

Wildlife Telemetry

In a Nutshell



Students will investigate the often complex field of wildlife management by participating in a simulated wildlife survey and using radio telemetry equipment.

Grade 5-6
Season Fall, Winter, Spring, Summer
Location Visitor Center

Learning Objectives

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

- List at least three wildlife survey methods used by biologists to collect information about Minnesota animals.
- Explain how radio telemetry is used by the U.S. Fish and Wildlife Service to gain specific information on the health and habitat preferences of an individual animal.

Literature Connections

Wired-Life by Jan and Bob Welsh, Minnesota Conservation Volunteer Magazine

Counting Critters by Jan and Bob Welsh, Minnesota Conservation Volunteer Magazine

Oh Deer! by Tom Dickson, Minnesota Conservation Volunteer Magazine

Wild Science: Amazing Encounters between Animals and the People Who Study Them by Victoria Miles

Tracking Wildlife with Frank Craighead by M.J. Calabro

Pre-Activities

Project WILD Deer Dilemma (modified)

Students participate in a simulated board of commissioners meeting regarding the challenges presented by an ever-increasing deer population in and around a local park.

A Delicate Balance (described in this curriculum)

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Students discover that deer population is directly dependant on the health of the herd's habitat.

Frog and Toad Survey (described in this curriculum)

Students learn how vocalizations can be used to identify and estimate population size of Minnesota frogs and toads.

On-site Activities

Students will use wildlife telemetry equipment to track their classmates in the same manner Wildlife Biologists track deer.

**Please note there must be at least 6 inches of snow in order to use snowshoes.*

Classroom Connection

Any of the following Project WILD activities:

Minnesota Wild Words (5-8)

MN Project WILD supplement students learn how to determine the affects of wildlife on a study site they select near the school.

Bird Song Survey (9-12)

Students learn how to identify bird calls and understand the importance of bird counts as a means to inventory wildlife populations.

History of Wildlife Management (5-8)

Students research and then describe major trends in wildlife management philosophies and practices.

Teacher Resources

Animal Tracks of Minnesota and Wisconsin by Ian Sheldon + Tamara Eder

Tracking Wildlife with Frank Craighead by Frank Craighead

Wildlife Telemetry Pre-Visit Activities

Begin with a discussion about the wildlife management roles and responsibilities of the U.S. Fish and Wildlife Service:

The U.S. Fish and Wildlife Service (the Service) is the premier government agency dedicated to the conservation, protection, and enhancement of fish, wildlife and plants, and their habitats. It is the only agency in the federal government whose primary responsibility is management of these important natural resources for the American public. The Service helps ensure a healthy environment for people through its work benefiting wildlife, and provides opportunities for Americans to enjoy the outdoors. The Service is responsible for implementing and enforcing some of our Nation's most important environmental laws, such as the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection.

Ask the students the following questions:

- Why do biologists monitor wildlife populations?
Biologists monitor wildlife populations to protect endangered species, to set hunting limits, and to maintain quality habitats for a wide variety of plants and animals.
- How do you think the U.S. Fish and Wildlife Service gathers information about wildlife?
Biologists use a wide variety of survey techniques from simple observation to complex banding and telemetry programs.
- What types of information would they need in order to manage wildlife populations?
The health of individual animals, population fluctuations, migration patterns, feeding behaviors, territory needs are all information gathered by biologists.
- What types of equipment would be needed?
Some research methods, sound surveys for example, require very little equipment and are quite inexpensive to administer. Examples are the annual Minnesota Frog and Toad Survey and the annual Christmas Bird Count.

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Other methods, such as the Isle Royal Wolf and Moose telemetry study require expensive equipment and costly specialists.

From their answers and the class discussion, assemble a list like the following. Include the survey technique, the equipment needed, and the types of information that can be obtained from a particular type of survey.

<u>Type of Wildlife Survey</u>	<u>Equipment Needed</u>	<u>Information Gained</u>
<ul style="list-style-type: none">• Observation• Population Estimates• Catch and Release• Radio Monitoring	<ul style="list-style-type: none">• Binoculars, guides• Airplanes, binocs, guides• Traps, scales, tape measures, syringes, bands, nets• Radio collars, receivers, antennae, car/truck	<ul style="list-style-type: none">• Species inventories, ranges, behaviors• Population estimates, changes• Migration routes, stopovers, distances• Habitat ranges, health details, hibernation rates.

