

# WINTER WHYS

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Life Sciences Program  
Teacher's Guide

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## Royal Saskatchewan Museum



Ministry of  
Tourism, Parks,  
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This teacher guide is meant for all teachers participating in the *Winter Whys* program and is developed for students in grades K-4. This program provides teachers with a choice of programming: Choosing two of the three components will provide a one-hour program.

Your choices are: (*Choose two only*)

1. A half-hour trek outside in Wascana Park
2. A half-hour hands-on program in the Museum's Discovery Room
3. A half-hour visit in the Life Sciences Gallery

This guide contains information that can be used for pre- and post-visit activities.

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*Illustrations by Paul Geraghty*

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## **Winter Whys Teacher's Guide**

*Winter Whys* is an interactive program that explores the ways that plants and animals adapt to Saskatchewan's harsh winters.

If chosen, the *Winter Whys* program makes use of Wascana Park, just outside the Museum's doors. Student groups go outside to explore the winter environment first-hand. Should the weather be too cold for this activity, students will be offered a tour of the Life Sciences Gallery.

Groups will not go out to the Park when the temperature goes below -20 °C and/or the wind-chill factor goes beyond 1700.

*Please be sure that students going outside are dressed warmly.*

### **Timetable**

The program begins by splitting the class into two groups. After 30 minutes, the two groups rotate. Each group will have a Museum instructor to deliver the program. Teachers are not required to lead their class through any part of the program.

Groups of more than 35 students will be split in half. Half will go with the Museum instructors for the *Winter Whys* program. The rest will have the option of visiting the Paleo Pit, or the Museum galleries. After the 1 hour program, the two groups will rotate. Teachers bringing large groups should be prepared to be at the Museum for 2 hours.

### **Chaperones**

Teachers are required to bring one adult for every 15 students. This provides one chaperone for each program group. It is important that a chaperone accompany each group, especially those going outside.

If teachers bring a large group that needs to be divided, they must also provide supervision for the students that are in the Museum, but not taking a program. A ratio of one adult for every 15 students is recommended.

Students in the Paleo Pit and galleries must be supervised at all times.

## Program Objectives

By participating in the program, students will be able to:

### Understand:

- What migration and hibernation mean.
- Two other ways that animals, who do not migrate or hibernate, cope with winter. (Camouflage, living under the snow, fur coats, etc.)
- That many plants become dormant and look dead over the winter.

### See:

- Plants and animals in a fall/winter habitat.
- Three animal adaptations for winter.

### Do:

- Visit the wild-flower garden.
- Look for migrating geese at Wascana Lake.
- Look for evidence of wild animals in the Park.

## Background Information

For animal species living anywhere in Canada, survival in winter can be a delicate balancing act. Too little snow, and many plant species will die. Too much snow, and animals such as White-tailed Deer have a difficult time finding food. All species in Canada have evolved ways to cope with the harsh conditions of winter. These methods can be either physical adaptations or behavioural. The *Winter Whys* program explores both.

### The Role of Snow

Snow is important to the survival of many species of plants and animals. Snow provides insulation. The temperature at the ground under a deep layer of snow will be much warmer than the air temperature. This enables plants such as small, herbaceous perennials to survive the cold. Animals such as mice and voles also need the insulation of a “snow coat” to provide protection from the cold.

## PLANT STRATEGIES

### What do Plants need to Survive?

Heat  
Light  
Food (minerals)  
Water

In winter most of the elements that plants need to survive are either absent, or, in the case of light, in very short supply (non-existent for low-growing plants). Adequate heat for growth is absent. Water is not available to the plants. Without water, the plants cannot absorb the minerals from the soil they need for growth.

Most plants cope with these conditions by shutting down - becoming dormant.

### Herbaceous Plants: Annuals and Perennials

Plants have two different survival strategies. One is to produce lots of flowers and seeds during the growing season, to ensure that many new plants grow the following spring. The adult plant does not survive over the winter. These plants are annuals. A new plant grows from seed each spring.

The other adaptation is to attempt to have the adult plant survive the winter to grow larger and produce new seeds the following season. These plants are perennials.

Perennials must have ways to survive the winter. Usually, the plant dies off above ground and the root becomes dormant. Many perennials need a deep layer of snow to protect the dormant root from the cold. The dead stems of the plant help to trap snow over the root system.

