

WILDLIFE

WHITETAILED ARE CHANGING OUR WOODLANDS

By STEPHEN B. JONES, DAVID
deCALESTA, and SHELBY E. CHUNKO

One of wildlife management's great success stories is turning sour as too many deer eat their habitat away and stir the emotional juices of those who love them.



"Is Bambi Hogging the Forest?"

This headline from a January 1993 article in the *Washington Post* gets to the heart of scientists' concern that browsing by an overabundance of whitetail

deer is inhibiting forest growth and reducing the diversity of plant and animal species. The article cites an excessive deer population in Virginia C...probably five times as large as it was when European settlers arrived."), but in fact the problem extends throughout the eastern temperate hardwood forests from southern New England through the mid-Atlantic states and westward to the Crest Lakes region.

From the *Post*: "Recent studies of whitetail deer in the eastern deciduous forest demonstrate that there

can be too many deer, and that their feeding has major impacts on forest vegetation and wildlife. But the general public and deer hunters do not understand this impact. This lack of understanding greatly impedes support for the only viable solution to the problem of too many deer, which is to reduce deer populations to the point where they no longer endanger forest resources."

The task as we see it, however, is not to find a way to reduce deer populations (there are solutions, which we'll talk about later). It is

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rather to convince those for whom there cannot be "too many deer" of the serious and permanent consequences of *not* reducing deer numbers—thereby removing impediments to what we believe are necessary actions.

In his essay "Wilderness," Aldo Leopold eloquently described the phenomenon of deer overpopulation:

This effect of too many deer on the ground flora of the forest deserves special mention because it is an elusive burglary of esthetic wealth, the more dangerous because unintentional and unseen... One is put in mind of Shakespeare's warning that 'virtue, grown into a pleurisy, dies of its own too-much.' Be that as it may, the forest

landscape is deprived of a certain exuberance which arises from a rich variety of plants fighting with each other for a place in the sun.

Leopold offered those cautions as he toured Germany in 1935. Almost 60 years later and an ocean removed, we must now come to grips with our own forest system that has been out of balance for decades.

The whitetail deer, hunted to near extinction at the turn of the century, has made a remarkable recovery throughout its range. Populations have irrupted in response to protective game laws, freedom from natural predators (wolves and mountain lions were mostly eliminated by early settlers

because they preyed on livestock), and an abundance of favorable habitat (landscapes of intermingled young forest and agricultural fields that produce a plethora of deer food). Resource managers, forest landowners, and the general public are faced with the consequences—reduced diversity of woody and herbaceous forest ground cover and songbirds, delayed and altered recovery of forests from disturbance, and difficulty in regenerating commercially valuable tree species.

And the deer's impact is not limited to the forest ecosystem: Crop-damage figures are astronomical, totalling over \$80 million annually in Penns^ylvania alone. In addition,

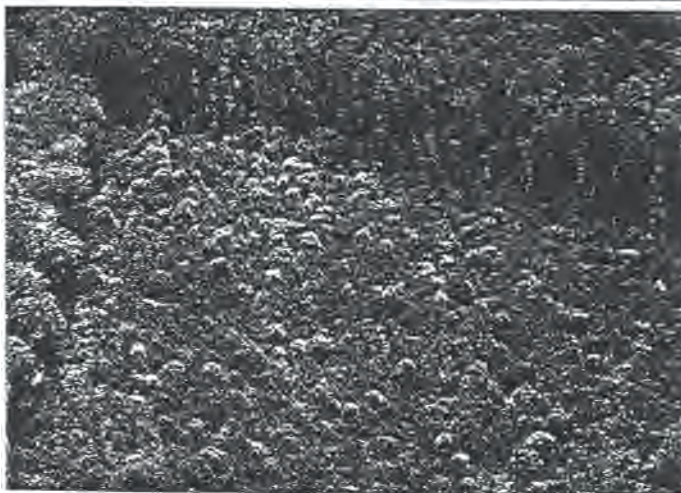
Much loved and highly adaptable, whitetail deer number 80 or more per square mile in some areas of the Northeast.



Two Pennsylvania clearcuts demonstrate the effects of deer density. Only 65 percent of the forest regenerated in the area above, where deer numbers are 80 per square mile. Forest renewal is far more complete in the area at right, where there are about 10 of the animals per square mile.

But deer numbers are not the only factor determining whether the animals are impacting other resources. The habitat itself is another vital element.