(For more background information about wildlife management study techniques read: Wired-Life and Counting Critters by Jan and Bob Welsh, Minnesota Conservation Volunteer Magazine)

Frog and Toad Survey

Students learn how vocalizations can be used to identify and estimate population sizes of Minnesota frogs and toads.

Materials

- CD Player and Stan Tekiela's Frogs of Minnesota CD
- Frogs and Toads of MN poster

Introduction

There are many methods scientists use to study wildlife. In this activity, students will become familiar with a survey technique that utilizes animal vocalization.

Each species of animal makes a unique sound to communicate. Frogs and toads are great examples. Frogs, often found in wet inaccessible locations, are most active

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at night. In the study of frogs, biologists often listen for the spring mating calls. Each one of Minnesota's 14 frogs and toad species can be identified by a unique call. In addition to identifying species, scientists can also estimate and monitor population numbers using the volume of the frog chorus and whether individual frogs can be heard.

Activity

First, teach students a few frog and toad calls. Test their listening skills by conducting some practice surveys using Stan Tekiela's *Frogs of Minnesota* CD and the Identifier. After each call discuss key identification sound features like:

- **Western Chorus Frog** sounds like a finger going over a comb
- **Green Frog** sounds like banjo strings being plucked.

Now play a wetland sample at the end of the CD and ask students the following questions.

- How many different frog calls did you hear?
- What species are calling?
- How many frogs of each species are calling?

Play the sample again to help students "train" their ears to listen for differences. If time permits play another new wetland chorus.

Wrap-Up

Ask students what challenges they might expect conducting a real vocalization survey like this simulated frog and toad survey? Ask if they are familiar with other wildlife survey methods scientists use to estimate population size. What other questions might a biologist want to answer besides whether a species is present or the size of a population? Answers to these questions can be found in the Minnesota Conservation Volunteer, Young Naturalist article *Counting Critters* by Bob and Jan Welsh.

Wildlife Telemetry On-site Activities

Materials

- Transmitter Collars (with magnet for “turning off”)
- Receivers (with extra batteries)
- Antennas & cords
- Transmitter examples and cards
- Telemetry Channels lists
- Photos of wildlife with transmitters
- Snowshoes (*winter season with at least 6” of snow*)

Introduction & Management Connection

Inside Visitor Center (20 minutes)

Begin with a discussion about the wildlife management roles and responsibilities of the U.S. Fish and Wildlife Service:

The U.S. Fish and Wildlife Service (the Service) is the premier government agency dedicated to the conservation, protection, and enhancement of fish, wildlife and plants, and their habitats. It is the only agency in the federal government whose primary responsibility is management of these important natural resources for the American public. The Service helps ensure a healthy environment for people through its work benefiting wildlife, and provides opportunities for Americans to enjoy the outdoors. The Service is responsible for implementing and enforcing some of our Nation’s most important environmental laws, such as the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection.

Ask students to refer back to the pre-activity question “How do you think the U.S. Fish and Wildlife Service studies wildlife?” From their answers assemble a list like the following that includes the types of information that can be obtained from a particular type of survey.

For more background information about wildlife management study techniques read: Wired-Life and Counting Critters by Jan and Bob Welsh, Minnesota Conservation Volunteer Magazine

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Type of Wildlife Survey

Observation

Counting Surveys

Catch and Release Surveys

Radio Monitoring

Information Gained

Species inventories, ranges, behaviors

Population estimates, population changes

Migration: routes, stopovers, distances

Habitat ranges, health details, hibernation rates

Share with students that biologists developed a set of standard methods for each survey technique to ensure the data scientists collect is accurate and comparable from survey to survey.

Explain that Radio Telemetry is one method of wildlife monitoring. Radio waves are transmitted from a sending unit, which is attached to the animal, to a receiver. This technique makes it possible for a biologist to locate and “track” an animal day and night without having to recapture or re-sight the animal. Telemetry is most useful when working with wildlife that may be difficult to approach (coyotes), are nocturnal (bats), or travel long distances (yellow warbler). A list of vocabulary associated with this wildlife monitoring technique is included at the end of the curriculum unit.

Ask students what information they think biologists might obtain using radio telemetry.

