the Bear! By Marjorie Dennis Murray. 2003. Marshall Cavendish Corporation, Tamytown, NY.

Every Autumn Comes the Bear by Jim Arnosky. 1996. Paper Star, New York, NY.

Hibernation by Anita Ganeri. 2005. Heinemann Library, Chicago, IL.

Hibernation by Margaret Hall. 2006. Capstone Press, Mankato, MN.

Hibernation Station by Michelle Meadows. 2010. Simon & Schuster, Chicago, IL.

The Journey: Stories of Migration by Cynthia Rylant. 2006. Blue Sky Press, New York, NY.

The Magic School Bus Goes Upstream: A Book About Salmon Migration by Joanna Cole. 1997. Scholastic Paperbacks, New York, NY.

The Mitten by Jan Brett. 1989. G.P. Putnam's Sons, New York, NY.

Red Fox Running by Eve Bunting. 1993. Clarion Books, New York, NY.

They Walk the Earth: The Extraordinary Travels of Animals on Land by Seymour Simon. 2000. Harcourt.

Time To Sleep by Denise Fleming. 1997. Henry Holt & Company, New York, NY.

Wake Me in Spring by James Preller. 1994. Cartwheel Books, New York, NY.

What Is Hibernation? By John Crossingham. 2002. Crabtree Publishing Company, New York, NY.

Why Do Animals Sleep Through Winter? by Chris Arvetis and Carole Palmer. 1987. Checkerboard Press, New York, NY.

For the Older Student

Being Caribou: Five Months on Foot With a Caribou Herd by Karsten Heuer. 2007. Walker and Company, New York, NY.

Hibernation by Clive Roots. 2006. Greenwood Press, Westport, CT.

Hibernation by Frederic P. Miller, Agnes F. Vandome, John McBrewster. 2010. Alphascript Publishing, USA.

Life in the Cold: An Introduction to Winter Ecology by Peter J. Marchand. 1996. University Press of New England Hanover, NH.

They Swim the Seas: The Mystery of Animal Migration by Seymour Simon. 1998. Steck-Vaughn, Chicago, IL.

For the Teacher

Activities to go with *Time to Sleep*. http://www.denisefleming.com/pages/activites-sleep.html

Check online for other activities that support the above mentioned picture books.

Sierra Nevada Natural History by Tracy I Storer and Robert L. Usinger. 1963. University of California Press, Berkeley, CA.

Keepers of the Earth by Michael J. Caduto and Joseph Bruchac. 1988. Fulcrum, Inc., Golden, CO.

Language Arts/English	Social Studies/History	Foreign/Sign Languages
•Make a library display about animals that hibernate, migrate and adapt in winter. •Read a picture book to younger students about hibernation.	•Create a poster showing how animals cope with winter and display it at the school or county library.	•Learn to sign a song about winter and share this with classmates and younger students.
Arts	**Vocational Arts**	**Math**
•Help a classroom of younger students to create nature journals. •Lead a school hike for younger students to observe and draw what they see in their own schoolyard.	•Photograph and identify birds at your school and share the pictures with other students.	•Research the statistics on the local populations of black bears, eagles, mountain lions, etc. and create a graph of these populations. Share this information with the local community. •Create a budget for materials to build bird houses for a classroom of 30 students. Propose this budget to the school principal.
Physical Education	**Computer**	**Science**
•Create a poster on exercises that prep students for snowshoeing and post it on campus for the students to read. *Research the history of snowshoes and make a presentation to several classes. •Take younger children on a hike near the school and explain about tree, plants, and animals that live in the local habitat.	•Research the weather forecast for a month. Create a poster to display in the classroom.	•Research the structure of snowflakes, how they are made, and the kinds of snowflakes. Create a display and give an oral presentation to classmates and to younger students.

Winter is Coming

It is fall and all around you leaves are turning bright colors and dropping to the ground. The sun is rising later and setting earlier every day and the morning air is cold. Fog forms over the ponds, lakes and rivers as the sun rises. The mist disappears when the sun climbs high in the sky. You have a great need to eat as many berries, insects and nuts as you can find, and you are storing fat as you eat. Can you feel your body growing larger?

As each day goes by, the nights grow longer and colder. White frost crystals cover the plants, turning many of them brown and lifeless. Food is running low, yet you are using more food to keep warm. Ponds and lakes are freezing over and you have to travel farther each day to get water. Winter is coming fast! Soon the snow will blow, food will be hard to find and much of the water around you will become ice.

You are a wild creature and winter is coming. What are you going to do to survive?

