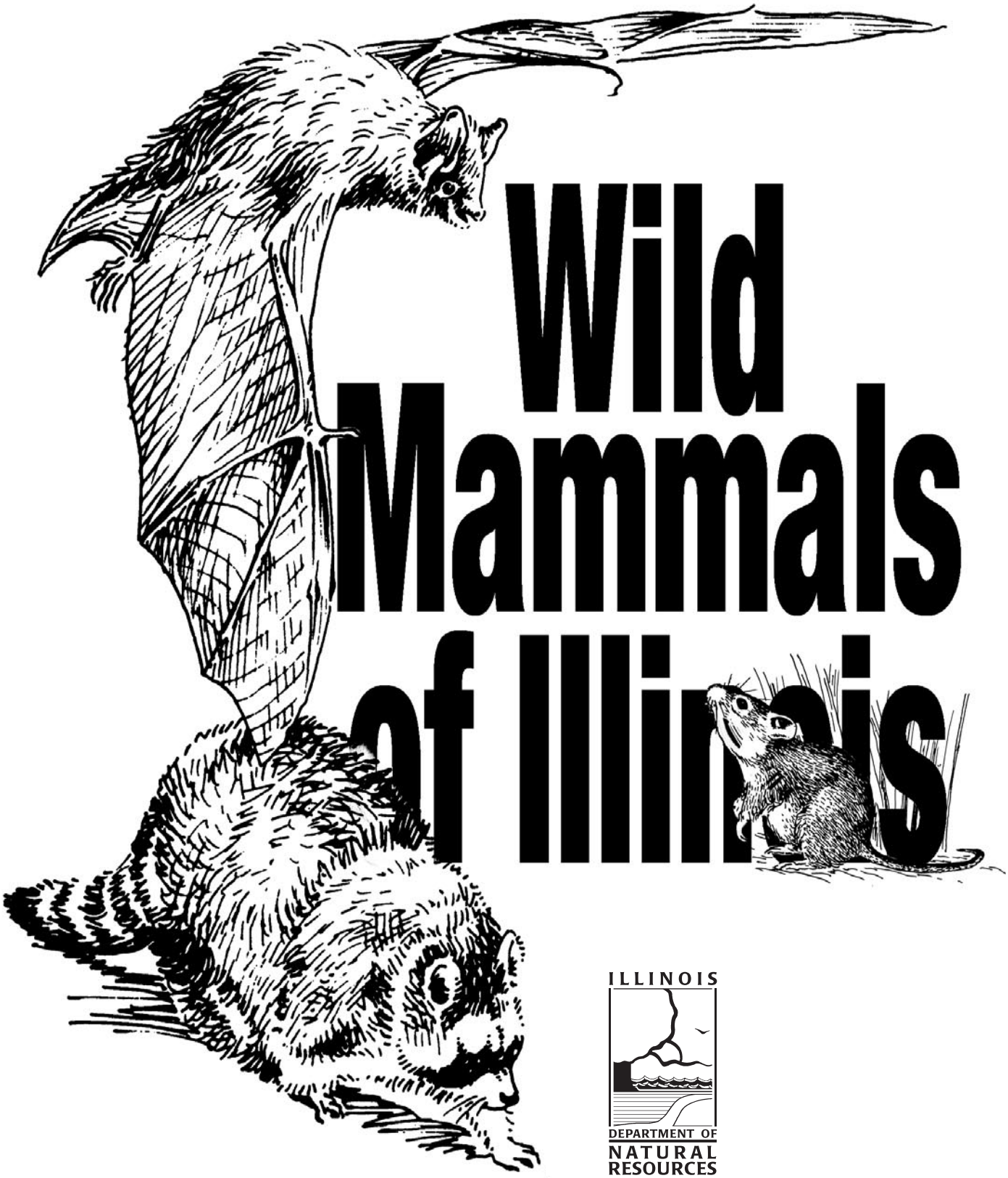
State of Illinois
Illinois Department of Natural Resources

Wild Mammals of Illinois



ILLINOIS
DEPARTMENT OF
NATURAL
RESOURCES

Wild Mammals of Illinois

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IDNR Division of Education

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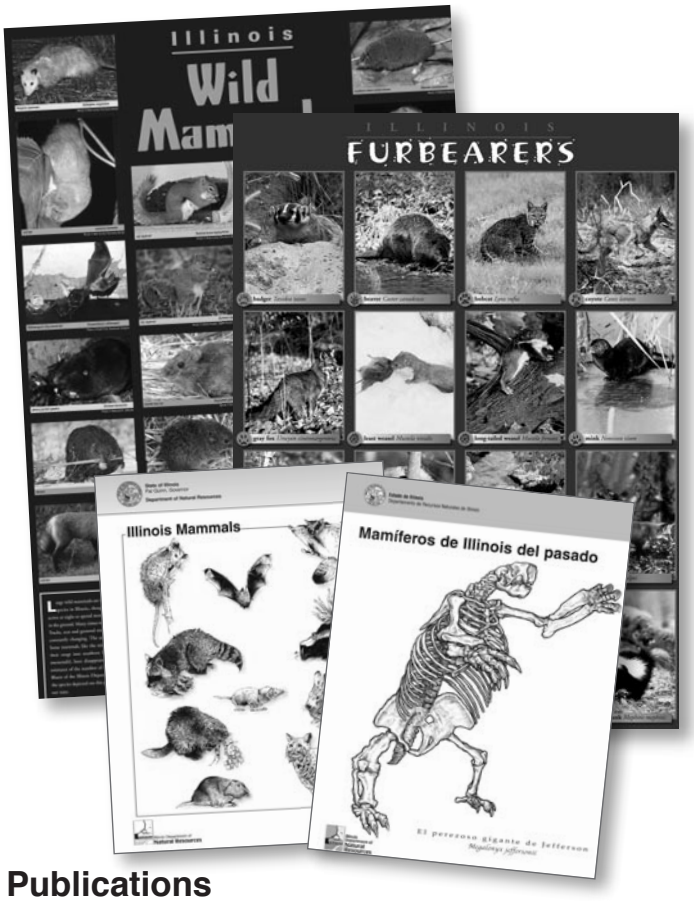
IDNR Division of Education

The Illinois Department of Natural Resources' (IDNR) Division of Education developed this unit on *Wild Mammals of Illinois* for use in Illinois classrooms. Additional supplemental resources to help you teach about mammals in Illinois are also available from the IDNR.

Illinois Wild Mammals Resources Trunk

Posters, field guides, lessons, skulls, pelts, rubber track replicas and rubber scat replicas are just some of the items contained in this "trunk." The trunk is a large plastic container filled with hands-on resources that will help make mammal lessons more meaningful for students. *Illinois Wild Mammals Resources Trunks* are available for loan from locations throughout Illinois. Visit https://www2.illinois.gov/dnr/education/Pages/ItemsForLoan.aspx to access the list of lending sites and the trunk content list.



Publications

Posters, activity books, books and other items can be ordered or downloaded through the IDNR Publications page at https://dnr2.illinois.gov/teachkids/.

Illinois' Natural Resources Trading Cards

The cards provide images and information to be used in a variety of ways in the classroom. Each card contains an image, habitat association, common name and scientific name (where applicable) on the front side with additional relevant information on the back side. Teachers in Illinois schools may request one pack of each of the available sets of cards. Send your request on school letterhead to the address shown on the next page.

Videos

Videos from the Illinois Department of Natural Resources about Illinois mammals can be accessed through the Podcast page at https://www2.illinois.gov/dnr/education/Pages/podcasts.aspx or through YouTube.

Field Trip Tips Web Page

Let the IDNR help you plan your field trip with this interactive site. Field trip destinations are correlated with topics that can be studied, lesson plans and supplemental resources. Go to https://www2.illinois.gov/dnr/education/Pages/fieldtrip.aspx to access the Web page.

Illinois Biodiversity Field Trip Grant

Take your students to visit Illinois' natural or cultural heritage with an *Illinois Biodiversity Field Trip Grant*. Visit https://www2.illinois.gov/dnr/education/Pages/GrantsIBFTG.aspx for details and an application form.

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Wild Mammals of Illinois

Order Didelphimorphia	
Family Didelphidae	
Virginia opossum	*Didelphis virginiana*
Order Soricomorpha	
Family Talpidae	
eastern mole	*Scalopus aquaticus*
Family Soricidae	
masked shrew	*Sorex cinereus*
American pygmy shrew	*Sorex hoyi*
southeastern shrew	*Sorex longirostris*
northern short-tailed shrew	*Blarina brevicauda*
southern short-tailed shrew	*Blarina carolinensis*
North American least shrew	*Cryptotis parva*
Order Chiroptera	
Family Vespertilionidae	
hoary bat	*Aeorestes cinereus*
southeastern bat	*Myotis austroriparius*
gray bat	*Myotis grisescens*
eastern small-footed bat	*Myotis leibii*
little brown bat	*Myotis lucifugus*
northern bat	*Myotis septentrionalis*
Indiana bat	*Myotis sodalis*
eastern red bat	*Lasiurus borealis*
silver-haired bat	*Lasionycteris noctivagans*
tri-colored bat	*Perimyotis subflavus*
big brown bat	*Eptesicus fuscus*
evening bat	*Nycticeius humeralis*
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*
Order Cingulata	
Family Dasypodidae	
nine-banded armadillo	*Dasypus novemcinctus*
Order Lagomorpha	
Family Leporidae	
swamp rabbit	*Sylvilagus aquaticus*
eastern cottontail	*Sylvilagus floridanus*
Order Rodentia	
Family Sciuridae	
eastern chipmunk	*Tamias striatus*
woodchuck	*Marmota monax Spermophilus*
Franklin's ground squirrel	*franklinii Spermophilus*
thirteen-lined ground squirrel	*tridecemlineatus Sciurus*
eastern gray squirrel	*carolinensis*
eastern fox squirrel	*Sciurus niger*
red squirrel	*Tamiasciurus hudsonicus*
southern flying squirrel	*Glaucomys volans*
Family Geomyidae	
plains pocket gopher	*Geomys bursarius*
Family Castoridae	
American beaver	*Castor canadensis*
Family Cricetidae	
marsh rice rat	*Oryzomys palustris*
western harvest mouse	*Reithrodontomys megalotis*
cotton mouse	*Peromyscus gossypinus*
white-footed mouse	*Peromyscus leucopus*
deer mouse	*Peromyscus maniculatus*
golden mouse	*Ochrotomys nuttalli*
eastern woodrat	*Neotoma floridana*
prairie vole	*Microtus ochrogaster*
meadow vole	*Microtus pennsylvanicus*
woodland vole	*Microtus pinetorum*
muskrat	*Ondatra zibethicus*
southern bog lemming	*Synaptomys cooperi*
Family Muridae	
brown rat	*Rattus norvegicus*
house mouse	*Mus musculus*
Family Dipodidae	
meadow jumping mouse	*Zapus hudsonius*

Wild Mammals of Illinois

Order Carnivora	
Family Canidae	
coyote	*Canis latrans*
red fox	*Vulpes vulpes*
gray fox	*Urocyon cinereoargenteus*
wolf	*Canis lupus*
Family Mustelidae	
long-tailed weasel	*Mustela frenata*
least weasel	*Mustela nivalis*
American mink	*Neovison vison*
American badger	*Taxidea taxus*
North American river otter	*Lontra canadensis*
Family Mephitidae	
striped skunk	*Mephitis mephitis*
Family Procyonidae	
raccoon	*Procyon lotor*
Family Felidae	
bobcat	*Lynx rufus*
Order Artiodactyla	
Family Cervidae	
white-tailed deer	*Odocoileus virginanus*

Extirpated Mammals	
North American porcupine	*Erethizon dorsatum*
white-tailed jackrabbit	*Lepus townsendii*
cougar	*Puma concolor*
American marten	*Martes americana*
fisher	*Martes pennanti*
American black bear	*Ursus americanus*
elk	*Cervus elaphus*
American bison	*Bison bison*

GRADE LEVELS: 3 - 4

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 3-LS4-3, 4-LS1-1

SKILLS/PROCESSES: observation, analysis, comparison & generalization, identification, creativity

OBJECTIVE: Students will be able to identify the five characteristics by which mammals are determined.

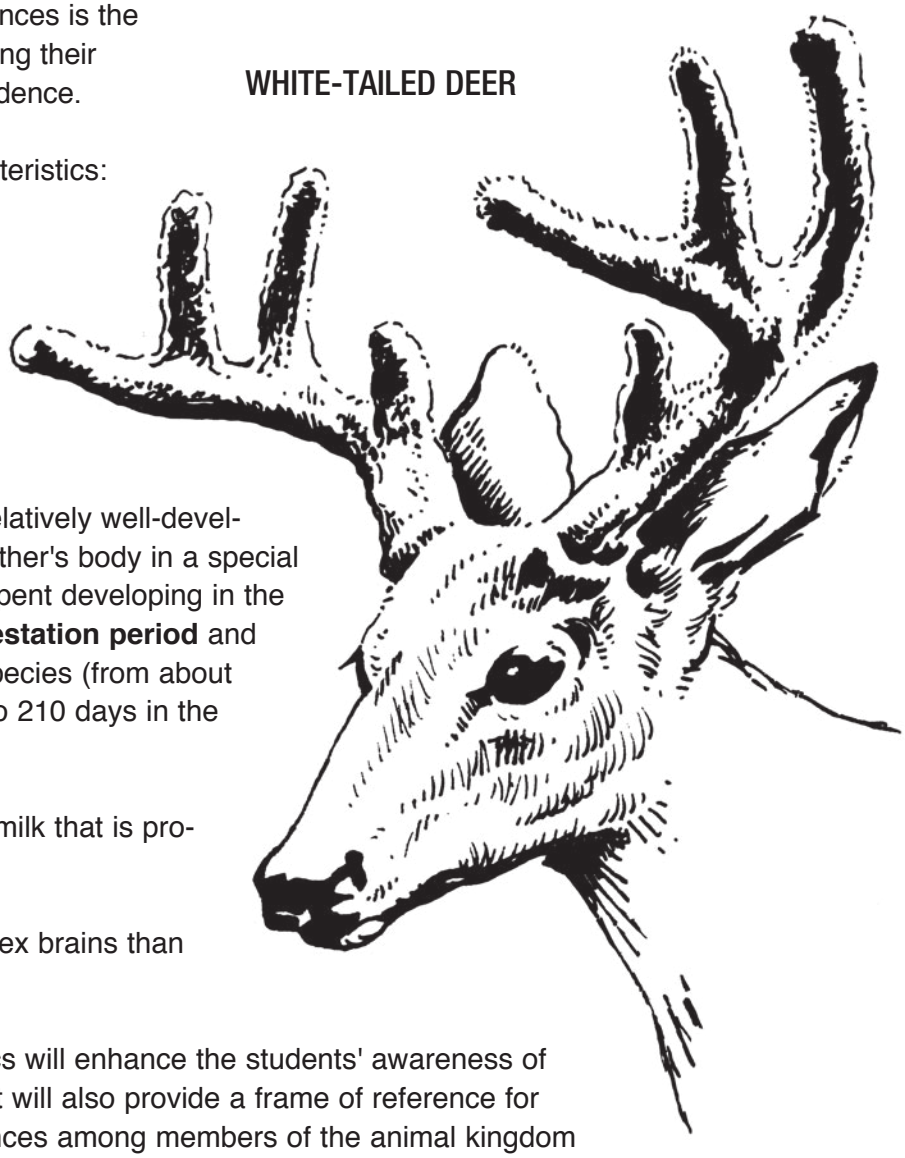
TEACHER'S GUIDE

UNIT ONE ▪ LESSON ONE

What Makes a Mammal a Mammal?

BACKGROUND

Classifying animals into categories and groups based on their similarities and differences is the first step in studying and understanding their origins, development and interdependence.



WHITE-TAILED DEER

Mammals have the following characteristics:

1. They are covered with hair or fur.

2. They are **warm-blooded** (meaning their internal body temperature is maintained at a constant level regardless of external conditions).

3. They are usually born alive and relatively well-developed, having grown inside the mother's body in a special organ called a **uterus**. The time spent developing in the uterus before birth is called the **gestation period** and varies in length from species to species (from about 13 days in the Virginia opossum to 210 days in the white-tailed deer).

4. After birth the young are fed with milk that is produced by **mammary glands**.

5. They have larger and more complex brains than any other group of animals.

Focusing on these five characteristics will enhance the students' awareness of and interest in mammals of Illinois. It will also provide a frame of reference for exploring the similarities and differences among members of the animal kingdom and how those characteristics relate to the environment and lifestyle of individual species.

PROCEDURE AND DISCUSSION

Review the student information with the class, providing students with (or inviting them to provide) examples of each of the five mammal characteristics. Encourage them to look for differences within individual characteristics, such as long, shaggy hair versus short, stiff fur; fully developed young at birth, such as deer, versus less developed young at birth, like rabbits and mice. A list of mammal species found in Illinois is included with these lessons to help you lead the discussion on the Activity Page. Use the *Illinois' Natural Resources Trading Cards*, the *Illinois Furbearers poster* and the *Illinois Wild Mammals* poster from the Illinois Department of Natural Resources to see photographs of mammals.

1. **What five characteristics do mammals have in common?**

   Mammals have hair or fur; are warm-blooded; most are born alive; the young are fed milk produced by the mother's mammary glands; and they have a more complex brain than other animals.

2. **How do mammals feed their young?**

   With milk produced by the mother in special organs called mammary glands.

3. **Why are mammals described as warm-blooded?**

   They maintain a constant internal body temperature, regardless of the outside temperature.

4. **What is a gestation period?**

   A gestation period is the length of time a mammal develops and grows inside its mother's body before being born. In humans the gestation period is nine months; in dogs it is approximately 60 days; in cows, 280 days; in rabbits, 26-30 days; and in mice, 20-30 days depending on the species.

5. **Where do mammals grow and develop before they are born?**

   In a special organ, called a uterus, in the mother's body.

ACTIVITY PAGE EVALUATION

Evaluate the students on the content of their report, attention to detail and ability to follow instructions.