The abundant food and cover of Virginia's Shenandoah Valley, for example, can support many more deer than the large, unbroken forests of West Virginia. Timber harvesting, too, creates real snackbars for whitetails. Such areas can support higher deer numbers than can less lush forests before the animals begin to make inroads on other resources.



deer-vehicle collisions exceed 40,000 every year in both Michigan and Pennsylvania. And finally, the whitetail's voracious appetite includes most garden and home landscaping plants.

Motorists are often subjected to the conflicting sensations of

adventure and danger that accompany most nighttime drives in the rural Appalachians and lake states. There may be pleasure in viewing a doe and her fawns grazing along the shoulder, but there is definitely terror in finding a 150-pound buck in your headlights at 55 miles per hour.

High deer numbers are also implicated in the rapid increase in the incidence of Lyme disease in humans, which is the second-fastest-growing infectious disease in the country, according to a recent Associated Press article.

On the other hand, some of the effects of high deer numbers are quite pleasant:

Two of the authors are runners who, during a late-summer jog at dawn through New York's Allegany State Park, counted 55 deer along our 3.5-mile loop. The sighting triggered a special kind of runner's high.

Some observers see the parklike ambience of forests in the eastern hardwood region as another benefit of the deer situation. In many areas, there is not much undergrowth to obscure the view or interfere with a stroll through the woods. Clear visibility and ease of travel, combined with high deer populations, are factors that please some deer hunters. But other kinds of "hunters" may not be so enamored—nothing dismays wildflower enthusiasts more than the view of a barren understory, where the only evidence of an oncoming spring is the emerging fiddleheads of the current fern crop (deer find ferns unpalatable).

The above personal observations aside, researchers are providing far more than anecdotal evidence to support the claim that deer populations are too high.

First, let's define "too high" in terms of three types of carrying capacities: cultural (the maximum number of deer that can coexist compatibly with local human populations); biological (the number of deer the ecosystem can support in good physical condition over an extended period of time); and biodiversity (the maximum number of deer that can exist without negatively affecting floral and faunal diversity).

When deer numbers exceed the biodiversity carrying capacity, they eliminate some species and reduce others. Biodiversity carrying capacity is reached at deer densities lower than either cultural or biological carrying capacity. Deer-vehicle accidents, crop depredation, and garden and landscape plant losses serve notice that in parts of the East, we are pushing the boundaries of cultural carrying capacity. The research findings outlined below should convince you that we are beyond both the biological and biodiversity carrying capacities as well. In general, deer densities in excess of 20 per square mile appear to decrease

A LANDOWNER'S LAMENT

Dwight and Jo Lewis of Hills Grove, Pennsylvania, long-time Life Members of American Forest Owners Association, own and operate, with their four children, a family timber business in the heart of the state's prime hardwood country. We asked them to give us a landowner's perspective on the deer problem there. Here is the result:

The whitetail deer is changing our lives and the lives of future generations. The changes are affecting many elements of the natural world here.

The soil and climate conditions of the Appalachian range grow some of the most valuable hardwood timber in the world. The deer are decimating some of those trees, particularly the black cherry (*Prunus serotina*). We're proud of our cherry; the richest stands of cherry in the world grow here. The stumpage price for cherry currently is \$1 per board-foot!

The price is so high because the trees are disappearing. Deer eat the new seedlings, allowing only ferns to grow. Once ferns cover the ground, hardwoods cannot grow. I like to get out in the woods on a bulldozer and scrape away the thick mats of ferns, but it's disappointing to see how quickly the deer nibble off the seedlings that come up in such places.

Years ago we enjoyed hunting the big white snowshoe rabbits that were common in the swamps, and the cottontails in the thick underbrush. Often it was a New Year's Day event. The baying of the hounds as they worked the rabbits in a big circle (hopefully back toward us), the snow on the ground that sometimes allowed us to see the chase in progress, occasionally a glimpse of the ghostly snowshoes, and even a shot once in a while—those were memorable days.

But the deer have eaten away most of the brushy cover, and the rabbits have disappeared. So have the whippoorwills, which we loved listening to in the evenings but have not heard for many years.

Also gone is the wild ginseng. Years ago an old logger, who had gathered the roots in burlap bags in the 1930s, showed me a wild ginseng plant and told me they were getting scarce. There was always some of the root remaining to continue the growth. But now the ginseng is gone here as far as I know.

It used to be that areas where we cut timber grew up quickly in lush patches of wild raspberries and blackberries. Now we find lots of short plants that have been nibbled off by the white-tails, but few large plants with delicious berries.

Our life is good here in this beautiful wooded country—but it is changing. —DWIGHT LENZ



species richness (number of species present), species abundance (number of individuals present), and species composition of an affected area.

