August 14, 2011

Mr. Robert Masson, Biologist
Morristown National Historical Park
30 Washington Place
Morristown, NJ 07960

Re: Morristown National Historical Park Vegetation and White-tailed Deer Management Plan

Dear Mr. Masson:

We submit these comments on behalf of the League of Humane Voters of New Jersey and the Animal Protection League of New Jersey.

The purpose of Morristown National Historical Park (MNHP) Vegetation and White-tailed Deer Management Plan/EIS is to provide the framework for managing vegetation and white-tailed deer browsing in the Jockey Hollow and the New Jersey Brigade. The stated goal is to promote naturally regenerating hardwood forests with mixed classes of trees that reflect the historic and naturally diverse character of the park.

The League of Humane Voters of New Jersey and the Animal Protection League of New Jersey harbor no illusions regarding the outcome of the public comment process; the die is cast.

The Human Dimensions Research Unit advises wildlife departments and associated trade associations in the use of media, molding public attitudes, the ideal composition of local deer advisory committees (by gender; negative experiences/views). The unit has poll-tested the most effective means of discrediting non-lethal methods and how government can best meet hunter demand for access to private and public land.

Human Dimensions has advised Northeastern National Parks, including MNHP, not whether, but how, to initiate lethal programs for deer. It has addressed possible challenges that may arise under the National Environmental Policy Act and the National Park Service Organic Act "to promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

We note parenthetically that shooting organizations and forestry interests pressuring the National Park Service to permit hunting to protect forest health are simultaneously pressing the Forest Service to manage forests to maximize deer reproduction.

MNHP is poised to begin the perpetual killing of deer, intensified at times, with recurring kills, recreational or otherwise, in areas bordering the park. There will be unintended ecological consequences. Ethical and humane imperatives remain unaddressed.

Mature forests mean fewer deer. As of June, 2011, Virginia's hunters were "concerned over decline in national forest deer: "The deer herd and harvest have plummeted, especially on national forest land."[1] Biologists explained**:** **"**The quality of deer habitat on the national forest has declined. The once succulent understory that was the result of timber harvests, fires and wildlife work, has matured into contiguous blocks of aging hardwoods. Environmentalists love what is happening, but it doesn't make good deer

[1] Cochran, B. Hunters concerned over decline in national forest deer. Roanoke.com. June 2011.

habitat, and the same can be said of other species, especially grouse. Old growth forest becomes a deer desert when there is a mast failure, like in 2007, 2008 and 2009."

A similar natural decline prompted a massive "Deer Range Improvement" program in Michigan:

> In 1971, the chief of DNR's Wildlife Division proposed to the Michigan Natural Resources Commission that a major habitat improvement program be initiated with the goal being the attainment of a stable fall deer population of one million animals by 1981 (Bennett, 1971). This proposal was prompted by two different factors. One of these was a decline in good deer habitat.
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> By the 1960's and early 1970's, most of Michigan's forests were growing into a mature, late-successional stage, in which shade-tolerant species dominated (Hansen, 1977). *This meant that less sunlight was reaching the forest floor as the canopies closed over which also meant less herbacious [sic] material was able to grow. Without this food source, deer and other early successional type species declined in number.*[2] (Emphasis added.)

With natural fluctuations, the unhunted deer at Jockey Hollow have remained stable. In 1975 (Ehrenfeld 1975), MNHP deer were not damaging the understory.

The killing of the natural, or unhunted, deer population within MNHP will destroy that stability, leading to higher reproduction, a changed age structure, setting in motion a cascade of events.

Under heavy and pervasive hunting pressure, in Wildlife Management Areas (WMAs) (Black River, Sparta Mountain, and more), Great Swamp National Wildlife Refuge, 17 Morris County Parks, regional and area townships, and the adjacent Sherman-Hoffman Sanctuary, area deer are likely at peak production. The Morris County Parks Commission does not collect fertility data, yet conducts detailed "hunter satisfaction" surveys seeking ways to make the experience more pleasurable. Morris County parks under hunting regimes include:

* Baudenhausen Tract
* Bamboo Brook and Willowwood Arboretum
* Black River County Park
* Central Park of Morris County
* Elizabeth D. Kay Environmental Center
* Flanders Valley Golf Course
* Fosterfields Living Historical Farm
* Frelinghuysen Arboretum
* James Andrews Memorial Park
* Jonathan's Woods
* Knight, Allen, Luce Property
* Lewis Morris Park
* Loantaka Brook Reservation
* Mahlon Dickerson Reservation
* Mount Hope Historical Park
* Mount Paul Memorial County Park
* Old Troy Park
* Pyramid Mountain Natural Historic Area
* Schooley's Mountain Park
* Tourne Park

[2] Michigan Department of Natural Resources in Favre, David S. Detroit College of Law. 1979.

Restoring "natural" diversity is problematic: the oaks within MNHP are the result of acute human disturbance. Clear-cutting, logging, and agriculture permitted oaks, which require sunlight, to flourish. The growth of shade-tolerant trees at this stage appears to be natural. MNHP may well be in a "natural" stage of succession, albeit not what certain interests prefer to see. The life of a forest is not measured in one hundred years, or two. Avian prairie species in fact flourished during the slash and burn, intense agricultural period. Natural disturbances – wind and ice storms – create openings over time. With the level of development and early succession surrounding the park, natural events should be permitted to suffice.

The white-tailed deer is a keystone herbivore that has, very successfully, co-evolved with forests for 3.4-3.9 million years, through periods of ecological upheaval, not a mythical "balance." Deer are an important factor in creating, and sustaining, natural diversity (Smithsonian); they are an important vector in seed dispersal, for native plants, and for some human-introduced invasives. So are birds.

New Jersey Audubon and MNHP single out deer for grazing on trillium, an endangered plant, ignoring scientists' findings that deer also dispense trillium seed.[3] Japanese barberry is spread by birds.

Deer are consuming understory within MNHP. They are supposed to. Another function, other than seed dispersal, is the prevention of density-dependent disease. Deer consume red clover (another indictment). Without deer herbivory, the clover can succumb to fungus. That deer, naturally, consume parts of tree seedlings has been over-stated: the process of canopy replacement spans hundreds of years, not a decade, or since the "1980s."

The difficulties lie in introduced non-natives, which thrive whether deer are present, or not. The ornamental Japanese barberry is sold at Morris County garden centers, and at centers throughout the state. A requisite first step would be mechanical removal. A second would be to ban its sale. The fact remains that MNHP, no matter what it does, is surrounded by locales whose actions are stimulating breeding and changing age structure.

Among other management goals, the National Park Service proposes opening forest canopies so that sunlight reaches the floor. The park is already engaged in controlled burns. Both are classic enhancement of deer range. White-tails browse and forage on warm weather grasses and woody stems.