VOCABULARY

bgestation period—the length of time a mammal develops inside the mother's body prior to birth

mammals—animals having these five characteristics: hair or fur; warm-blooded; usually born alive; young are fed on milk produced by the mother; larger brain than other animals

mammary gland—a special organ in female mammals that produces milk to feed the young

uterus—the organ in a female mammal in which the young develop prior to birth

warm-blooded—maintaining a constant internal body temperature

CHALLENGE YOURSELF EVALUATION

1. Answers will vary.
2. Answers will vary.
3. Three places where wild mammals live in Illinois include forests (trees), grasslands, underground, in water and in thickets.
4. Other animals catch food and bring it to their young. Some animals don't stay with their young at all, and the young are on their own.
5. The characteristics that make a mammal a mammal include presence of hair or fur, warm-blooded, young born alive, mammary glands and complex brain.

EXTENSIONS

Take a walk to a local park, wooded area or schoolyard and look for mammals and mammal signs (nests, dens, mole hills, tracks, droppings, etc.). Place emphasis on mammals by contrasting them with birds, reptiles, fishes, amphibians and insects.

Have the students begin a journal to keep records of wild mammal activities and habits around their school, home and community. Use this journal throughout their study of *Wild Mammals of Illinois*.

What Makes a Mammal a Mammal?

STUDENT'S GUIDE

There are many different kinds of animals in Illinois. Insects, spiders, fishes, amphibians, reptiles, birds and many others are all animals. Another group of animals is the **mammals**. Let's take a closer look at the mammals. What makes an animal a mammal? Any animal is a mammal if:

1) it has hair or fur;

2) it is **warm-blooded** (which means its body temperature is kept at the same level regardless of the outside temperature);

3) its young are born alive (not hatched from eggs). Before they are born, they develop inside the mother's body in a special organ called a **uterus**. The time spent developing in the uterus before being born is called the **gestation period** and varies from mammal to mammal;

4) after birth the mother feeds the young with milk that is made in specialized organs called **mammary glands**; and

5) it has a larger and more complex brain than any of the other animal groups.

CHALLENGE YOURSELF

1. Name five animals in Illinois that are mammals. Name five that are not.

2. What kind of hair or fur do the mammals you've named have?

3. Name three places where mammals live in Illinois.

4. Mammals are the only kind of animals that feed milk to their young. How do other kinds of animals feed their young?

5. What characteristics make a mammal a mammal?

EASTERN GRAY SQUIRREL

VOCABULARY

gestation period
mammals
mammary gland
uterus
warm-blooded

ACTIVITY PAGE: Mammals in the News

What you will need

- paper
- art supplies or computer access
- old newspapers
- research materials such as the "Species Sheet" pages from this educational unit, field guides, the *Illinois Wild Mammals* resources trunk from the IDNR, Internet access

What You Do

1. Discuss the mammals that are found in Illinois (see list on pages iv-v). Ask students to talk about the Illinois wild mammals they have seen or are familiar with. If they talk about any mammal species that are domesticated, it is a good time to point out the differences between wild and domesticated mammals.

2. Provide newspapers for the students to look at. Have them look for mammals (other than humans) in the news. Also have them review the structure of the newspaper's front page.

3. Each student should select one Illinois mammal species and research it. Make sure that each student selects a different species. The students should collect information about the mammal's life history, range, endangered/threatened status and any other information they can find. They should compile this information in the form of a newspaper front page, complete with illustrations.

4. Each student should show the completed page to the class and present a short report on the information.

What's the difference between wild and domesticated mammals?

Wild mammals are those species that depend upon themselves to find the food, water and shelter that they need. In Illinois, raccoons, deer mice, foxes and bobcats are some wild mammals. Domesticated mammals are those that have been bred for special purposes. They are related to mammals that were once wild. Cows, horses, sheep and pigs are all examples of domesticated mammals. Domesticated mammals receive some of their survival requirements from humans. "Tame" mammals are pets. They are domesticated animals. However, not all domesticated mammals are tame. With most mammal species, a single animal may become "tame" while the rest remain wild. Some mammals that were once domesticated have become wild again. They are called "feral," such as feral hogs and feral cats.

GRADE LEVEL: 2

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 2-LS4-1

SKILLS/PROCESSES: observation, data collection & interpretation, analysis, comparison & generalization, grouping, identification

OBJECTIVE: Students will become familiar with evidence showing that mammals inhabit a given area.

TEACHER'S GUIDE

UNIT ONE ▪ LESSON TWO

Mammal Signs

BACKGROUND

Wherever they live, mammals produce evidence of their presence. This evidence is most commonly seen in the form of footprints or **tracks** in the soil or snow, indications of feeding activity and obvious kinds of habitation. Any walk in the wild will present numerous examples of each . . . if you know what you're looking for and where to look.

RACCOON

Areas of soft soil, mud, sand or snow are the best places to look for tracks. Along stream banks or at the edge of any body of water you're likely to find the footprints of many kinds of animals which come there to drink or feed. Using a field guide, you should be able to identify many of the tracks.

Evidence of feeding activity includes any collection of nuts, seeds or fruits stored in a concealed spot (under logs and tree roots, or inside log piles and hollow stumps). Tooth marks on anything indicate feeding–look for gnawed mushrooms or chewed nuts, fruits, leaves or twigs. Areas of bark are often chewed or stripped off as food–look for tooth marks on the exposed wood.

Signs of habitation can be especially interesting. Any natural cavity in a tree, stump or fallen log is likely to contain signs of use by some animal. Look for tracks, droppings and bits of food around the opening or signs of nesting within (piles of leaves, grasses or twigs).

Many mammals live underground, and any undeveloped area will reveal many openings to such **dens** and **burrows**.

Finally, some mammals build easily recognizable homes of their own. Squirrel nests are a common and highly visible sight in the trees of woodlands, parks and urban areas. Lakes, ponds, streams and swamps are likely to contain muskrat or beaver lodges.

PROCEDURE AND DISCUSSION

Review the student information with the class. Emphasize the variety of mammal living conditions, the diversity of their living arrangements, their adaptability and the importance of observation and attention in recognizing the signs of habitation (homes).

1. **What are the three categories of evidence indicating the presence of animals?**

   tracks; evidence of feeding activity; and signs or places of habitation

2. **Where is the best place to look for mammal tracks?**

   Tracks are most easily found in soft, damp soil, mud, sand or snow, especially at the edge of any body of water where animals come to drink.

3. **Where are you most likely to find collections of nuts, seeds and fruits?**

   Collections of nuts, seeds and fruits gathered for food are commonly found under logs and tree roots or inside log piles and hollow stumps.

4. **What would indicate that a mammal has been living in an opening or hollow space?**

   piles of leaves, grasses, twigs; food remains; scratch marks or bits of hair or fur

VOCABULARY

burrow—a tunnel or system of tunnels dug underground by an animal and used for a home

den—a hollowed chamber or space used as a home by an animal

tracks—the footprints left by an animal in soft soil, mud, sand or snow

CHALLENGE YOURSELF EVALUATION

1. The three clues that may be used to determine the presence of mammals are tracks, homes and feeding.
2. The least useful clue in a dry, rocky area is tracks. Tracks can only be made where the ground or ground covering is soft.
3. Mammal tracks are often seen in large numbers around water because the soil is soft, and the animals come there to drink and/or eat.
4. You would be most likely to find collections of nuts, seeds or fruits left by mammals under logs or tree roots, or inside log piles or hollow stumps.
5. Scientists study mammal signs because many times you don't see the animal, but you do see its signs. The signs can tell you much information about the animal.

ACTIVITY PAGE EVALUATION

Answers will vary but should include the coyote walking, then running, capturing a cottontail and returning to its den.

EXTENSION

Visiting the wooded areas of a local park or even a large field or clearing will provide ample opportunity for students to apply the information contained in this lesson. They can look for examples of all three categories of evidence.

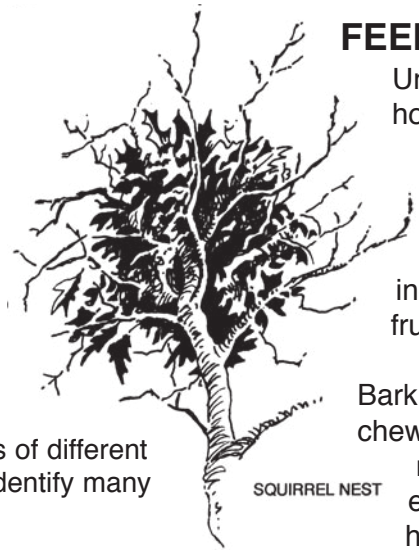
Mammal Signs

STUDENT'S GUIDE

Wherever they live, mammals produce signs that show they are present. Learning about and looking for these signs can tell you whether mammals are living in an area even if you never actually see them. These same clues will often tell you exactly what kinds of mammals are present.

TRACKS

When an animal walks across soft ground, mud, sand or snow, it will leave footprints or **tracks**. Near the edge of any body of water, such as a stream, a pond, a river or a lake, you're likely to find the tracks of many kinds of animals that have been there to eat or drink. Using a field guide, that contains pictures of different animal footprints, you can identify many of these tracks.



SQUIRREL NEST

HOMES

Mammals' "homes" are especially interesting. Any natural hollow place in a tree stump or fallen log is likely to contain signs that some mammal has used it for a home. Tracks and signs of feeding near the opening, or piles of leaves, grasses and twigs inside used as bedding can show that a mammal lives here.

Many mammals, like woodchucks and moles, live in burrows that are underground. In some areas, openings to reach **dens** (small chambers) and **burrows** (systems of tunnels) can be seen. Some mammals even build themselves rather fancy homes. Squirrel nests are a common sight in trees. Lakes, ponds, streams and swamps are likely to contain muskrat or beaver lodges built of mud, cattails, sticks and logs.

FEEDING

Under logs and tree roots, or inside log piles and hollow stumps, you're likely to find collections of nuts, seeds and fruits gathered by some mammal.

Tooth marks can be found on many things, including gnawed mushrooms, chewed nuts and fruits, and nibbled leaves and twigs.

Bark on trees and bushes may be chewed or stripped off as food. Tooth marks can be seen on the exposed wood. Generally the higher off the ground the bark has been removed, the larger the mammal that ate it, or the deeper the snow was.

CHEWED BARK

CHALLENGE YOURSELF

1. What three clues may be used to determine the presence of mammals?
2. If you were in a dry, rocky area, which of the three clues do you think would be the least useful to you in finding evidence of mammals? Why?
3. Why are mammal tracks often seen in large numbers around water, such as at a pond or along a river bank?
4. Where are you most likely to find collections of nuts, seeds or fruits left by mammals?
5. Why would scientists want to study mammal signs?

VOCABULARY

burrow
tracks
den

ACTIVITY PAGE: Mammal Signs

What you will need
- paper
- pencil or ink pen

WHAT YOU DO

Read the following story, then follow the directions.

Trail of Tracks

A scientist went for a walk in the country on a sunny day after a recent snowfall. She had been studying coyotes for several months in the area and wanted to see if there were signs of their activity in the snow. She had not been walking long when she saw a set of coyote tracks. She followed the tracks. At first, the tracks were easy to see. They were close together and evenly spaced. Soon she found a place where the tracks became farther apart. Then she saw some eastern cottontail (rabbit) fur and a little blood on the snow. The coyote tracks became closer together again. The tracks led to a hole in the ground. The snow was packed down all around the hole. Many tracks were seen around the hole.

What did the tracks tell the scientist about the coyote and its activities? Write a story to explain what the coyote did while roaming in the snow.

GRADE LEVEL: 4

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 4-LS1-2

SKILLS/PROCESSES: comparison & generalization, grouping, fact finding, creativity, relationships

OBJECTIVE: Students will understand the difference between nocturnal and diurnal behavior among mammals.

TEACHER'S GUIDE

UNIT ONE ▪ LESSON THREE

Mammals Night and Day

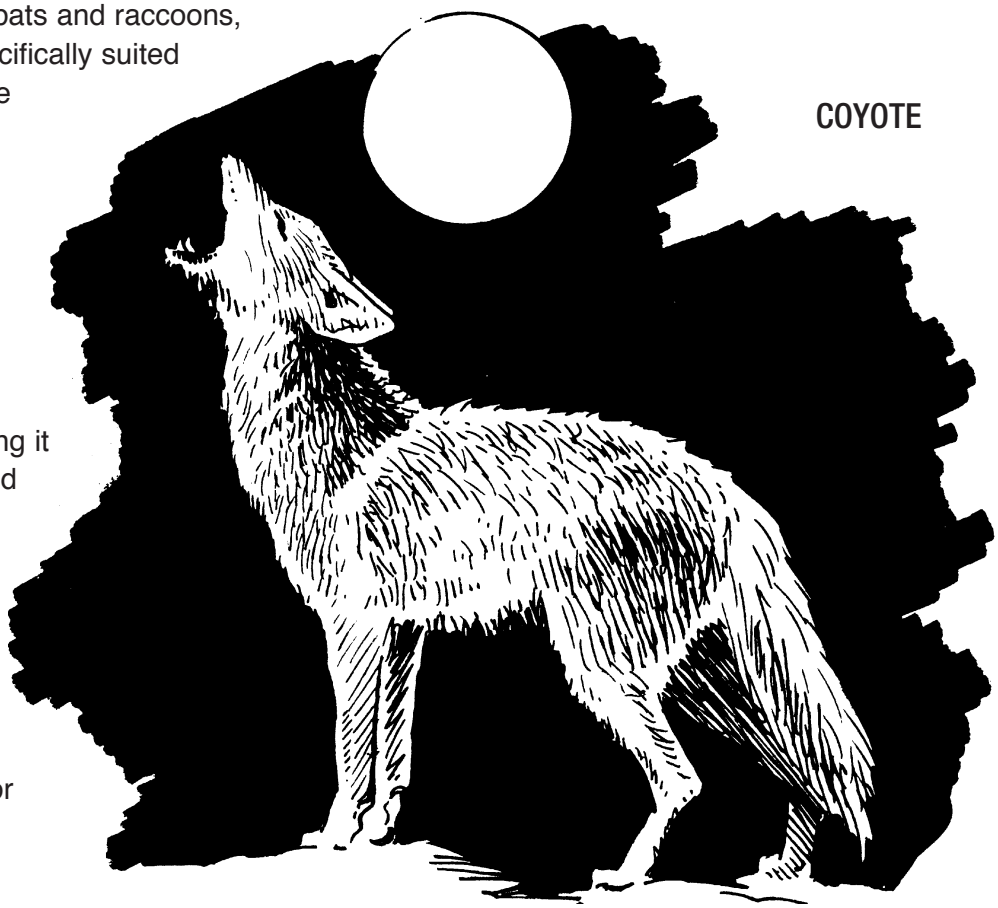
BACKGROUND

All mammals require some period every day or night for rest and sleep. Whether a mammal sleeps primarily during the day or at night depends on an individual species' particular habits and survival techniques. All mammals adapt to either daytime or nighttime activity.

Those mammals that rest during the day and engage in feeding, mating and other activities at night are called **nocturnal**. Those that rest at night and are active during the day are called **diurnal**.

Nocturnal mammals, like bats and raccoons, have evolved in ways specifically suited to life in the dark. Bats use **echolocation**, a unique system in which their extremely sensitive ears help them navigate through the dark. Most other nocturnal mammals have light-sensitive eyes and darkly colored fur or natural **camouflage** making it difficult for predators to find them. These mammals spend most of the day sleeping in dens or burrows.

Diurnal mammals, like tree squirrels, have evolved beneficial ways for daytime living. Most have developed protective coloration or camouflage appropriate to their daytime habitat which makes them less visible to predators. Such mammals' eyes are adapted to bright light, and each mammal has its own special means of escape or protection from predators. For instance, squirrels are very fast and agile, allowing them to outrun or outmaneuver their enemies. Diurnal mammals take their rest at night in dens or burrows.



COYOTE

PROCEDURE AND DISCUSSION

Review the student information with the class. Emphasize the nocturnal versus diurnal behavior and the advantages and disadvantages of each.

1. **What characterizes a nocturnal mammal?**

   A nocturnal mammal is active at night and rests or sleeps during the day.

2. **What characterizes a diurnal mammal?**

   A diurnal mammal is active during the day and rests or sleeps at night.

3. **What is echolocation, and what mammal uses it?**

   Echolocation is a sound-and-hearing technique used by bats to "see" in the dark.

VOCABULARY

camouflage—coloration that blends into the natural background

diurnal—of or occurring during the day

echolocation—a technique of sound and hearing used by certain animals to navigate in the dark

nocturnal—of or occurring during the nightg

CHALLENGE YOURSELF EVALUATION

1. Nocturnal mammals have eyes that are sensitive to dim light, natural camouflage for night activity or dark fur, sleep in dens or burrows and may use echolocation. Diurnal mammals have eyes that are adapted to bright light, camouflage for daytime activities and have the ability to move quickly.

2. Answers will vary.

3. Echolocation is a system of using sounds to “see” at night. Bats use this system.

ACTIVITY PAGE EVALUATION

Evaluate students based on participation in discussion.

EXTENSION

Many zoos and museums have special exhibits of nocturnal animals in which nighttime conditions are maintained during the day. Visit one of these displays and let the students observe the activity of these animals.

Mammals Night and Day

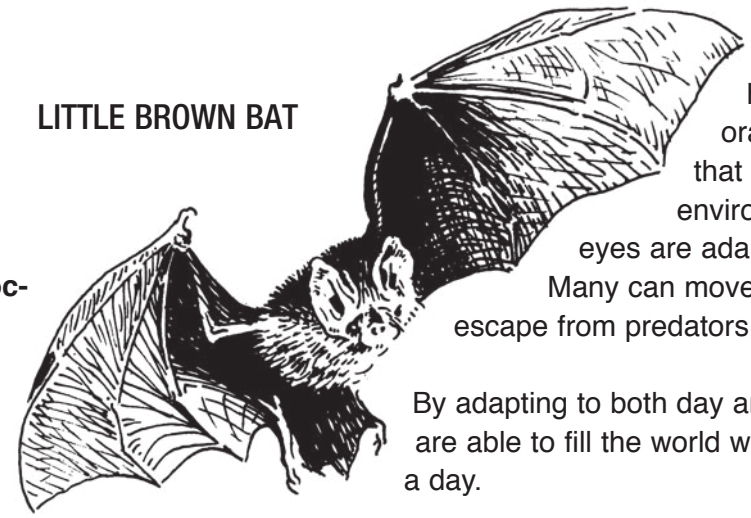
STUDENT'S GUIDE

Like all animals, mammals must spend part of every day or night resting or sleeping.