Wildlife biologists can determine an animal’s habitat preference, age, health, territory and home range. It can also be used to learn more about the balance between predator and prey and how these interactions affect overall populations. Information gained through the use of radio telemetry can help biologists make management decisions to maintain healthy wildlife populations including: manipulating habitat, limiting hunting seasons, and restricting human contact. The Service is authorized to use radio and satellite telemetry to study wolves, bears, fish, moose, white-tailed deer, peregrine falcons, and several other species. Radio telemetry has helped restore Minnesota populations of the Eastern Gray Wolf and Bald Eagle. For more information regarding radio telemetry read the attached *Success Stories in Minnesota*.

Transmitter Activity

Divide the students into the number of groups based on the number of sample transmitters available. Give each group a transmitter card that explains how to use the transmitter. Lay out all the sample transmitters. Instruct students to read each card and select a transmitter they believe matches. *Some groups may think one transmitter matches more than one card. This is okay.* Once all groups have made a decision have each group read the bold text and show their selection to the class. This activity demonstrates all the different types of transmitters that are used for wildlife.

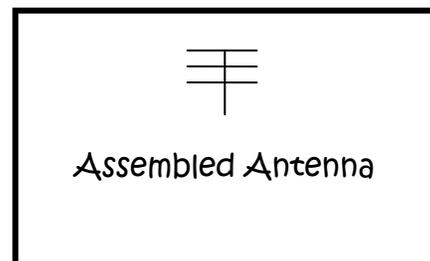
BEFORE GOING OUTSIDE:

Divide the class into groups depending on the availability of tracking equipment. Each group will need an adult leader to assist with equipment assembly and operation. Pass out one of each piece of equipment used for this activity to each team, identifying each item as you distribute.

- directional antenna used to locate the animal
- 16-channel receiver used to pick up the signal from the collar
- cable used to attach the antenna to the receiver
- transmitter collar/tag placed around the animal (in this case, to be carried by a student)

Show the teams how to attach the antenna to the receiver with the cable. Referring to the instructions enclosed with the equipment, explain to students how to turn on and operate the radio receiver. Point out the radio collar number and associated channel on the receiver. Remove the magnets taped to the side of each collar to “turn on” the signal. Leave these magnets in the classroom during the activity.

Ask each team to turn on their receiver and make sure it is on the proper channel for the transmitter they are using. Refer to the transmitter sheet for frequencies. Show students how to assemble the antenna (see diagram) making sure to tighten the wing nuts. Show the students how to attach the receiver to the antenna using the coax cable.



Outside Activity: Wildlife Telemetry

On refuge, (60 minutes)

Outside, designate a “territory” for each group to conduct this simulation. The farther apart the territories the less chance signals will interfere with each other. Explain to the students that each group will divide in half taking turns pretending to be “study animals” (those that carry the transmitter) and “trackers” (those that carry the radio receiver and antenna).

Give the “study animals” a couple minutes to hide. Demonstrate how to use the radio telemetry equipment to the “trackers”.

- Select one student to hold the antenna. Hold the antenna, chest high, by the gripped handle and walk slowly in a full circle.
- Select two students to operate the receiver. One carries it and the other assists by watching the indicator needle to verify the direction of the strongest signal.
- As the student circles with the antenna, instruct everyone to listen for the “beep” signal. Ask students to determine the direction in which the signal is being transmitted the loudest. *As students walk further away from the transmitter (collar) the signal will become weaker. As students walk closer toward the transmitter the receiving signal will become louder. If they can still hear the signal after disconnecting the antenna, students are very close to the signal.*

Now begin “tracking” the “study animals”.

- Travel in the direction the transmitter signal is the loudest for a few hundred yards or until a major landscape change happens (hill, direction change in trail, etc). Make sure the antennae and receiver stay close to each other or the coax cable connection may break. The rest of the students should listen for signal changes. *Bloomington participants: Please turn off the receiver during travel as the batteries are drained rapidly.*
- Stop, turn the receiver back on and repeat the circle. Continue moving in the direction the signal is the loudest until you find the “study animals”.

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Give each student an opportunity to try all the tools while searching for the transmitter. When the “study animals” and transmitter have been located, switch roles. Do as many rounds as time will allow.

Back in the classroom, give students time to disconnect and turn off all the equipment. To turn off the radio collar transmitters, tape the magnets back over the silver dots on the transmitter batteries.

Wrap-Up Management Connection- Wildlife Studies

Inside Visitor Center (10 minutes.)