FOREST REGENERATION

The eastern hardwood region, with its abundant rainfall and generally benign climate, is irrepressibly green. Clearcut, burned, and grazed by cattle at the turn of the century, it quickly

returned to its customary green in response to conservation efforts, although the new green was brushland and not deep forest. That "brush" included the seedlings that grew into today's hardwood forests. But when we create similar forest openings today, the new growth that springs up is often of a far different nature. Commercially important, high-value hardwood trees are often difficult to regenerate. Are deer a factor?

U.S. Forest Service researchers



WILLIAM S. TEAR

Who can resist the sight of a spotted fawn in sun-dappled woods? But Bambi and his brethren in some areas are driving out such fellow forest dwellers as snowshoe rabbits, wild ginseng, and the valuable black cherry.

have found that deer can indeed eliminate the seedlings and saplings of woody plants they prefer for forage, causing shifts in species composition of future forests. Where deer density exceeds 20 per square mile, preferred plants such as sugar maple, white ash, yellow poplar, hemlock, pin cherry, oak, and aspen are eliminated. The plants that are left—black cherry, beech, striped maple, prickly ash, and the tree of heaven or ailanthus—grow into species-poor forests. An old-growth forest grove in northwestern Pennsylvania called Heart's Content supported 27 woody tree and shrub species in the understory in the 1920s, when deer density was less than 20 per square mile. Today, after 70 years of browsing by a deer herd that has averaged over 40 per square mile, only 11 woody species are left in the understory.

By their continued browsing even on non-preferred woody plants, deer also reduce the rate at which trees grow from saplings into mature trees. Scientists in Pennsylvania found that trees inside fenced plots, protected from deer, were twice as tall as those

outside after only five growing seasons. The impact of deer on tree height began at between 10 and 20 deer per square mile.

FERNS, FLOWERS, AND SHRUBS

These plants of the forest floor, together with grasses, sedges, and mosses, comprise vital habitat for numerous wildlife species, and form a major part of the forest vegetation that appeals to many private landowners, resource managers, and nature lovers.

At densities over 20 per square mile, the effect of deer on these plants is the same as on tree seedlings: Some species are eliminated, abundance and size of others are reduced, and overall composition changes.

Fewer shrubs and wildflowers means more growing space for the less palatable ferns, grasses, and sedges, which can monopolize the understory. Too many ferns and grasses will inhibit the growth and survival of tree seedlings. On sites subjected to high deer densities for decades, sometimes the only thing growing at ground level is ferns. If

trees there are harvested or blown down, no forest will replace them—only fields of ferns and grasses.

In a number of parks and refuges in the Northeast, deer densities in excess of 50 per square mile are eliminating *all* ground vegetation, including threatened and endangered plants.

WILDLIFE

The whitetail's inroads on other forest dwellers is a primary concern of Brad Nelson, a wildlife biologist for Pennsylvania's Allegheny National Forest.

"When a high deer herd decimates the shrub layer," he notes, "we lose nesting sites for forest songbirds, a winter food source for turkeys, and protective cover for ruffed grouse and black bears. I think all of us who enjoy the outdoors have at least one thing in common—we want healthy, diverse forests with abundant wildlife for our children and grandchildren to enjoy. Future generations won't have healthy forests to enjoy if deer herds remain above what the habitat can sustain."

Forest Service researchers in New England noted that high deer densities were associated with irreversible shifts in composition of some small mammal species, and a few species were lost. Similarly, researchers in Pennsylvania found that at deer densities above 20 per square mile, habitat for songbirds that nest from the ground to about 25 feet above the ground has been greatly reduced. Some of those species—the least flycatcher, wood peewee, and cuckoo—are no longer found. Additionally, abundance of songbirds generally has been reduced by about 20 percent.

Deer themselves are impacted when their numbers get out of whack. Herd health and resistance to parasites and disease decline with increases in deer density. Deaths by starvation increase.

CHARTING A COURSE FOR CHANGE

BIODIVERSITY

Forest managers view as critically important the need to maintain biodiversity, which is the collective presence of such things as woody plants, shrubs, wildflowers, songbirds, and small mammals. The concept of biodiversity is integral to the national Forest Stewardship Program, which encourages private nonindustrial landowners to practice responsible forest-resource management, and to the management of national forests, parks, and refuges.

We have many reasons to be concerned—the silence of songbirds that no longer find acceptable habitat, the absence of a spring orchid browsed to extirpation, the conversion of a commercially productive forest to species of far less value and diversity.