Source:
Keepers of the Earth by Michael J. Caduto and Joseph Bruchac

Name Date

How Animals of the Sierra Nevada Mountains Survive Winter

Student Study Sheet

Animal	Strategy for Survival
Black Bear	Hibernates in a state of torpor and decreases body metabolism by lowering temperature, heart rate and breathing; eats lots of food in the fall to create a layer of brown fat; delays implantation; pregnant female dens.
Opossum	Hibernates in a deep sleep in the ground, a cave, a tree and decreases body metabolism by lowering temperature, heart rate, and breathing; eats lots of food in the fall to create a layer of brown fat; huddles with others to keep warm, sometimes with woodchucks, raccoons, and skunks.
Shrew and mole	Increases body metabolism by raising heart rate, breathing, and temperature; grows a dense coat and secretes oils to help waterproof the fur; stores food to eat later; tunnels under snow to find food; huddles with others to keep warm; produces a layer of brown fat; hunts all winter; changes diet.
Bats (9 species)	Some hibernate in a state of torpor and decrease body metabolism by lowering temperature, heart rate, and breathing; create a layer of brown fat; wrap wings around themselves in a cave, tree, or attic; delay fertilization; others wake up on warmer days to look for food and water, and others migrate to warmer areas and hunt all winter.
Snowshoe Hare	Changes color by growing a white coat with hollow hairs without the color pigment, melanin, that have more air spaces within the hairs and thus has greater insulation; hunts all winter.
Yellow-Bellied Marmot (Woodchuck/ groundhog)	Hibernates in a deep sleep in rock piles or tree roots and decreases body metabolism by lowering temperature, heart rate, and breathing; eats lots of food to create a layer of brown fat;
California Ground Squirrel	Stores food to eat later; decreases body metabolism by lowering temperature, heart rate and breathing.
Northern Flying Squirrel	Stores food to eat later; huddles with others to keep warm.
California Gray Squirrel	Builds insulated nests high in the trees; stores food such as acorns for eating later; hides during bad weather.
Golden-Mantled Ground Squirrel	Hibernates; stores food to eat later; eats lots of food in the fall to create a layer of brown fat.
Chipmunk	Hibernates in a state of torpor (short sleeps) and decreases body metabolism by lowering temperature, heart rate and breathing; stores food to eat later.
Chickaree	Builds an insulated nest; changes color; stores food to eat later.
Mice	Some hibernate in a deep sleep in the ground and decrease body metabolism by lowering temperature, heart rate, and breathing; others hibernate in a state of torpor (short sleeps) and decrease body metabolism by lowering temperature, heart rate and breathing; eat lots of food in the fall to create a layer of brown fat; build insulated nests underground to keep warm.

Animal	Strategy for Survival
Beaver	Eats lots of food in the fall to create a layer of brown fat; stores food underwater to eat later; uses an interlaced network of blood vessels as a heat exchanger to block excessive loss of heat to the environment.
American Porcupine	Grows a dense coat; males roost in trees for days, eating bark; females and juveniles huddle together in dens.
Red Fox	Grows fur on feet and between toes for greater insulation, warmth, and better mobility over the snow; changes diet; hunts all winter.
Raccoon	Hibernates in a state of torpor (short sleeps) and decreases body metabolism by lowering temperature, heart rate and breathing; huddles with others to keep warm; eats lots of food in the fall to create a layer of brown fat; changes diet.
Weasel	Tunnels under snow to find food; stores food to eat later; delays implantation; short-tailed weasel changes color by turning white to camouflage with the snow.
Skunk	Hibernates in a state of torpor (short sleeps) and decreases body metabolism by lowering temperature, heart rate and breathing; huddles with others to deep warm; eats lots of food in the fall to create a layer of brown fat.
Bobcat	Migrates to a new area, changes diet, and hunts all winter.
Mule deer	Migrates to new area, changes diet and hunts all winter; grows new hair that is hollow, which provides more insulation.
Bird	Migrates to a new area, usually a lower elevation, changes diet, and hunts all winter; fluffs out feathers to keep self warm; goes into short periods of torpor at night; generates heat by shivering.
Snake, lizard, newt, turtle	Hibernates in a deep sleep under stones, logs, compost heaps, and old burrows, and decreases body metabolism by lowering temperature, heart rate, and breathing.
Frog	Some hibernate in a deep sleep the ground at the bottom of streams and ponds where the water does not freeze; some find shelter under leaves and dirt; decrease body metabolism by lowering temperature, heart rate and breathing.
Slug, snail, queen wasp, bumblebee	Hibernates in a state of torpor (short sleeps) and decreases body metabolism by lowering temperature, heart rate and breathing; releases chemical to prevent itself from freezing.
Monarch butterfly	Migrates to coastal and southern areas and hunts all winter.
Most insects	Die so eggs can hatch in the spring.
Ladybug	Eats lots of food like aphids and pollen to create a layer of fat.
Fish	Migrates to warmer water and hunts all winter.
Earthworm	Migrates down into the ground, some as far as six feet.
Coyote	Grows a dense coat and secretes oils to help waterproof the fur; grows fur on feet and between toes for greater insulation, warmth, and better mobility over the snow.

