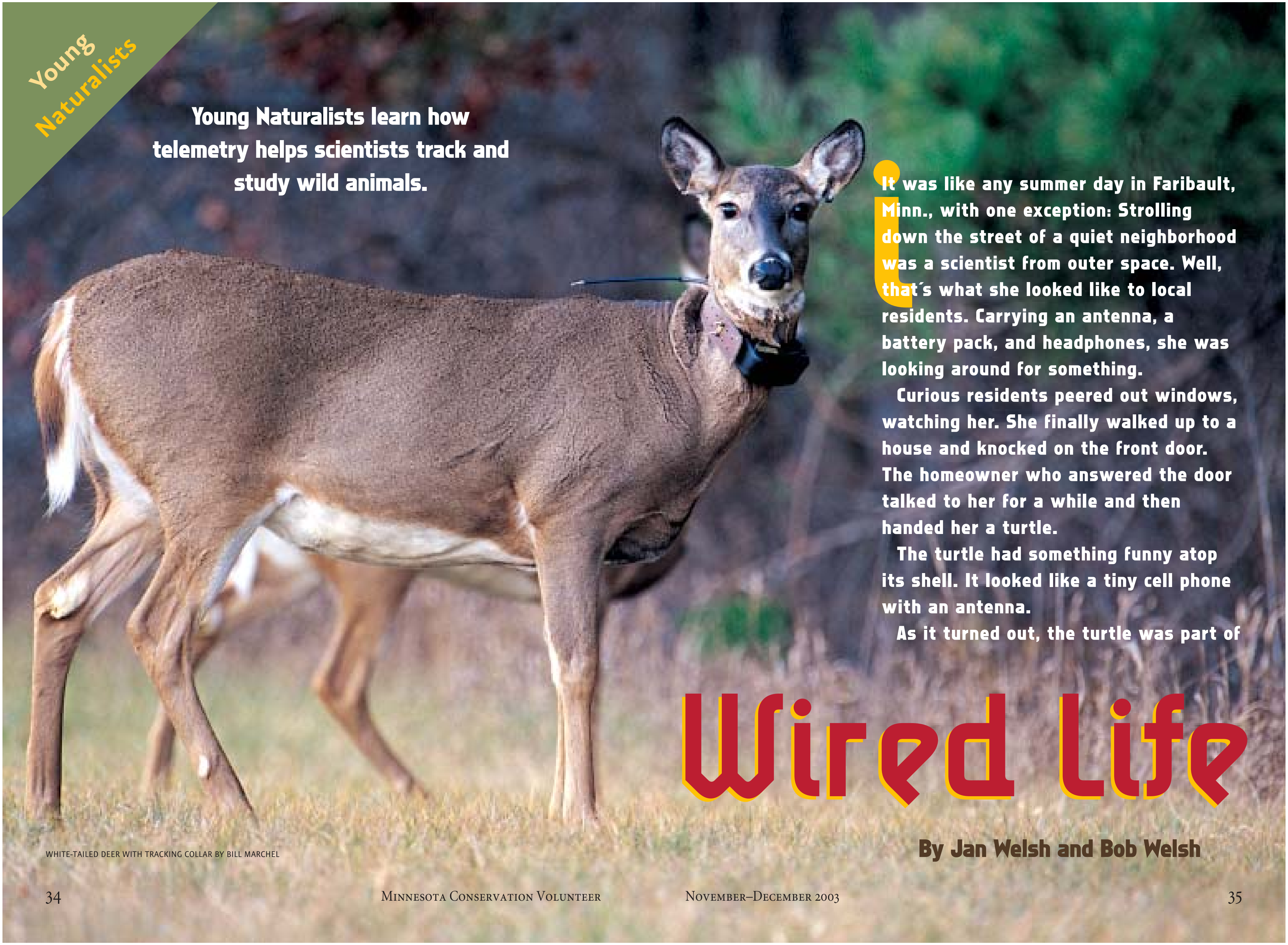
Young Naturalists



WHITE-TAILED DEER WITH TRACKING COLLAR BY BILL MARCHEL

Wired Life

Young Naturalists learn how telemetry helps scientists track and study wild animals.