### **Trees and Shrubs: Deciduous and Coniferous**

Trees and shrubs can take decades to grow and reach maturity. There are no annual trees and shrubs. They all must survive the winter.

Deciduous trees lose their leaves each fall. During the growing season, the leaves of deciduous trees capture the energy of the sun to produce products needed for growth and maintenance. With the coming of fall, the heat, light, water, and minerals the plant needs for photosynthesis, become less and less available. The only use leaves provide for the plant is photosynthesis. When the leaves can no longer do this, they are not needed by the plant and the tree gets rid of them.

Deciduous trees have adapted strategies to get rid of the leaves they no longer need. There is a layer of special cells where the stem of the leaf joins to the twig. This is called the abscission zone. When the weather gets colder and the days shorter, chemical changes cause the tree to grow a protective layer of cells on the leaf side and the twig side of this zone. The cells between these two new layers weaken, and the old leaf falls from the tree. A leaf scar is left behind. Leaves on branches that are diseased or that have been injured may die before the abscission layer can form. In this case the leaves will not fall off the tree, but stay on the branch. Trees that hold dead leaves over the winter are not healthy.

Coniferous trees do not have broad leaves like deciduous trees, and they produce cones instead of flowers. In Saskatchewan, all coniferous trees except for one species are evergreen. This means that they do not lose their needles in the fall, but remain green all year round. The Larch or Tamarack is the one exception. The needles turn bright yellow in autumn and fall off the tree. New needles grow each spring.

Coniferous trees lose their needles a little at a time throughout the year. They tend to drop more needles in late summer.

Even though the tree remains green, it is not growing through the winter. Like the deciduous trees, it cannot get nutrients, heat, and water, so it slows down for the cold season.

## **ANIMAL STRATEGIES**

### **What do Animals Need to Survive?**

To survive and reproduce, animals need shelter, food, and water. Depending on the animal, water and food can be in short supply over the winter period. Shelter may be the deciding factor as to whether or not the animal survives. Animals have developed various ways to cope with winter.

## Hibernation - The Big Sleep?

Hibernation is not really sleep. Hibernation is a period of inactivity where the animals' life processes slow down. This includes much lower breathing and heart rates and lower body temperatures. The animals appear dead. Many hibernating animals can and will rouse from their "deep sleep" and then go back into hibernation.

Because Richardson's Ground Squirrels (commonly called "gophers") are so numerous in the Regina area, the program concentrates on their winter survival strategies.



*Richardson's Ground Squirrel (Spermophilus richardsonii)*

## Seasonal Cycle

In spring, adult Richardson's Ground Squirrels emerge from their dens in April and May. After mating, the male and female separate. The young are born about 1 month later and emerge from the burrow in early June.

In mid to late June, adult male ground squirrels go back into hibernation! Adult females follow in July. The young stay active into September and go into hibernation in the fall. Any ground squirrels that are seen after mid July are juveniles. This strategy lessens the competition among ground squirrels as food supplies dwindle in late summer and fall.

## Shelter

Successful hibernators must have someplace to sleep that is fairly safe from predators. Ground squirrels dig a very elaborate burrow, with numerous openings and different chambers. If a predator comes in one hole, they can escape out another - if they are awake.

## Food

Richardson's Ground Squirrels cache some food over the time they are above ground. During their hibernation, they wake up every 10 to 14 days and have a "midnight snack".

## OTHER ANIMALS THAT HIBERNATE

Some bats also hibernate. In Saskatchewan Big Brown Bats will, in fall, seek appropriate shelter for the winter. They will come together in large flocks for the hibernation season and do not hibernate singly.

Bats hibernate from October through to April. They hang upside down and pull their wing and tail membranes close to their bodies to keep warm. As with all hibernators, bats' body temperature and heart rate drop and they appear dead. They wake up about once a month through the hibernation period.

In the fall, when bats are looking for appropriate winter shelter, they are often attracted to warm buildings. This is the time of year that people have the most problems with bats in buildings. It is very difficult to bat-proof a house, because bats can squeeze through holes the size of a thumb.

Frogs hibernate. Species such as Leopard Frogs will hibernate at the bottom of streams and ponds where the water does not freeze. Species of frog like the Wood Frog and Boreal Chorus Frog find shelter under leaf clutter and dirt and they freeze solid. In spring, they thaw and wake up. Scientists do not yet know how they can survive this annual freeze, but know that they produce anti-freeze-like chemicals.

