

# Deer and Forests, and the People Who Love Them

**It is common knowledge that if we allow deer to become too abundant, their health will be threatened (malnutrition, winter die-off, disease). But if our goal is to conserve biodiversity, particularly our rare plants, allowing deer to become overabundant presents concerns that extend far beyond the health of just the deer...**

by Thomas J. Rawinski

Finding a shed deer antler is a rare delight. I have found them in Winchendon, West Tisbury, Uxbridge, Sturbridge, Holden, Dudley, and almost Bedford (my companion spotted one there a split-second before I did). I don't go out of my way to look for them – they just appear while I scan the understory looking at the plant life. On average, I find one every other year in Massachusetts, which equates to about 100 days afield walking an average of 3 miles a day, or one shed found for every 300 miles walked. I have had better success finding them in Connecticut, New York, and Virginia.



Photo © Bill Byrne

A serious shed hunter would visit suburban conservation lands in eastern Massachusetts (excluding Cape Cod), where deer densities are well above the management goals set by the Massachusetts Division of Fisheries & Wildlife (DFW). Sheffield, Hampden, and Quabbin Park in Ware would also provide good shed hunting opportunities: It's easier to spot a shed when the undergrowth has been heavily browsed...

*The beautiful Yellow Lady's Slipper (Cypripedium parviflorum) is one of many plant species that may be threatened by overabundant deer.*



Photo © Chris Buelow

My work has taken me to the most glorious environs of the eastern United States. I can remember what forests used to look like before deer arrived *en masse*, and I have taken a special interest in documenting deer impacts on vegetation. I am certainly not alone – the subject is under intense scientific scrutiny all across the nation. My purpose in writing this article is to share some observations and concerns on the subject of White-tailed Deer overabundance in the context of the forest resource.

Why are deer populations rising? There are myriad reasons. Whitetails are astonishingly adaptable, as evidenced by their ability to inhabit much of the Western Hemisphere, and to thrive even in well-urbanized towns such as Needham or Dedham. Whitetails are prolific. Seven deer introduced to Block Island, Rhode Island, in 1967 grew to a herd of 700 animals by 1994. Whitetails have remarkably acute senses and keen survival instincts, evolved over millions of years, to detect and evade predators (which makes hunting them the ultimate challenge).

And finally, consider the impact of humans in radically altering habitats and predator-prey relationships. In the report, *Managing White-tailed Deer in Forest Habitat From an Ecosystem Perspective: Pennsylvania Case Study* (available from the Audubon Pennsylvania website, [http://pa.audubon.org/deer\\_report.htm](http://pa.audubon.org/deer_report.htm)), the authors state: “There is a widespread impulse to blame recent policies and management actions, or inaction, for the current deer situation, but the ultimate causes run much deeper and have been around for a very long time. Profound changes to the landscape and to interactions among wildlife species brought about by humans are responsible for the current high densities of white-tailed deer and their pervasive effects on the rest of the ecosystem.”

For a historical perspective, we can look to the writings of Aldo Leopold, who had deep concerns about the ecological devastation being wrought by too many deer, as well as concern for the health of the deer themselves. As an undergraduate in the University of Massachusetts’ Wildlife Biology Program, I was advised by the late Dr. Frederick Greeley, who in his own gentlemanly way, imparted the

wisdom of Leopold. Dr. Greeley had been a student of Leopold’s in the 1940s and I once asked him the brilliant question: “What was Aldo like?”

Fred paused, sat back in his chair with his lit pipe, took a puff, and said, “He was a very nice man.” And in his next breath he said, “It was so sad to witness the vicious attacks he endured as a result of his views on deer management.”

At Leopold’s urging and in response to widespread starvation mortality in the wintering areas, the state of Wisconsin liberalized the harvest of deer in 1943, opening an antlerless season. A record harvest was followed by public outcry. Shooting so many does was abhorrent to many people, but Leopold continued to assert the necessity of such. To make matters worse, guess in what year Disney released the movie, *Bambi*? It was 1943, and it created the perfect storm of controversy to destroy Leopold’s hope for ecologically-sound deer management in the state. In the aftermath of his defeat, Leopold articulated a compelling philosophical vision of conservation:

*Conservation is a state of health in the land. The land consists of soil, water, plants, and animals, but health is more than a sufficiency of these components. It is a state of vigorous self-renewal in each of them, and in all collectively. Such collective functioning of interdependent parts for the maintenance of the whole is characteristic of an organism. In this sense, land is an organism, and conservation deals with its functional integrity, or health.*

Had Leopold prevailed, I wonder if we’d be in the pickle we find ourselves in today.