Gather the class together and discuss the challenges they encountered in this activity. Some challenges biologists face include rugged terrain and natural obstacles, such as wetlands and lakes, that they are not prepared to cross. Can students think of any manmade obstacles that might interfere with radio monitoring? Ask students to summarize why this type of wildlife monitoring is used by the U.S. Fish and Wildlife Service and the types of valuable information it provides to wildlife biologists.

Wildlife Telemetry Rainy Day Hike Alternatives

Activity 1: Telemetry and Wildlife Management

Inside classroom (60 minutes total; 30 minutes each lesson)

Materials

- Telemetry equipment-antenna, receiver, cord, and collar
- “Canada Goose Story” DVD

Split the class into two groups. One group will watch the video “Canada Goose Story” while the other uses the telemetry equipment inside the Visitor Center.

Video: This video is 20 minutes long and presents the life cycle of the Canada Goose; shows the banding process, and explains the role of hunting in habitat protection. Discuss with students what they learned from the video. Answer student questions and identify areas they might like to research further.

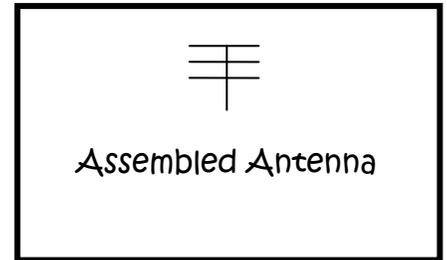
Telemetry: Refer to the On-site Introduction described on pages 11-13. Pass out one of each piece of equipment used for this activity identifying each item as you go.

- directional antenna used to locate the animal
- 16-channel receiver used to pick up the signal from the collar
- cable used to attach the antenna to the receiver
- transmitter collar/tag placed around the animal (in this case, to be carried by a student)

Show the students how to attach the antenna to the receiver with the cable. Referring to the instructions enclosed with the equipment, explain to students how to turn on and operate the radio receiver. Point out the radio collar number and associated channel on the receiver. Remove the magnets taped to the side of each collar to “turn on” the signal. Leave these magnets in the classroom during the activity.

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Turn on the receiver and make sure it is on the proper channel for the transmitter being used. Refer to the transmitter sheet for frequencies. Show students how to assemble the antenna (see diagram) making sure to tighten the wing nuts. Show the students how to attach the receiver to the antenna using the coax cable.



Now demonstrate how to use the radio telemetry equipment.

- Select one student to hold the antenna. Hold the antenna by the gripped handle and walk slowly in a full circle.
- Select two students to operate the receiver. One carries it and the other assists by watching the indicator needle to verify the direction of the strongest signal.
- As the student circles with the antenna, instruct everyone to listen for the “beep” signal. Ask students to determine the direction in which the signal is transmitted the loudest. *As students walk further away from the transmitter (collar) the signal will become weaker. As students walk closer toward the transmitter the receiving signal will become louder. If they can still hear the signal after disconnecting the antenna, students are very close to the signal.*

Send two students at a time out to hide with the collar to represent the “study animals” while the rest of the group waits in the classroom. After 2-minutes, take the rest of the group out with the telemetry equipment. This group represents the “trackers” trying to locate the “study animals”. Once the “study animals” have been found, head back to the classroom and send out two more students with the collar. Continue in this manner until all the students have had a chance to be “trackers” and “study animals”.

Remember to give students time to disconnect and turn off all the equipment. To turn off the radio collar transmitters, tape the magnets back over the silver dots on the transmitter batteries.

After 30 minutes switch groups and conduct the same activities with the other half of the class.

Wrap-Up Management Connection

Wildlife Studies

Inside Visitor Center (10 minutes)

Gather the class together and discuss the challenges they encountered in this activity. Some challenges biologists face include rugged terrain and natural obstacles, such as wetlands and lakes, that they are not prepared to cross. Can students think of any manmade obstacles that might interfere with radio monitoring? Ask students to summarize why this type of wildlife monitoring is used by the U.S. Fish and Wildlife Service and the types of valuable information it provides to wildlife biologists.

Activity 2: Simulated Wildlife Survey

Inside Visitor Center (30 minutes)

Students will conduct a simulated “survey” of wildlife from inside the refuge visitor center.