Predictably, hunted deer sought refuge within Morristown National Park. At the same time, surrounding hunts may prevent deer from dispersing from park lands. The issue is not, simplistically, the number of deer; New Jersey's herd is decreasing. Rather, we ought to look at where the white-tail is pushed and pulled, by hunting, by habitat enhancement, and by conservation politics.

> Stating that hunting in adjacent parks and suburbs has forced deer to seek refuge in Jockey Hollow in Morristown National Historic Park, Morris County and New Jersey Audubon staffers admonish the Park Service to be 'a responsible neighbor' and install an annual hunt. Jockey Hollow, alleges the Morris official responsible for adjacent hunts, is a "textbook" example of what the deer - not the hunt managers - have wrought. That hunting would drive deer into Jockey Hollow was a foregone conclusion. In response to killing programs, does increase their home range by an average of 30% (Henderson, Warren et al 2000). Hunting increases birth rates, or keeps rates high.
>
> On the fly, local managers are conducting random, patchwork kills that not only stimulate birth rates, but drive panicked animals into neighboring areas or towns. The pattern is circular. Baited kills at Baltrusol Gulf Club are causing 'a heavy influx of deer into the Watchung Reservation.' (Watchung Report, 1999). Deer fleeing heavy gunning during the Watchung annual kill seek refuge in adjacent neighborhoods (Watchung Report. 1999.) After the reservation hunt began, surrounding

[3] Velland, M., Cornell News, Dispersing seeds is newly discovered role for deer, 2003.

> boroughs initiated hunts. The refuge-seeking justifies more reservation killing. On the heels of Millburn Township 2001 deer kill, the township began receiving complaints from 'neighborhoods where deer hadn't been seen before.' Kills ensued (Russell 2000).

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Merely hopping, under political pressure, onto the lethal bandwagon solves little. The systematic and non-selective killing of deer in New Jersey – Sunday hunting; severely reduced home safety buffer zones for bows, both statewide and non-targeted -- is in large part political, or commercial, servicing industry needs to bring hunting closer to an aging and fast diminishing clientele. Absent systemic change in how deer are "managed," and for whom, the current situation will persist.

The editors of the Smithsonian publication, *The Science of Overabundance*, warn: "We therefore caution that in the absence of adequate empirical understanding of forest ecosystem dynamics, management should not continue to reduce deer numbers systematically in order to enhance woody tree production because this may have dire consequences for the entire ecosystem."

An alternative option would be an objective analysis of the cumulative impacts relating to regional and local game management regimes on Wildlife Management Areas (WMAs), private lands and woodlots leased or owned by hunting clubs or conservation organizations whose management may include food plots, cutting, burning, or farm crops. We have appended materials concerning the management of hunting lands under forestry stewardship programs and the promotion of early succession, or deer range, throughout the state. A second step would be to gather fertility and deer movement data from 17 Morris County parks, adjacent Sherman-Hoffman land, WMAs, and townships.

Studies in Virginia (Cross, McShea et al 2003) present a salient fact: in the absence of major disturbance, deer browsing does not effect canopy composition for hundreds of years. The Park has ample time to act.

- ◊ NPS Research: **Pressure on forest regeneration from a large deer population. Although there have been repeated increases and decreases in deer population estimates over the last 10 years, in general the deer population density levels have been between 50-60 deer/sq.mi.)**

The MNHP technical report (Shaw, Adams 2006) provides a remarkably incomplete history of deer management in New Jersey, limiting such management to a) the past, and b) to the "re-stocking from deer parks and preserves" beginning in 1904:

> White-tailed deer were at a low point around 1900, and in 1904, the New Jersey Board of Fish and Game Commissioners began restocking from deer parks and game preserves (Tillett 1963), despite the fact that farm abandonment in the latter half of the 19th century provided ideal habitat--a varied pattern of forests in various stages of growth combined with open fields (as at MNHP). Uncontrolled by predatory pressures or hunting in proximity to residential and commercial areas, deer populations have recovered to levels above the carrying capacity of the land.

That natural predators regulated deer may be a myth (See "Hunters replacing predators," p. 17). Far from limiting the herd, commercial hunting served to force peak reproduction.

In 1977, the Journal of Wildlife Management reported that "deer herds are being managed with ever-increasing intensity. The primary management plan has been directed at increasing the productivity of the white-tailed deer through habitat manipulation and harvest regulation" (Mirarchi et al 1977).[4] The pre-controversy literature is pervasive

[4] Mirarchi, R., Scanlon, P., Kirkpatrick, R. Annual Changes in Spermatazoan Production and Associated Organs of the White-tailed Deer. Journal of Wildlife Management. 1977. 92.

The New Jersey Division of Fish and Wildlife (DFW) reported (Burke 1990):

> Habitat development and maintenance to benefit deer* are conducted on 73 state owned Fish and Wildlife Management Areas totaling over 192,000 acres. Habitat management is encouraged on other public and private lands. Limited burning, wood harvest and planting of various agricultural crops favored by deer* can increase the carrying capacity by increasing the quality and quantity of food available.23

In 2011, WMAs encompass 328,000 acres in 121 areas. There are seven in Morris County; most manage for deer.

(Editor's Note: DFW subsequently excised the word "deer" after "benefit and "favored by deer" after "various agricultural crops." The agency has also modified the report to minimize habitat development.)

"From the mid-1970s through the 1980s," wrote DFW in 1990, "the Division and the Fish and Game Council sought to allow deer numbers to increase within the inner coastal plain …by 1990, deer occupied all available range."

Nationwide, from 1975 and 1985, the last year for which specific manipulation statistics were published, the tally included 6 million acres burned; 517,754 acres chemically defoliated; 4 million acres planted and seeded; 1.8 million acres clear-cut and bull-dozed, 264,000 acres harvested for timber -- mainly for deer. "The majority of acreage burned," wrote Interior, "impacted deer." The seeding and planting "increase[d] supply of forage for deer. . . Seventy-two percent of the areas harvested benefited deer." Benefits for deer, or hunters, included acreage managed for "small game." From 1975 to 1985, states spent $949 million to increase numbers of hunted animals, especially deer.[5]

According to the Department of Interior, manipulation affected "significant acreage" required by non-hunted species [6] dependent upon destroyed ecotypes. "Sand hill cranes, short-eared owls; Henslowe's sparrows, marsh wrens and grasshopper mice" are among the dislodged. Habitat is modified via "controlled burning, chemical usage, seeding and planting, mechanical, water development, water maintenance and timber harvest."13

The federally-funded "New Jersey Statewide Development Project" sought "to manage habitat on State lands so as to maximize wildlife populations; to develop and maintain facilities and lands for public users; and to provide public access to wildlife resources." The primary revenue magnet in New Jersey is the white-tailed deer.

Private enhancement was and remains common. In fact, it has increased. DFW advised hunters to clear-cut for deer. ("Clear-Cutting Forests: Good or Bad for Deer in New Jersey?" Fish and Wildlife Digest," 1991-92). The Natural Resources and Conservation Resources Service until recently openly advised managing private land in New Jersey for deer. USDA's South Jersey Research, Conservation and Development Council instructed farmers in burning and clear-cutting techniques for lease hunting at $50 -$250 per person, when farmers complained of too many deer.