Snakes also hibernate. They travel to one spot where hundreds of them will hibernate together. This increases the amount of warmth available to them. A snake's den is called a hibernaculum. In the wild a hibernaculum is most often located in crevices in the soil, splits in rock formations, or abandoned animal burrows. Snakes will occasionally choose abandoned wells or basements.

### **I am not a true hibernator**

Contrary to popular belief, bears are not true hibernators. Black Bears will go to their den in the fall and not emerge until spring, but their body processes do not change enough to meet the hibernation criteria. Females will give birth to their young sometime in January or February. Cubs are extremely tiny when born during hibernation. Bears store fat in the fall before going to their den. By spring, they are very thin and ferociously hungry.

Like a true hibernator, a bear's heart rate and body temperature will drop but not to the same extreme. For example, a Woodchuck's (*a true hibernator*) breathing drops from 35 breaths per minute to only 1 breath every 6 minutes. Its body temperature drops close to that of its surroundings.

In contrast, a bear's internal body temperature will drop from 37 to 32 °C. Its heart rate will slow from 40 to 10 beats per minute.

### **Super Nappers and Midnight Snackers**

Skunks, badgers, and racoons are super nappers. They do not hibernate for the entire winter. During the coldest times, they will enter a state of torpor, during which they live off their stored fat. When the temperature rises a bit and the weather is good, they do come out and forage for whatever food they can find.

Squirrels and beavers are midnight snackers. They cache food for the winter and snack off the stores. Squirrels cache nuts and pine cones to eat when food is not available. They also consider bird feeders to be convenient food caches. During the coldest days, they stay in their dens and nibble on their stored food.

Beavers are also midnight snackers. During the winter they spend their time in lodges with entrances below the frozen surface so they can leave the lodge. They store aspen branches a short swim from the lodge for use during the winter. In winter, the water in their pond cannot freeze all the way to the bottom. If it did, they would be unable to leave their lodges and they would eventually starve to death.



*American Beaver (Castor canadensis)*

## Migration

When food supplies become short, many species of birds will migrate to where they can find food. V's of migrating geese and ducks are a familiar sight in the skies around Regina. Few other kinds of animals migrate. Some that do include Monarch butterflies, Barren-ground Caribou and some species of bats. Some scientists believe that bison also migrated, but whether or not this was a true migration or simply following food supplies is not known.

Birds and animals that migrate follow a predictable pattern of movement; geese, ducks, and other waterfowl, for example, will use the same flyway year after year. Other species of birds, such as owls and hawks, will "follow" the prey species and come south in the winter in search for food. Should there be an easy winter, they might not have to travel far from the summer nesting area (see description of *irruption* on p. 7).

There are four major flyways in North America. Saskatchewan is part of the Mississippi flyway. Birds using this route fly between the Arctic and the Gulf of Mexico. Other flyways are the Atlantic, Pacific, and Mountain flyways.

Migration is one solution to the need to find food in winter - simply travel to where the food is available. Many birds migrate thousands of miles each spring and fall and it can be a very dangerous, exhausting time.

In addition to laying on a store of fat before migration, birds must find sources of food during the journey. They expend tremendous amounts of energy to make the trip and need extra sources of food to survive. Sometimes this puts them in conflict with farmers - especially when large flocks of ducks, geese, and cranes settle into a ripe wheat field ready for harvest.

Migration poses many dangers for birds. Strong winds can blow them off course. If the weather is very mild, they may stay too long in one spot and then get caught in sudden bad weather. Storms can force them to stay on the ground. If food supplies cannot be found, they become weak and easy prey for predators. Sometimes they can fly into tall buildings and communication towers. Migratory birds depend on stops along the way where they can rest and find food. The disappearance of these areas may mean that the birds will not survive migration. They also need good habitat at both ends of their long journey. If they are not fit for the long flight, they can become exhausted and die during migration.

Ducks and geese fly in a "V" formation. Other migratory birds do not fly in these tightly organized flocks. Geese and ducks always have a flock leader. By flying in a "V", birds can take turns being the leader. The birds that fly one behind another have the advantage of flying in the other bird's air stream, which is not as strenuous.