Materials

- 15 numbered animal pictures
- Tape, clipboards, pencils, and blank paper for survey activity
- Binoculars for each student
- Bird and mammal field guides per two students (any on hand will work)

Activity

Instruct students to seek out 15 wildlife pictures that have been hung around the Visitor Center. Where possible, the pictures have been placed in areas that represent the animal’s real habitat. Instruct students to start by scanning the area with their naked eye and then with the binoculars, just like a real wildlife biologist might. Once students locate an animal picture, instruct them to use their field guides to identify the animal and record their answers by listing them on their sheet of paper. Encourage students to both the official common name and the scientific name for each species as listed in their field guide. For example, the correct name for deer is “White-tailed deer” and the scientific name is *Odocoileus virginianus*. Students should try to locate and identify all fifteen animals. Some are easy and some are very hard. Roam around the visitor center as they work and help them by giving hints about their animal. Wrap up

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this activity by seeing how many students got all 15 correct; 10 correct; 5 correct, or none at all.

The animals are:

1. Pintail Ducks
2. White-tailed Deer
3. Red Fox
4. Bald Eagle
5. Northern Cardinal
6. Baltimore Oriole
7. Blue jay
8. Coyote
9. American Goldfinch
10. Virginia Opossum
11. Star-nosed Mole
12. Wood ducks
13. American Bittern
14. 13-lined Ground Squirrel
15. Mink

It is very important for biologists to be able to identify a species of animal by sight or sound. Oftentimes during a survey the animals move so fast that they have to be identified and counted quickly and correctly or else the biologist's data will be wrong.

Activity 3: Plaster Casts

Inside Classroom (30 minutes, plus dry time)

Lay out the mammal tracks for the students to choose from along with the ziploc bags and small plastic containers. Set up a Plaster of Paris station that includes a spoon and lotion/vegetable oil. For groups over 8 set up additional stations.

Materials

- Assortment of rubber animal tracks (one per student)
- Ziploc bags (1 per student)
- Hand Lotion or vegetable oil
- Plaster of Paris (about $\frac{1}{2}$ cup per student)
- Small plastic containers (1 per student)
- Spoons or $\frac{1}{2}$ dry measuring cup (as needed per Plaster of Paris station)

Activity

Instruct students to select 1 track for casting, 1 Ziploc bag and 1 container then bring the materials back to their seats. Provide the students with the following instruction:

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- One student at a time should bring their track and ziploc bag to the plaster station.
- Rub a small amount of hand lotion/vegetable oil on the rubber animal track. Doing this makes it easier to remove from the dried Plaster of Paris.
- Scoop about $\frac{1}{2}$ cup of Plaster of Paris into the ziploc bag and head back to their seat.

Once everyone has received all their supplies go over directions on how to make a track cast. Plaster of Paris is a fast drying molding material. Remind students to work carefully but quickly.

- Pour about $\frac{3}{4}$ - $\frac{1}{2}$ cup of water into the bag, ziploc it closed, and kneed the bag until it resembles pancake batter. If it is too thick and will not pour add a little more water.
- When mixed well, open the bag and pour it into the small plastic container until $\frac{3}{4}$ full.
- Place the mammal track, print side down, into the plaster. Set the container aside until dry-about 30 minutes.
- When dry, carefully pull the track out of the cast and wash off the lotion.
- Gently push the cast out of the container and wash the container. Do not wash your track cast (the plaster will disintegrate)!
- Write your name and identify the track on the back of the mold.

Success Stories in Minnesota Using Radio Telemetry

Northwest Minnesota Moose Mystery Research

Agassiz National Wildlife Refuge, Red Lake Management Area, & Viking area agricultural lands

The moose research project was initiated in 1995 to investigate the reasons for the sharp decline in moose numbers during the early 1990's. Between 1995 and 1998 researchers radio collared 152 moose (52 calves, 100 cows) with motion sensors that sent out a different signal rate when the collar (or moose) had not moved for 4 to 6 hours. This signal, often called a "mortality signal", indicates that an animal has died. When biologist receive a mortality signal they attempt to locate the study animal to determine the cause of death. This study concluded that climatic changes and increases in deer populations that carry and transmit parasites (liver flukes, brain worm, and winter ticks) may have rendered Northwest Minnesota inhospitable to moose. The current decline of the moose population in Northwest Minnesota is outside of management control and is likely to continue until the climatic factors reverse.