As reported in *The New York Times*:

> Some critics says that notwithstanding the intentions of Dr. Alt and his counterparts elsewhere, many practices by state game agencies and private landowners could still increase deer numbers despite the shift in killing.

[5] U.S. Fish and Wildlife Service. Federal Aid in Fish and Wildlife Restoration EIS. 1985.
[6] U.S. Fish and Wildlife Service, Pittman-Robertson Environmental Impact Statement (EIA). 1987.

> For example, some opponents of hunting say, Pennsylvania and other states often using millions of dollars in federal money collected through firearms taxes –raise forests' carrying capacity for deer by clearing patches in the woods and cultivating food plants like clover.
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> Sue Russell, a founder of the New Jersey League of Animal Protection Voters, said quality deer management not only encouraged shooting of does, but also encouraged landowners to provide wild deer with food.
> That practice was evident on Dr. Alt's tour. He and Mr. Grasavage passed a 600 –acre tract owned by a deer hunter who had cleared wooded hills and carpeted them with cornfields – all intended for deer.
>
> A few miles away, Dr. Alt spent half an hour hearing complaints from the Castrogiovanni family, whose 600-acre dairy farm is losing corn, tree-seedlings and sprouting seed to roving herds. In essence, the only difference between the two nearby properties was that one was raising and fattening livestock, while the other was raising and fattening deer. The goal of such programs, Ms. Russell said, is "to create more targets for hunters."[7]

In 1950, farmers clamored for deer kills. The State found little merit:[8]

> During the last months of this study of deer damage, it became manifest that a large proportion of the number of complaints did not bear the same relationship to the existing degree of damage as formerly reported. Many complaining property owners asserted to the project leader that their complaints were made primarily for the purpose of impressing the Division of Fish and Game with the apparent extent of the deer problems, and to support any movement which might result in a desired reduction of the deer herd, particularly in the northern counties. Upon investigation of the complaints, rendered during 1949, it was found that 58 per cent of the total number (118) of properties involved sustained light or no actual damage at the time of inspection.
>
> Despite its usually low effectiveness, the permit method is still a favored measure of deer damage control in New Jersey, some farmers regard the killing of deer as so obviously the only solution to crop damage that they seldom calculate its cost or compare its actual efficiency with that of other methods of control.[9]

Concerns impacting forest health surfaced, and were ignored, during the 1940s.

White-tailed Deer Breeding Ecology, Habitat Development, Hunting

Habitat

Habitat management is based on white-tailed deer breeding ecology. Scientists uniformly report that well-fed does breed earlier, and bear more fawns.[10] In natural (unhunted) populations, birth and death rates "reach a balance, so that the net rate of increase becomes zero and the populations numbers stabilize at some equilibrium level" (Putman 1989).[11]

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[7] New York Times, States Seek to Restore Deer Balance, December 29, 2002.
[8] New Jersey Division of Fish and Wildlife. Final Report: Federal Aid to Wildlife: A Survey of White-Tailed Deer (Odocoileus Virginianus Subsp.) Damage, Damage Control Methods and Population Characteristics. 1950.
[9] Ibid.
[10] Abler et al, J. Wildl. Manage, 40 (3): 1976
[11] Putman, Rory, *The Natural History of Deer*, Cornell University Press (1989).

Mature forests do not support large numbers of deer. Canopies prevent the growth of requisite herbaceous plants, forbs, and grasses.[12]Deer thrive in a combination of habitat types, especially where forest (cover) meets early succession, and edge (food). State wildlife departments create edge by defoliation, clear-cutting, burning, mowing, and planting deer-preferred vegetation.

"Early successional habitats [deer range] are a priority habitat for WHIP NJ (Wildlife Habitat Incentive Program)."[13]

Describing the benefits of clear-cutting, the Ontario Ministry of Natural Resources notes that "habitat has a major influence on deer reproduction" because clear-cutting forces earlier breeding. At higher numbers, "deer may not be bred until the 2nd or 3rd estrus."[14] As the number of does increases, births decline, because "there is relatively less food available per deer."[15] The percentage of fawns and yearlings who breed early depends on their physical development, "which is based on food supply (Verme 1967)." [16]

Declining birth rates do not connote starvation or destruction of habitat. Differences in deer reproductive rates have long existed in New Jersey. Deer in southern New Jersey reached carrying capacity and reduced fertility in 1935:

> At the present time [1978] differences still exist between areas of the state. In 1975, reproductive capacity, as determined by examination of harvested females, ranged from 1.60 embryos per doe (of all age classes) included in Zone 12 to .78 embryos per doe in Zone 6 (Winkle and Burke, 1976). This is a reflection of range conditions. Zone 12 is an important agricultural area and diversified in cover and food available. Zone 6 is becoming heavily urbanized and the predominant cover is mature forest.[17]

Maintenance entails mowing, thinning canopies, and controlled burns to retard natural forest regrowth and seral stage. The impact of ambitious programs is not marginal. By 1971, deer were on the decline in Michigan. The Michigan Department of Natural Resources proposed "[that] improvement programs be initiated with the goal being the attainment of a stable fall deer population of one million animals by 1981 (Bennett 1971)." Through cooperative forestry agreements, Michigan clear cut over 1.3 million acres for white-tail deer to meet "increasing wildlife user demand. . . and extensive habitat improvement program was initiated on state-owned lands." In the end, the herd swelled from 400,000 to over one million animals.

Ornithologists studying the aftermath of Bureau of Land Management forest cuts for deer report that birds associated with mature forests declined.[18] Experts report that forest management for deer "may not hold for other organisms, such as forest interior birds, salamanders and wildflowers."[19] The U.S. Fish and Wildlife Service admits these practices impact "significant acreage" required and used by non-hunted species.[20] Burning for the bog turtle must be exquisitely managed, or it can backfire.

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[12] [12] Voight, D. et al, "Forest Management Guidelines for the Provision of White-tailed Deer Habitat," Ontario Ministry of Natural Resources (Aug. 1997)

[13] Dunne, T., "Wildlife Habitat Incentive Program (WHIP) Assists State Wildlife Management Areas with Native Grass Restoration Projects," New Jersey Division of Fish and Wildlife (Mar. 2004)

[14]Voight, D. et al, "Forest Management Guidelines for the Provision of White-tailed Deer Habitat," Ontario Ministry of Natural Resources (Aug. 1997)

[15] Ibid.

[16] Ibid.

[17] Ibid.

[18] Varble, Bill, "Study: Birds flee thinned areas," Mail Tribune (21 Sept 2003)

[19] McShea, William J. et al, The Science of Overabundance, Smithsonian Institution Press (1997)

[20] U.S. Fish and Wildlife Service, "Pittman-Robertson Environmental Impact Statement" (1987).