Name Date

Survival Strategies for Animals in Winter

Student Study Sheet

1	Hibernates in a deep sleep in the ground, a cave, a tree, or compost pile and decreases body metabolism by lowering temperature, heart rate, and breathing.
2	Hibernates in a state of torpor (short sleeps) and decreases body metabolism by lowering temperature, heart rate and breathing.
3	Migrates to a new area, changes diet, and hunts all winter.
4	Eats lots of food in the fall to create a layer of brown fat.
5	Grows a dense coat and secretes oils to help waterproof the fur.
6	Huddles with others to keep warm.
7	Stores food to eat later.
8	Increases body metabolism by raising heart rate, breathing, and temperature.
9	Changes color.
10	Dies so eggs, larvae, or pupae may continue to live.
11	Releases a chemical (glycerol) to keep from freezing
12	Grows fur on feet and between toes for greater insulation, warmth, and better mobility over the snow.
13	Delays implantation: egg is fertilized, but does not implant and grow until later date
14	Delays fertilization: sperm is stored in female's body and egg is fertilized at a later date.
15	Builds an insulated nest.
16	Tunnels under snow to find food.
17	Generates heat by shivering.
18	Decreases body metabolism by lowering temperature, heart rate and breathing.
19	Hides during bad weather.
20	Changes diet.

Name Date

How Animals Survive in Winter

Student Worksheet

Animal	List 2–3 strategies by number from the Student Study Sheet: *Survival Strategies for Animals in Winter*
Black Bear	
Opossum	
Shrew and mole	
Bat	
Snowshoe Hare	
California Ground Squirrel	
Northern Flying Squirrel	
California Gray Squirrel	
Golden-Mantled Ground Squirrel	
Chipmunk	
Chickaree	
Mice	
Beaver	
American Porcupine	
Red Fox	
Raccoon	
Weasel	
Skunk	
Bobcat	
Mule deer	
Bird	
Snake, lizard, frog, toad, newt, turtle	
Butterfly, slug, snail, queen wasps, bumblebee	
Fish	
Earthworms	
Coyote	

Animal Survival Information Cards

Black Bear

- Hibernates in a state of torpor (short sleeps)
- Decreases body metabolism by lowering temperature, heart rate and breathing.
- Eats lots of food in the fall to create a layer of brown fat.
- Female delays implantation: the egg is fertilized, but does not implant and grow until later date.
- Pregnant female dens in a cave.

Opossum

- Hibernates in a deep sleep in the ground, a cave, a tree
- Decreases body metabolism by lowering temperature, heart rate, and breathing.
- Eats lots of food in the fall to create a layer of brown fat.
- Huddles with others to keep warm, sometimes with woodchucks, raccoons, and skunks.

Animal Survival Information Cards

Shrew & Mole

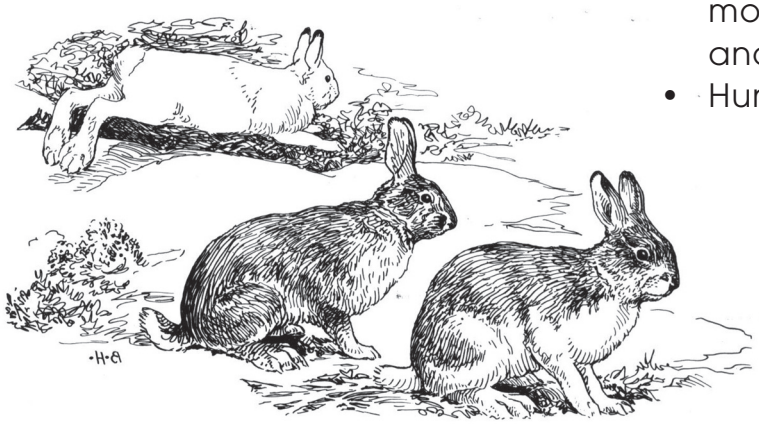
- Increases body metabolism by raising heart rate, breathing, and temperature.
- Grows a dense coat and secretes oils to help waterproof the fur.
- Stores food to eat later.
- Tunnels under snow to find food.
- Huddles with others to keep warm.
- Eats lots of food in the fall to create a layer of brown fat.
- Hunts all winter.
- Changes diet.