Last summer I helped DFW biologist Chris Buelow locate Lion’s Foot (*Nabalus serpentarius*), a state endangered plant, at the Palmer Wildlife Management Area. Our concern was that the population there was being browsed by deer, and, as a result, was not reproducing. We found one remaining patch of the rare plants, and, as we suspected, the stems had all been chomped. Using dead cedar trees, we constructed a make-shift barrier around the plants, which was later replaced by fencing. By autumn, the plants had successfully flowered and all was well.



Photo © Bruce Sorrie

The Small Whorled Pogonia (*Isotria medeoloides*) shown right, is a state-endangered and federally-threatened species that is eaten by deer. Thanks to its upland habitat preferences, its small populations are typically easy to protect with fencing. The same is not true of the rare Showy Lady's Slipper (*Cypripedium reginae*), left, judged by many to be the most beautiful orchid in New England, because it typically inhabits mucky tamarack swamps where effective perimeter fencing is difficult or impossible to install.

While deer are generalist herbivores, they prefer some species over others and seem to know where the delectable plants grow. So, even when deer population densities are at moderate levels, as in Palmer and much of central and western Massachusetts, some negative impacts can be expected on rich-soil sites where deer congregate to feed. When rare species such as Lion's Foot, American Ginseng (*Panax quinquefolius*), Sweetbay Magnolia (*Magnolia virginiana*), or Small Whorled Pogonia (*Isotria medeoloides*) are threatened, fencing can be a relatively simple remedy.

But fencing isn't as viable an option in the mucky tamarack swamps of Berkshire County where Showy Lady's Slipper (*Cypripedium reginae*), the resplendent queen, presides. Her populations have dwindled in recent years, and botanists are in agreement that deer herbivory is the main reason. The Natural Heritage and Endangered Species Program recently proposed elevating the rank of the species from Special Concern to Endangered to reflect the heightened threat from deer.

Many of us have fond childhood memories of Pink Lady's Slipper (*Cypripedium acaule*). It was the universally adhered-to ethic – based on some obscure law written long ago – that people must not pick these flowers. But some of us couldn't resist the temptation to bring a few home to Mother where they were always received with gratitude and a mild reprimand: "Thank you very much, but you really shouldn't be picking these."

Today, children returning from their adventures in the woods are more likely to arrive home with deer ticks on their pants instead of lady's slippers in their



Photo © Jennifer Garrett

grasp. The decline of this iconic wildflower is a sad consequence of the burgeoning deer population in the developed landscapes of eastern Massachusetts. If you live inside of Interstate 495 and are fortunate enough to have lady's slippers on your property, you might think about purchasing some fencing before the deer eat every last one of them.

The extent to which deer are negatively impacting biodiversity in Massachusetts has not yet been rigorously documented, but observational evidence is mounting. In addition to the impacts to the aforementioned species, I am very worried about New England Blazing Star (*Liatris scariosa* var. *novae-angliae*), Northern Wild Comfrey (*Cynoglossum virginianum* var. *boreale*), Yellow Lady's Slipper (*Cypripedium parviflorum*), Trumpet Honeysuckle (*Lonicera sempervirens*), American Bittersweet (*Celastrus scandens*), and Great Laurel (*Rhododendron maximum*). These rarities need to be closely monitored, and remedial measures implemented to protect them when necessary. As an aside, deer do **not** pose a threat to rare woodland grasses and sedges, of which there are many in the state.