According to Partners in Flight, "The plight of many forest-nesting songbirds has brought into question the benefits of certain traditional wildlife management techniques." While creating edge may benefit some birds, "we now know, however, that forest-interior species may disappear from areas that contain extensive edge, and that edges may serve as 'ecological traps' for some breeding birds."[21]

Hunting

Commercial hunting enhances breeding range by removing competitors:

"The increased reproductivity of a population under exploitation [hunting] is now well documented (e.g. Wact, 1955; Silliman and Gutsell, 1958; Gulland, 1962; and see also Eltringham, 1984.) In our discussions of management for control or exploitation, we have repeatedly stressed that most natural populations respond to reduction in numbers by increased productivity."[22]

In herd management, managers employ hunting to stimulate and/or sustain "productivity." As relayed by the New Jersey Division of Fish and Wildlife (undated):

> The age structure of the harvest is assumed to reflect that age structure of the population. Generally, high percentages of fawns and yearlings reflect a productive herd experiencing heavy hunting pressure.[23]

This was seen in Morris County. As noted in the MNHP technical paper:

> Tillet (1963) showing accidental deer kill in six northern NJ counties between 1953 and 1961. Morris County exceeds all others by a factor of 2 to 3. Legal kill records between 1947 and 1961 likewise show Morris County far outstripping other northern NJ counties.

Morris County deer were, and are, highly productive due partly to heavy hunting pressure in prime habitat.

Natural or unhunted populations respond to hunting with increased reproduction:

> "[w]ithin such populations, hunting acts to reduce numbers. In so doing, it brings the population once more below the level at which it is limited by environmental resources, effectively releasing the density-dependent brake on population growth. Reproduction increases, juvenile mortality falls, and the whole population age structure shifts towards young animals . . . productivity of the population rises." And: "We have repeatedly stressed that most natural populations respond to reduction in numbers by increased productivity."[24]
>
> However, it does not follow that all deer populations should or need to be hunted. Most wildlife biologists and managers can point to situation where deer populations have not been hunted yet do not fluctuate greatly or cause damage to vegetation. Certainly deer reach overpopulation status in some park situations, but the surprising thing is how many parks containing deer populations have no problems.[25]

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[21] Cornell Lab of Ornithology, "A Land Manager's Guide to Improving Habitat for Scarlet Tanagers and other Forest-interior Birds," www.birds.cornell.edu/conservation/tanager (5 Jul 2004).
[22] Putman, Rory, The Natural History of Deer, Cornell University Press. 1989.
[23] New Jersey Division of Fish, Game and Wildlife. Assessing the Condition of New Jersey's Deer Herd – 1995-1996 Harvest. Undated.
[24] Putman. R. The Natural History of Deer, Cornell University Press. 1989.
[25] Ibid.

In optimum habitat, killing thwarts natural coping mechanisms. It is at this nexus that the definition of "healthy" deer differs. To wildlife agencies serving a narrow clientele, "healthy" is synonymous with "productive."

Habitat improvement, through killing deer, can be more pronounced at nutrient-poor sites (sandy soil) that do not support large numbers of deer. DFW, partner New Jersey Audubon, and hunting club efforts to substantially increase early successional habitat in South Jersey (New Jersey WHIP) will disproportionately impact white-tailed deer, and are a problem in the making. Artificial stimulation in poorer habitat brings equally artificial consequences when deer overwinter.

In 2000, The Illinois Natural History Survey reported "deer reproduction increases" in response to killing programs within the DuPage County Forest Preserve District:

> "An additional complication in urban deer management is that per capita reproduction is density-dependent, meaning that the average number of fawns produced and reared by each doe increases as the total population decreases. This is analogous to having a bank account where the interest rate (reproduction) is a declining function of the account balance (population size). Maximum return (number of new recruits in the next breeding season) is thus achieved at some intermediate account balance where a declining balance and increasing interest rate is optimized. Similarly, deer reproduction increases as managers begin to remove deer, thus requiring managers to work ever harder to reduce the deer population to offset the population's increasing reproductive effort."[26]

Unless the goal is elimination, hunting retains deer at peak reproduction. High breeding rates in optimum habitats can marginally increase, but rates will certainly stay high. With high density, the natural breeding curve is downward; hunting reverses the curve: "Productivity reaches a peak at intermediate levels of the population and decreases as population size reaches carrying capacity, because of the depressed productivity of each individual." [27]

University of Florida researchers observed:

> "[M]ean number of fetuses per pregnant doe was greater on hunted land … than on nonhunted sites… Incidence of twinning was 38% on hunted sites and 14% on nonhunted sites. No twinning was observed among pregnant fawns or yearlings from nonhunted areas, whereas 6 of 33 (18%) of the pregnant yearlings and 1 of 3 (33%) pregnant fawns from hunted areas carried twins." [28]

"By keeping the deer population below the carrying capacity of the available habitat," explains the University of Tennessee Agricultural Extension Service, "more forage (nutrition) is available per deer":

> Thus, does are healthier, reproductive success is higher and more does are able to carry two fawns. Ironically, this can result in a greater deer harvest each year. Depending on the relationship of the population and the carrying capacity, an 'optimum sustained yield' can be achieved where a relatively high reproductive rate allows an abundant harvest each fall. With high-quality habitat and increased nutrition, the percentage of doe fawns that breed their first fall increases (sometimes up to 25 percent). Also, a higher percentage of yearling does produce two fawns instead of one. Because fawns are born at approximately a 1:1 sex ratio, more bucks may be born each year.

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[26] Van Deelen, Timothy R., Etter, Dwayne R... "Cost and Controversy in Managing Urban Deer," INHS Reports March-April 2000.

[27] "Big Game Harvest Theory and Practice." Texas A&M University. 9/28/01.

[28] Richter, A. R., and R. F. Labisky. "Reproductive Dynamics Among Disjunct White-Tailed Deer Herds in Florida." J. Wildl. Manage. 49(4):964-971. 1985.

> Therefore, in some areas, you actually can increase the number of bucks born by shooting more does."[29]

The result can be "dramatic": (''An Assessment of Deer Hunting in New Jersey,'' prepared in 1975 by the Deer Research Project of the state Division of Fish, Game and Wildlife):

> "One of the most dramatic examples of the effect of improvement of habitat and food availability on reproductive capacity occurred in the Earle Naval Ammunition Depot in Monmouth County. Range conditions were improved in this case by annual removal of deer by hunting. Since 1966, 228 male and 195 female deer have been removed. Between 1968 and 1973 the reproductive rate almost doubled. In areas [in New York State] *where no antlerless seasons were held and the population density remained unchanged, fertility declined.''*(Emphasis ours.)
>
> Monmouth County. Range conditions improved in this case by an annual removal of deer by hunting. Between 1968 and 1973 the reproductive rate doubled, an indication that the herd was in much healthier condition [higher breeding].The estimated fawn crop in 1969 was 116 fawns produced by 122 females, a reproductive rate of 0.95 fawns per doe, compared to 1974 when 78 does produced 133 fawns, or 1.70 fawns per doe (Burke et al. 1975).