Bats

- Some hibernate in a state of torpor
- Decrease body metabolism by lowering temperature, heart rate, and breathing.
- Create a layer of brown fat.
- Wrap wings around themselves in a cave, tree, or attic.
- Delay fertilization: sperm is stored in female's body and egg is fertilized at a later date.
- Others wake up on warmer days to look for food and water.
- Others migrate to warmer areas and hunt all winter.

Animal Survival Information Cards

Snowshoe Hare



- Changes color by growing a white coat with hollow hairs without the color pigment, melanin, that have more air spaces within the hairs and thus has greater insulation.
- Hunts all winter.

Yellow-Bellied Marmot

(Woodchuck/groundhog)

- Hibernates in a deep sleep in
- rock piles or tree roots
- Decreases body metabolism by lowering temperature, heart rate, and breathing.
- Eats lots of food to create a layer of brown fat.

Animal Survival Information Cards

Northern Flying Squirrel

- Stores food to eat later.
- Huddles with others to keep warm.

California Gray Squirrel

- Builds insulated nests high in the trees.
- Stores food such as acorns for eating later.
- Hides during bad weather.

Animal Survival Information Cards

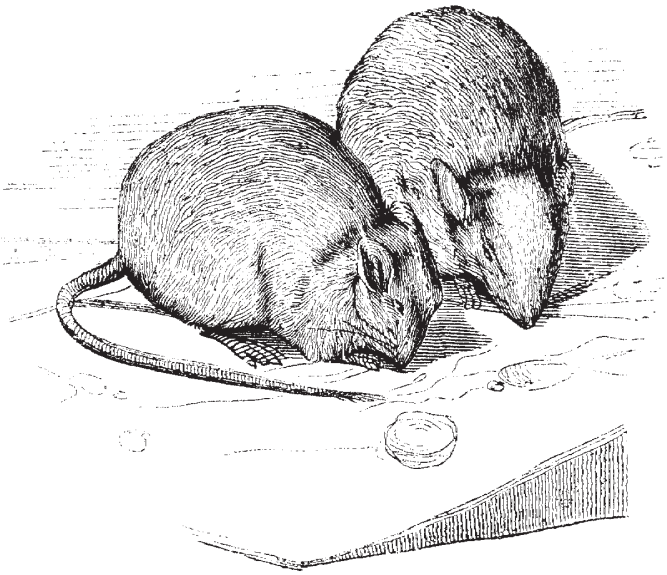
Chipmunk

- Hibernates in a state of torpor (short sleeps)
- Decreases body metabolism by lowering temperature, heart rate and breathing.
- Stores food to eat later.

Chickaree

- Builds an insulated nest.
- Changes color.
- Stores food to eat later.

Animal Survival Information Cards



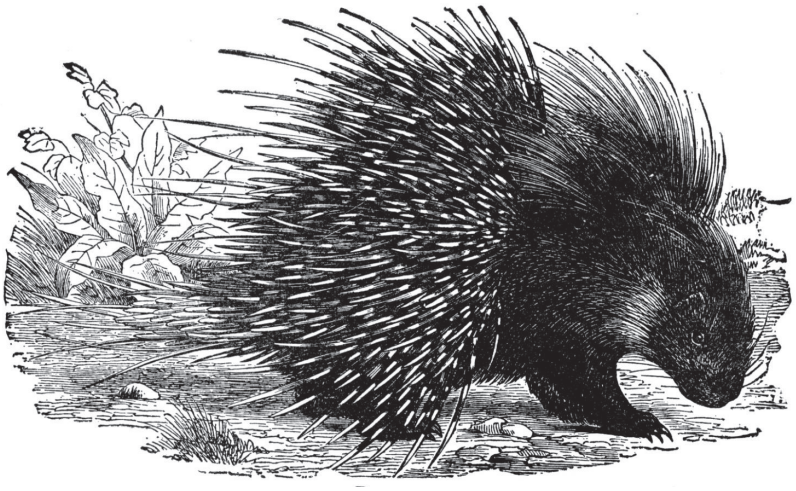
Mice

- Some hibernate in a deep sleep in the ground
- Decrease body metabolism by lowering temperature, heart rate, and breathing.
- Others hibernate in a state of torpor (short sleeps).
- Eat lots of food in the fall to create a layer of brown fat.
- Build insulated nests underground to keep warm.