By Jan Welsh and Bob Welsh

It was like any summer day in Faribault, Minn., with one exception: Strolling down the street of a quiet neighborhood was a scientist from outer space. Well, that´s what she looked like to local residents. Carrying an antenna, a battery pack, and headphones, she was looking around for something.

Curious residents peered out windows, watching her. She finally walked up to a house and knocked on the front door. The homeowner who answered the door talked to her for a while and then handed her a turtle.

The turtle had something funny atop its shell. It looked like a tiny cell phone with an antenna.

As it turned out, the turtle was part of a study by the Department of Natural Resources Nongame Wildlife Program. Several months earlier a researcher had captured the wood turtle near the Straight River, glued a radio transmitter to her shell, and returned her to the river.

A child had found the turtle and taken her home. Meanwhile, the scientist had used a device called a *receiver* to pick up the radio transmitter's electrical signal and follow it to the child's house.

Standing on the child's doorstep, the scientist explained the wood turtle is a threatened species in Minnesota and that scientists were using radio tracking to learn more about how wood turtles use their river habitat. Scientists hoped to improve the chances of survival for the state's rare wood turtles. The child gave the turtle to the scientist, who returned it to its home on the Straight River.

Detective Device

This process of remotely sending signals over a distance in order to record information is called *telemetry.* In radio telemetry, transmitters send signals that can be picked up by a special receiver.

Once the transmitter is in place and giving off signals, researchers can track the animal with the receiver (see photo below left). The receiver collects and amplifies the signals so researchers can hear them.

Think of the transmitter and receiver this way: You're riding in a car and want to listen to BE-BOP 99.1 on the radio. By turning on the radio and dialing the setting 99.1, you pick up a signal that delivers music. A radio station sends the signal through a tall antenna, or transmitter.

For wildlife telemetry the animal wears a transmitter. Using a radio receiver and dialing a certain setting, the researcher hears a beep when the animal is within range.

Telemetry is a tool in wildlife and fisheries research because it helps researchers learn how various kinds of animals live and what they need to be healthy. It's useful when a researcher cannot physically follow an animal on its day-to-day routine. For example, a person would find it tricky or impossible to follow a bird in flight or a fish in a lake or river. Telemetry also makes it possible to learn a lot about an animal without being seen by it. This is important because an animal's natural behavior may change if it knows a human is nearby.

CHRISTOPHER KOCHANNY, ADVANCED TELEMETRY SYSTEMS, INC.

Picking up signals. A researcher dials a certain setting on a receiver hanging at her waist. She holds an antenna that picks up a signal from a radio transmitter attached to a turtle. The signal tells her in which direction the turtle is located. To find out the turtle's location, she must move to another spot. Turn to page 39 to discover how she locates the turtle without seeing it.

Sticking to rare turtles. A wildlife researcher glues a tiny transmitter to a wood turtle's carapace (top shell). At the end of the tracking study, the researcher will retrieve the turtle and simply pop off the transmitter without harming the carapace.

ERIK R. WILD

How Telemetry Works

The examples in this story use conventional radio telemetry, which is the oldest and most common way to track animals. Researchers can also electronically track animals using Global Positioning System telemetry and satellite telemetry. Here's how each works.

CONVENTIONAL TELEMETRY

Using a conventional receiver, a researcher can map an animal's location and movements. This conventional telemetry works well for animals that travel less than 6 miles.

The radio transmitter's signal tells a wildlife researcher in which direction the animal is but not how far away it is located. After using the antenna to find the animal's direction, the researcher takes a compass reading and records it on a map. The researcher draws a line on the map from the spot where he or she is standing in the direction of the animal. By quickly moving to another spot and listening, the researcher can draw another directional line toward the animal. The spot where the two lines meet on the map is where the animal is. This technique, known as *triangulation,* estimates the location of the animal without disturbing it. More readings increase the accuracy.