Management fully extends to federal lands. Great Swamp and Edwin B. Forsythe National Wildlife Refuges actively manage acreage for deer, maintain early succession and open fields, and incorporate DFW deer management zones (DMZ). The Great Swamp is in a deer "increase" zone. The species is killed as a pest throughout Morris County and limiting refuge deer is a public rationale for the annual Great Swamp deer hunt. Forsythe Refuge management plans (2004) that outlined active management expressly for deer has been removed from the system's website.

Management texts advise:

> Increased harvest resulting from a more liberal hunting season aimed at reducing the deer population actually may stimulate the population's growth simply by cropping deer efficiently to ensure increased recruitment [birth] because of improved nutrition.[30]

In contrast, non-hunted areas show declines:

"In western areas of the state [New York] a 1.60 fawn/doe ratio existed in 1939-43. Following antlerless [male/female] seasons, the reproductive rate increased to 1.90 embryos per doe in 1947-49. In areas where no antlerless seasons were held and the population density remained unchanged, fertility declined."

This far exceeds "re-stocking from farms and preserves" in 1904. The seminal cause of artificial abundance, and mitigating science, remains resolutely off the table. All are important in resolving the problem, where it exists.

◊ **NPS Research:**

"Consumption by deer of the more palatable species and increases in populations of less palatable species resulting in changes to the forest understory. Ongoing monitoring indicates that the park has an average cover of invasive nonnative plants that is considerably greater than the cover of native plants."

[29] Agricultural Extension Service" Quality Deer Management: Guidelines for Implementation," The University of Tennessee .Undated.
[30] Hall, Lowell K. White-tailed Deer Ecology and Management. Stackpole Books. 1984.

• Competition from a variety of woody and non-woody invasive plant species. Over much of the forest, nonnative invasive plant species are out-competing native species and depressing or eliminating native tree seedling regeneration rates.

• Pressure on forest regeneration from a large deer population. Although there have been repeated increases and decreases in deer population estimates over the last 10 years, in general the deer population density levels have been between 50-60 deer/sq.mi.

We include the abstract from "Regional-Scale Assessment of Deer Impacts on Vegetation Within Western Connecticut, USA," (Rutherford and Schmitz 2010, The Journal of Wildlife Management Volume 74, Issue 6, pages 1257–1263, August 2010):

> **Abstract:** High densities of white-tailed deer (*Odocoileus virginianus*) are believed to cause broad-scale forest regeneration failure and loss of plant diversity. But, the empirical basis for such presumptions is limited. We, therefore, conducted a survey in western Connecticut, USA, woodlots to examine how spatial variation in deer densities influences variation in impacts on plant species abundance, identity and diversity, and tree regeneration. We also used a Geographic Information System to quantify trends between land-cover type and deer density. Deer density was not correlated with any vegetation or land use variable. This suggests that deer density is not a leading factor determining variation in vegetation impacts across western Connecticut.

Herbivory may enhance plant survival (Maron et al 2006):

> Most simply, herbivores can reduce plant abundance if they directly kill plants or their seeds *and* this mortality reduces the number of individuals in subsequent generations. The challenge in determining whether consumers limit plant abundance is that there are many cases where the first condition applies but not the second. For example, if consumer-induced mortality of either seedlings or adults ultimately reduces the density of adult plants, the survival or fecundity of plants that escape herbivory may be enhanced due to reduced intraspecific competition. This can counterbalance losses due to herbivory.[31]

MNHP places much of the blame, if not all, for failure of oak regeneration with white-tailed deer, yet:

> To foresters, however, oaks can be problematic. If they are cut for timber products or killed by the gypsy moth, oak wilt or fire, they do not consistently reproduce from natural seeding, though young trees that are cut or killed by fire will sprout from the stump. Typically, a forest that consisted primarily of large oak trees may naturally reproduce to become one in which oak is a minor component or absent altogether, and maples, cherry, ash, elm or other woody species take over. Because this reproduction problem is compounded by high grading, wide-scale death of oaks from gypsy moth defoliation and oak wilt, the acreage of oak forests is declining and will continue to do so

[31] Maron, J. and Crone, E. Herbivory: effects on plant abundance, distribution and population growth. 2006 The Royal Society.

in the future.[32]

◊ **NPS Research: The purpose of this plan/EIS is to provide the framework for managing vegetation and white-tailed deer browsing to promote a naturally regenerating hardwood forest with mixed age classes of trees that reflect the historic and naturally diverse character of the park.**

Over time, the absence of regeneration will result either in:

1. Replacement of forest stands with species that do not reflect the forest's historic character or natural diversity or 2. The disappearance of mixed hardwoods altogether. As a result, action is needed now to meet the Congressional intent and the park's GMP direction of maintaining a naturally regenerating and sustainable forested landscape.

Studies in Virginia (Cross and McShea et al 2003) found that deer affect "only the smaller stage classes of trees likely to die due to other limiting factors" and do not, as the Service plan says, affect forest canopy diversity unless other disturbances, many proposed by the Service, are present.

We include an extended excerpt:

Forest Succession:
A Case Study of White-tailed Deer Impacts in Virginia
Paul C. Cross, William McShea, Thomas M. Smith

The magnitude and frequency of environmental disturbances, such as hurricanes, wildfires, and ice storms, combined with deer browsing can influence the speed and direction of forest succession. We assessed the synergistic effects of deer browsing and disturbance on the canopy composition of the Appalachian Mountains of Virginia using an eight-year deer exclosure study and an individual-based gap model. The empirical data indicated that white ash (Fraxinus americana) and blackberry (Rubus) increased in the exclosure sites ($p<0.05$), and suggested that red oak (Quercus rubra), red maple (Acer rubrum), and black cherry (Prunus serotina) also increased within the exclosure sites ($p<0.10$). None of the 11 species analyzed increased in the control sites. These results were incorporated into an individual-based gap model (ZELIG) along with simulated disturbances to predict forest succession. When disturbances were simulated in combination with deer browsing the speed of forest succession increased relative to simulations without disturbance. Depending upon the disturbance regime, a large impact of deer on sapling establishment did not always translate into a similar impact on the resulting canopy composition. The importance of deer browsing versus competitive interactions amongst saplings is a function of disturbance.