Those mammals that rest during the day and are active at night are called **nocturnal**.

Nocturnal mammals, like bats, raccoons and weasels, have developed many special ways of surviving in the dark. Bats use a sound system called **echolocation** and very sensitive ears to "see" or navigate in the dark. The sounds they make bounce back to them. Their ears pick up the sounds. Their ears send a message to their brain. The brain determines where objects are located based on the sound sent and the sound bounced back. Most nocturnal mammals have eyes which are very sensitive to dim light. They have dark-colored, or naturally **camouflaged** fur, which makes them difficult to see at night. Nocturnal mammals spend most of the day sleeping in their den or burrow.

Those mammals that rest at night and are active during the day are called **diurnal**. Diurnal mammals like squirrels, have developed ways of surviving in the daylight. Most have protective coloration or camouflage that blends in with their environment, and their eyes are adapted to bright light. Many can move very fast in order to escape from predators.



LITTLE BROWN BAT

By adapting to both day and night, mammals are able to fill the world with activity 24 hours a day.

CHALLENGE YOURSELF

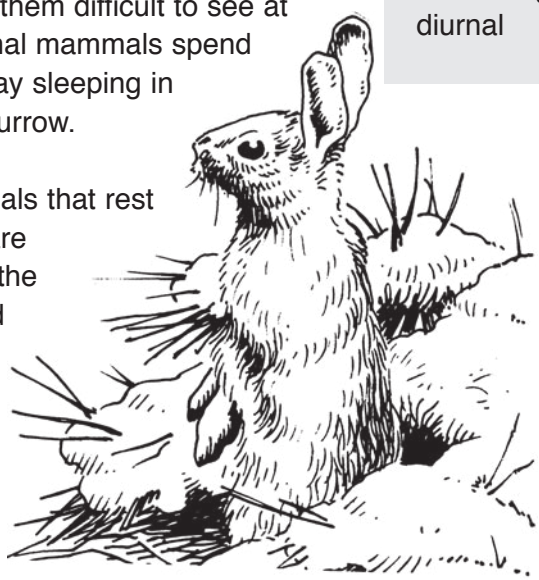
1. What are some differences between nocturnal and diurnal mammals?

2. Write a paragraph explaining what changes you would have to make to become nocturnal.

3. What is echolocation, and what mammals use it?

VOCABULARY

camouflage	echolocation
diurnal	nocturnal



EASTERN COTTONTAIL

ACTIVITY PAGE: Creature of the Night

What you will need

- group size: 20 or more students but can be modified for fewer students
- a blindfold

WHAT YOU DO

Go outside to a flat, open area and have students form a large circle. Choose someone to be a bat, three or four other students to be insects and another three or four students to be trees. All of these students should go to the center of the circle.

The bat must put on the blindfold. The trees should then take up random positions in the circle and remain in those spots throughout the game. The insects are free to move about anywhere in the circle.

The object of the game is for the bat to tag insects while avoiding trees. In order to do this in the "dark," the bat must continually call out "bat." Every time the bat makes this call, the insects and trees must respond by calling out "insect" or "tree." When insects are tagged by the bat, they should rejoin the circle. If the bat blunders into a tree, the bat is out and someone else must put on the blindfold.

Rotate play until everyone has had a chance to be the bat, an insect or a tree.

As a group, discuss what it was like to be a bat in this activity. How is it similar to what a real bat would experience while hunting for insects at night?

GRADE LEVELS: 1, 3

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 1-LS3-1, 3-LS1-1, 3-LS3-1

SKILLS/PROCESSES: observation, data collection & interpretation, analysis, fact finding, evaluation, computation/calculation, charting/graphing

OBJECTIVES: Students will become familiar with the processes of mammalian birth and nurturing.

TEACHER'S GUIDE

UNIT ONE ■ LESSON FOUR

Raising Mammal Young

BACKGROUND

Most mammals are **viviparous**, which means they give birth to living young, as opposed to hatching their young from eggs. (Exceptions are the duck-billed platypus and the echidna of Australia. These mammals lay eggs.) Some young mammals, like mice, rabbits and bats, are born blind and totally hairless, while others, such as deer, are developed enough to move about with the parent soon after birth.

After birth, all newborn mammals are nourished with milk produced in the mother's **mammary glands**, (see Unit 1, Lesson 1). This milk is composed of water, fats, proteins, sugars and mineral salts. Mammals whose young grow the fastest produce milk with the highest protein content.

Weaning generally occurs after the young can eat solid food. Small rodents generally nurse for a week and a half to three weeks. Badgers can eat solid food in the first month but are suckled for four or five weeks.

As physical development progresses, behavioral development also occurs. Behavior patterns are either instinctive, learned or a combination of both. **Instinctive behavior** is automatic and triggered internally, while **learned behaviors** are picked up through imitation of the parent and through play among siblings or other young.

As young mammals mature, their dependency on parents decreases, and they become independent.

RACCOON WITH YOUNG

PROCEDURE AND DISCUSSION

Review the student information with the class. Emphasize in general the mammalian nurturing process and variations from species to species.

1. **What characterizes a viviparous animal?**
   A viviparous animal gives birth to live young (not hatched from eggs).

2. **What do newborn mammals eat? Where does it come from? What is it made of?**
   Newborn mammals drink milk produced in the mammary glands of the mother. This milk is composed of water, fats, proteins, sugars and mineral salts.

3. **What two kinds of behavior do young mammals develop?**
   Young mammals develop both instinctive and learned behavior.

4. **How do young mammals learn those behaviors which are not instinctive?**
   Young mammals learn by imitating their parents and playing with other young.

VOCABULARY

instinctive behavior—an inborn, automatic response or behavior pattern

learned behavior—behavior acquired through imitation and play

mammary gland—a specialized gland in female mammals which produces milk to feed the young

viviparous—giving birth to live young (not hatched from eggs)

wean—the progression of a young mammal from dependence on its mother's milk to independent eating

CHALLENGE YOURSELF EVALUATION

1. Viviparous means giving birth to live young. No, the duck-billed platypus and echidna are egg-laying mammals.
2. Newborn mammals drink milk as their food. The milk is produced by the female's mammary glands. It is made of water, fats, proteins, sugars and mineral salts.
3. The two types of behaviors young mammals develop are called instinctive and learned.

ACTIVITY PAGE EVALUATION

Numbers correspond to paragraphs.

1. See "Species Sheets" for information about each mammal. Students should develop a table to record the information.
2. total offspring which could be produced in one year = litter size x number of litters per year; total offspring which could be produced in two years = litter size x number of litters per year x 2
3. Students should make a graph to illustrate the requested information per species. A line graph is probably their best choice since they will be graphing three different features (weight, litter size and age at maturity) on the same graph.
4. a: least b: fastest c: 40
   d: Many of the young die before reaching maturity. Many others are eaten by other species.
   e. Answers will vary.

EXTENSIONS

Raise a family of mice or other small mammal in the classroom. Record and chart their progress.

Have students conduct more research about instinctive versus learned behaviors in mammals.

Raising Mammal Young

STUDENT'S GUIDE

Most mammals are **viviparous**. That means they give birth to living young. (Exceptions are the duck-billed platypus and the echidna in Australia. These species lay eggs.)

Just how fully developed these newborn mammals are depends on the particular species. Some, like mice, rabbits, squirrels and bats, are born blind and hairless. They must be kept warm, carefully protected and fed by their mother or parents until they grow enough to care for themselves.

Others, like deer, are developed enough at birth to walk around with their parents almost immediately.

All mammals feed on milk produced in the mother's **mammary glands**. This milk is made of water, fats, proteins, sugars and mineral salts.

Some mammals nurse for only a few days (like field mice) and some for a few weeks (like bobcats and coyotes). Sometime after the young begin to eat solid food, the mother's mammary glands no longer produce milk and the young are **weaned**, meaning they no longer depend on their mother's milk.

As the young grow, they also begin to develop the behavior patterns they will need to survive on their own, such as how to find food or build a shelter. These behavior patterns are either **instinctive** or **learned**. Instinctive behavior is "built in," which means the animal is born knowing how to do it. Learned behaviors are picked up from imitating the parents or playing with other young.

As the mammal matures, its dependency on its parents decreases, and eventually it strikes out on its own.

CHALLENGE YOURSELF

1. What does **viviparous** mean? Are all mammals viviparous?

2. What do newborn mammals eat? Where does it come from? What is it made of?

3. What two kinds of behavior do young mammals develop?

VOCABULARY

instinctive behavior	viviparous
learned behavior	wean
mammary gland	

EASTERN COTTONTAIL WITH YOUNG

ACTIVITY PAGE:
Graphing Mammal Reproduction

What you will need
- paper or graph paper
- ruler
- writing implements (colored pencils, too, if possible)
- copies of Species Sheets

WHAT YOU DO

Use the "Species Sheets" to gather the following information about each mammal: weight; age at maturity; gestation period; litter size; number of litters per year. Record the information in a table. Leave two columns open at the end of the table. Label one of them "Number of Offspring After One Year" and label the other one "Number of Offspring After Two Years."

Calculate the total offspring that could be produced in one year for an individual mammal of each species. Now find the total offspring that could be produced in two years. (Some of these species do not live for two years but calculate the numbers anyway.)

Make a graph to show the differences in weight for each species. On the same graph, using a different color, show the litter size for each species. Be sure to put a key on your graph to show what the colors stand for. Now add a third color for age at maturity.

Study your table and graph, then answer the following questions.

a) Which mammals produced the most offspring: those that weighed the most or the least?

b) Which mammals produced the most offspring: those that matured the fastest or the slowest?

c) How many white-footed mice offspring were possible after two years?

d) Why do you think that the actual numbers of white-footed mice in nature are lower than in your results?

e) Write a paragraph explaining the trends you observed.

GRADE LEVELS: 3 - 4

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 3-LS4-3, 4-LS1-1

SKILLS/PROCESSES: observation, data collection & interpretation, comparison & generalization, identification, application

OBJECTIVE: Students will become aware of the variety of mammalian locomotive techniques and adaptations.

TEACHER'S GUIDE

UNIT TWO ▪ LESSON ONE

Mammals on the Move

EASTERN COTTONTAIL

BACKGROUND

Almost all animals are mobile. To find food, shelter and mates, avoid predators and interact with their environment, animals must have the ability to move.

Mammals live in a variety of environments and have adapted different strategies for locomotion. These strategies are as varied as the animals themselves but are directly related to the specific kind of environment in which they live.

Most mammals have four limbs with their appendant paws, claws and hooves, which are their means of locomotion. These **limbs** and **appendages** are specifically adapted to each species' particular needs.

Mammals that live underground in burrows, such as moles and badgers, have claws on their forelimbs designed for digging and crawling through dirt.

Predatory mammals that chase their prey, like bobcats, have feet with thick, rough pads for traction and sharp claws for grabbing. Deer and other grazers have flat, hard hooves for solid support on soft earth and kicking for defense. Beavers and muskrats, which spend most of their lives in water, have webbing between their toes. Mammals that climb, like squirrels, have very sharp, short claws for holding.

Perhaps the most fascinating examples of locomotive adaptation among mammals are bats and flying squirrels. In the former, the forelimbs, especially the "finger bones" and the skin between them, have evolved into fully functional wings. Flying squirrels have large flaps of skin connecting their "wrists" to their "ankles" enabling them to glide great distances between trees and branches.

In most cases, the greater a mammal's need for speed, the longer its legs will be in proportion to the rest of its body.

PROCEDURE AND DISCUSSION

Review the student information with the class. Emphasize the reasons for a mammal's need to move, the variety of adaptations evolved to meet this need, and the relationships of those adaptations to the individual species' habits and environment.

1. **Why do mammals move around?**

   Mammals move in order to find food, shelter and mates.

2. **What can claws be used for?**

   Claws can be used for digging, running, grabbing, holding, climbing, scratching and self-defense.

3. **What are limbs and appendages?**

   Limbs are the "arms" and "legs" of an animal, and appendages are their "hands" and "feet" or claws, paws and hooves.

4. **What adaptation would most benefit an animal that digs tunnels?**

   Long, hard claws for scraping and shoveling soil.

VOCABULARY

appendages—the "hands" and "feet" of an animal; in the case of mammals they are usually paws or hooves

limbs—the "arms" and "legs" of an animal

CHALLENGE YOURSELF EVALUATION

1. Mammals need to move to find food, shelter and mates and to avoid predators.
2. Appendages are "hands" and "feet" or claws, paws and hooves.
3. Claws can be used for digging, running, grabbing, holding, climbing, scratching and self-defense.
4. Hooves would not be sensible for a squirrel because squirrels need to grasp tree trunks, branches and other objects as they climb. They also need to hold onto and pick up food. Hooves would not allow these activities to take place.
5. Some mammals need thick pads on the feet for traction.
6. A. squirrel, small foot with claws for grasping

   B. skunk, large foot with claws for digging

   C. coyote, thick pads and short claws

   D. deer, hooves

ACTIVITY PAGE EVALUATION

Any answer which contains supporting information will work. There is no best method.

EXTENSION

Draw, paint or construct a make-believe mammal. Have students describe their mammal's special adaptations for locomotion and explain where it might live.

Mammals on the Move

STUDENT'S GUIDE

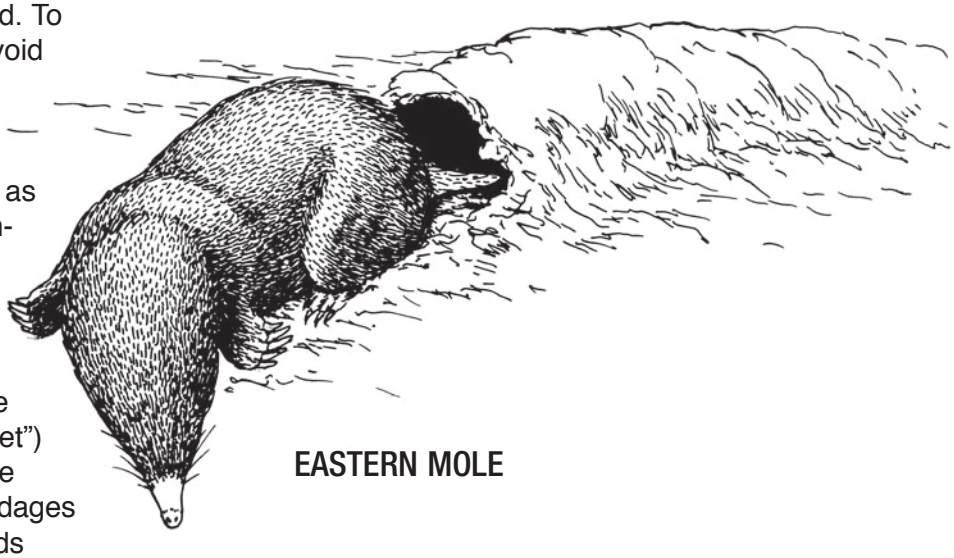
All mammals need to move around. To find food, shelter and mates, to avoid predators, and just to live in their world, they must be able to move.

The ways in which they move are as varied and interesting as the mammals themselves.

Most mammals have four limbs, but these "arms" and "legs" come in many shapes and sizes, and the appendages (their "hands" and "feet") can be paws, claws or hooves. The exact form these limbs and appendages have depends on the specific needs and habits of the individual species.

For instance, mammals that dig burrows and tunnels have large claws on their forelimbs for scraping and crawling through the soil. Mammals that chase and hunt have feet with thick, rough pads for traction and short, sharp claws for grabbing. Those species that graze, like deer, have flat, hard hooves for solid support on soft ground and for kicking in defense. Those that spend a lot of time in the water, such as beavers and muskrats, have webbing between their toes for more efficient swimming. In addition many mammals have claws that help them to climb and forepaws they use to pick up, hold and handle food or other objects.

Two of the most fascinating adaptations of mammal limbs are found in bats and flying squirrels. In bats, the forelimbs, especially the "finger" bones and the skin between them, have evolved into wings for flying. Flying squirrels have large flaps of skin between their "wrists" and "ankles" enabling them to glide great distances between trees and branches.



EASTERN MOLE

CHALLENGE YOURSELF

1. Why do mammals need to move around?

2. What are appendages?

3. What can claws be used for?

4. Why wouldn't hooves be sensible for a squirrel?

5. Why do some mammals need thick, rough pads on their feet?

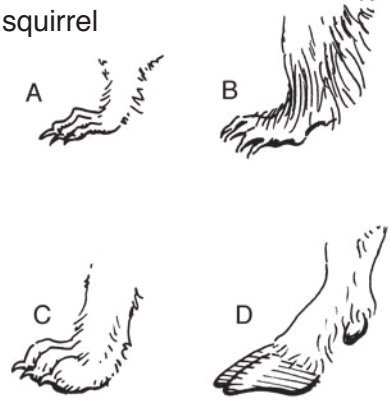
6. Match the mammal from this list to the drawing of its foot. On the back of this page, tell why you placed the name with each foot. coyote, deer, skunk, squirrel

A. _____

B. _____

C. _____

D. _____



VOCABULARY

appendages limbs

ACTIVITY PAGE: Mimicking Mammals

What you will need

- three long (8-12') strips of paper
- markers or crayons
- resource materials, such as the *Illinois Furbearers* poster, the IDNR *Wild Mammals of Illinois* resources trunk, mammal or animal track field guides

WHAT YOU DO

Find examples of various mammal tracks, and the patterns the mammals leave as they walk.

Choose three of these species and adjust their track size and spacing to match your own proportions. Sketch the tracks on the strips of paper, as if the animal had walked along its length.

Placing your own hands and feet on the first four tracks, try to walk in their footsteps.

Some animals walk by moving both left feet, then both right feet. Others move right front and back left then left front and right back. Still others hop. Try "walking" on all fours in all these combinations.

What do you think is the best method of walking? Why? Write a paragraph about a mammal with the type of movement you selected, explaining why its method of moving is best. You may need to do some research about the mammal to collect more information about its life.

GRADE LEVELS: 1, 3

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 1-LS3-1, 3-LS1-1, 3-LS3-1

SKILLS/PROCESSES: observation, data collection & interpretation, comparison & generalization, grouping, fact-finding, identification, charting/graphing

OBJECTIVE: Students will become familiar with hibernation and its function as a survival technique for certain mammals.