Herbivory impacts will vary spatially, temporally, and among plant species in relation to the population density of the herd. As deer densities steadily increase,



Photos © Thomas Rawinski

*When deer are allowed to achieve high population densities their browsing can reduce healthy woodlands rich in species diversity to impoverished habitats where most understory vegetation and tree seedlings are eliminated (left) or only certain ferns and other highly unpalatable understory plants can survive (right).*

so do the detrimental impacts on vegetation. Much of the early scientific research examined impacts on tree regeneration. Saplings of preferred Sugar Maple, Red Maple, Northern White Cedar, White Ash, and oaks are suppressed, while the less-palatable White Pine, Red Spruce, American Beech, Sassafras, Black Cherry, and Black Birch are left to grow. Over time, this selective browsing can change the species composition of woodlands. From a forestry perspective, the decline in valuable timber species is cause for concern.

About 15 years ago, a portion of the Great Cedar Swamp in Westborough was flooded by beavers, killing a stand of Atlantic White Cedar trees. Periodic disturbances of this nature are to be expected, and even welcomed. Plants and wildlife that depend on early successional conditions flourish for a time, while a new generation of young cedar trees arises.

But when I visited the area just a few years ago I was dismayed to find the young cedars heavily impacted by deer browsing. They resembled bonsai, no

higher than my knee. And these were the saplings that had managed to survive; how many others had been browsed to death during their early years of growth? Deer now represent a stressor in the population dynamics of Atlantic White Cedar, and it is unlikely that this cedar swamp will be able to return to its former glory.

To observe is not necessarily to perceive. Evaluating deer impacts requires careful study, experience in knowing what to look for, and some detective work. Consider American chestnut, which only survived the introduced blight of the 1930s thanks to its relentless propensity to sprout new stems from old root collars. But for its sprouting ability, American chestnut would already be extinct in the wild.

I visited many deer-impacted forests before I finally realized what was missing. Old chestnut boles lay on the ground and stumps were recognizable. But where were all the sprouts? Overabundant deer had prevented them from growing higher than a foot or two, which eventually led to the death of the entire plant. It was the final

nail in the coffin for American Chestnut at these sites. The best place to see this quiet drama unfolding in Massachusetts is on the south slope of Quabbin Hill in Quabbin Park, where hunting is not allowed.

In another instance, I recall a visit to Shawangunk Ridge State Forest in eastern New York, where I commented on the sorry condition of the forest vegetation. A younger botanist in our group was a bit puzzled by my comment. I explained that the forest seemed to be missing plants that ought to be there, such as White Wood Aster (*Aster divaricatus*), Calico Aster (*Aster lateriflorus*), Bluestem Goldenrod (*Solidago caesia*), Forest Goldenrod (*Solidago arguta*), and Perfoliate Bellwort (*Uvularia perfoliata*). We walked a bit further and I gravitated toward an old fallen tree. Among its branches, which formed a barrier to the deer, was a single stem of Perfoliate Bellwort.

When evaluating deer impacts to habitat, pay special attention to Perfoliate Bellwort and other members of the lily family, as these are relished by deer. False Solomon's Seal (*Maianthemum racemosum*) is a great indicator. The browsing impact is tolerable if you find at least a few flowering or

fruiting stems. In contrast, the impact is detrimental if all of the stems are small and vegetative, or in extreme cases, all but gone from suitable habitats. In the grasslands of Martha's Vineyard and Nantucket, monitor populations of Wood Lily (*Lilium philadelphicum*). This stunning wildflower is being damaged by deer on both islands.

One representative of the lily family that deer avoid is the poisonous American False Hellebore (*Veratrum viride*). It often grows with Skunk Cabbage, which is also avoided, for reasons that are rather obvious. Another plant that deer recognize as poisonous is White Snakeroot (*Ageratina altissima*), which often thrives with Hayscented Fern (*Dennstaedtia punctilobula*) in deer-impacted forests on hilly terrain. Prominent outdoor writer and conservationist Ted Williams used the phrase "ecological blight" to characterize the condition of such forests.

Much can be learned by examining places inaccessible to deer, such as steep ledges, bouldery terrain, or fenced land. If the forbs are more robust or abundant in these areas, a deer impact can be inferred.