We expected to see a much more pronounced impact of deer browsing within 250 years. An 80% reduction in sapling recruitment did not lead to a similar reduction in that species' canopy dominance within the first 250 years. There are two explanations for this phenomena. First of all, there is a significant time lag between the sapling and mature size classes. It may take those saplings that survive deer browsing 20 to 100 years to grow into the canopy. Secondly, most trees exhibit a type III survivorship curve (Harcombe 1987),whereby only a small fraction seedlings ever make it into the canopy. In a stable population only one offspring will survive for each adult. In terms of forest succession, there is no difference whether the mortality agent of seedlings is deer browsing or some other limiting factor (e.g. light, water) so long as the number of adults remains the same.Fig. 6 illustrates three possible survivorship curves of a single tree species. In the presence of deer the seedling and sapling mortality is greater, but the number of mature adults may not be affected. The impact of deer on the forest succession is a function of the size at first reproduction and the relationship between size and fecundity. If in Fig. 6 reproduction begins later, then deer have very little impact upon the canopy composition because there is no change in the number of

[32] Dickmann, D. and Lantagne, D. Planting Oaks for Timber and Other Uses. Michigan State University. Undated.

reproductive adults. If reproduction begins earlier then deer can impact forest succession because they alter the number of individuals that become reproductive. Disturbance increases the survivorship of one cohort of individuals (Mueller-Dombois 1987).

The magnitude of deer impact on canopy composition is not solely a function of increased sapling mortality. Disturbance and increased resource availability also affect deer impact.

Disturbance acts to speed succession by increasing the probability that a sapling grows into the canopy. When more saplings have a chance of maturing, competitive interactions and selective deer browsing become more important. Forest succession is not a game dominated by means. In the absence of disturbances, succession is controlled by those outlier trees that are abnormally large and survive to maturity. But, when resources are increased and more seedlings will survive to the canopy then the means become more important.

In the years following a major disturbance, the forest is in a state of flux. It is during these times that it is most sensitive to deer browsing. To support the above statements we ran ZELIG varying the degree of deer impact and probability of canopy mortality. To simplify interpretation, deer impact was simulated by decreasing the reproductive potential of red oak only. Different levels of disturbance and resource availability were simulated by altering the mortality of mature trees. All those trees greater than 50 cm DBH were affected by these disturbances, which occurred only in the first year of the model simulation. The lines in Fig. 7 form a 3-dimensional response surface similar to a topographic map, illustrating that the canopy composition changes most rapidly when there is both high disturbance and high deer impact. If there is high deer impact but low disturbance, then the canopy composition may change very slowly.

Although, there has been a large amount of interest in deer impact, we still have little confidence in our ability to predict how deer browsing alters forest succession. Not only are the effects of deer variable in space, but also in time. To facilitate analysis we assumed that the deer population and impact remained constant. This is almost certainly not the case. In fact, disturbances may act to increase the deer population via increased herbaceous growth. This could in turn have cascading effects upon browsing selectivity and impact. In addition, the deciduous forest is not a closed system driven only by internal factors such as plant and deer population dynamics. It is an open system influenced by external factors such as the disturbance regime of the area. Finally, the internal processes of nutrient cycling can also play an important role in forest succession (Pastor and Post 1986). Pastor et al. found that moose depressed N mineralization and net primary production by indirect effects on recruitment into the tree stratum (1993). Ritchie, Tilman, and Knops discovered that herbivore exclusion (white-tailed deer and insects of the Orthoptera and Homoptera orders) increased soil nitrate and total available N concentrations (1998). However, how nutrient cycling interacts with disturbance and browsing pressure to alter forest succession is a question that may be impossible to answer empirically due to the long time scale and difficulty of manipulating these factors.

CONCLUSION

There are particular points in time when the direction and speed of forest succession is sensitive to deer browsing. In the absence of large-scale disturbances the forest canopy is resistant to change despite large amounts of under-story herbivory. In these situations, it may take several hundred years for browsing to effect a switch in the dominant components of the canopy. This is due to the low resource availability and type III survivorship curve exhibited by most tree species. Deer affect only the smaller stage classes of trees likely to die due to other limiting factors. However, disturbances drastically quicken the pace of forest succession by increasing resource availability (e.g. light). Following a disturbance the proportion of individuals that will survive to maturity increases, and as a result there is the potential for a relatively quick change in canopy composition due to the combined effects of disturbance and browsing. This study has important implications for both researchers and managers. Mean response variables may be poor predictors of forest succession. Outliers are important, especially during periods of low resource availability. This was a case study in deer browsing impacts, but the conclusions may apply to other systems which have the same combination of type III survivorship and an extrinsic factor affecting only the smaller size classes. Managers should recognize that deer are only one factor of several affecting the complex behavior of a forest.

(End of excerpt)

Quotes are excerpted from The Science of Overabundance (William J. McShea, Smithsonian Institution Press. 1997) The book includes conflicting studies and opinions, including those of the editors.

"More deer now than ever before"

"The hypothesis that deer are more abundant now than they were prior to European colonization is equivocal at best . . . there is intense debate over how to obtain accurate counts of existing populations, let alone how to determine numbers of deer from periods before counting had even begun. Even if assessments of pre-colonial numbers could be made," says McShea; forests are now secondary, different in species make-up and appearances. (Pgs. 1-7) Editors.

"Extinctions and extirpations from these pre-colonial ecosystems have removed critical plant and animal components, and without these components, it is difficult to place current effects of deer on their environment into realistic historical perspective. For example, the historic role of deer in tree-seed consumption and seedling establishment in eastern forests is moot when a major seed predator, the passenger pigeon, and a major seed producer, the American chestnut, have both been removed from the system." (Pgs. 1-7) Editors.

McShea observes that density itself is "problematic," and that "no static number of deer per square kilometer can provide an accurate reflection of the dynamics of the system." Numbers of deer in southwestern Virginia "have remained rather sparse since 1950" while "populations on some federal lands have maintained high densities for 30 years or more. Changes in deer abundance over a broad scale do not necessarily reflect what is happening within specific refuges." (Pgs. 1-7) Editors.

Hunters Replacing Predators

"A key point made by authors in all parts is that even if agreement could be reached on a correct density of deer, maintaining such a level would be both difficult and of questionable value. Stability in either a deer population or an ecosystem is an elusive state. . . In addition, the idea that predators can serve to maintain prey populations at stable levels may be incorrect. Therefore, attempts to recreate a mythical stable population density through hunting may not be a sound strategy, if the goal is to maintain ecosystem health." (1-7). Editors.

"The easier, but not necessarily correct, approach is to say that deer are abundant in comparison with historical densities, then their numbers should be reduced." (1-7) Editors.

"This approach has been taken by the U.S. Forest Service when arguing that high deer populations can have negative effects on forest resources. . . However, care must be taken to assure that subjective criteria about what the natural world should look like are not confused with objective management goals. Caughley felt only when high-density populations disrupt ecosystem function should they be considered truly overabundant." (1-7). Editors.

Early Succession and Forestry Management for Deer

"At the forest-stand level, deer densities sufficient to satisfy hunter demands may be too high to permit sapling recruitment for a preferred browse species. Unfortunately, the old adage that good forestry management is good wildlife management may be appropriate for encouraging species such as white-tailed deer or ruffed grouse, that thrive under early successional conditions that may not hold for other organisms, such as forest-interior birds, salamanders and wildflowers." (1-7) Editors.