TEACHER'S GUIDE

UNIT TWO ▪ LESSON TWO

Hibernation

BACKGROUND

Survival may be difficult for mammals in climates such as we have in Illinois, particularly when harsh, prolonged winters drastically reduce the natural food supply. One of the most fascinating techniques some mammals use to deal with such conditions is **hibernation**, a state of extremely reduced **metabolic** processes.

HIBERNATING MEADOW JUMPING MOUSE

Hibernation is seldom an all-or-nothing condition. Many mammals use varying degrees and lengths of **dormancy**, or inactivity, to conserve energy and survive periods of limited food supply. Skunks and raccoons, for instance, "den up" during extremely cold weather, remaining in their burrows and living off excess body fat, while not actually hibernating.

True hibernation involves drastic reductions in a mammal's bodily functions as well as physical activity. Body temperature drops dramatically, as do heart and breathing rates. From a normal body temperature of 95°F, the temperature of a hibernating mammal may be as low as 36°F. A normal heart rate of more than 100 beats per minute may drop to only four or five, and breathing may slow to less than one breath per minute. Woodchucks are an example of a true hibernator.

Prior to the hibernation period, these mammals accumulate a thick layer of excess body fat, which supplies them with the energy needed to survive. A hibernating mammal may lose as much as one-third of its total body weight during hibernation. Others gather and store a supply of food to eat during brief periods of wakefulness.

Scientists have discovered that even during hibernation there are periods of wakefulness, which become more frequent as the hibernation period comes to an end. External temperature is a factor in these periods of sporadic activity. For each species there is a **critical temperature** above which they will waken, and all will waken temporarily if the temperature drops so low that they are in danger of freezing. Wakening allows mammals to move to a deeper, warmer chamber or to warm up a little—by shivering or moving around—until the temperature moderates.

As spring approaches the air warms, food supplies are once again sufficient, and the hibernating mammals return to normal activity.

PROCEDURE AND DISCUSSION

Review the student information with the class. Emphasize hibernation as a survival technique. Note that hibernation is designed to protect mammals from food shortages, not from low temperatures.

1. **What is hibernation?**

   Hibernation is a state of reduced metabolism, similar to a very deep sleep, that allows a mammal to survive periods of food scarcity.

2. **Why do some mammals hibernate?**

   Some mammals hibernate in order to survive during periods of inadequate food supply.

3. **How do hibernating mammals live?**

   During hibernation, mammals live on accumulated excesses of body fat.

4. **What will cause a hibernating mammal to awaken?**

   For all hibernating mammals there is a critical temperature above which they will waken. They will also rouse temporarily if the temperature drops so low that they are in danger of freezing.

5. **What is metabolism?**

   Metabolism is the rate at which a living creature uses the energy it gets from its food.

VOCABULARY

critical temperature—the temperature at which a hibernating mammal will automatically waken (varies from species to species)

dormancy—a condition of inactivity or sleep

hibernation—a state of reduced metabolism, like a very deep sleep, which allows an animal to survive periods of food scarcity

metabolism—the rate at which a living creature uses the energy it gets from its food

CHALLENGE YOURSELF EVALUATION

1. Some animals hibernate to survive during periods when food is not readily available.
2. Hibernating mammals live on stored body fat.
3. A hibernating mammal will awaken at a critical temperature or if the outside temperature becomes too low and its body might freeze.
4. In hibernation, the animal's metabolism slows down as does the heart rate, body temperature and breathing. Hibernation lasts for months during which the animal lives off its body fat. Hibernation is controlled by temperature. In sleep, the metabolism of the organisms does not change drastically. Sleep is a state that an organism can enter and leave easily. Sleep does not last for long periods of time.
5. Hibernating animals spend several months doing nothing. They must complete all of their other life functions while not in the hibernating state.

ACTIVITY PAGE EVALUATION

1. Plants, insects and seeds make up the diet of the hibernating species.
2. They hibernate so long because during the time they are hibernating their food supply is gone. They wait for it to return.
3. Answers will vary.

EXTENSION

The woodchuck, or groundhog, and February 2 have become very closely associated. Research Groundhog Day and its origin. Is it based on scientific research?

Hibernation

STUDENT'S GUIDE

During harsh, cold winters like we have in Illinois, many of the foods mammals need become scarce or are not available. In order to survive these periods of limited food supply, some mammals hibernate. **Hibernation** is like a very deep, long sleep. This condition of **dormancy**, or inactivity, allows a mammal to live a long time on very little food.

The rate at which a living creature uses the energy it receives from food is called **metabolism**. During hibernation a mammal's rate of metabolism is slowed substantially.

Also during hibernation, a mammal's body temperature drops greatly as does its heart rate and breathing rate. While a normal body temperature may be 95°F, during hibernation it can drop as low as 36°F. A normal heart rate of over 100 beats per minute may drop to only four or five per minute. Breathing may slow to about one breath per minute.

Before they begin hibernation, mammals eat so much that they develop a thick layer of fat. This fat will supply them with the energy they will need during their long "nap." Some hibernating mammals will lose as much as one-third of their total body weight during hibernation. Mammals that do not hibernate deeply gather and store food to eat during wakeful periods.

Hibernation is never continuous. There are always periods of wakefulness, which become more frequent as the hibernation period comes to an end. For each species that hibernates there is a **critical temperature** above which they will wake, and they will wake temporarily if the temperature drops so low that they are in danger of actually freezing. Upon waking they can move to a deeper, warmer chamber or warm up a little by shivering or moving around until the temperature rises.

HIBERNATING THIRTEEN-LINED GROUND SQUIRREL

As spring approaches and the air warms, food is once again available, and the hibernating mammal will waken and return to normal activity.

CHALLENGE YOURSELF

1. Why do some animals hibernate?

2. What do hibernating mammals live on?

3. What will waken a hibernating mammal?

4. How do you think hibernation is different from regular sleep?

5. What do you think might be a disadvantage of hibernation?

VOCABULARY

critical temperature
dormancy
hibernation
metabolism

ACTIVITY PAGE: Investigating Hibernation

What you will need
- paper
- pencil or ink pen

WHAT YOU DO

Eleven Illinois mammal species hibernate in winter. Study the chart and answer the questions.

Species	Diet	Time Spent Hibernating
little brown bat	insects	six months
Indiana bat	insects	six months
southeastern bat	insects	six months
northern bat	insects	six months
tri-colored bat	insects	six months
big brown bat	insects	six months
eastern small-footed bat	insects	four or five months
woodchuck	plants	five or six months
Franklin's ground squirrel	plants, insects	six or seven months
thirteen-lined ground squirrel	plants, seeds	six months
meadow jumping mouse	seeds	six or seven months

1. What makes up the diet of these mammal species?

2. Why do you think they hibernate so long?

3. Construct a time line showing what events normally happen in your life during the six or so months these mammals are hibernating. Use October through March for the time line. Include events like school, sports, birthdays, etc. Write a paragraph explaining the time line.

GRADE LEVELS: 1, 3

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 1-LS3-1, 3-LS1-1, 3-LS3-1

SKILLS/PROCESSES: observation, data collection & interpretation, analysis, grouping, fact-finding, identification, application, inference

OBJECTIVE: Students will become familiar with the basic categories and functions of mammal teeth.

TEACHER'S GUIDE

UNIT TWO ▪ LESSON THREE

The Right Teeth

BACKGROUND

There are three types of mammal teeth: **incisors** (used for cutting and gnawing) located in the front and center of one or both jaws; **canines** (used for stabbing and tearing) located on each side of the incisors; and **premolars** and **molars** (for grinding and shearing) situated along the sides of the jaws.

Because each tooth type is designed for specific functions, they have evolved differently in different mammal species, depending on eating habits. Based on these relationships, mammals are categorized into four groups:

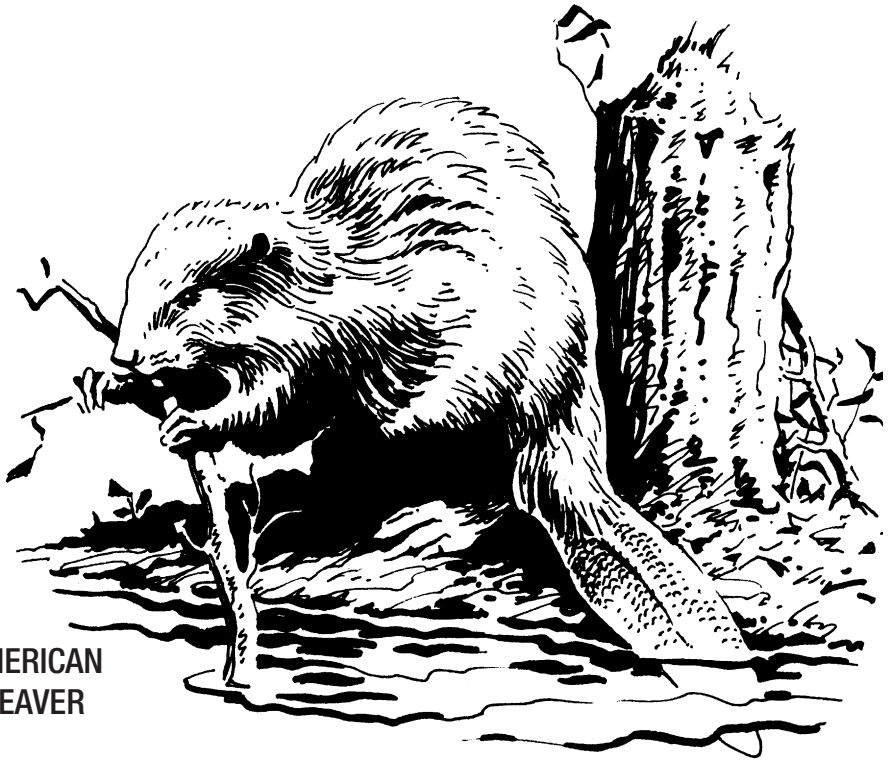
1. **Herbivores** are mammals that eat mainly vegetation. There are two sub-groups: plant-tearing mammals (deer) and plant-gnawing mammals (beavers, squirrels and mice). Plant-tearing mammals have incisors in their lower jaws only, no canines at all and flat, sharp-edged molars. This arrangement is best for tearing leaves, stems, bark and grasses.

   Plant-gnawers have sturdy, sharp incisors on both jaws for cutting through nuts, bark, wood and grasses. They lack canines and have flat molars for grinding.

2. **Carnivores**, or meat-eating mammals (such as coyotes, bobcats and foxes), have small but sharp incisors in both jaws for grabbing and holding; long, fanglike canines for stabbing and tearing; and large, sharply edged premolars and molars for slicing through flesh, bone, skin, scales, fur and feathers.

3. **Insectivores**, or insect-eating mammals (like shrews, moles and some bats), have long incisors for picking insects out of dirt and leaves and small but sharply edged canines, premolars and molars for chewing hard-shelled beetles, other insects and worms.

4. **Omnivores** (such as raccoons, opossums and humans) eat almost anything edible. These mammals develop all three types of teeth, with no one category more prominent than the others.



AMERICAN BEAVER

PROCEDURE AND DISCUSSION

Review the student information with your class and emphasize the three types of teeth and how they relate to other mammalian characteristics (such as fur, feet, etc.). Encourage them to think of examples of Illinois mammals with each of the four teeth categories.

1. **What are the three kinds of mammal teeth, and what are their functions?**

   Incisors, for holding, cutting and gnawing. Canines, for stabbing and tearing. Premolars and molars for grinding and shearing.

2. **What is an omnivore? An insectivore? An herbivore? A carnivore?**

   An omnivore is any animal that eats plants and animals. An insectivore is any animal that eats only insects. An herbivore is any animal that eats only plants. A carnivore is any animal that eats only the flesh of other animals.

VOCABULARY

canines—those teeth located on either side of the incisors, in one or both jaws, used for stabbing and tearing

carnivore—any animal that eats only the flesh of other animals

herbivore—any animal that eats only plants

incisors—those teeth located in the front and center of one or both jaws, used for holding, cutting or gnawing

insectivore—any animal that eats only insects

omnivore—any animal that eats plants, the flesh of other animals and anything else that is edible

premolars/molars—those teeth located along the sides and back of one or both jaws, used for grinding and shearing

CHALLENGE YOURSELF EVALUATION

1. Animals other than mammals use a beak, different types of teeth, jaws or grabbing and swallowing as their methods of eating their food.
2. Sometimes mammals in one feeding category can eat food from another feeding category. Omnivores can eat from all the categories. Herbivores could accidentally eat an insect. Carnivores can eat plants, fruits and insects.
3. herbivore: eats plants
   carnivore: eats meat (flesh)
   insectivore: eats insects
   omnivore: eats a variety of items

   Examples will vary but could include the following mammals from the "Species Sheets:" herbivore–American beaver, eastern fox squirrel, thirteen-lined ground squirrel, plains pocket gopher, white-tailed deer, eastern cottontail, prairie vole; carnivore–coyote, bobcat; insectivore–eastern red bat, northern short-tailed shrew; omnivore–raccoon, Virginia opossum, white-footed mouse, eastern chipmunk.

ACTIVITY PAGE EVALUATION

little brown bat–insectivore; 2
raccoon–omnivore; 7
eastern gray squirrel–herbivore; 5
North American river otter–carnivore; 6
bobcat–carnivore; 3
eastern mole–insectivore; 1
white-tailed deer–herbivore; 4

EXTENSION

Borrow an IDNR *Illinois Wild Mammals* resource trunk and use the skulls it contains to help you teach about mammal teeth. Let students identify teeth types and decide whether the mammal was an herbivore, carnivore, insectivore or omnivore. Visit https://www2.illinois.gov/dnr/education/Pages/ItemsForLoan.aspx to find a lending location near you.

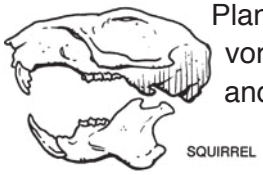
The Right Teeth

STUDENT'S GUIDE

Most mammals have three kinds of teeth: **incisors** used for grabbing, cutting and gnawing; **canines** used for stabbing and tearing; and **premolars** and **molars** for grinding and shearing. The type of teeth a mammal has will determine how and what it can eat. Mammals can also be grouped by what they eat.

Herbivores

Mammals that eat only plants are called herbivores. There are two kinds of herbivores. Plant-tearing herbivores, such as deer and goats, have incisors only in their lower jaws, no canines and flat, sharp-edged premolars and molars.

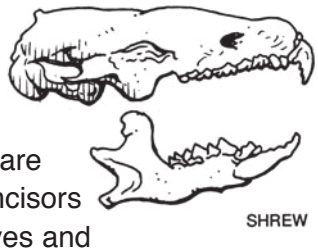


Plant-gnawing herbivores, like beavers and squirrels, have large, sharp incisors in both upper and lower jaws, no canines and flat premolars and molars.

Carnivores

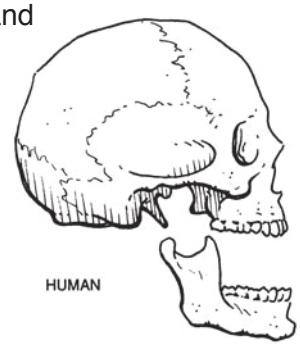
Mammals that eat only other animals are called carnivores. Bobcats, foxes and coyotes are some Illinois carnivores. They have small but sharp incisors for grabbing and holding; long, fanglike canines for stabbing and tearing; and large, sharply edged premolars and molars for slicing through flesh, bone, skin, scales, fur and feathers.

Insectivores



Like shrews, moles and some bats, some animals eat only insects. They are called insectivores. They have long incisors for picking insects out of dirt and leaves and small, but very sharp canines, premolars and molars for chewing hard-shelled beetles, other insects and worms.

Omnivores



Some animals, like raccoons and humans, are called omnivores. They have all three types of teeth, allowing them to eat plants and flesh.

CHALLENGE YOURSELF

1. How do animals other than mammals—like birds, fishes, insects and reptiles—bite, chew and eat their food?

2. Can mammals in one category eat the food of mammals in other categories? Why or why not?

3. Explain the difference between the four feeding categories and give an example of a wild Illinois mammal in each category. (HINT: Use the "Species Sheets" to find the examples.)

VOCABULARY

canines
carnivore
herbivore
incisors
insectivore
omnivore
premolars/molars

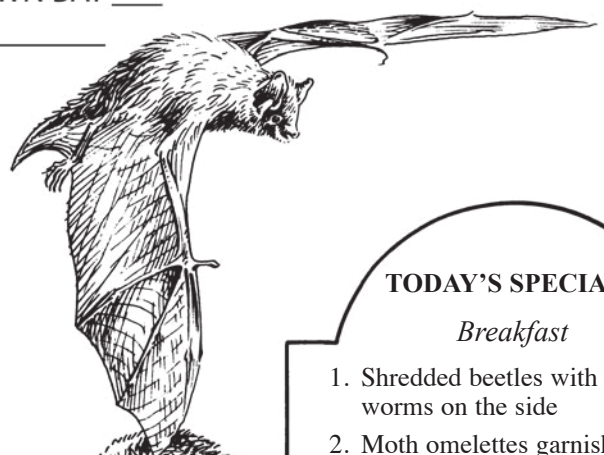
ACTIVITY PAGE: Menu of the Day

WHAT YOU DO

In the long blank, indicate whether the mammal is an herbivore, insectivore, carnivore or omnivore. In the short blank, put the number of the menu item it would be most likely to eat.

LITTLE BROWN BAT ___

_____



BOBCAT ___

_____

TODAY'S SPECIALS

Breakfast

1. Shredded beetles with earthworms on the side
2. Moth omelettes garnished with mosquitoes

Lunch

3. Squirrel and field mice stew
4. Grass and leaf salad on bed of tree bark

Dinner

5. Berry soup with nuts, bark and buds
6. Frog legs and fish, turtle and muskrat soup

Leftover Special

7. Chef's salad of crayfish, fishes, mice, nuts, berries, grain and fruits

RACCOON ___

_____

EASTERN MOLE ___

_____

EASTERN
GRAY SQUIRREL ___

_____

WHITE-TAILED DEER (FAWN) ___

_____

NORTH AMERICAN RIVER OTTER ___

_____

GRADE LEVEL: 5

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 5-LS2-1

SKILLS/PROCESSES: observation, comparison & generalization, grouping, fact-finding, identification, group planning, relationships, inference

OBJECTIVE: Students will become familiar with the concept of predation and the relationship between prey and predator.

