

## Oh, Deer

Exploding populations of white-tailed deer are stripping our forests of life

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Photograph by Geof Kern

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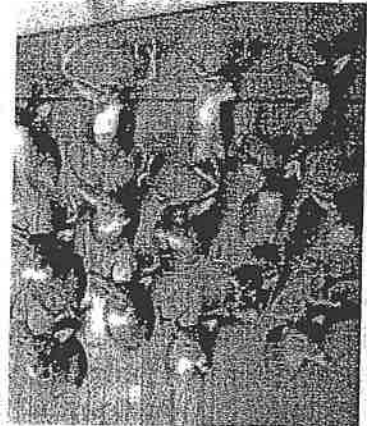
Memorial Grove is just north of State Highway 70 in Wisconsin. It's dedicated to four local Forest Service employees who didn't return from the Second World War, but it's also a living memorial to the great trees that once towered over the lake country. By accident or luck, 47 acres here were never cut, and the eldest hemlock checks in at a hoary 320 years. On a gray January morning, Tom Rooney tramps about on a thin crust of snow, surveying the forest floor. "Lots of maple seedlings," he says, "but there are hardly any hemlock."

As a postdoctoral botanist with the University of Wisconsin, Rooney has studied hemlock regeneration at more than 100 sites. "We lost a lot of hemlock during the wave of logging," he says, referring to the Paul Bunyan era at the turn of the last century. "Now we're losing the remaining ones to browsing." He singles out a small maple as thick as a soda straw and less than two feet tall. All about the stem, shoots have been clipped off, their growth redirected by precise dentition—bites. "We don't know what the browsing is like, but the plants sure know."

When a tree begins to die, it can take years before anyone notices; forests can hide their decline for decades. Seeds fail, saplings wither, young trees don't make the vault to the canopy. Eventually the last survivor from a once-mighty stand reaches the end and casts a final seed. Standing before a hemlock seedling about three feet tall, Rooney parses its branches with gloved hands. "A lot of the lower branches appear to be browse-damaged," he says. "You have needles coming off the main stem, which indicates the plant is stressed, so it is getting eaten periodically." The usual suspects: deer.

Fifty years ago, botanist John T. Curtis of the University of Wisconsin orchestrated a massive reconnaissance of the state's plant communities. He then put it all together in a book, *The Vegetation of Wisconsin*, which established a benchmark. In 2000 and 2001, Rooney and his boss, botanist Don Waller, revisited 67 of Curtis's northern plots. Of the 62 sites still undeveloped, the most changed were in two state parks where deer hunting is not permitted: Lake Gogebic in Michigan and Brunet Island in Wisconsin. Both lost 75 percent of their species between 1950 and 2000, and sites across the board showed dramatic declines. On average, Waller and his team found almost 20 percent fewer species than Curtis had 50 years before, although they sampled the same sites much more intensively.

"People have heard of endangered species. They haven't thought that their local woodlot may have only half the species that it had 50 years ago," Waller says. "We have around us today plant communities that still look intact, that still seem intact. The trees are still standing;



**Should we just shoot 'em? Americans suffer from "sacred doe" syndrome, wildlife managers say. They protect deer from overharvesting even when deer populations are out of control.**

they still have some flowers underneath them in the springtime. But those grand-canopy trees may not be reproducing. This is the leading edge of the wedge; it's what happens before things go extinct."

The solution, botanists say, is as obvious as it is politically explosive: Americans need to kill more deer.

The story of deer in America has been a tragedy of both good and bad intentions. In 1607, when settlers landed at Jamestown to start the first British colony, there were between 24 million and 31 million white-tailed deer in North America. Those numbers began to decline as settlers pushed west, and the bottom fell out in the late 1800s. Hunters slaughtered deer for their meat and hide just as they did buffalo, and with similar results. The most industrious hunters routinely bagged 150 to 200 deer in a season; one Virginian killed 2,700 in his career. By the end of the century, less than half a million deer were left. In vast tracts of the country—Massachusetts, New Jersey, southern Wisconsin, Pennsylvania—there were almost no deer at all.