For more information visit:

www.fws.gov/midwest/agassiz/moosesite/agassiz_2005_moose_summary_report.pdf

University of Minnesota Raptor Center, Osprey Studies

In 1995, the Raptor Center began using satellite telemetry to monitor the migratory routes, stopover sites, and wintering grounds of ospreys and Swainson's hawks nesting in North America. Sixteen birds were tracked by placing a one-ounce transmitter in a small backpack attached with nylon straps. The signal was picked up by satellites orbiting the earth and integrated into classrooms through a web-based environmental education program called *Highway to the Tropics*. The *Highway to the Tropics* project concluded in 2002, when The Raptor Center determined that the tracking project had generated sufficient information regarding osprey flyways. From this research, it was discovered that during migration, ospreys travel up to 5,400 miles each way. It was also concluded that the greatest threat to ospreys is human interference; for example shooting birds and destroying osprey habitat.

For information on current research of ospreys and other raptors visit:

<http://www.cvm.umn.edu/raptor/contactus/home.html>

Radio Collar Frequency Channels

Bloomington

Channel 7 164.075 ear tag

Channel 14 164.140 turtle

Rapids Lake

Channel 2 164.024 small mammal

Channel 7 164.064 small mammal

Radio Collar Frequency Channels

Bloomington

Channel 7 164.075 ear tag

Channel 14 164.140 turtle

Rapids Lake

Channel 2 164.024 small mammal

Channel 7 164.064 small mammal

Wildlife Telemetry Transmitters (pictures and/or models)

Large Mammal Collar: Used on large mammals including deer, moose, caribou and bighorn sheep.

Small Mammal Collar: Used on small mammals including young raccoon, rabbit, opossum, and skunk.

Bird Backpack: Used on raptors such as bald and golden eagles. Teflon harness straps are tied around the chest and wings of the bird.

Prong & Suture Backpack: Used on waterfowl. A small incision is made between the wings and the arrow is inserted just under the skin. The holes on the side are used to suture the transmitter to the skin.

Necklace: Used on game birds such as grouse and pheasants. The transmitter is placed around the neck with the bottom part of the transmitter lying against the breast feathers.

Harness: Used on birds, like woodcock. The tubing is wrapped around the chest and wings of the bird and then tied.

Neck Band Collar: Used on Geese and Swans. The collar is attached around the neck and held together with glue.

Ear Tag: Used on young animals like pronghorn antelope, elk, deer, moose, and bear. As the animal grows, their necks get larger and a collar might prevent them from feeding properly.

External Transmitter: Used with turtles. The transmitter is glued to the top of the turtle's shell.

Internal transmitter: Used in fish. The body of the transmitter is surgically implanted into the stomach; and the antenna remains outside of the body of the fish.

Background Information

White-Tailed Deer

The White-tailed deer is the most common and easily recognized large game mammal in the United States. Deer populations are currently at moderate levels throughout most of Minnesota. Please refer to the Deer Population Model map for the population level in your county. *Note: the Metro Area county populations are not part of this data due to the extremely high populations in limited concentrated green spaces.*

White-tailed deer live in agricultural, urban, and timberland. White-tailed deer are considered a prey species with a high reproductive rate. One male, or buck, may breed with many females, or does, during a given mating season. If the deer herd is healthy, does may produce twins and possibly triplets. These reproductive characteristics allow deer populations to grow quickly where habitat is good.

There are natural limits to the number of deer a particular habitat can support. This concept, known as carrying capacity, is the highest number at which a population can sustain itself without harming the habitat it depends on. A deer herd, above the carrying capacity, can eat the forest under-story faster than it can re-grow. They slowly eat themselves “out of house and home” and are potentially devastating to other animals that depend on similar food and shelter.

Societal changes and economic concerns have virtually eliminated the deer’s natural predators: wolves and cougars. Today, throughout much of their range, humans are the deer’s last predator. Wildlife managers use hunting to manage deer populations and maintain healthy forest habitat. Wildlife managers use season lengths, bag limits, and sex permits (where hunters can hunt either does or bucks) to regulate the number of deer taken by hunters each year. Annual monitoring ensures that deer populations remain at a level compatible with human populations and habitat.

As development expands into what was once rural habitat and closed to hunting, deer populations grow at an uncontrolled rate. Biologists continue to study ways to balance deer management with human safety and concerns in these areas.