### Why Don't Birds Get Lost?

Scientists can't fully explain how migratory birds find their way. Those species that fly at night appear to use the stars to navigate. Experiments that have been done in a planetarium show that they navigate by the stars. How they can fly on cloudy nights, or how they recognize the stars is not known.

Birds that fly during the day use the position of the sun as a guide. Waterfowl follow the courses of rivers, while hawks and eagles follow mountain ranges.

Some birds appear to be able to plot their own courses and navigate. Homing pigeons seem to be able to do this. This ability has not been explained, but they may have a "magnetic compass" in their brains! It is truly an amazing mystery!

## Why do Some Geese Stay in Regina All Winter?

Migration is difficult, and sometimes humans create situations that allow wildlife to change their natural patterns of survival. In their natural state, geese that do not migrate would not survive. However, in some circumstances, they can take advantage of “unnatural” habitat. Some geese in Wascana Park are a good example of this. In some areas, the Park provides the kind of habitat that allows them to stay here over the winter. The Park staff used to feed the geese that stayed, but they found that more and more of them were not making the flight south, so the feeding program was stopped. Even so, a limited number of geese are able to survive here without the strenuous flight south.

Birds fly at different times of the year. Some adult shorebirds that nest in the Arctic arrive in the central prairies on their way south in July. In August, songbirds, warblers, and hummingbirds begin to move south. In September, robins and black birds leave. Snow Geese and lesser Canada Geese arrive in the central prairies on their way south. During October and November, swans, ducks, and geese continue to flock and fly south. Mallard ducks do not fly south until they absolutely have to. They will often stay as late as December.

### Semi-Migrators/Winter Birds

Although many families of birds must migrate far south to survive the winter, a few winter in Saskatchewan. Some birds like the Northern Hawk Owl and Goshawk will move south only when conditions in their more usual northern ranges become too difficult. This type of movement is called an *irruption* and is not migration because it is irregular in both movement and pattern.

Some species are simply residents all year. The following are the orders of birds that stay in Saskatchewan all year. These orders include:

Falcons (Falconiformes)

Pigeons (Columbiformes)

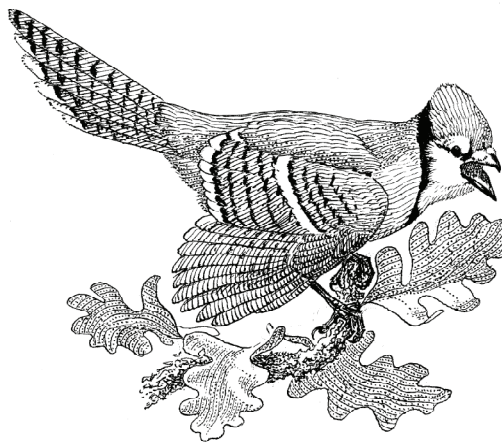
Grouse (Galliformes)

Owls (Strigiformes)

Woodpeckers (Piciformes)

Perching Birds (Passeriformes)

- chickadees
- nuthatches
- grosbeaks, finches, redpolls, crossbills
- snow buntings, cardinals
- waxwings
- magpies, jays, ravens, crows
- house sparrows
- starlings



*Blue Jay (Cyanocitta cristata)*

Birds that can find food in winter are able to stay in Saskatchewan. Dead plants that still carry seeds are a source of food for the seed eaters. Also, many berry bushes keep berries until the birds can find them. Many species of seed eaters have pouches in their throats that hold food before it enters their stomachs. They may have to gather seeds and berries in the open where they are vulnerable to predators. Their pouches enable them to gather seeds quickly and eat them when they are in a safe, sheltered location.

For birds that eat insects, suet from bird feeders or dead animals are alternate sources of food. Some birds like chickadees eat seeds and suet.

It is difficult for over-wintering birds to keep warm. Feathers provide a lot of insulation. Birds will fluff their feathers and trap air between the feathers. This air traps body heat and acts like insulation - much like a down-filled sleeping bag keeps campers warm on cold nights. Some birds, like ptarmigan, have feathers on their feet to help them stay warm.



*Pine Grosbeak (Pinicola enucleator)*

harsh winters, they can be seen in the rural areas around Regina. However, if game stays available further north, they won't bother to fly south.

## WINTER ACTIVE

Besides winter birds, there are animals that stay active all winter. They too have developed ways to survive the cold and scarce food supplies.