TEACHER'S GUIDE

UNIT TWO ▪ LESSON FOUR

The Predator-Prey Relationship

BACKGROUND

Among the mammal species in Illinois are some known as **predators**. From bobcats and foxes to raccoons and weasels, they share a common behavioral trait: they catch, kill and eat other animals (called **prey**).

There are different degrees of predation. Some strict predators, such as bobcats, eat only meat. But other mammals, such as raccoons and opossums, eat berries, nuts and plants in addition to catching and eating prey.

Most predators are prey to other, larger predators. A weasel that eats a field mouse may then be dinner for a bobcat. Those few predators that are not prey to others are called **top predators**.

Both predators and prey are links in what is called a **food chain**. Food chains are the routes along which energy flows through the living world.

This energy always starts with the sun.

Through the process of **photosynthesis**, plants use the sun's energy to produce food. Animals such as rabbits and deer eat the plants and transfer the energy from the plants' stored food into their own bodies . . . only to become prey to the predators, who again transfer the energy to themselves.

But the flow of energy doesn't end there. Even top predators eventually die, and their bodies become food for **scavengers**, those animals that eat dead animals and plants. Bacteria and fungi break down bones, scales, fur and feathers into the simplest chemical compounds. These compounds become the nutrients in the soil that are the raw materials for plant growth. Thus the food chain becomes a closed cycle with no real beginning and no real end.

Most food chains overlap (individual species of plants and animals may be links in the food chains of several species of predator) and the entire system becomes a food web.

GRAY FOX

PROCEDURE AND DISCUSSION

Review the student information with your class. Emphasize the relationship between predators and prey, and their mutual dependence on one another. Lead the students to an understanding of the entire food chain.

1. **What is a predator?**

   A predator is any animal that catches, kills and eats other animals.

2. **What is photosynthesis?**

   Photosynthesis is the process whereby plants use sunlight to convert carbon dioxide, water and nutrients into food.

3. **What is a top predator?**

   A top predator is a predator that is not prey to any other animal.

4. **What is a scavenger?**

   A scavenger is an animal that feeds on the dead bodies of other animals but does not catch and kill them itself.

5. **What is a food chain?**

   A food chain is the route along which energy flows through any community of plants and animals.

VOCABULARY

food chain—the route along which energy flows through a community of plants and animals

photosynthesis—the process by which plants use sunlight to convert carbon dioxide, water and nutrients into food

predator—any animal that catches, kills and eats any other animal

prey—any animal that is caught, killed and eaten by any other animal

scavenger—any animal that eats the dead bodies of other animals but does not catch and kill them itself

top predator—any predator in a food chain on whom no others prey

CHALLENGE YOURSELF EVALUATION

1. The two predators are the white-footed mouse and the least weasel.
2. The sun provides energy to the plants.
3. Two prey items in the diagram are the white-footed mouse and the grasshopper.
4. The weasel dies and is decomposed by the bacteria and fungi.
5. Yes, a mammal can be classified as both a predator and a prey item. For example, the white-footed mouse eats the grasshopper. The mouse is a predator in this situation. If the least weasel then eats the mouse, the mouse is a prey item. Many other examples could be given.

ACTIVITY PAGE EVALUATION

The top predator was the least weasel.
The other predator was the white-footed mouse.
The prey items were the grasshopper and the white-footed mouse. The game represented a food chain by having the sun providing energy to the plants, the plants converting the energy to stored energy in food, the grasshoppers eating the plants to get the energy, the white-footed mice eating the grasshoppers to get energy and the least weasels eating the white-footed mice to get energy. Usually a few grasshoppers survive but not always. Usually a few mice survive but not always. Weasels have many food squares because they were eating mice which had previously eaten grasshoppers. All of the food squares are passed along, although realistically some of the energy would be lost in each transfer. That's why they need so many food squares and why there are fewer top predators. The transfer of energy is shown by passing along the food squares in the "stomachs." The game is fairly realistic. There would not be such chaos and things would not happen as quickly as they do in the game, but the result is basically the same. Other factors such as population fluctuations, disease and pollution are not considered in the game. Predators do not normally kill all of the prey species because in nature there are many other species to prey upon, too.

EXTENSIONS

Have each student pick a favorite meal, list the foods that make up that meal, and develop a food chain from the various foods listed.

Using the "Species Sheets," have the students develop a possible food chain.

The Predator-Prey Relationship

STUDENT'S GUIDE

Among the mammal species in Illinois are some we call **predators**. Predators are animals that catch, kill and eat other animals. The animals that are eaten are called **prey**.

Some predators, like bobcats, are called strict predators because they eat only other animals. Others, like raccoons and opossums, will, in addition to catching and eating prey, also eat a lot of berries, nuts and plants.

Most predators are themselves prey to other, larger predators. A weasel that eats a field mouse for lunch may itself be dinner for a bobcat. Those predators that are not prey to others are called **top predators**.

Both predators and prey are links in what is called a **food chain**. Food chains are the routes along which energy flows through the living world.

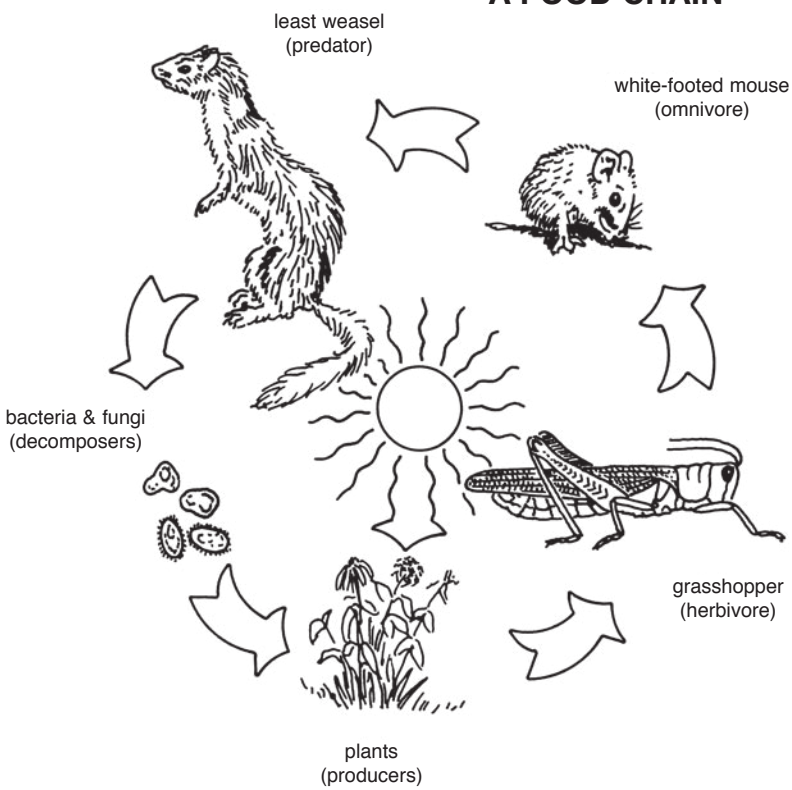
This energy always starts with the sun. Through a process called **photosynthesis**, plants are able to use the sun's energy to convert carbon dioxide, water and nutrients from the soil into food. Animals like rabbits and deer eat the plants and use the food energy for their own needs. When they become prey, the energy is transferred to the predator.

But the flow of energy doesn't end there. Even top predators eventually die, and then their bodies become food for **scavengers**, those animals that eat the bodies. The remains of all animals are broken down into their simplest compounds by microscopic bacteria and fungi. These compounds are the nutrients that plants then use for their own growth. The food chain becomes a closed cycle which begins all over again.

CHALLENGE YOURSELF

1. What are the two predators in the "A Food Chain" diagram?
2. What is the sun providing to the plants in the diagram?
3. What are two prey items in the diagram?
4. What is represented by the arrow between the least weasel and the bacteria and fungi?
5. Can a mammal be both a predator and a prey item? Explain and give an example.

A FOOD CHAIN



VOCABULARY

food chain
photosynthesis
predator
prey
scavenger
top predator

ACTIVITY PAGE:
The Predator-Prey Pyramid

What you will need

- per class of 26 students (can be modified for other class sizes)
- two pieces of brown cloth
- six pieces of white cloth
- 18 pieces of green cloth
- 18 small paper bags or envelopes
- small (1" x 1" or so) construction paper squares, about 500
- watch or timer

WHAT YOU DO

Go outside to a large, open playing field. Designate two students to be least weasels, six students to be white-footed mice and 18 students to be grasshoppers (or use these proportions for other class sizes). Loosely tie a green cloth around the arm of each "grasshopper" (you may want to use clothes pins to pin the cloth to clothing instead or use construction paper squares instead of cloth). Following the same procedure use white cloth for the white-footed mice and brown cloth for the least weasels.

Give each "grasshopper" a small paper bag or envelope. This container represents the "stomach" of the animal. Have the students turn their back to the playing area. Scatter the small construction paper squares over the playing area.

Tell the students to turn around. The "grasshoppers" may now go to feed by picking up the paper squares and putting them in their "stomach" bag. The "mice" and "weasels" watch from the sidelines. After about 15 seconds, tell the "mice" that they may hunt the grasshoppers. (NOTE: Times can be adjusted. If 15 seconds is too short for your class, try 30 seconds or one minute.) If a mouse tags a grasshopper, the grasshopper dies and must give its "stomach" to the mouse. The "dead" grasshopper then goes to the sideline to wait. After about 15 more seconds, allow the "weasels" to hunt the mice. If a mouse is tagged by a weasel, it must give the "stomach(s)" it has collected to the weasel. After another 15 seconds or so, stop the game.

Ask the students what the top predator was in the game. What was the other predator? What were the prey items? How did the game represent a food chain? Did any grasshoppers survive? If so, how many food squares does each have? Did any mice survive? How many food squares does each have? How many food squares does each weasel have? Why do the weasels have so many food squares? Does it take more energy for them to survive? How is the transfer of energy shown in this game? Is this game realistic?

Have the students line up in this order: first line, all grasshoppers (students who were grasshoppers at the start of the game); second line, white-footed mice (centered in front of the grasshopper line); third line, least weasels (centered in front of the mice line). Your formation should be like a pyramid to illustrate the decrease in numbers as you go up from herbivores to top predators.

Adapted with permission from "Hazardous Links, Possible Solutions," Project WILD K-12 Curriculum and Activity Guide, 2000, Council for Environmental Education.

GRADE LEVEL: 3

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 3-LS4-3, 3-LS4-4

SKILLS/PROCESSES: comparison & generalization, analysis, fact-finding, evaluation, creativity, application, inference, relationships

OBJECTIVE: Students will be able to: 1) identify and describe some causes for extinction of animal species; and 2) define rare, threatened and endangered as they apply to animal populations.

TEACHER'S GUIDE

UNIT THREE ▪ LESSON ONE

Endangered and Threatened Species

BACKGROUND

Although **extinction** is a natural process, extensive and excessive human interaction with the environment has greatly increased its rate. Habitat destruction is the single greatest cause of extinction. Other human-related causes include habitat damage, unregulated or illegal commercial and personal use, disruption of migration routes and breeding behaviors, contamination by pollutants, and competition or predation from artificially introduced species.

In Illinois, in 2020, a total of 372 species of plants and animals are **endangered**, and 114 species are **threatened**. There are five species of endangered mammals and three species of threatened mammals.

Rare species, though not in immediate danger, are few in number. Some species have always been rare because their natural range does not include much of Illinois or because they have limited habitat preferences. Threatened species are those still present in their natural range, but whose numbers are declining and are likely to become endangered in the foreseeable future. Endangered species are those in immediate danger of extinction as a breeding species. **Extirpated** species are those that have become eliminated from a portion of their range. For instance, elk and American bison have been extirpated from Illinois.

NORTH AMERICAN RIVER OTTER

PROCEDURE AND DISCUSSION

Review the student information with the class, emphasizing the impact of human activity on threatened and endangered species and methods for correcting the situations we have created.

1. **What is extinction?**

   Extinction is the complete elimination of a species.

2. **What human activities can threaten a species with extinction?**

   Destroying natural habitats, unregulated killing of animals for personal or commercial use, pollution, disturbing migration or breeding behaviors, and introducing exotic species can threaten or endanger animal species.

3. **What criteria make a species rare?**

   A species is considered rare if its numbers are low but stable.

4. **What does endangered mean?**

   A species is endangered if it is in immediate danger of extinction as a breeding species.

VOCABULARY

endangered—any species which is in danger of extinction as a breeding species

extinction—the elimination of a species

extirpated or **extirpation**–the elimination of a species from a portion of its historic range

rare—low, but stable, in number

threatened—a breeding species which is likely to become endangered in the foreseeable future

CHALLENGE YOURSELF EVALUATION

1. Extinction is the elimination of a species.

2. The prey items would greatly increase until the habitat could no longer support them.

3. We can help endangered species by careful planning of construction and development, acquiring critical land, educating people and making environmental regulations stronger.

4. We are increasing the rate of extinction tremendously beyond the natural rate.

5. The American bison no longer is found in the wild in Illinois although it does live in other areas of the United States.

ACTIVITY PAGE EVALUATION

Each poster should be assessed, making sure that it meets the stated parameters.

EXTENSIONS

Create a publicity campaign to increase awareness about local endangered and threatened species.

Have the students conduct research to find out what people are doing to help endangered species. As a class, develop and implement a project that can be used to help endangered species in Illinois to survive.

Endangered and Threatened Species

STUDENT'S GUIDE

When all members of a particular species have died, the species has become **extinct**. Dodo birds and passenger pigeons are extinct.

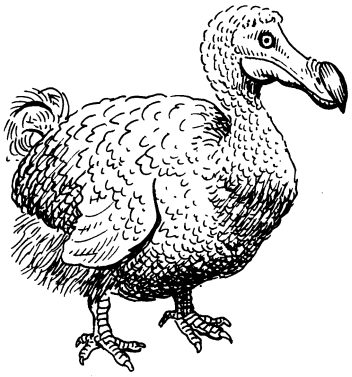
Extinction is a natural process and often has natural causes. If the climate changes greatly, as it has at different times in the past, many species unable to live in the new conditions will die. Many scientists believe this is what happened to the mastodon and other species during the last Ice Age.

Since the 1600s, several hundred species of wildlife, including the dodo bird and passenger pigeon, have become extinct directly or indirectly as a result of human activities. When humans excessively clear forests or other habitats for their own use, kill great numbers of animals for personal or commercial use or pollute the water and land, many species are driven toward extinction. Sometimes our activities interfere with natural migration routes or breeding behaviors. If we introduce a foreign or alien species into an ecosystem, it can change or even destroy the delicate balance of the food chain.

In Illinois one or another of these activities is threatening short-eared owls, spotted turtles, rusty patched bumble bees, Indiana bats and other species.

When the number of a species is low but stable, we say it is **rare**. If its numbers are low and getting lower, and it is likely to become **endangered** as a breeding species within the foreseeable future, we say it is **threatened**. When it is threatened with extinction, we say the species is endangered. If it has been eliminated from a part of its historic range, it is **extirpated** in that area.

It is our responsibility to recognize and evaluate the consequences of our actions and, through planning and management of our natural and cultural resources, strive to correct and avoid them. Education, careful planning of construction and development projects, acquisition of critical land and more stringent environmental regulation may help to slow the process, but even these practices do not offer guaranteed results. There have been successful efforts, though. The reintroduction of the North American river otter to its historic habitats in Illinois has resulted in the establishment of this species that was once thought to be headed for extirpation.



DODO BIRD – failure

NORTH AMERICAN RIVER OTTER – success

CHALLENGE YOURSELF

1. What is extinction?
2. What do you think would happen in an ecosystem if predators became extinct?
3. How can we help a species that is endangered?
4. Since extinction is a natural process, why would we be concerned about our actions and the problems our actions have caused?
5. The American bison has been extirpated from Illinois. What does this statement mean?

VOCABULARY

endangered
extinction
extirpated or extirpation
rare
threatened

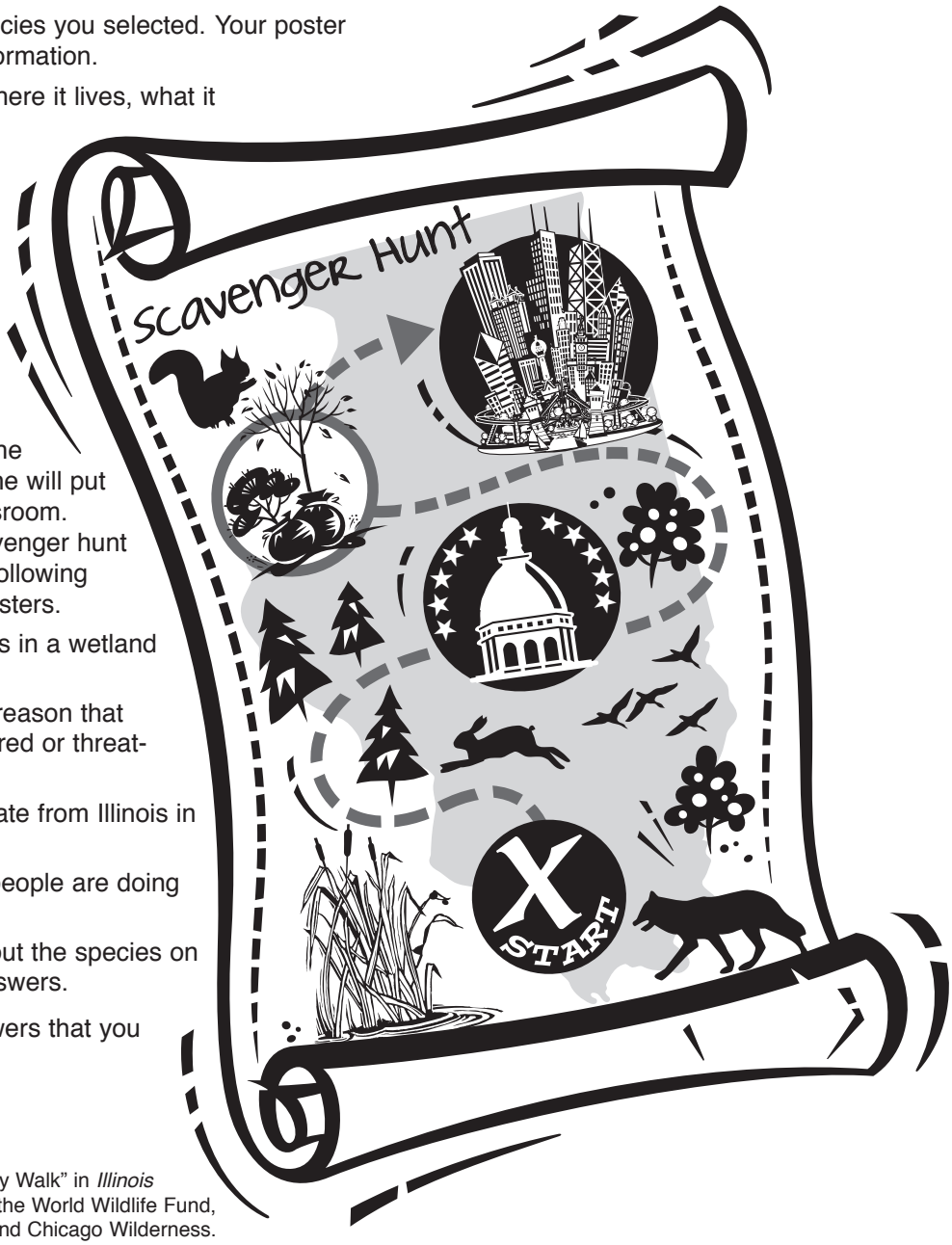
ACTIVITY PAGE:
Endangered Species Gallery Walk

What you will need
- poster board or large paper
- writing/coloring tools
- access to reference materials

VOCABULARY

WHAT YOU DO

1. Select an animal from the current Illinois endangered and threatened species list. You can find the latest list at https://www2.illinois.gov/dnr/education/Pages/default.aspx.
2. Develop a poster about the species you selected. Your poster should include the following information.
   - life history of the animal (where it lives, what it eats, how long it lives, etc.)
   - why this species is endangered or threatened
   - what is being done to help the species
   - a photograph or drawing of the species
   - a range map (where the species lives in Illinois)
3. When you have finished, give the poster to your teacher. He or she will put the posters up around the classroom. Now you will take part in a scavenger hunt using the posters. Answer the following questions as you look at the posters.
   - Name one species that lives in a wetland habitat.
   - What is the most common reason that these species are endangered or threatened?
   - Do any of the species migrate from Illinois in the fall?
   - What are two actions that people are doing to help these species?
   - Make up two questions about the species on the posters and find the answers.
4. Discuss with the class the answers that you found.