How Deer Impact Ecosystems

"Clearly, deer browsing affects some species, but is this effect sufficient to affect ecosystem function?" And, "Does a forest composed of browse-resistant species have any less biological worth than one with a significant complement of browse-sensitive species?" (1-7) Editors.

"Concerns about deer density may be misplaced in the presence of more severe impacts on understory composition." (298-309)

"Not only do large herbivores respond to plant heterogeneity, but they are important agents in creating it." (298-309)

"Density of woody stems did not vary with distance from woodlot, near vs. far away from fences or between deer exclosures and control plots." "Diversity showed no effect." (298-309)

"Presence vs. absence of woody species was related to six different variables: fences, woodlot, soil, moisture, diversity, mean coverage, variation in coverage"; "Black walnut was the only species to show significant effect of deer exclusion occurring more frequently when deer were present." (346-365)

"Results presented here suggest a relatively weak effect of deer on the establishment of woody plants during the first 8 years of plant succession. (310-326)

"Species richness averaged only one species higher where deer were excluded than where they were present." (310-321)

"Distance from forest edge, presence vs. absence of fences, soil moisture and features of colonizing plant community all accounted for more of the variation in the presence or absence of individual woody plant species than did exclusion of deer. Whereas black walnut showed the strongest response to deer exclusion, it occurred more frequently outside than inside deer exclosures -- a result that might reflect squirrel accessibility and caching rather than deer effects per se." (310-326)

At later successional stages, deer may have greater impact.

Early Negative Plant Response

"Some herb species showed strong response to deer exclusion early in the study. However, the relationship between short-and-longer-term responses of the vegetation to herbivory appeared to be buffered by community-level interactions involving other consumers and plants. For example, Bowers and Sacchi reported that red clover occurred in deer exclosures 3 years into the study at abundances 150% that in controls. However, a subsequent density-dependent infection of red clover by a rust-formed fungus more strongly affected red clover abundance (especially in deer exclosures) than did herbivory on forage where deer were present than where they were excluded. So with the direct effect of herbivory on forage plants was negative, by keeping plant abundances below that at which fungal infections became lethal, the net effect of herbivores was positive for some plant species. Cases like this stress that simple cause-and-effect relationships between herbivore and pressure and plant responses may be difficult to infer from abundance data alone." (310-326)

Exclosures

"The fence effect is clearly related to the dispersal of propagules by birds, who used fence tops for perching, and hence, defecation, thereby contributing to the local seed rain . . . it is clear that the fence effect is partially an artifact of using exclosures to limit accessibility by deer." (310-326)

The author goes on to note that studies showing more deer impact in later successional stages were performed in clear-cuts surrounded by forests -- "prime foraging sites of open areas of high net productivity are localized, limited and surrounded by forests." (310-326) [These sites would show more damage than in less absolute landscapes.]

"In response, deer undoubtedly concentrate foraging within clear-cuts where net productivity and food availability would be high. One result would be strong, localized deer effects on the vegetation." (310-326)

By contrast, the author's study site was "embedded within an agricultural landscape mosaic composed of an overabundance of fields but relatively little forest habitat." . (310-326)

"Evaluating the full effect of deer overabundance requires an approach that both stresses within-community responses of vegetation to herbivory as well as considers the importance of landscape structure that may function to increase herbivore intensity in some areas and decrease it in others." (310-326)

Forest Composition and Diversity -- Eastern Hemlocks

"Alverson et al (1988) suggested that deer browsing is central to decimated eastern hemlock regeneration in Wisconsin and the region. The temporal and spatial extrapolation of Alverson et al have been questioned (Mlagdenoff and Stearns, 1993) on the basis that alternative hypotheses concerning species life history, ecosystem dynamics, land-use, and climate have not been adequately evaluated. In fact, Mlagdenoff and Stearns (1993) found deer browsing to be only a secondary factor in eastern hemlock decline. Without interpretation in long-term contexts we hypothesize that the impact of deer browsing can be counterintuitive simply because of the inertia inherent in current vegetative composition or successional status. That is, time lags between browsing effects and understory growth to forest dominance must be considered, and tree species' life histories can exert greater control on forest successional trend than can even extreme browsing effects. (346-365)

Browsing Effects on Seedling and Sapling Diversity -- Bottomland Hardwood Forest

Under control conditions of no browsing (absence of deer): "Diversity showed a downward trend to a low value of approximately 7 (then exhibited recovery to a value of 10, then a final value of 8)." "The low in diversity resulted from plot domination by large American beech trees that reduce many seedlings and sprouts and exclude seedlings of many less shade-tolerant species. At the death if these canopy dominants, the recovery of seedling diversity results from a mix of tree species seedlings with a broader range of shade tolerances." (346-365)

"Although also displaying significant temporal variation, both high and moderate browsing scenarios generally resulted in greater understory diversity than did the control simulation. . . Browsing increased the seedling death rate of American beech regeneration by slowing seedling growth rate. Decreased survival of American beech seedlings is apparently sufficient to allow establishment of other species, primarily the relatively shade-tolerant red maple, oak species and green ash. This high turnover is the mechanism for increased seedling diversity. Low browsing intensity, on the other hand, displays only a moderate effect on seedling diversity and actually may lower diversity by having less of an effect on American beech seedlings relative to other species." (346-365).

". . . heavy browsing in mixed species forests can interact with species life histories to increase diversity of the seedling and sapling stratum" -- but does not eliminate the potential for browsing to eliminate preferred species. (346-365)

"This rapid departure followed by a decline in displacement is common to all three browsing intensities and results from browsing interaction with tree life histories. The initial displacement is caused by selective browsing [fewer deer] of early successional species (yellow poplar and sweet gum). Even under control

conditions these early successional species are eventually replaced with more shade-tolerant American Beech and red maple, and thus the amount of displacement declines over time. (346-2365)

Hemlocks

"However, when dealing with long-lived organisms such as trees, temporal predictions of browsing impacts on forest composition are inherently long-term. Mlagdenoff and Stearns (1993), who found that alleviation of intense deer browsing may have little direct effect on local and regional eastern hemlock population recovery highlighted the difficulties of making such predictions. Their analysis implicated climate variation, land use, natural disturbance and natural regeneration cycles as key factors in eastern hemlock decline and decreased potential for population recovery. "(346-365)

And,

"It is clear that deer browsing cannot be isolated as the single direct impact on long-term forest succession. Likewise, indirect effects of browsing cannot be overlooked as a feedback to forest ecosystem processes land succession. Moose browsing has been demonstrated to influence soil nutrient dynamics significantly by changing boreal forest stand composition and thus the quality and quantity of litter returned to the soil." 346-365)

(End of excerpts)

Gettysbury National Military Park – and Shrubs

At the July 27 scoping meeting, several kill advocates suggested Gettysburg as a successful template. Much of the program appears hit or miss. Then there are the burgeoning shrubs.