### Turn coats/Winter coats

Animals who stay active during the winter have to either hunt or forage for food. One good adaptation for both hunters and hunted is camouflage. Many animals in Saskatchewan turn white in the winter. Two that turn coats are:



*White-tailed Jack Rabbit (Lepus townsendii)*

**White-tailed Jack Rabbits** are very common members of the hare family. They can be found in Wascana Park or in any large undeveloped area. White-tailed Jack Rabbits turn from brown to white in the fall and from white to brown in the spring. The tips of their ears remain black and their tails stay white year-round.

During winter, these hares eat whatever plants are available, including unprotected garden shrubs and the bark from young trees.

The hares' white winter coat helps to hide them in the snow. They are vulnerable in years when the snow is late and they turn white before the snow stays. White-tailed Jack Rabbits actually have three layers of fur. The innermost layer is a very dense, dark brown coat. The second layer is longer and a lighter brown in colour. The outer layer is the longest and this is the white layer. Each spring, the hare loses the white fur and grows

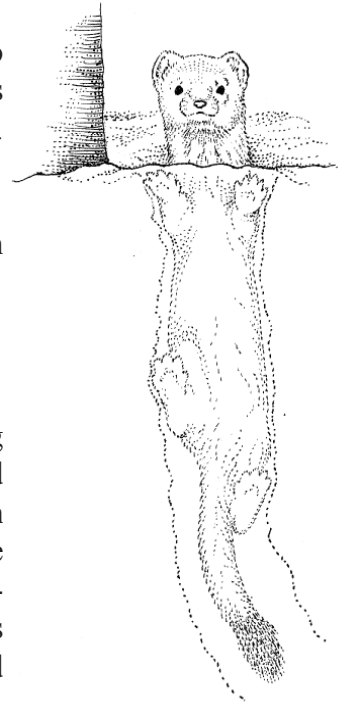
it back each fall. This layer of fur is long and dense enough to completely cover the brown layers. By adding and losing one coat of fur, not only does the varying hare grow camouflage, it also grows a warm winter coat at the same time.

**Ermines** are predators that also use camouflage. Their coat turns from brown to white in the fall, with only the tip of the tail staying black. The white coat helps them to sneak up on prey animals. The ermine's white coat has made it a prize fur. Royalty used to have ceremonial robes trimmed with ermine.

Ermines eat small rodents, ground squirrels, and birds. They are very useful in keeping mice and rat populations from becoming too great.

### **Life under the Snow (The Taming of the Shrews)**

Snow is very important to the survival of small mammals and some insects. During the winter, these animals live above the soil, but beneath the snow. This is called the subnivean space. The temperature at the ground under a blanket of 30 cm of unpacked snow is much warmer than the air temperature. On days when the thermometer registers  $-40^{\circ}\text{C}$  the temperature at ground level can be as cozy as  $-4^{\circ}\text{C}$ . The subnivean space can be a fairly active place during the winter. Weasels burrow down to ground level, as do their main prey species of mice, voles, and shrews.



*Ermine (Mustela erminea)*

### **Pack Hunters**

Wolves and coyotes are Saskatchewan's pack hunters. They survive the long harsh winter both through physical and behavioural adaptations.

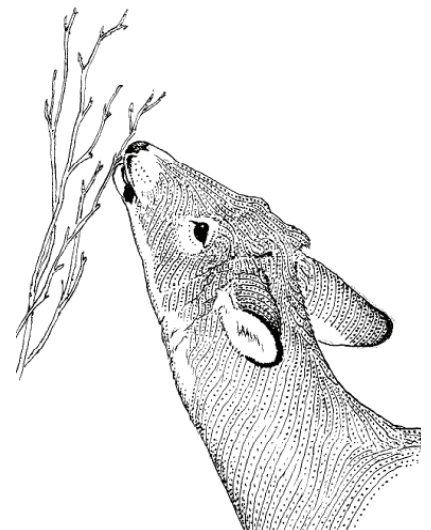
Coyotes use their excellent hearing to help them through the winter. They can hear the sounds of mice and other small mammals moving about in the subnivean space. By listening carefully, waiting and then pouncing, coyotes can find a tasty snack.

Wolves change hunting techniques in the winter. The packs get larger in size, and they will more actively hunt large game such as moose and deer. At this time of year, game animals are much more vulnerable, especially if the snow is soft and deep. Deep snow slows deer down and makes them easier to hunt successfully.