Adapted from "Endangered Species Gallery Walk" in *Illinois Biodiversity Basics,* 2002, a publication of the World Wildlife Fund, Illinois Department of Natural Resources and Chicago Wilderness.

GRADE LEVEL: 3

CORRELATION TO NEXT GENERATION SCIENCE STANDARDS: 3-LS4-3, 3-LS4-4

SKILLS/PROCESSES: observation, data collection & interpretation, analysis, group planning, creativity, application, inference, relationships, organization

OBJECTIVE: Students will: 1) understand the need to conserve and manage natural resources; and 2) learn different ways currently in use to preserve habitat.

TEACHER'S GUIDE

UNIT THREE ▪ LESSON TWO

Maintaining Mammals

BACKGROUND

Early settlers in Illinois found a vast array of plants and animals living in the territory's clear streams, wide prairies and extensive forests.

In the 1820s, forests covered about 38 percent of the state; the remainder was mostly tallgrass prairie and wetlands. Today, about 14 percent of the forest and one percent of the original prairie remain. More than nine million acres of natural wetlands have been reduced to less than 500,000 acres.

Such drastic loss of **habitat**—whether the result of modern agricultural practices, urban sprawl, pollution, sedimentation, **habitat fragmentation** or flood-control activities—is the most serious threat to the ultimate survival of Illinois' wild mammals.

Since human activity is the primary cause for this habitat reduction, humans are also responsible for controlling and/or reversing this devastating trend.

The Illinois Department of Natural Resources (IDNR) administers a number of programs which help to maintain current habitats and slow further habitat loss.

Illinois Acres For Wildlife, a voluntary program, involves rural and urban landowners who want to help provide wildlife habitat on their property. The landowners, in cooperation with an IDNR biologist, set goals for their land. Participants receive assistance in conserving or improving habitat and can get free tree and shrub seedlings, food patch seed mixes and help in obtaining financial assistance for habitat improvement.

Hunting and trapping are highly regulated activities in Illinois. Laws limit when, where and how many animals may be taken by hunters and trappers and keep these species from becoming endangered. Fees collected from hunters and trappers for licenses, special stamps and excise taxes go toward conservation programs which benefit all wildlife species.

The Illinois Nature Preserve System includes more than 350 nature preserves across the state, encompassing a total of more than 46,000 acres (as of 2009). These preserves were created to keep unique areas of the state undeveloped for scientific research, education and public enjoyment. These areas provide homes to a wide diversity of biological treasures and harbor many of Illinois' rare and endangered species.

Through education and a commitment to the importance of preserving our natural heritage, we must all strive, both individually and as a society, to learn to share the world with all living things.

PROCEDURE AND DISCUSSION

Review the student information with the class, emphasizing the extent of human responsibility in the reduction of wild mammal habitat and the potential for human intervention in controlling or reversing this trend.

1. **What are the most significant contributors to habitat loss?**

   Modern agricultural practices, urban sprawl, pollution, habitat fragmentation and flood control programs contribute most to habitat destruction.

2. **What are three programs that help manage, preserve and restore natural habitats?**

   Three programs that help manage, preserve or restore habitat are Acres For Wildlife, the Illinois Nature Preserves System and conservation areas purchased and managed with fees and special taxes collected from hunters and trappers.

3. **Who is responsible for the conservation and preservation of our natural heritage?**

   Everyone, both individually and as a society.

VOCABULARY

habitat—the natural environment in which wild animals can thrive

habitat fragmentation—separation of areas of natural habitat by agricultural or urban development

CHALLENGE YOURSELF EVALUATION

1. All of the factors increase the rate of habitat loss, either directly or indirectly.

2. You can provide habitat for wildlife and support conservation programs, practices and organizations.

ACTIVITY PAGE EVALUATION

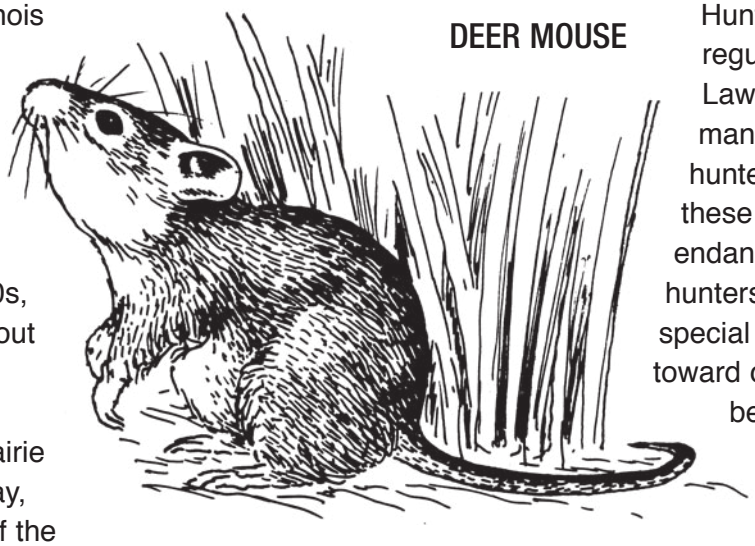
Answers will vary.

EXTENSION

Order a copy of the *Fur Hunting and Trapping in Illinois* DVD and booklet from the IDNR publications page at https://dnr2.illinois.gov/teachkids/. Show the video to the class and hold a discussion about the use of wildlife management techniques.

Maintaining Mammals

STUDENT'S GUIDE



DEER MOUSE

Early settlers in Illinois found clear streams, sprawling prairies and vast forests, all inhabited by many kinds of wildlife. In the 1820s, forests covered about 38 percent of the state; the rest was mostly tallgrass prairie and wetlands. Today, about 14 percent of the forest and one percent of the grassland remain. More than nine million acres of wetlands have been reduced to less than 500,000 acres.

These changes mean a drastic loss of **habitat**, or natural environment, for wild mammals. Modern farming practices, urban sprawl, pollution, **habitat fragmentation** (dividing up natural environments by agricultural or urban development) and flood-control activities (which drain wetlands of water) are the most serious threats to the survival of Illinois' wild mammals.

People who have land they want to use to help provide habitat for wildlife can join a program called Illinois Acres For Wildlife. The person who owns the land gets help from a biologist in deciding what to do to make the land a better home for Illinois mammals and other wildlife.

Hunting and trapping are highly regulated activities in Illinois. Laws limit when, where and how many animals may be taken by hunters and trappers and keep these species from becoming endangered. Fees collected from hunters and trappers for licenses, special stamps and excise taxes go toward conservation programs which benefit all wildlife species.

The Illinois Nature Preserve System includes more than 350 nature preserves across the state (as of 2009). These preserves protect special habitats. Many of the state's rare and endangered species live in these preserves.

In addition, there are many other public and private conservation organizations and groups striving to understand, manage and protect our natural environment.

By making a commitment to the importance of preserving our natural heritage and to maintaining a wide range of plants and animals, we can all learn to share the world of living things.

CHALLENGE YOURSELF

1. How do you think each of the following factors affects the loss of natural habitat? Modern farming practices like chemical fertilizers and pesticides; expansion of urban and suburban development; pollution; flood-control programs.

2. What can you do to help maintain wild mammals?

VOCABULARY

habitat
habitat fragmentation

ACTIVITY PAGE: Taking Action

WHAT YOU DO

Make a list of projects that you and your fellow students can do to help the mammals and other wildlife that live in your area. Think about these questions as you make your list.

- What actions could we take at school?
- What actions could we take at home?
- What actions could we take in our community?
- How can we let people know about this issue?
- How can we get other people to help us?
- What will we need to get started?
- What will we need to maintain our project?
- How will wildlife benefit?
- Will any problems be caused by our actions?
- Are there any laws that we should be aware of?

Now that you are prepared, start your action project! You and your classmates can make a positive difference for wildlife!

GLOSSARY

abundant – more than enough; plentiful

There was an abundant supply of nuts for the squirrels to eat.

adaptable or adapt – able to adjust to new conditions or surroundings

River otters reintroduced from Louisiana had to adapt to their new surroundings.

appendages – the "hands" and "feet" of an animal; in the case of mammals, usually paws or hooves

The raccoon used its appendages to catch a crayfish.

burrow – a tunnel or system of tunnels dug underground by an animal and used for a home

The badger lives in a burrow in the soil.

camouflage – a disguise or false appearance that is used to hide something

The mink's dark fur camouflages it at night when it hunts for prey.

canines – teeth located on either side of the incisors, in one or both jaws, used for stabbing and tearing

The long canines of the coyote help it to capture mice and other prey.

carnivore – any animal that eats only the flesh of other animals

The bobcat is a carnivore, catching and eating squirrels, mice and other species.

conservation – the protection and wise use of the forests, rivers, animals, minerals and other natural resources

Conservation of our natural resources is important so that wild mammals can continue to exist.

critical temperature – the temperature at which a hibernating mammal will automatically waken (varies from species to species)

A thirteen-lined ground squirrel will awaken from hibernation when the air in its burrow reaches a critical temperature.

den – a hollowed chamber or space used as a home by an animal

Fox young are born and raised in a den.

diurnal – of or occurring during the day

Squirrels are diurnal animals, active throughout the daylight hours year round.

domestic – not wild; tame

Pets are considered to be domestic animals.

dormancy – a condition of inactivity or sleep

Skunks use dormancy to help protect them when the outside temperature is very cold.

echolocation – a technique of sound and hearing used by bats to navigate in the dark

Bats use echolocation to help them navigate and locate prey in the dark.

endangered – threatened with danger of extinction

The Indiana bat is an endangered mammal in Illinois.

environment – the surroundings in which an organism lives

A good environment helped the mammal species to survive.

extinction – the elimination of a species

The rate of species extinction has been increased by the actions of humans.

extirpated or extirpation – the elimination of a species from a portion of its historic range

The porcupine has been extirpated from Illinois.

food chain – the route of energy flow through a community of organisms

The transfer of energy from sun to plant to grasshopper to white-footed mouse is an example of a food chain.

gestation period – the length of time a mammal develops inside the mother's body prior to birth

The gestation period for the white-tailed deer is about 210 days.

habitat – the natural environment in which living things can thrive

Woodlands and forest edges are the preferred habitats for the fox squirrel.

habitat fragmentation – separation of areas of natural habitat by agricultural or urban development

Construction for the new highway caused habitat fragmentation of the forest.

herbivore – any animal that eats only plants

The white-tailed deer is an herbivore.

hibernation – a state of reduced metabolism, like a very deep sleep, which allows an animal to survive periods of food scarcity

Hibernation is used by the thirteen-lined ground squirrel as a survival technique in winter.

home range – a large area of land on which animals live

The home range of a white-tailed deer can cover many square miles.

incisors – teeth located in the front and center of one or both jaws, used for holding, cutting or gnawing

A beaver's strong incisors let it gnaw tree bark.

insectivore – any animal that eats only insects

Insectivores, such as the northern short-tailed shrew, feed on insects.

instinctive behavior – an inborn, automatic response or behavior pattern

Instinctive behavior by mammals does not have to be learned.

learned behavior – behavior acquired through imitation and play

Learned behavior comes from watching or playing with other members of a mammal's species.

limbs – the "arms" and "legs" of an animal

The front limbs of a bat are modified for flying.

GLOSSARY

mammals – animals having these five characteristics: hair or fur; warm-blooded; usually born alive; young are fed milk produced by the mother; a more complex brain than other animals

Mammals include bats, mice, squirrels and many other species.

mammary glands – special organs in female mammals that produce milk to feed the young

A young mammal feeds on milk from its mother's mammary glands.

management – the act of directing or controlling

Management practices for wildlife can involve habitat protection.

metabolism – the rate at which a living creature uses up the energy it gets from its food

During hibernation, the metabolism of a mammal slows down.

natural resources – materials, plants and animals found in nature that are useful or necessary for people to live

Water, wildlife and forests are just some of Illinois' natural resources.

nocturnal – of or occurring at night

Bats are nocturnal mammals.

omnivore – any animal that eats plants, the flesh of other animals or anything else

Raccoons are omnivores, eating fishes, fruits, grain and other items.

photosynthesis – the process by which a plant makes simple sugar using light, chlorophyll, carbon dioxide and water

Photosynthesis is an important step in all food chains.

predator – animal that lives by hunting other animals for food

As a predator, the bobcat feeds on prey, such as mice and squirrels.

premolars/molars – teeth located along the sides and back of one or both jaws, used for grinding and shearing

The large premolars and molars of a white-tailed deer grind the plant material that it eats.

prey – animal that is caught, killed and eaten by another animal

The grasshopper was prey for the white-footed mouse.

rare – low, but stable, in number

The population of some rare species may have always been low due to their specific habitat requirements.

restocking – replacing a supply of something, refilling

Biologists raise and restock wildlife into their natural habitats, such as wetlands.

scavenger – any animal that eats the dead bodies of other animals but does not catch and kill them itself

A Virginia opossum can be a scavenger on road-killed animals.

sedimentation – filling up of streams, ponds, lakes and other bodies of water by silt and runoff

Sedimentation can cause many problems for aquatic mammals.

small game – small wild animals or fishes hunted or caught for sport or food

The group went hunting for rabbits and other small game species.

species – a type of living thing

Gray squirrels and fox squirrels are two different species of mammals.

survive – to live longer than; live through; to continue to exist

The rabbit survived the harsh, cold winter.

terrain – the physical features of a piece of land

Meadow voles prefer a moist terrain, such as near marshes, bogs and sedge meadows.

threatened – to be in danger of harm; any animal or plant species which is likely to become endangered in the foreseeable future

Three mammal species in Illinois are listed as threatened (as of 2020).

top predator – any predator in a food chain on which no others prey

The bobcat is a top predator.

tracks – the footprints left by an animal in soft soil, mud, sand or snow

Many animal tracks can be seen in the mud along the river.

uterus – the organ in a female mammal in which the developing young grow

Development of mammals before birth occurs in the mother's uterus.

viviparous – giving birth to live young (not hatched from eggs)

All mammals, except the duck-billed platypus and echidna, are viviparous.

wean – the progression of a young mammal from dependence on its mother's milk to independent eating

The fawn was weaned and now eats only plant materials.

warm-blooded – maintaining a constant internal body temperature

One of the traits of a mammal is that it is warm-blooded.

SPECIES SHEET

AMERICAN BADGER

Taxidea taxus

Statistics
length: head and body 17 - 31”;
tail 4 - 6”
weight: 13 - 26 lbs.
number of teeth: 34
young: one to five young per litter, born in March or April; one litter per year

Habitat
open country such as prairies, pastures, brushy fields, alfalfa fields

Food
animals (carnivore): thirteen-lined ground squirrels, woodchucks, plains pocket gophers, voles, mice, cottontails, birds

Period of Activity
mainly at night (nocturnal) but also in the day (diurnal)

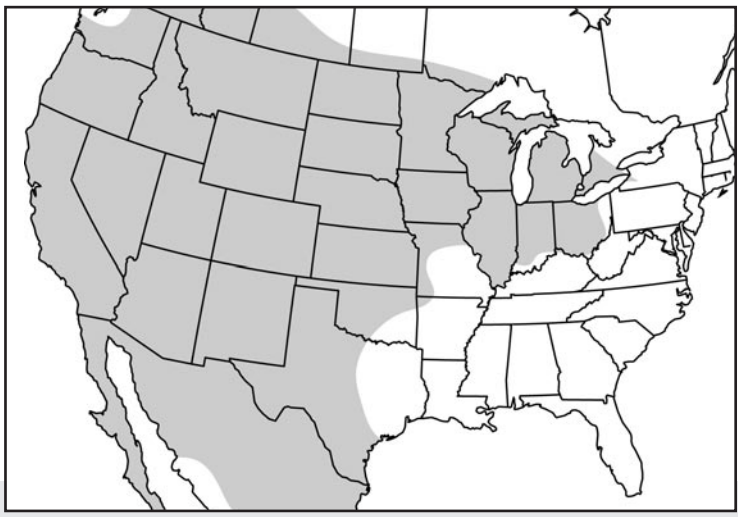
Gestation Period
about seven months
(development is delayed after mating)

Age at Maturity
about one year

Hibernates?
no

Distribution
statewide

US Distribution



Badger Trivia
The badger’s body is broad and flat, and its legs are short and strong. The claws on its front feet are very long. All of these features make badgers powerful diggers. Badgers dig burrows in search of food and then use those burrows for shelter.