*The Wood Lily (Lilium philadelphicum), like most members of the lily family, is relished by deer. The author reports this wildflower is being damaged by deer on Martha's Vineyard and Nantucket, and suggests that its populations in the grasslands on these islands can be monitored as indicators of browsing impact.*

*The best way to evaluate deer impacts is to construct deer exclosures and then compare the development of the vegetation on the inside versus the outside. Results, as in this case, can be dramatic.*

The very best way to evaluate deer impacts is to construct exclosures, using fencing at least 7.5 feet tall, and then to compare the development of the vegetation on the inside versus the outside. If deer are impacting the vegetation, the effect will be apparent in only a year or two, even if large-mesh woven wire fencing is used that allows for the entry of rabbits and other small herbivores. On Nantucket, exclosures might begin to show us what the natural vegetation looked like before deer were introduced to the island in 1926. (Local residents took it upon themselves to bring the animals in from Michigan, an operation that would be illegal today.) On the mainland, where deer, and now moose, are part of natural forest systems, exclosures are providing insights into the feeding habits and herbivory impacts of these animals.

Nothing, I believe, would help more in conveying the seriousness of the deer overabundance problem than having exclosures set up at high-visibility, publicly accessible sites in Millis, Medfield, Norfolk, Sharon, Milton, Boxborough, North Andover, Topsfield, Ipswich, and just about every other eastern Massachusetts town. Exclosures established on school properties would provide outstanding opportunities for student science projects. Like politics, all conservation is local, and people will care most about the places they know and love.

Revealing a more subtle but equally grim impact of overabundant deer browsing, research in Pennsylvania has demonstrated a strong link between deer and invasive plants (Knight, et al. 2009. *Natural Areas Journal* 29:110-116). In that study, native White Trillium (*Trillium grandiflorum*) was the dominant herb within the protective confines of a deer exclosure,



Photo © Matt Paul

while repulsive Garlic Mustard (*Alliaria petiolata*) a non-native, invasive species, dominated the adjacent areas where deer had access. The authors concluded that deer create and sustain conditions for invasive plants to dominate the understory, while deer exclusion reverses the trend. What a marvelous revelation: to perceive invasive plants as symptoms, and not the direct cause, of vegetation degradation in deer-impacted forests! Reducing the size of overabundant herds, or excluding deer from sensitive habitats by fencing, should shift the balance back toward native plants. The emerging mantra has become “Native plants can beat invasives if given a level playing field.”

Pay close attention to Orange Jewelweed (*Impatiens capensis*), beloved for its beautiful nectar-laden flowers, entertainingly explosive fruit capsules, and tasty little seeds. Jewelweed is an annual that germinates early in the spring and grows rapidly to form dense stands on moist soils. Deer love this plant and browse it preferentially. As deer suppress or prevent seed production, jewelweed populations dwindle or disappear altogether.

In parts of Connecticut and New York, where deer densities are extraordinary, I have walked for hours without finding any jewelweed. The habitats that should support it, and no doubt once supported it, are now dominated by a different annual, Japanese Stiltgrass (*Microstegium viminium*), which the deer totally avoid. So please monitor the stands of jewelweed in your community and sound the alarm if



**New England Blazing Star (*Liatris scariosa* var. *novae-angliae*) is one of several rare plants deer consume that warrants concern.**



Photo © Bill Byrne

## Orange Jewelweed

they begin to decline. Japanese Stiltgrass is presently found along road edges, railroad tracks and utility rights-of-way in Massachusetts. It is poised to invade the niche occupied by jewelweed if deer are allowed to provide the opportunity.

Glossy Buckthorn (*Frangula alnus*), Japanese Barberry (*Berberis thunbergii*), and Black Swallow-wort (*Cynanchum louiseae*) are three of our most troublesome invasives. All three are avoided by deer and are filling niches left vacant by decimated native plants. These species don't necessarily require deer for establishment, but they certainly flourish when deer are overly abundant. One of the most deer-resistant invasives is the spiny-stemmed Japanese Angelica Tree (*Aralia elata*), which is showing up in more and more places. Finding it recently in Quabbin Park, where deer have damaged the native vegetation, came as no surprise.

On the subject of Quabbin, I should point out that much of the Reservation is now open to deer hunting within the framework of a controlled public hunt. Where the deer have been hunted, the forest vegetation has rebounded beautifully. No single management action has done more to improve the health and sustainability of Quabbin's forests.