Wolf kills provide food for other animals besides the hunters. Magpies, crows, foxes, and coyotes all try for a piece of the carcass once the wolves have finished. Usually there is very little left of a carcass after a couple of days.

### **Oh Deer!**

For deer, elk, and moose, winter is a very dangerous time. All hooved animals must find food and keep an eye out for predators like wolves. In fall, members of the deer family grow long thick coats. They eat lots through the summer and fall to put on extra fat to see them through the winter. They may move to areas where food is more available. Often this results in a high concentration of deer in one spot termed a "yard".



*White-tailed Deer (Odocoileus virginianus)*

Most members of the deer family are browsers, eating leaves, tender buds, young bark, and twigs. This fodder can be in very short supply by the end of the winter. If female deer do not find enough nutrients, they may lose their

unborn fawns. Even if fawns are born live, the mother may not be able to nurse them properly and the fawns will die of starvation. This can occur when and where the deer population becomes too high for the amount of fodder available.

Deep snow can cause problems for deer, especially if a thin crust develops on the top layer. Deer will break through the crust leaving them vulnerable to predators such as wolves and coyotes. The movements of deer populations are seasonal in nature but cannot be called migrations in the strictest meaning of the term. They will move to food as needs be, but not in unchanging annual patterns.

Pronghorn, like deer are cloven-hoofed cud-chewers, but are not in the same family as deer. They may move short distances to the south and will seek shelter such as large stands of trees and valleys.

### **Related Activities**

- Winter Hikes

Take your class outside the school and look for signs of winter animal life. Tracks in the snow and bird sightings are the most common signs of animal activity. Look for places where animals can find shelter and food. Measure the temperature on top of the snow and at ground level. Look for different kinds of snow. Is there a hard crust on the top of the snow? Where does it drift? Is there a greater temperature difference in places where the snow has drifted deep, or where the snow layer is very shallow? What are the plants doing under the snow? Can the class find perennial herbaceous plants that stay green year-round? Are there plants that still have seeds and/or berries clinging to them?

- Record Winter Weather

Keep track of the winter weather. Record temperature, snowfall and wind direction and velocity. What effects would the weather have on animals and birds? Is the weather above or below averages for the month?

- Keep a Bird Feeder

Along with the weather records, keep a bird feeder. Is there any relationship between stormy weather and the number and type of birds that use the feeder? Keep a record of the birds that come to the feeder. Do the species and use change over the course of the winter?

- Year in pictures

Make a photographic or pictorial record of the outdoor area around the school for each of the four seasons.

- Create a Creature

Saskatchewan has a very variable climate. It is hot and dry in the summer, but winters can be long and extremely cold. Strong winds blow most of the year. Have the students create an animal that is adapted to this climate. What physical adaptations would it need? What behaviours would it have to help it survive? What would it eat? How would it live with the different animals the other students created?

## Vocabulary

Adaptations	Insulation
Subnivean space	Camouflage
Herbaceous plants	Population
Annuals	Perennials
Deciduous	Coniferous
Hibernation	Migration
Navigate	Abscission zone

## Related Reading and Resources

Check out our Interactive Learning Centres titled “Winter Survival Tools” and “Winter Survival Skills” on our website at: <http://ilc.royalsaskmuseum.ca/home/>

### *Knee High Nature - Winter*

Dianne Hayley & Pat Wishart  
Lone Pine Publishing  
10145 - 81 Avenue  
Edmonton, Alberta T6E 1W9

### *Saskatchewan Birds*

Smith, Alan R.  
Lone Pine Publishing 2001  
10145 - 81 Avenue  
Edmonton, Alberta T6E 1W9

### *Knee High Nature - Fall*

Dianne Hayley & Pat Wishart  
Lone Pine Publishing  
10145 - 81 Avenue  
Edmonton, Alberta T6E 1W9

### *Owl's Winter Fun*

Laima Dingwall Annabel Slight ed.  
Owl Magazine/Golden Press  
Greedy de Pencier Books  
Toronto, 1983

### *Wintersigns in the Snow*

Gerald Cox  
Michael Kesend Publishing Ltd.  
New York 1984

### *A Guide to Bird Behaviour*

Stokes Nature Guide  
Donald W. Stokes  
Little, Brown and Company  
Toronto 1979