Beaver

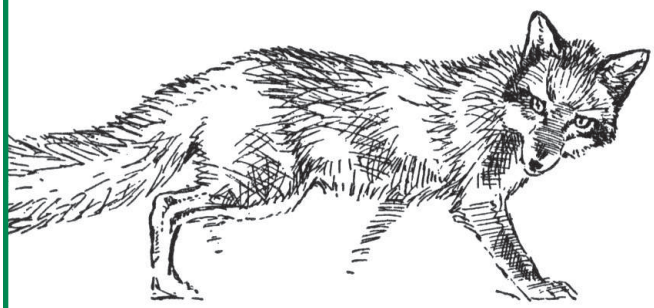
- Eats lots of food in the fall to create a layer of brown fat.
- Stores food underwater to eat later.
- Uses an interlaced network of blood vessels as a heat exchanger to block excessive loss of heat to the environment.

Animal Survival Information Cards



American Porcupine

- Grows a dense coat.
- Males roost in trees for days, eating bark.
- Females and juveniles huddle together in dens.



Red Fox

- Grows fur on feet and between toes for greater insulation, warmth, and better mobility over the snow.
- Changes diet.
- Hunts all winter.

Animal Survival Information Cards

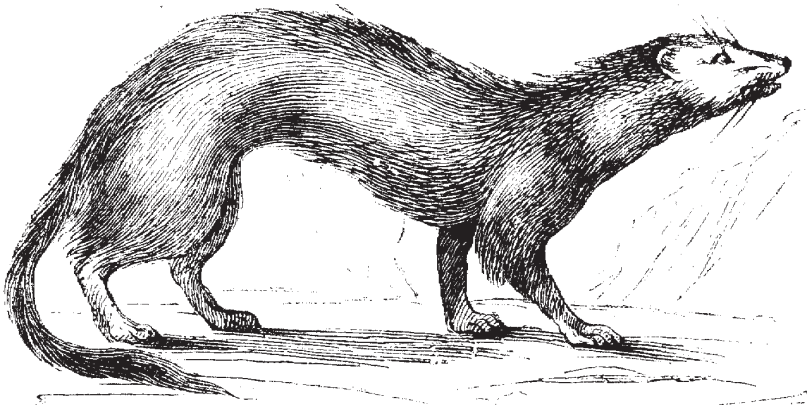
Raccoon

- Hibernates in a state of torpor (short sleeps)
- Decreases body metabolism by lowering temperature, heart rate and breathing.
- Huddles with others to keep warm.
- Eats lots of food in the fall to create a layer of brown fat.
- Changes diet.

Skunk

- Hibernates in a state of torpor (short sleeps).
- Decreases body metabolism by lowering temperature, heart rate and breathing.
- Huddles with others to keep warm.
- Eats lots of food in the fall to create a layer of brown fat.

Animal Survival Information Cards



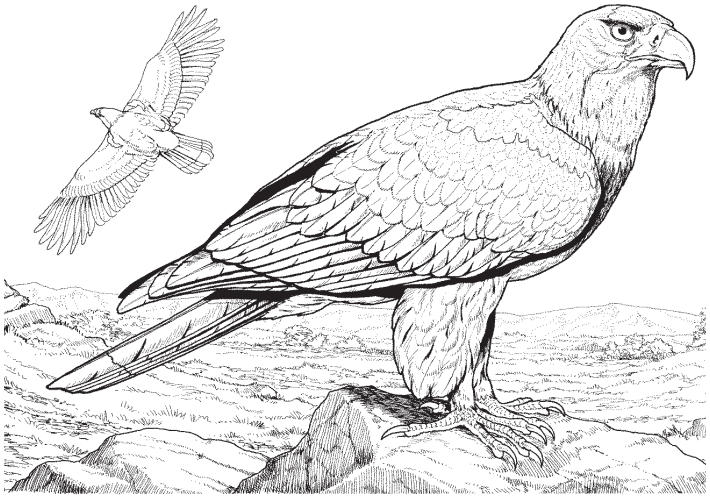
Weasel

- Tunnels under snow to find food.
- Stores food to eat later.
- Delays implantation: egg is fertilized, but does not implant and grow until later date.
- Short-tailed weasel changes color by turning white to camouflage with the snow.