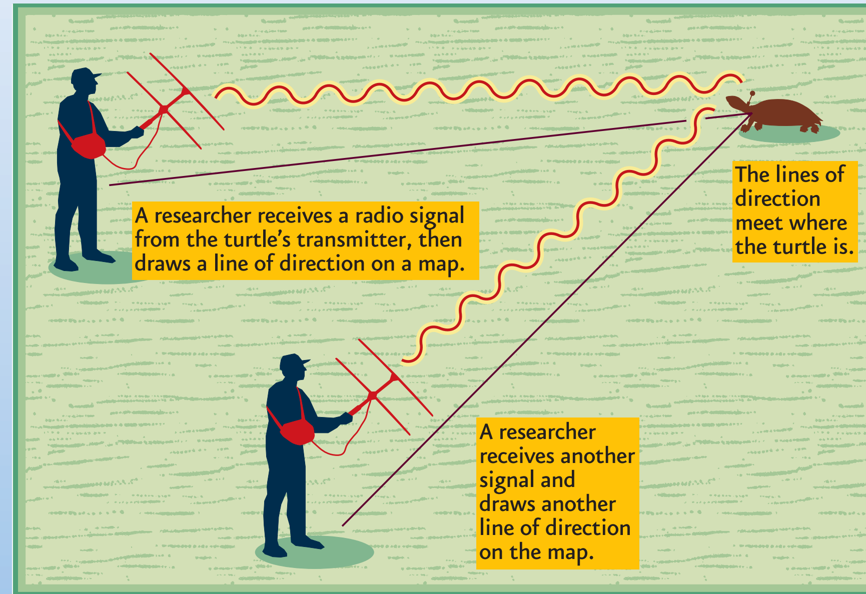


ILLUSTRATION BY MATT KANIA

How to find a turtle. The illustration above shows how researchers use a map, a radio transmitter on a turtle, and radio receivers to locate the turtle.

GPS TELEMETRY

Collars that use the Global Positioning System (GPS) can show where an animal has been for up to a year. The GPS collar stores the location information gathered from satellites revolving around Earth. After retrieving the collar from the animal, the researcher downloads the data to a computer.

GPS collars cost much more than conventional transmitters do, and the battery wears out faster. However, the GPS collects data 24 hours a day, seven days a week, so the researcher doesn't have to track the animal directly.

SATELLITE TELEMETRY

This tracking method is especially useful for whales, migratory birds, and other animals that migrate great distances. A transmitter on the animal sends location information to satellites revolving around Earth.

The satellites relay the data to stations on land, where it is translated into a usable form. The researcher can then get the information over the Internet.

FISH TO FOLLOW

DNR fisheries researchers hook up tiny radio transmitters to fish to find out where they travel in spring, summer, fall, and winter. For example, researchers used telemetry to study muskies (muskellunge) on a 70-mile stretch of the Mississippi River from Brainerd to Sartell. Thirteen muskies, ranging in length from 36 to 48 inches, received surgical implants of small radio transmitters. Using the signals, the researchers tracked the muskies' seasonal movements, studied their use of habitat, and discovered where the fish spawn (reproduce).

SNAKE CHASE

Telemetry helped wildlife researchers track and study bullsnakes in the grasslands of Crow Hassen Park Reserve, west of Minneapolis. Once plentiful in prairie habitat, bullsnakes disappeared as farms and roads changed the land. When researchers reintroduced bullsnakes to the park's grassland areas, they wanted to see how the snakes adapted. So, in 1991, they implanted six bullsnakes with tiny radio transmitters and followed their slithering movements for 18 months. In 1992 they recaptured the snakes and removed the transmitters.