Many Essex County forests are getting absolutely hammered by overabundant deer, and yet, most people don't see it. The trees look fine, and tall saplings can be plentiful. But the perception changes once a browse impact survey has been conducted. Saplings of browse-preferred oak, maple and ash are practically non-

existent. There are no young hemlock saplings in the hemlock groves. American beech sprouts are scarcely a foot tall, and the deer have resorted to feeding on white pine, a non-preferred species. I've seen this level of impact many times before in my travels – in Virginia, West Virginia, Maryland, Pennsylvania, New Jersey, New York, Connecticut, and Rhode Island. I don't know, nor do I need to know, the deer density in these forests. What I *do* know is that the deer impact is high, and these forests are in trouble.

Whenever I walk in these forests, I notice they are becoming evermore open and park-like. There is diminished habitat for birds that prefer to occupy the low or intermediate layers of woodland habitats. On the forest floor the otherwise ubiquitous Canada Mayflower (*Maianthemum canadense*) is now uncommon. What you see mostly is Indian Pipe (*Monotropa uniflora*), Beech-drops (*Epifagus virginiana*), Spotted Wintergreen (*Chimaphila maculata*), Rough Goldenrod (*Solidago rugosa*), Black Huckleberry, Sheep Laurel, sedges, woodland grasses, and ferns – all plants that are unpalatable due to their chemical defenses or low-digestible content. Lowbush Blueberry, Maple-leaved Viburnum, and Blackberry, which under normal circumstances would provide soft mast (i.e., berries and the like) for many species of wildlife, are now too stunted to bear fruit. Thus, there are ripple effects, or, as researchers say, “cascading ecological effects,” of deer overabundance throughout the ecosystem. An extreme example would be the extirpation of Black Bears from Anticosti Island in Quebec, attributed to the loss of soft mast caused by decades of over-browsing of blueberry and raspberry bushes by introduced whitetails.

As high quality forage becomes scarce in deer-ravaged forests, it's no surprise that these animals venture into neighborhoods at night to raid gardens and ornamental plantings. I think we all would tolerate some level of damage to our shrubbery in exchange for the occasional opportunity to view these graceful beauties at close range outside the picture window. But when an annoyance becomes a chronic nuisance, it may be time to deploy the fencing, invite the bow-hunters, or select deer-resistant species for all future ornamental plantings.



We all have empathy toward wildlife, and it's heartbreaking to think that the doe we so admired out the picture window has entered a very dangerous environment. She has placed herself at risk of a vehicle strike as she wanders through our neighborhoods in search of food. Nothing good comes from a deer-vehicle collision. On that, hunters and non-hunters can certainly agree.

Some would say that finding solutions to the dilemma of White-tailed Deer overabundance has emerged as the nation's single greatest wildlife-management – and ecosystem-management – challenge of the 21st century. No argument here. A useful guidance document for communities struggling with this issue is *Community-based Deer Management: A Practitioners' Guide*, available on the web at <http://wildlifecontrol.info/pubs/Documents/Deer/Guide.pdf>. Let's hope that people with diverse viewpoints can reach consensus on a course of action that benefits deer, forests, and people over the long term. And let's hope that the issue is addressed with a sense of urgency in Massachusetts, before the deer herds become so much larger than they already are.

Wildlife management professionals must continue to work closely and

cooperatively with communities and other stakeholders in crafting solutions to problem situations. The book, *Wildlife and Society: The Science of Human Dimensions* (Island Press, 2009), is an outstanding resource. On page 315 one finds the following definition:

*Wildlife management is the guidance of decision-making processes and implementation of practices to purposefully influence interactions among and between people, wildlife and habitats to achieve impacts valued by stakeholders.*

In Oakham, where I live, deer hunting remains a vibrant aspect of local culture. Forests are healthy, and deer are hardly ever struck by cars. I'll probably never find a deer antler in Oakham, which suits me just fine.



*Tom Rawinski is a U.S. Forest Service botanist based in Durham, New Hampshire. He holds two degrees in wildlife biology and has worked as a plant ecologist/scientist for The Nature Conservancy, the Virginia Department of Conservation and Recreation, and the Massachusetts Audubon Society. He serves on the Massachusetts Natural Heritage and Endangered Species Advisory Committee. His email address is [trawinski@fs.fed.us](mailto:trawinski@fs.fed.us).*