Bobcat

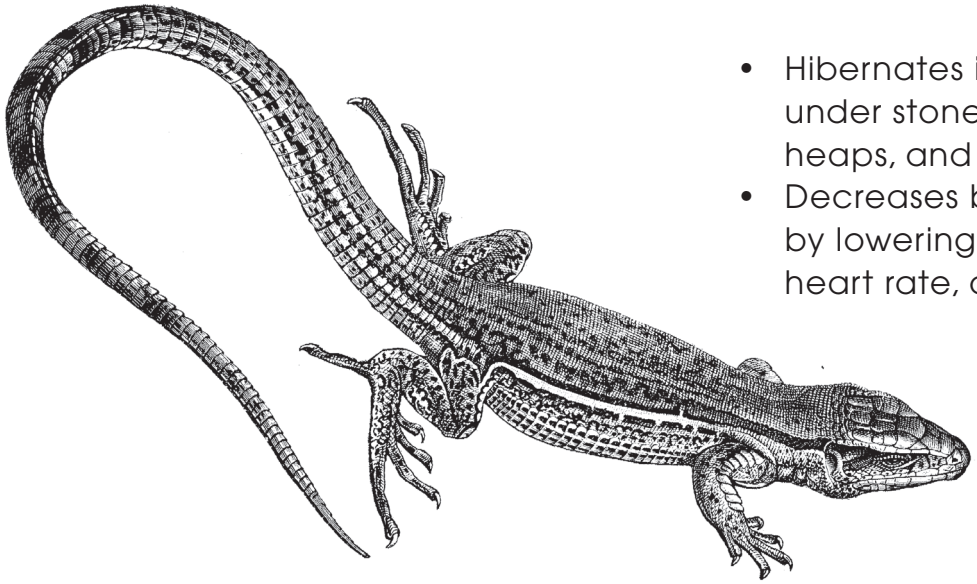
- Migrates to a new area.
- Changes diet.
- Hunts all winter.

Animal Survival Information Cards



Bird

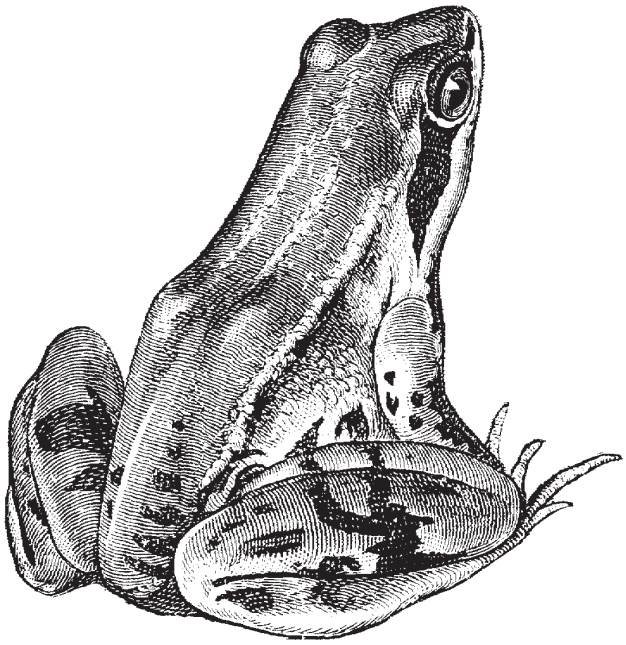
- Migrates to a new area, usually to a lower elevation.
- Changes diet.
- Hunts all winter.
- Fluffs out feathers to keep self warm.
- Goes into short periods of torpor at night.
- Generates heat by shivering.



Snake, Newt, Lizard, Turtle

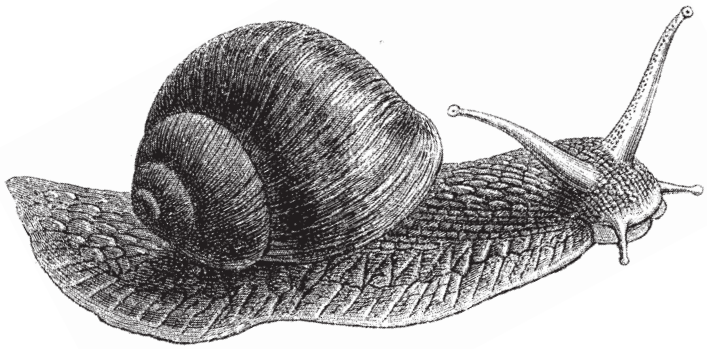
- Hibernates in a deep sleep under stones, logs, compost heaps, and old burrows.
- Decreases body metabolism by lowering temperature, heart rate, and breathing.