What happened next was a textbook case of overcompensation. In 1896 the U.S. Supreme Court declared all wild animals property of the state, forcing hunters to obtain licenses and abide by hunting restrictions. Conservationists such as Theodore Roosevelt had already begun to lay some ethical ground rules. They declared it unsporting to trap large game animals or to shoot them while they were crossing streams or snowbanks. They urged hunters to spare does and fawns and concentrate on bucks. Soon, state game commissions were formed, funded by taxes on firearms and ammunition, and hunting seasons, bag limits, and sex restrictions helped deer populations recover. By the 1940s, 30 states had *too many* deer. In northern Wisconsin, deer populations had grown so large that some were starving to death.

The situation seemed tailor-made for Aldo Leopold. Both a pioneering conservationist and a clear-eyed pragmatist, Leopold had more or less invented the field of wildlife management with his 1933 book, *Game Management*. Leopold lived on a washed-up farm along the Wisconsin River and set up the nation's first wildlife ecology program, at the University of Wisconsin. In 1943 he took control of the Wisconsin Conservation Commission and tackled the deer problem head-on.

Instead of feeding deer and killing wolves, Leopold argued, people should focus on killing does to decrease the overall population. "Just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer," he wrote.

Leopold's views helped set the stage for scientific herd management, whereby hunters register the sex and age of each kill, and biologists use simple models to reconstruct the size of the herd. By looking at the relative growth rates of the herd, biologists can now deduce a given area's carrying capacity—how many deer it can support without endangering other inhabitants. Although Leopold was well known and respected, his point of view was anathema to hunters. For decades they had been taught to think of deer as a precious, endangered resource. One fruitless hunt was enough to convince them that nothing had changed.

Today Wisconsin boasts 1.6 million deer, 700,000 licensed hunters, and a deer-management system that is tops in its field. Yet biologists who think there are too many deer are still excoriated by hunters and nonhunters. When the number of antlerless deer killed dropped 42 percent in 2001, hunters didn't blame the unseasonably warm weather, which allowed deer to hunker down and evade tracking. They blamed state game managers for encouraging the shooting of too many does. "Most hunters have never experienced a sustained decline in deer populations," says Keith McCaffery, a retired deer biologist who

volunteers for the state of Wisconsin. "It's almost like a record number every year." Seeing deer in the forest used to be a magical experience, McCaffery says. Now it's exciting only if they're coming through your windshield. æ

A few miles west and south of Memorial Grove is Fould's Creek, home to another large hemlock grove bordered by a wetland. Deer like to gather under hemlock in the winter because the flat boughs catch the snow, uncovering browse and leaving a clear escape path from predators. Such "deer yards," as these gathering points are called, are often hit hardest by browsing. Sometime in the 1930s, when Wisconsin's deer problems began, a protective fence was erected around a corner of the yard, and it has been maintained ever since. It's not worth much scientifically—there are no records and no controls, and a forest without deer is as unnatural as one with too many—but Rooney sees a lesson in the contrast.

"This is our alternate trajectory: No deer for the last 60 years," Rooney says as he scales the rotting ladder. The contrast is striking: Outside the fence, the understory is wide open, roomy enough to park a Winnebago. Inside, you have to crouch and crawl to move about. Clearly, the persistent nibbling of generations of deer is a tremendous force. Inside the fence, the hemlock is reproducing; a stand of hemlock can persist for 3,000 years or more. Outside, the last stands are dying out. "We don't have any midsize hemlock here because of what happened 50 years ago," Rooney says. "We don't have any hemlock coming in now because of what's happening today."

You can learn a lot about the effects of browsing by examining what deer most like to eat. Rooney finds a good example inside the fence: three young white cedars. The cedar's common name, arborvitae, which means "tree of life," dates from the 16th century, when French explorer Jacques Cartier and his men brewed tea from its bark and leaves to overcome scurvy. Cedar is loaded with vitamin C, and it's easier to digest than other winter browse. If a deer can get enough of it, it may not even lose weight in the winter. Yet that very wholesomeness limits its supply. In the Wisconsin uplands, cedar has been browsed nearly to eradication. Canadian yew is tasty as well, and also quite scarce. Moving down the chain of palatability comes hemlock, balsam fir, pine, and finally spruce. In most of Wisconsin deer have already arrested the regeneration of cedar, yew, and hemlock. Now they appear to be showing some interest in fir. Bite by bite, they're eliminating their own favored food sources.

This is how herbivores structure a landscape. In areas with lots of deer, grasses survive because they contain silica, which wears down teeth. They also propagate with tiny seeds, or underground, and grow so low that they rarely get clipped in passing. Ferns do well because they've evolved nasty, unpalatable chemicals in their fronds. But flowers are another story. They invest tremendous energy in their spring emergence but pay the price if winter doesn't knock back the deer herd.