SPECIES SHEET

AMERICAN BEAVER

Castor canadensis

Statistics
length: head and body 20 - 36”; tail 9 - 15”
weight: 30 - 66 lbs.
number of teeth: 20
young: three or four born in May or June; one litter per year

Habitat
along streams, rivers, ponds and lakes usually with trees in close proximity

Food
vegetation (herbivore): bark of trees and shrubs, leaves, aquatic plants and grasses

Period of Activity
late afternoon and at night (nocturnal)

Gestation Period
105 days

Age at Maturity
two years

Hibernates?
no

Distribution
Illinois: statewide

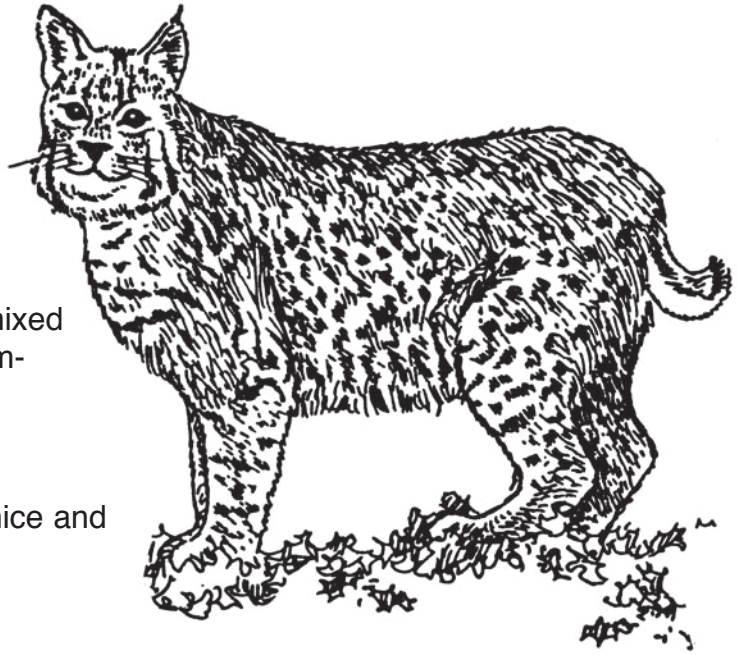
US Distribution

Beaver Trivia
The beaver is the largest rodent in Illinois. This mammal has a large, flat, paddlelike tail and webbed hind feet that help it swim. The large tail of the beaver may be used to slap the water as a means of communicating with other beavers. Beavers spend most of their time in the water, only coming onto land to rest, rear young and feed. Undoubtedly, the most well-known fact about the beaver is its ability to cut trees which it uses to construct dams and lodges.

SPECIES SHEET

BOBCAT

Lynx rufus



Statistics
length: head and body 20 - 39”; tail 4 - 7”
weight: 15 - 22 lbs.
number of teeth: 28
young: one to four born late spring; one litter per year

Habitat
wooded or timbered bluffs or rolling hills intermixed with open fields, brushy ravines or open bottom-lands

Food
meat-eater (carnivore): cottontails, squirrels, mice and various types of birds

Period of Activity
night (nocturnal)

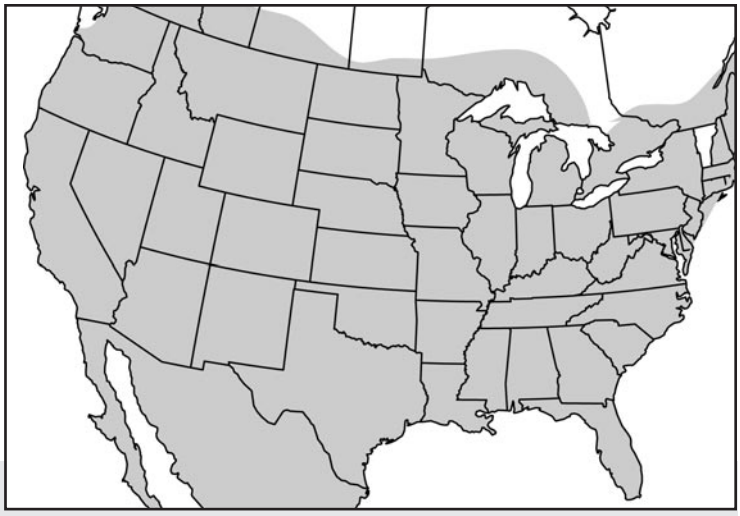
Gestation Period
about two months

Age at Maturity
one year

Hibernates?
no

Distribution
Illinois: southern third of the state and sporadically remainder of state

US Distribution

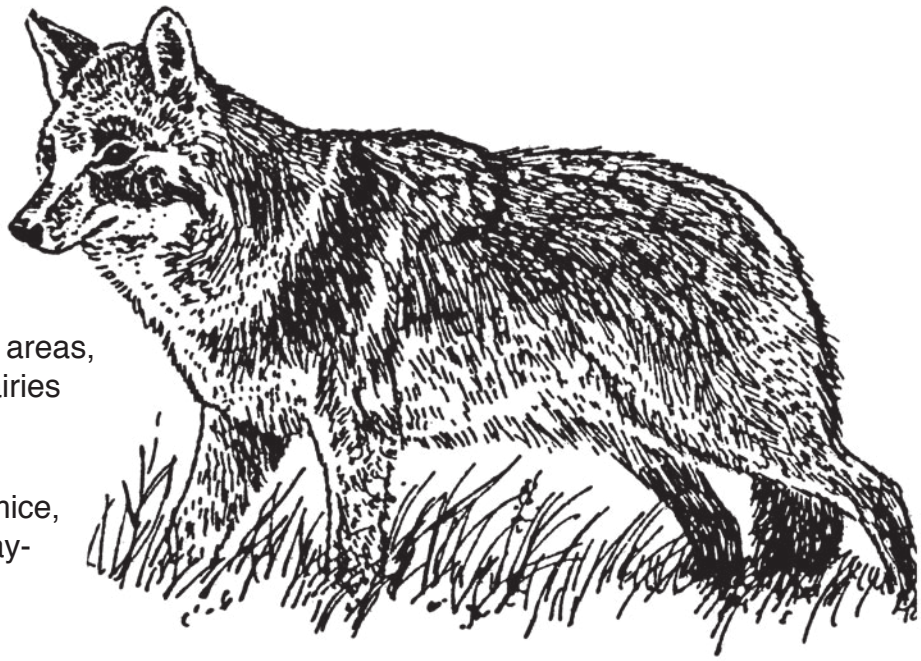


Bobcat Trivia
Bobcats were once considered rare in Illinois. They are now common in forested areas in southern Illinois and increasingly so along major river systems in the state. The home range of a bobcat is usually two miles in diameter; however, they have been known to wander as far as 25 - 50 miles.

SPECIES SHEET

COYCOTE

Canis latrans



Statistics
length: head and body 28 - 44”;
tail 11 - 15”
weight: 20 - 35 lbs.
number of teeth: 42
young: six or seven young born in spring; one litter per year

Habitat
various habitats including brushy areas, woodland, wooded bluffs and prairies

Food
animals (carnivore): cottontails, mice, deer, raccoons, various birds, crayfish and grasshoppers

Period of Activity
mainly at night (nocturnal) but also during the day (diurnal)

Gestation Period
two months

Age at Maturity
one or two years

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

Coyote Trivia
The coyote was present before European settlers arrived in Illinois and has increased in numbers since then due to the removal of timber. The coyote travels approximately 10 miles daily in search of food and has been known to travel distances as much as 100 miles. Coyotes can run at speeds more than 40 mph, a speed faster than cars are allowed to travel on most city streets.

SPECIES SHEET

EASTERN CHIPMUNK

Tamias striatus

Statistics
length: head and body 5 - 7”; tail 3 - 4”
weight: 2.8 - 5.3 oz.
number of teeth: 20
young: two litters of two to six young born in spring and summer

Habitat
wooded bluffs, ravines and brushy areas in or adjacent to deciduous forests, urban areas

Food
vegetation and animals (omnivore): nuts, seeds, fruits, fungi, flowers, buds, snails, caterpillars and frogs

Period of Activity
day (diurnal)

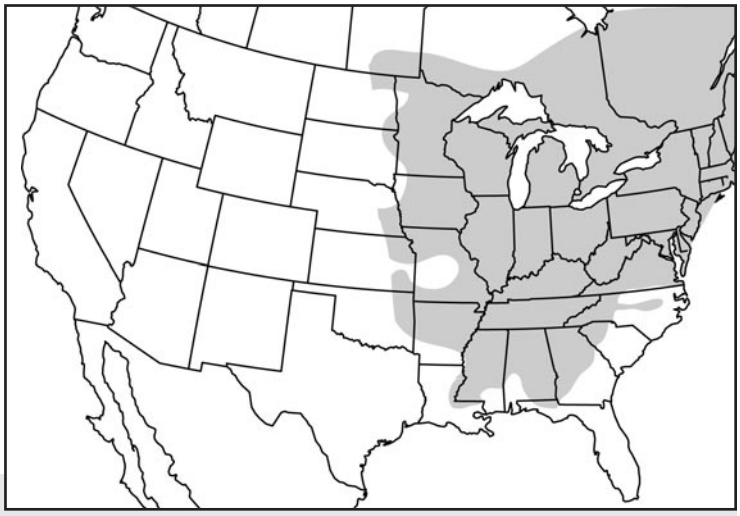
Gestation Period
one month

Age at Maturity
one year

Hibernates?
no

Distribution
Illinois: statewide

US Distribution



Chipmunk Trivia
Chipmunks spend a considerable amount of time searching for food, which they may store in burrows. Food is carried to the burrow in the cheek pouches inside their mouth. Chipmunks do not store much fat in their body and must awaken often in winter to eat food that is stored in the burrow.

SPECIES SHEET

EASTERN COTTONTAIL (RABBIT)

Sylvilagus floridanus

Statistics
length: head and body 11 - 18”;
tail 2.0 – 2.5.”; ears 2.5 - 3.0”
weight: 2 - 3 lbs.
number of teeth: 28
young: four to six young per litter born from March to September; three to seven litters per year

Habitat
a variety of cover types including weeds, brush piles, hedges, short grasses and shrubs

Food
vegetation (herbivore): grasses, clover, alfalfa, seeds, buds, fruits and bark

Period of Activity
early evening to early morning (mostly nocturnal)

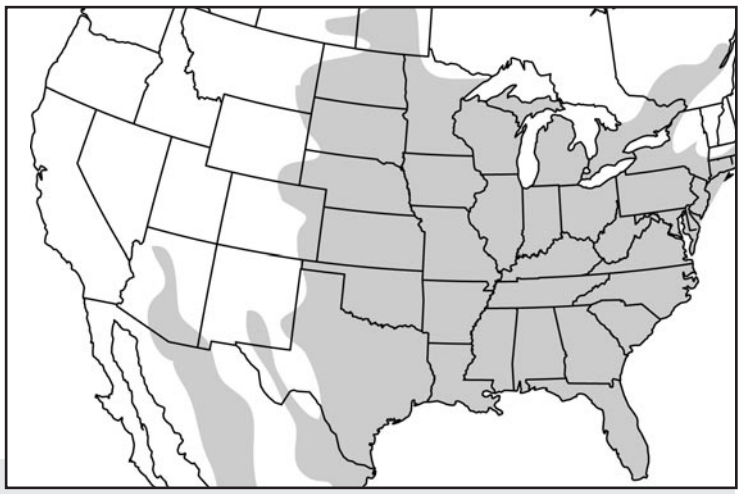
Gestation Period
one month

Age at Maturity
six months

Hibernates?
no

Distribution
Illinois: statewide

US Distribution



Cottontail Trivia
The cottontail has large hind legs that help it hop and run fast. The female cottontail places the blind, helpless newborns in a shallow depression in the ground or a short burrow. These areas are lined with hair and covered with grasses to hide the young when the female is away.

SPECIES SHEET

EASTERN FOX SQUIRREL

Sciurus niger

Statistics
length: head and body 10 - 16”; tail 8 - 12”
weight: 1.1 - 3.0 lbs.
number of teeth: 20
young: two litters (late winter and summer) of two to four young each

Habitat
lives on the edges of forests and other open woodlands, urban areas

Food
vegetation and animals (omnivore): fruits, buds, seeds, flowers, leaves, fungi and insects

Period of Activity
day (diurnal)

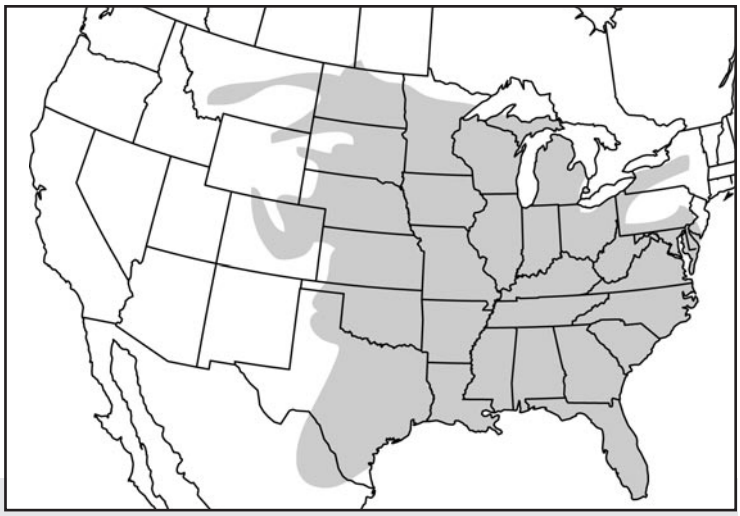
Gestation Period
six weeks

Age at Maturity
one year

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

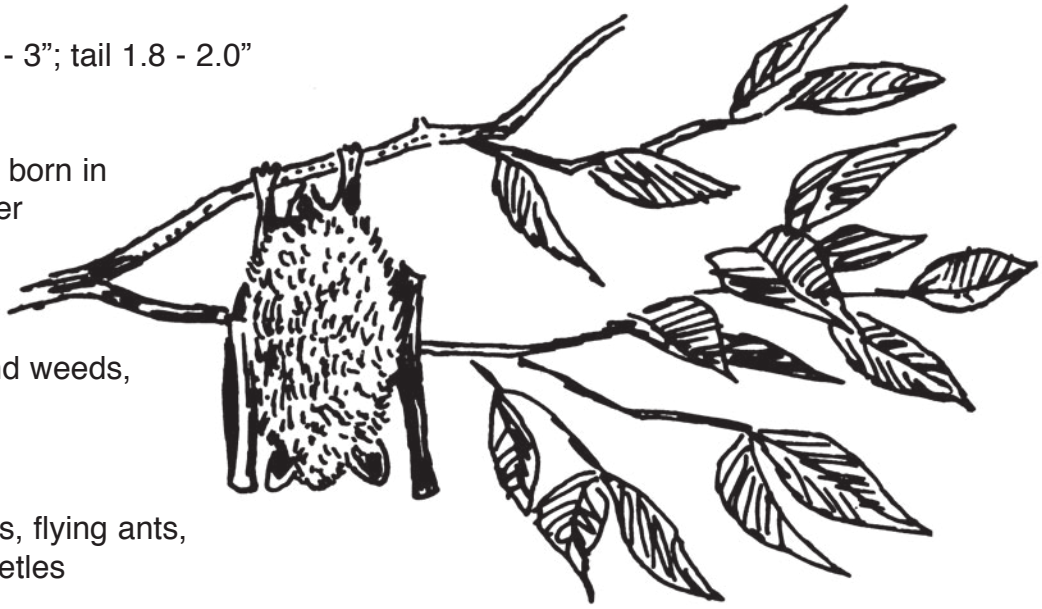


Fox Squirrel Trivia
Fox squirrels become inactive in winter. A fox squirrel curls up into a ball shape inside of a tree cavity or a leaf nest. Leaf nests are constructed in large trees and often used in habitats where tree cavities are absent. The home range of a fox squirrel is between 10 and 40 acres.

SPECIES SHEET

EASTERN RED BAT

Lasiurus borealis



Statistics
length: head and body 2 - 3”; tail 1.8 - 2.0”
weight: 0.25 - 0.60 oz.
number of teeth: 32
young: one to five young born in May or June; one litter per year

Habitat
found in trees, shrubs and weeds, rarely in caves or attics

Food
insects (carnivore): moths, flying ants, leafhoppers, flies and beetles

Period of Activity
night (nocturnal)

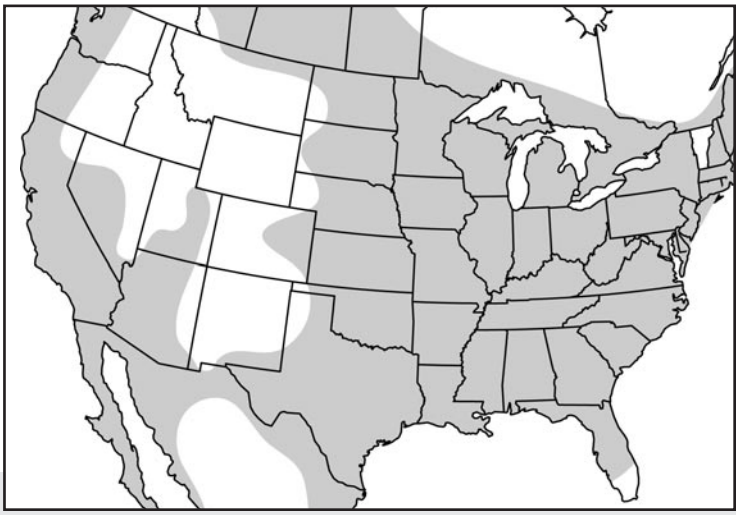
Gestation Period
three months

Age at Maturity
one year

Hibernates?
no; migrates south for the winter

Distribution
Illinois: statewide

US Distribution



Red Bat Trivia
Eastern red bats reside in Illinois during spring-summer-fall and migrate south for the winter when their food supply, insects, is not available. There are 12 species of bats found in Illinois, and red bats are one of the more common species. Bats rely on echolocation, or supersonic sounds, to locate objects.