Animal Survival Information Cards



Frog

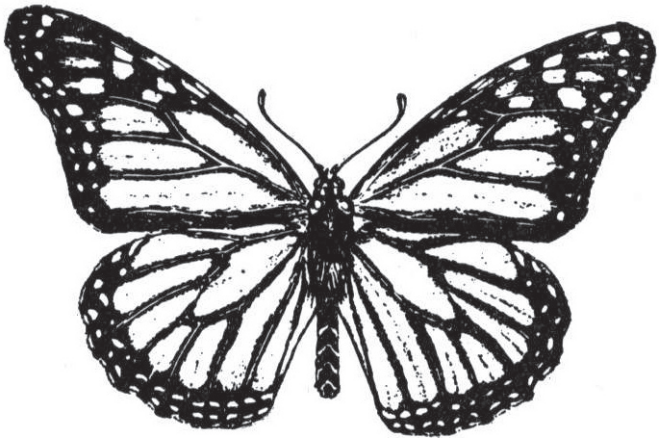
- Some hibernate in a deep sleep the ground at the bottom of streams and ponds where the water does not freeze.
- Some find shelter under leaves and dirt.
- Decreases body metabolism by lowering temperature, heart rate and breathing.



Slug, Snail, Queen Wasp, Bumblebee

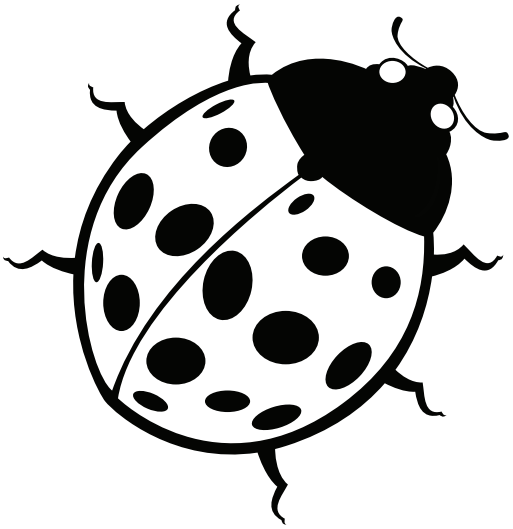
- Hibernates in a state of torpor (short sleeps).
- Decreases body metabolism by lowering temperature, heart rate and breathing.
- Releases chemical to prevent itself from freezing.

Animal Survival Information Cards



Monarch Butterfly

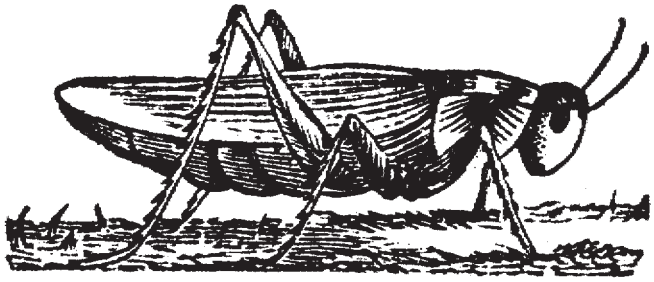
- Migrates to coastal and southern areas.
- Hunts all winter.



Ladybug

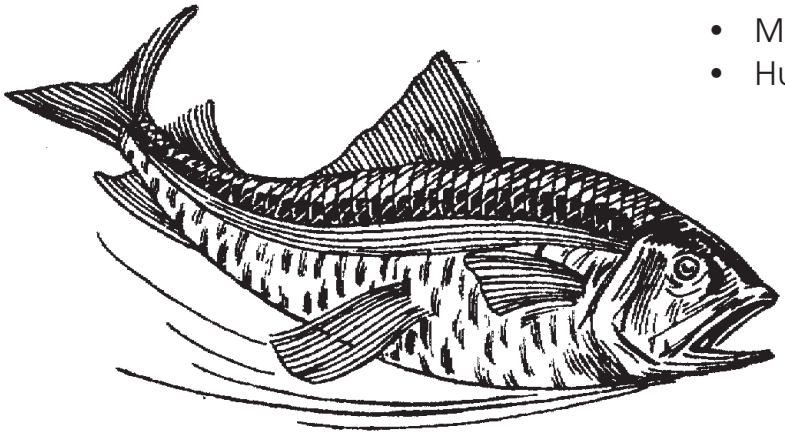
- Eats lots of food like aphids and pollen to create a layer of fat.