This is an emotionally charged issue. Although we three authors are convinced that deer populations exceed the forest's carrying capacities, many people, from hunters to state legislators, disagree. For every homeowner fighting to protect landscaping plants, many others relish observing deer in the neighborhood. For every motorist who experiences a costly collision with a deer, others cruise country roads with a spotlight to view the creatures. For every naturalist frustrated by the loss of forest diver-



sity, hundreds of hunters lament that "I just don't see deer like I used to."

The issue is further complicated by the fact that most of the negative impacts of the out-of-control deer herds are subtle enough to escape even those people who spend a lot of time in the woods. If you are middle-aged or younger, you haven't seen our forests when they were still "in balance," and thus have no way of knowing that current conditions are anything but normal. In contrast, the positive attributes of deer are apparent to everyone. Most of us are happy to encounter deer. In Pennsylvania

alone, more than one million licensed hunters generate 51.3 billion annually in local economic activity. Those two hectic weeks of hunting in November are the lifeblood of many rural communities. The issues are intensifying with the emergence of animal rights groups that decry any harvest of wildlife. Differences within the socio-political arena further polarize the issue.

On top of all that, the biology is not all that straightforward. Gaps in our knowledge prevent us from fully understanding the balance among forest disturbance, habitat, forage, and deer. Bill Palmer, a

continued On page 53

WHITETAILS ARE CHANCING OUR WOODLANDS

continued from page 25

Game Commission, admits that "We need more detailed information on the impacts of deer on other animals." Nevertheless, evidence gathered thus far points to too many deer. We must explore options for addressing the problem.

Stopgap Measures

FENCING

Where deer populations threaten forest regeneration and the potential timber value of a new forest is great enough to warrant the expense, fences may be erected to exclude deer from an area. Costs for five- or six-strand electric or woven-wire fence range from \$30 to \$150 an acre. Routine maintenance requires additional time and expense over the three- to five-year period until the new forest grows above the reach of deer.

Even if the investment presents no problem, fencing has its shortcomings. Because it is in place for a relatively short time on a small portion of the forest, it contributes little to maintaining biodiversity over the long term. Deer can infiltrate a poorly built or inadequately maintained fence. And there can be a biological consequence to excluding *all* deer—an imbalance in another direction.

A concerned landowner in northwestern Pennsylvania contacted us this summer and asked that we visit a large area that had been cut and fenced two years earlier. The fence had been effective. The area was lush with tree regeneration, but

closer inspection revealed that without deer, the area had converted to pure pin cherry. Deer love pin cherry, an aggressive competitor that few other native tree species can beat. Deer browsing helps keep its numbers under control.

This example reminds us that deer are a critical part of the ecosystem. With few or no deer, other problems with forest vegetation can occur. An emerging body of evidence suggests that very low browsing pressure from deer, like overbrowsing, can shift plant species composition, resulting in pure stands of a single species to the exclusion of all others. (See sidebar on page 54 for another fencing idea.)

TREE SHELTERS

When foresters elect to plant seedlings, the favored treatment is to protect individual trees with shelters—plastic tubes three to six feet tall that fit around the tree. Shelters are expensive—the cost of materials and labor average \$5 to \$6 apiece, not including the seedling costs.

As with fencing, there are no guarantees. And the shelters protect only the individual tree, contributing little to maintaining diversity of other resources. Shelters are a Band Aid approach intended mainly to establish commercial timber species.

HABITAT MANAGEMENT

One technique that may have merit is to reduce the "effective density" of deer simply by providing lots of forage. There are two ways to accomplish this. The first—broadcast application of a high-nitrogen fertilizer to regeneration areas—has been tried with limited success in the

Allegheny National Forest. The burst of available nitrogen rapidly boosts seedling growth beyond the reach of deer. The deer numbers remain high, but their impact abated by the rapid tree growth.

This too, however, is a stopgap measure intended only for regenerating commercial tree species on harvested tracts. Fertilization at harvest time does little to maintain biodiversity over the life of the broader forest.

The second way to lower effective deer density is to thin the mature forest more frequently and do a better job of balancing the age classes within the forest. Regionally, much of the forest is about 60 to 90 years old. A more balanced age-class distribution, with five to 10 percent of the forest in each 10-year age class (0 to 10 years, 11 to 20 years, etc.), might better support existing deer density by providing a more continuous production of deer forage than is currently available.

The Allegheny Forest demonstrated this principle by clearcutting 10 percent and thinning 30 percent of a 1,000-acre compartment over a three-year period in an attempt to overwhelm the deer herd. Regeneration was successful, but only two species—black cherry and red maple—make up over 90 percent of the seedlings. The resulting forest will be commercially valuable but lacking in diversity.