A few years back, in the forest of northwestern Pennsylvania, Tom Rooney came upon some large boulders and decided to scale one. Once on top, he was astonished to find a lush little garden growing on the rock. Good science is opportunistic, and Rooney realized he had come upon a natural experiment. Like the fence at Fould's Creek, the boulders were exclosures, keeping plants out of reach of the deer.

Rooney spent the afternoon counting, measuring, and identifying plants on 34 boulders from eight to 50 feet tall and 34 shorter boulders low enough for deer to reach. When he was done and had added up the numbers, he found that plants on the tall boulders grew three times as densely as those on the short boulders. They were 30 percent larger and nearly 40 times more likely to flower. What stuck with him most was the sight of an elegant lily with tiny, bell-shaped magenta flowers that grew on one of the boulders. Down on the forest floor, the lilies were scrawny and barren, but this one had grown to full size and flower. In the absence

of deer, the forest had bloomed.

By one count, 98 species of threatened and endangered plants, many of them orchids and lilies, are disturbed by deer browsing. While few if any species will be driven to extinction by browsing alone, the cumulative effect across the landscape can be startling. In a single park in Columbus, Ohio, a deer herd eradicated more than 150 plant species.

It doesn't stop there: When plant populations get hammered, the effect ricochets up the food chain. Across the Appalachian divide from Fould's Creek, biologist Bill McShea has spent the past 14 years studying the forest at the Smithsonian Institution's Conservation and Research Center in Front Royal, Virginia. Like many scientists who deal with the effects of deer, he didn't plan it that way. He was hired to study small mammals but soon found there weren't many around. There were deer, though, plenty of them.

McShea began to think there was a connection, and he found it in the Kentucky warbler. This little songbird likes the gaps in a mature forest, where a tree has fallen and the light draws a crowd of plants. It nests close to the ground, so it needs foliage—such as raspberry and blackberry patches—to hide in and hunt insects from. But when deer populations get too high, the warbler gets pushed out. Beginning in 1979, when all deer hunting was stopped at Front Royal, McShea and his colleagues watched for 13 years as the warbler disappeared from four of five habitat zones on the reserve. Nationwide, the same tale has been repeated again and again: As deer populations have exploded over the past 40 years, Kentucky warbler populations have declined by 1 percent per year.

Too many deer simplify a forest, McShea says. "Instead of ending up with woody seedlings and herbaceous plants and birds and insects, all that productivity ends up inside the deer." Other examples abound: In England, when deer were kept out of one study site, moth populations quadrupled. In Finland and Sweden, slug and snail populations took off when moose and reindeer were kept out of forest plots. In the northeastern United States, deer have triggered a chain reaction by gobbling up the acorns on which deer mice depend. The mice usually keep gypsy moth populations in check by eating the moths' pupae. But when the acorns disappear, mouse populations go bust—and gypsy moth populations boom.

A simplified landscape isn't necessarily unattractive. A well-grazed forest of mature trees that has an airy understory of ferns is often called a fern park. It's homogeneous—white bread with mayonnaise—but it's pretty to walk through. "A world with high deer density does function, but it doesn't have a lot of the qualities that we want in a protected area," McShea says. Environmentalists tend to focus on saving individual plants or animals, he says. They'd get a lot further by just managing the deer: "They run the show right now."

McShea's suggestion sounds reasonable. But "management" is mostly a tidy euphemism for hunting and killing, and that's where the trouble starts. Hunters want as many deer as possible, to improve the chances of a kill. Many nonhunters would rather not kill any deer at all. Either way, wildlife managers can only protect the forest by battling public opinion.

After the poor hunt last fall, Wisconsin game manager Bill Mytton spent weeks fielding calls from angry hunters. "I have not received one phone call from anybody saying, 'Good job! Looks like deer numbers are down. Looks like orchids are going to live longer,'" he says. Even the head of the Wisconsin Conservation Congress has complained that "more deer are certainly tolerable and acceptable."

Animal rights groups, for their part, want deer controlled humanely. Yet alternatives to hunting have had limited success. Relocating deer just puts the problem in somebody else's backyard, and the animals often suffer from the stress of capture, transport, and unfamiliar digs. Contraception can help control isolated populations, but it costs a great deal, and deer