Animal Survival Information Cards



Most Insects

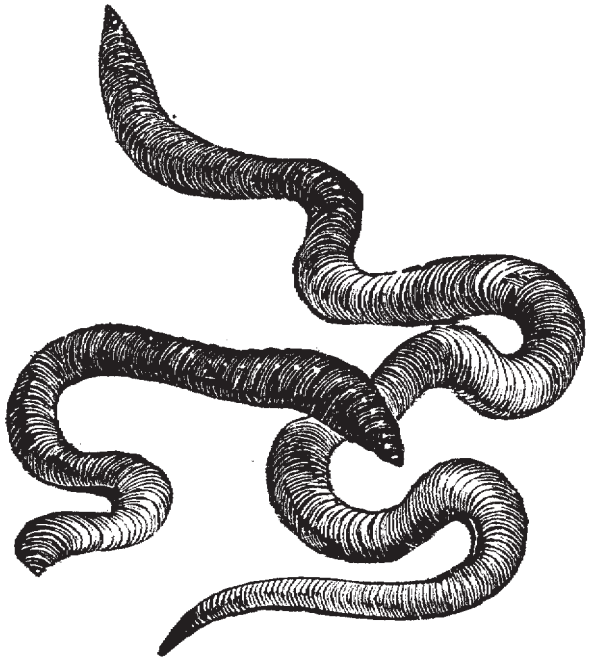
- Die so eggs can hatch in the spring.



Fish

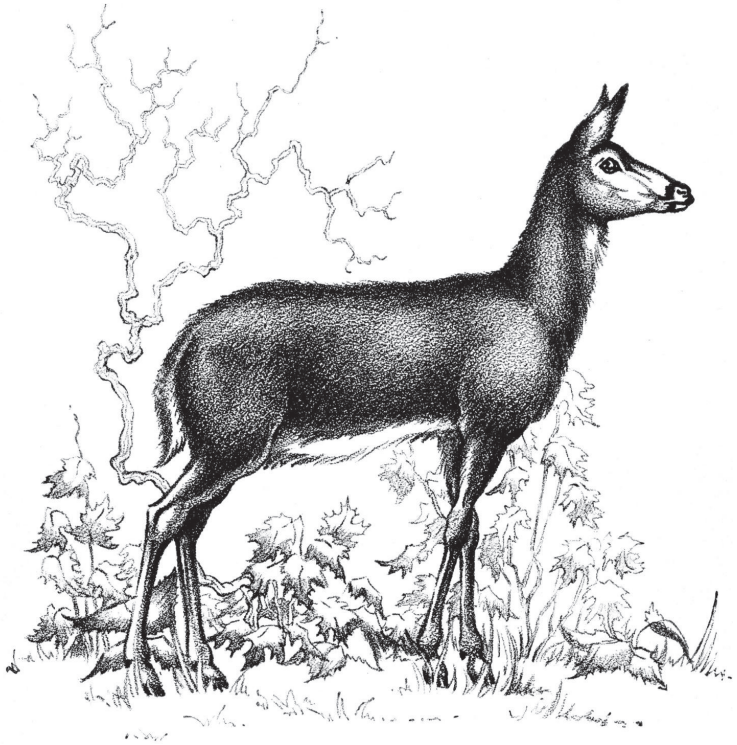
- Migrates to warmer water.
- Hunts all winter.

Animal Survival Information Cards



Earthworm

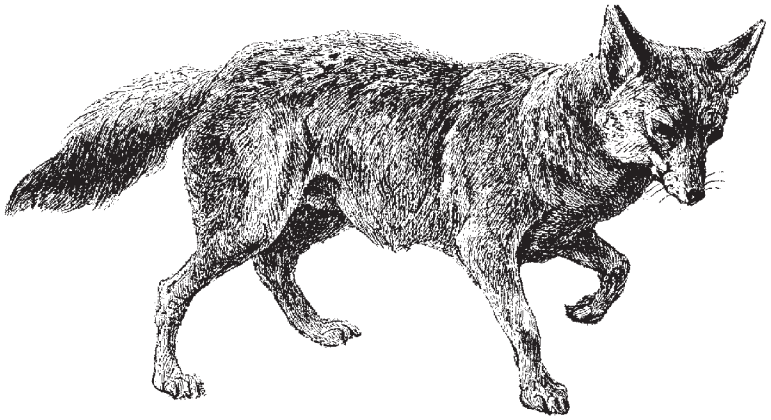
- Migrates down into the ground, some as far as six feet.



Deer

- Migrates to new area.
- Changes diet.
- Hunts all winter.
- Grows new hair that is hollow, which provides more insulation.

Animal Survival Information Cards



Coyote

- Grows a dense coat and secretes oils to help waterproof the fur.
- Grows fur on feet and between toes for greater insulation, warmth, and better mobility over the snow.

Migration

Hibernation

Other Physical Adaptations

Other Behavioral Adaptations