SPECIES SHEET

NORTHERN SHORT-TAILED SHREW

Blarina brevicauda

Statistics
length: head and body 3 - 4”; tail 0.5 - 1.2”
weight: 0.5 - 1.0 oz.
number of teeth: 32
young: four to seven young per litter born in spring and fall; two to three litters per year

Habitat
various habitats (grassy fencerows, open woodlands) but most common in woodlands

Food
earthworms, slugs, snails, insects, insect larvae and other small animals (carnivore)

Period of Activity
day (diurnal) and night (nocturnal)

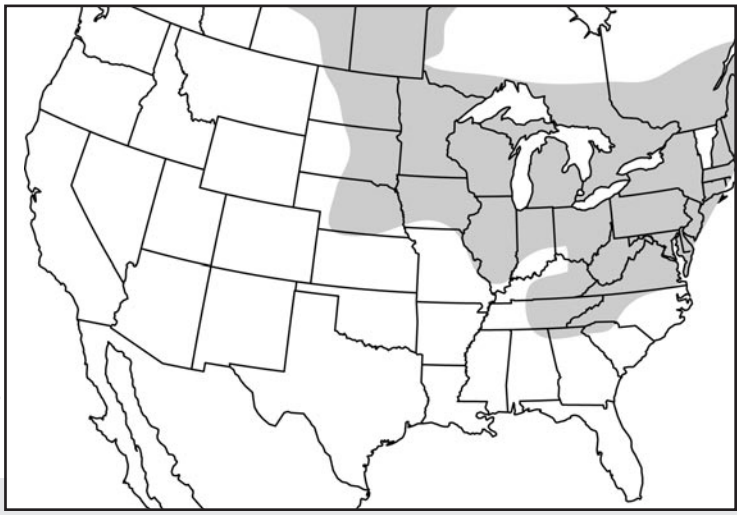
Gestation Period
three weeks

Age at Maturity
two months

Hibernates?
no

Distribution
Illinois: common in the northern two-thirds of the state and less common in southern Illinois

US Distribution



Shrew Trivia
Shrews have enormous appetites and are known to eat more than their body weight each day. They use their poisonous saliva to paralyze prey. They are able to produce sounds that humans cannot hear. These sounds help them to move about in their habitat. Shrews are ferocious fighters, protecting their home range (0.5 – 1.0 acre) and food supply.

SPECIES SHEET

PLAINS POCKET GOPHER

Geomys bursarius

Statistics
length: head and body 6 - 9”; tail 2 - 4”
weight: 0.5 – 1.0 lb.
number of teeth: 20
young: three to six young born in spring; one litter per year

Habitat
requires well-drained soil with tuberous-rooted plants

Food
vegetation (herbivore): roots, stems and leaves

Period of Activity
day (diurnal) and night (nocturnal)

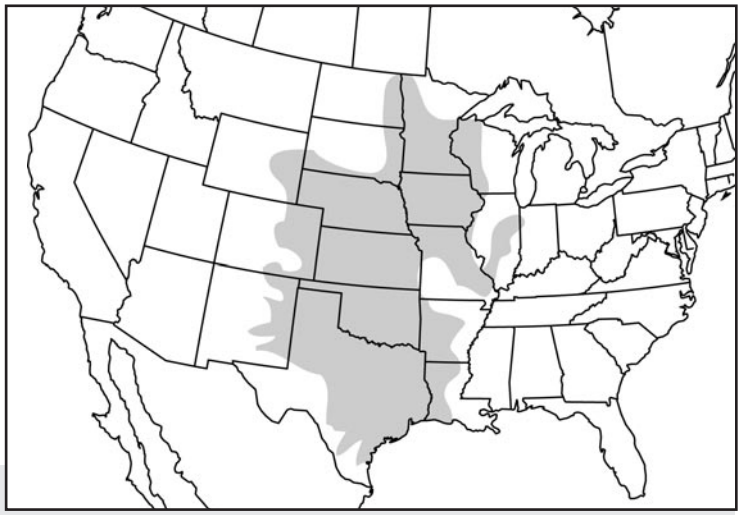
Gestation Period
one month

Age at Maturity
one year

Hibernates?
no

Distribution
Illinois: narrow band along the Illinois and Kankakee Rivers

US Distribution



Pocket Gopher Trivia
The pocket gopher is a rodent with special adaptations for a fossorial, or underground life. Its front feet are large with a strong claw on each toe to help it dig dirt. Gophers are able to close their mouth behind their incisors, or front teeth, so they can dig with their teeth without getting dirt in their mouth. Areas where pocket gophers live have mounds of dirt at the entrances of their burrows. The burrow system may be as much as 500 feet long.

SPECIES SHEET

PRAIRIE VOLE

Microtus ochrogaster

Statistics
length: head and body 3.8 - 5.5”; tail 1.0 - 1.5”
weight: 1.0 - 2.1 oz.
number of teeth: 16
young: three or four young per litter; several litters per year

Habitat
variety of grassy areas

Food
vegetation (herbivore): clover, alfalfa, grasses and weeds

Period of Activity
day (diurnal) and night (nocturnal)

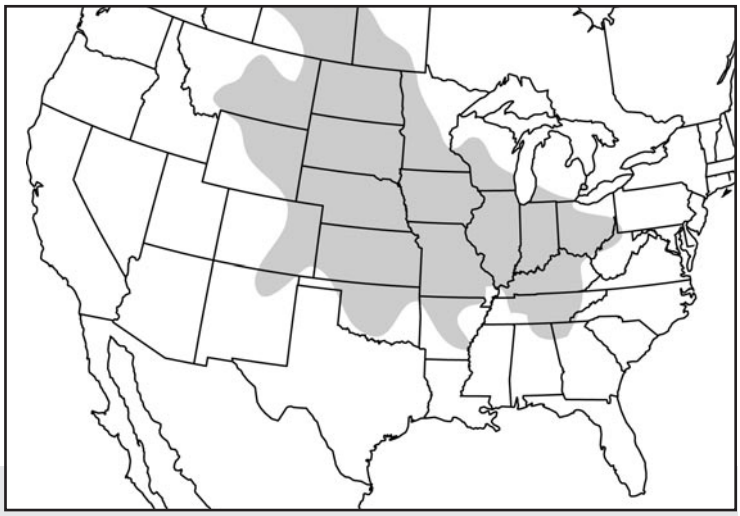
Gestation Period
three weeks

Age at Maturity
about three weeks

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

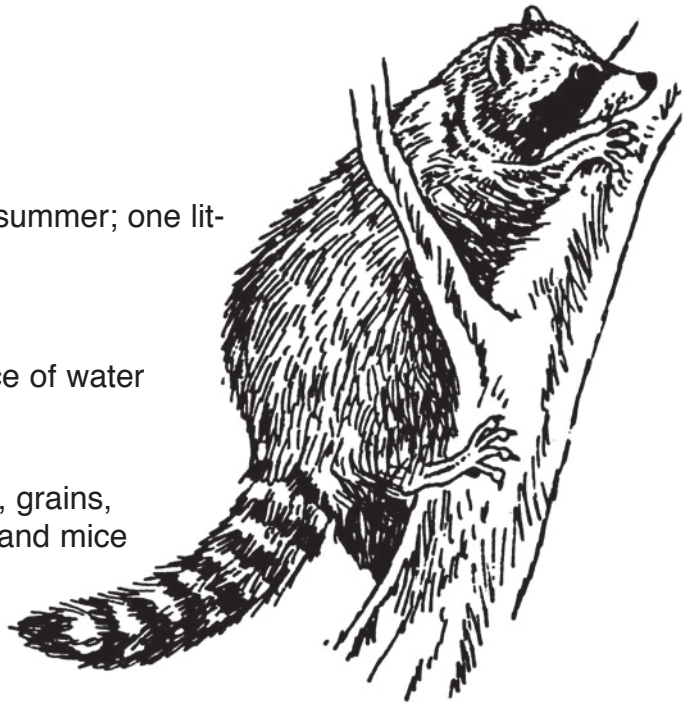


Prairie Vole Trivia
Prairie voles live in an extensive underground burrow system, connected on the surface by runways which can only be seen by parting the vegetation. The average life span of a prairie vole is five to 12 weeks, making it necessary for the species to produce young throughout the year. Prairie voles are a food source for many animals, including hawks, owls, coyotes, foxes and bobcats.

SPECIES SHEET

RACCOON

Procyon lotor



Statistics
length: head and body 19 - 28”; tail 8 - 12”
weight: 12 - 26 lbs.
number of teeth: 40
young: three to four young born in the spring or summer; one litter per year

Habitat
various habitats, always near a permanent source of water

Food
vegetation and animals (omnivore): nuts, berries, grains, seeds, crayfish, fishes, turtles, cottontails, voles and mice

Period of Activity
night (nocturnal)

Gestation Period
two months

Age at Maturity
eight months

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

Raccoon Trivia
The raccoon is an easily recognized mammal having a black-masked face and a ringed tail. Raccoons are good climbers and swimmers. The home range of a raccoon is one to two miles across. Raccoons have become common in urban environments, feeding on garbage and pet food and living in hollow trees and abandoned and occupied homes.

SPECIES SHEET

THIRTEEN-LINED GROUND SQUIRREL

Spermophilus tridecemlineatus

Statistics
length: head and body 5 - 8”; tail 3.0 - 4.5”
weight: 3.5 - 9 oz.
number of teeth: 22
young: six to 10 young born in May or June; one litter per year

Habitat
areas having short vegetation

Food
vegetation and animals (omnivore): grasses, weeds, seeds, grasshoppers, beetles, ants and earthworms

Period of Activity
day (diurnal)

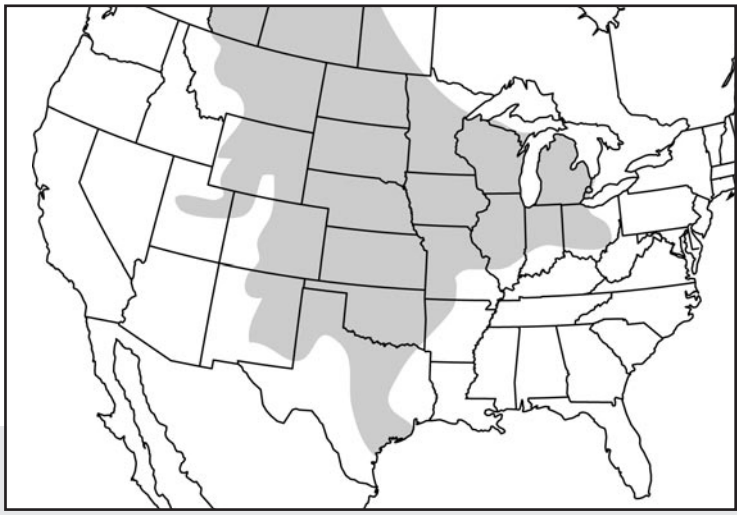
Gestation Period
one month

Age at Maturity
one year

Hibernates?
yes; five or six months of the year

Distribution
Illinois: northern two-thirds of state

US Distribution



Thirteen-lined Ground Squirrel Trivia
Thirteen-lined ground squirrels are found in short grassy areas where they are often seen sitting up on their hind legs. These ground squirrels live in burrows which are dug leaving no sign of the burrow except the opening. Three types of burrows are constructed (hiding, nesting and hibernation) with differences in the size and depth of the burrow and type of nest cavity present.

SPECIES SHEET

VIRGINIA OPOSSUM

Didelphis virginiana

Statistics
length: head and body 17 - 21”; tail 8.5 - 12.5”
weight: 6 - 12 lbs.
number of teeth: 50
young: seven to 21 young per litter; two litters per year (late February and May or June)

Habitat
various habitats including woodlands, stream corridors, brushy areas and urban areas

Food
vegetation and animals (omnivore): fruit, grain, seeds, insects, birds, eggs, reptiles and earthworms; scavenged material such as garbage, road-killed animals and pet food

Period of Activity
night (nocturnal)

Gestation Period
two weeks

Age at Maturity
nine months to one year

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

Opossum Trivia
The Virginia opossum is the only marsupial in North America. Marsupials are primitive mammals that give birth to immature young. The young crawl into a pouch on the female’s abdomen where they mature. When confronted with a threatening situation, an opossum may play dead, hiss, growl, bare its teeth or run.

SPECIES SHEET

WHITE-FOOTED MOUSE

Peromyscus leucopus

Statistics
length: head and body 3.5 - 4.2”; tail 2.3 - 4.0”
weight: 0.5 - 1.1 oz.
number of teeth: 16
young: two to six young per litter, born throughout the year; at least four litters per year

Habitat
prefer wooded and brushy areas but will live in most habitats

Food
vegetation and animals (omnivore): seeds and other types of vegetation, beetles, moth larvae and spiders

Period of Activity
night (nocturnal)

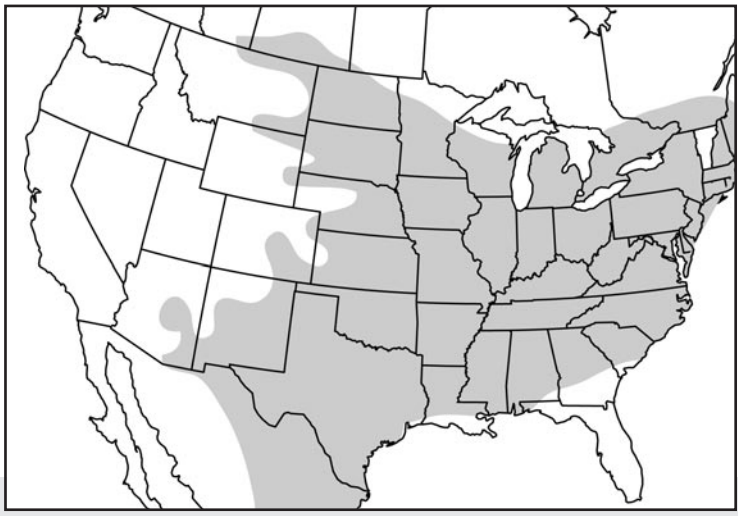
Gestation Period
three weeks

Age at Maturity
one month

Hibernates?
no

Distribution
Illinois: statewide

US Distribution

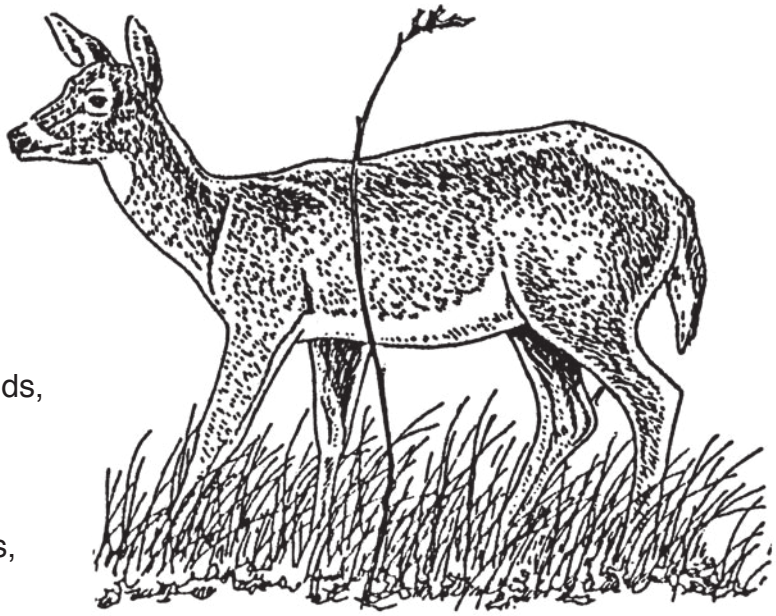


White-footed Mouse Trivia
White-footed mice live on the ground in logs and stumps. Since white-footed mice can climb, they often nest in abandoned bird nests in trees and bushes or in cavities in the trunks of trees. Nest cavities are lined with finely shredded plant materials. The opening is hidden. The home range of a white-footed mouse is 0.5 - 1.5 acres. These mice can live for two to three years.

SPECIES SHEET

WHITE-TAILED DEER

Odocoileus virginianus



Statistics
height: 3.0 - 3.5’
weight: males 75 - 300 lbs.; females 50 - 200 lbs.
number of teeth: 32
young: one or two young per year, born in May or June

Habitat
seek wooded areas for refuge; forage in fields, pastures and brushy areas

Food
vegetation (herbivore): shoots, twigs, leaves, grains, grasses and acorns

Period of Activity
night (nocturnal) and twilight hours

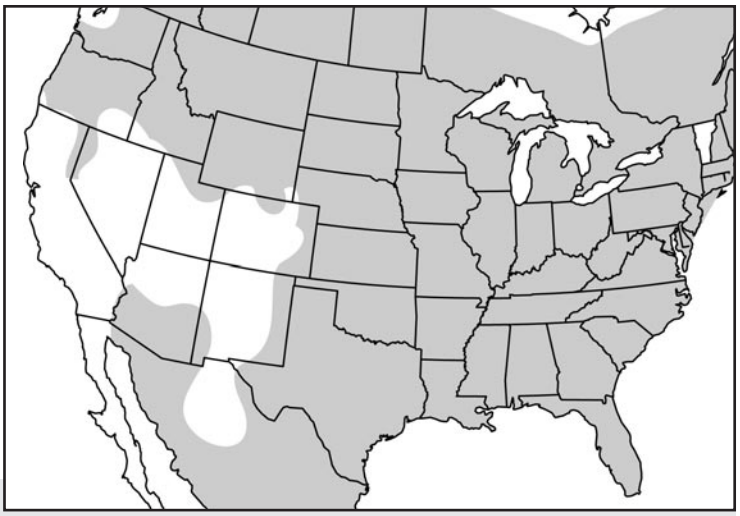
Gestation Period
seven months

Age at Maturity
six months

Hibernates?
no

Distribution
Illinois: statewide

US Distribution



White-tailed Deer Trivia
The white-tailed deer is the largest Illinois mammal. Deer are in the family of mammals characterized by having hooves, antlers that are shed and replaced annually and a four-chambered stomach, allowing them to chew a cud. Antlers usually are produced only on males. The size of the antler and number of points increase with the deer’s age until about five years of age.

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