The researchers discovered that bullsnakes move around more than anyone had previously thought they did. In a week, one snake traveled at least a mile from one spot to another. Depending on the route it crawled, the snake might have covered even more ground.

By going to see the snakes' location, the researchers learned that in the summer the snakes spend 60 percent of their time living underground, often in gopher burrows. When above ground, the snakes stay under a layer of dead grass and other plants.

From the telemetry study, researchers learned that bullsnakes need large blocks of grassland without roads to survive. Crossing roads is deadly to bullsnakes.

At least 640 acres of land (about one square mile) is needed to support enough adult snakes to reproduce enough young to keep the snake population going.

Minding moose. A helicopter prepares to leave after wildlife biologists attached a radio collar to a moose. Big as they are, moose are not easy to find because they live in large, often remote areas.

U.S. FISH AND WILDLIFE SERVICE

JOHN MORIARTY

Inside snakes. A bullsnake has surgery to implant a radio transmitter in its body. A mask covers the snake's head and delivers anesthesia before surgery. The transmitter will allow researchers to track the snake's movements in open country as it slithers into sandy burrows to find rodents to eat. Minnesota's longest snake has become less common because of being run over by cars and losing habitat as farms and houses have taken over grasslands.

STRANGE BEEPS

What happens if an animal with a transmitter dies? The transmitter has a switch inside that detects animal movement. When the animal does not move for a long time, the transmitter beeps at a different rate. This tells the listener that the animal might have died. Researchers then find the animal and investigate the cause of death.

Just right. Radio collars come in all sizes. At left, a thick leather collar, as big as a man's belt, will fit a moose. An elastic radio collar (center) works well for a fawn because it expands as the young deer grows. At right, a ring-sized collar of plastic-coated wire suits a mouse perfectly.

DEBORAH ROSE

MOOSE MEANDERS

One DNR moose study is trying to answer the question of why northwestern Minnesota has fewer moose today than it had years ago. The population has dropped from more than 4,000 moose in the early 1980s to fewer than 300 in 2003.

For the five-year study, researchers captured 152 moose and fitted them with radio collars or radio ear tags. They took samples of blood, hair, and feces (droppings), and later tested the samples in a laboratory. They found major problems: Most moose had parasites (liver flukes, brainworms, winter ticks, lungworms), and most had low amounts of copper (a trace element needed to be healthy).

online

- Adopt-A-Moose, run by DNR and U.S. Fish and Wildlife Service, reported results of a radio-telemetry study of northwestern Minnesota moose completed in 2000. Visit midwest.fws.gov/agassiz/moosesite/adopt.html.
- Highway to the Tropics is a 1995–2002 project to track the migratory routes, stopovers, and wintering grounds of Swainson's hawks and ospreys. Visit www.raptor.cvm.umn.edu/content.asp?page=3000.
- Advanced Telemetry Systems, Inc., Isanti, sells equipment and offers advice for wildlife telemetry. See www.atstrack.com.
- Eyes on Wildlife offers hands-on wildlife study opportunities for students. See www.mnstate.edu/regsci/eyes/project.html.

In the following study years, researchers were able to get close enough to radio-collared female moose to collect droppings for pregnancy tests. They found fewer than half of the females were pregnant most years.

DEER IN WINTER

For 13 years the DNR Wildlife Research Unit at Grand Rapids has been using radio telemetry to study white-tailed deer in north-central Minnesota. The goal is to see how much deer use conifers, especially northern white cedar and balsam fir, and determine just how important conifer stands are to winter survival of deer.

Researchers have captured and radio-collared almost 400 female deer, including 43 newborn females. They have also radio-collared 47 male fawns. The electronic tracking enables the researchers to answer questions about migration patterns, the number of deer that survive each year, causes of death, number of newborns, where the deer live, and how they use their habitat.

The researchers are studying how changes in snow depth and outdoor temperatures might lead to changes in deer habits and survival.

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