The idea of reducing effective density by overwhelming deer with forage is far from foolproof. Without hunter pressure, the deer population could rise in response to the lush forage. Perhaps most problematic is the region's land-ownership pattern. The Northeast has millions of individual, private owners holding an average of fewer than 30 acres each. The average tenure of ownership is less than 15 years.

The option may have promise locally within an area of larger ownerships or where landowners have formed associations that can link them for cooperative planning and action.

For most of the region's forests, however, we need another choice.

The Long-Term Solution

BRINGING THE HERD UNDER CONTROL

Harvesting deer by hunting is the only viable technique for reaching an enduring resolution to the dilemma. Hunting regulations must be modified to permit greater harvests to achieve deer-density target levels. (The current recommendation for "balanced" populations levels in the Northeast is about 20 deer per square mile.)

Wildlife biologist Brad Nelson agrees: "An aggressive program to harvest antlerless deer is one of the most effective ways to lower the deer herd. Allowing hunters to take two or more antlerless deer has lowered the herd in some Pennsylvania counties."

Palmer points out that the Game Commission is "committed to managing the state's deer herd. Our targeted cultural carrying capacity, which attempts to balance the tradeoffs, is 21 deer per square mile of forested habitat. Five years ago we averaged 30; today we're approaching 25. The target is within reach."

You might think that hunters would be pleased to be able to take more deer. But the strategy to permanently lower deer density makes many of them unhappy.

ODDBALL DEER DETERENTS

I problems with deer snacking on your veggies, flowers, or landscape plants, you may be interested in a couple of odd but apparently effective ways to keep Bombi at bay.

The word is getting around that the fragrant deodorant bar soap Irish Spring is a real turnoff to whitetails. Writing in a recent issue of *Field & Stream*, Ed Ricciuti tells of how deer devastated his vegetable plot until a farmer friend told him to hang bars of Irish Spring from stokes set around the garden. He did, and the deer stayed away all summer.

This discovery may send a different message to hunters and others who want to get up close and personal with deer.

And the Maryland Extension Service has details on an effective, affordable, single-strand electric deer fence made of polywire, a high-visibility plastic

filament wire interwoven with strands of stainless steel. A single strand of polywire is suspended about 30 inches above the ground from three- to four-foot-tall fiberglass rods spaced 30 to 50 feet apart.

Aluminum-foil lags," attached to the wire with tape or clips, are smeared with peanut butter. Deer are attracted to the peanut butter, try to eat it, and get zapped. The shock causes no serious harm, but leaves a lasting impression.

The polywire fence costs less than conventional high-tensile electric fencing—about \$277 for a three-acre area. It can be taken down and moved easily. Users must be aware of potential liability problems, of course.

For more info, contact the Cooperative Extension Service, 0119 Symons Hall, College Park, MD 20742; phone 301/405-4593.

Deer hunters have long been accustomed to seeing lots of deer—they expect it, even demand it. Hunters need to be better informed of the severe impacts of deer on the forest; otherwise, they simply won't support any changes in the regulations.

Even if hunters can be won over, demographic trends do not bode well for keeping the herd under long-term control. Shifting demographics are placing fewer young people in paths that lead to hunting as an adult avocation. Changing public attitudes, particularly among the more strident animal rights activists, also threaten to dilute efforts to promote hunting as a herd-reduction strategy.

Despite the difficulties, we know that reducing the herd can extend a lifeline to our forests. Just west of Green Bay, Wisconsin, private forests have the characteristic browse line and open understory that signal high herd levels. Landowners are having difficulty regenerating harvest-

ed tracts. However, on the nearby Menominee Indian Reservation, where hunting regulations are much more liberal and herd levels much lower, the forest is of a different nature. No browse line is visible, and regeneration abounds—not just tree species but also a varied and luxuriant growth that ascends from the ground cover through a multilayered canopy. It's a jungle out there!

EDUCATION IS ESSENTIAL

Unless we can achieve some form of sustained deer-herd reduction, our forests will continue to undergo a permanent change for the worse. We're losing options with each passing year as deer eliminate species after species. Action will be taken only with the informed consent of landowners, legislators, hunters, and the general public. All must be convinced of the dire consequences of inaction.

This article represents one effort to get the word out. We're working on others. Throughout Pennsylvania, demonstration areas are being created with fenced and unfenced units to dramatize the problem. One of these is near Philadelphia at French Creek State Park, adjacent to an existing nature trail. People will accept that Bambi has a dark side only when they can see it for themselves.

Our intent is not to blacklist this lovely woodland inhabitant. But the reality is that the eastern deer herd is out of control, inflicting potentially irreparable harm on forestlands. We need a solution now. AF

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