The park alludes to "deer productivity" and "movement of deer into the park." Saliently, *National Parks* noted: "Park resource managers are cooperatively managing the herd with the Pennsylvania Game Commission, *which promotes hunting outside the parks*." (Emphasis ours).

> Due to personnel limitations, time restrictions, effectiveness of the control action, movement of deer into the park, and deer productivity, it was expected to take three to four years to achieve the desired deer density goal. The deer population would then be maintained at the desired density goal of
> 25 deer/forested square mile until results of the woodlot monitoring determined if a change in the initial density goal was required to meet management objectives and woodlot stocking level goals (USDI NPS 1995). The initial reduction effort lowered the density to 158 deer/forested square mile in March 1996 and continued efforts reduced the density to 49 deer/forested square mile in March 2002 (Storm 2004). The initial deer density goal of 25 deer/forested square mile has not yet been achieved.
>
> In both the fenced and unfenced Demonstration Plots, the trend over six woodlots was a decline in seedling tree density and an increase in seedling shrub density from 1986/87 to 2002. From 1986/87 to1996 there had been a consistent trend of decreasing seedling tree densities in both the fenced and unfenced plots, with the unfenced plots always having fewer seedling tree stems than the fenced plots. However, in 2002 there were more seedling trees in the unfenced plots than in the fenced plots. The reason

for the increase in seedling tree density in the unfenced plots between 1996 and 2002 was due to the reduced deer foraging after the implementation of the Deer Management Program in 1995. Seedling tree densities within the fenced Demonstration Plots continued to decrease from 1996 to 2002 because of competition with seedling and sapling shrub species and a build-up of leaf litter within the fenced area. Over all woodlots and both the fenced and unfenced treatments, seedling tree and shrub species diversity increased over time.

In the Long-term Monitoring Plots, there was a trend of decreasing tree species diversity in all size classes from 1990/92 to 1996. From 1996 to 2002, however, there were improvements in species diversity of seedling, sapling, and overstory tree species among the woodlots, with the exception of Herr Ridge woodlot. The increases in seedling and sapling tree species diversity was closely linked to the implementation of the Deer Management Program in 1995. Conversely, the diversity of seedling and sapling oak species and density of oak seedlings and saplings were low, and in the unfenced plots (Biesecker and Pitzer woodlots) the density of oak seedlings declined between 1990/92 and 2002. Over all woodlots, the diversity of seedling and sapling shrub species increased from 1996 to 2002. The invasion and subsequent growth of non-native plant species has increased in all six woodlots.

Tree seedlings did not re-generate after park personnel killed deer; canopies, naturally, cast shade. The park opened the canopies; shrubs proliferated, smothering desired or preferred tree seedlings.

"Park resource managers are cooperatively managing the herd with the Pennsylvania Game Commission, which promotes hunting outside the parks. The density of seedling trees decreased among all the unfenced
Long-term Monitoring Plots between the 1990/92 and 1996 inventories (20,917 and 14,665 stems/ha, respectively), then increased to 27,260 stems/ha in 2002. Herr Ridge woodlot had declining unfenced seedling tree densities from 1990/92 to 3 2002, which was probably due to the difficulty in reducing the deer density in that area of the park. Over all woodlots, unfenced seedling shrub densities increased substantially with a doubling of density between 1996 and 2002 (20,508 and 41,251 stems/ha, respectively). In Biesecker and Pitzer woodlots, the density of unfenced oak seedlings steadily decreased over the 1990/92, 1996, and 2002 inventories. By 1997, the Deer Management Program was successful in reducing the white-tailed deer population to less than 20% of the pre-1995 implementation levels in both the Biesecker and Pitzer woodlots (Storm 2004). Therefore, white-tailed deer browsing was not the only reason for oak species seedling decline in these two woodlots after 1996. Light restrictions due to dense overstory canopy, understory competition with shrub species, and small mammal predation were probably having negative impacts on the presence of oak species. Seedling and sapling tree species' densities should improve with continued reduction of the white-tailed deer herd, removal of non-native shrub species, and opening of the overstory tree canopy to the recommended 60% Vegetation and Deer at Gettysburg National Military Park Page 4 of 8 stocking level.

There were increases in native seedling tree species diversity and seedling tree height in the Canopy Treatment Plots since the implementation of the Deer Management Program. Over all canopy treatments in 2002, the seedling tree densities were above the 60% stocking level goal of 16,834 stems/ha in Bushman Hill (36,111 stems/ha) and Powers Hill (28,889 stems/ha) woodlots but not in Herr Ridge woodlot (6,111 stems/ha). Over all woodlots in 2002, seedling tree densities were adequate in the closed (27,500 stems/ha) and partially open (37,222 stems/ha) canopy treatments but not in the open canopy (6,389 stems/ha) treatments. The increase in seedling tree density in the partially open and closed canopy treatments was due to the combination of reduced whitetailed deer herbivory after 1995 and less competition with shrub species than in the open canopy treatments. Although seedling tree Vegetation and Deer at Gettysburg National Military Park Page 5 of 8 http://www.nps.gov/nero/science/FINAL/GETT_deer/GETT_deer.htm 8/10/2011 densities were lowest in the open canopy treatments in 2002, the more favorable growing conditions when the plots were first established in 1992 enabled the initial seedlings to achieve greater height growth and grow into saplings between 1994 and 1996. By 2002, over all woodlots, more seedling trees had grown into the sapling size category in the open canopy treatments than in either of the other two canopy treatments. However, seedling trees were not surviving or growing into the upper height classes and being recruited in sapling trees at densities sufficient to achieve the historic forest overstory as described in Fairweather and Cavanaugh (1990).

It is likely that the density of seedling shrubs influenced the presence and growth of seedling trees in the Canopy Treatment Plots. Among all woodlots and canopy treatments, the seedling shrub density increased from 37,834 stems/ha in 1992 to 64,444 stems/ha in 2002. Seedling shrub density was three times greater than seedling tree density (23,704 stems/ha) over all woodlots in 2002. Two native shrub species, Rubus and spicebush, were the dominant seedling shrub species with densities of 24,352 and 20,463 stems/ha, respectively, in 2002. Non-native seedling shrubs combined comprised 15% of the total seedling shrub density in 2002.

The Park's goal remains: kill more deer.

◊ N**PS Preliminary Management Strategies**

The following elements represent preliminary management strategies for potential alternatives and revisions may occur throughout the plan development process.

Vegetation Management
- **Removal of invasive species (physical and/or chemical)**
- **Improve conditions, such as selective tree removal, to increase the amount of sunlight that reaches the forest floor to encourage the regeneration of native hardwoods**
- **Soil amendments**
- **Experimental native forest planting**

- **Fence sensitive native vegetation to exclude deer**
- **Use of white-tailed deer repellants**

White-tailed Deer Browse Management
- **Deer fencing in targeted areas**
- **Reproductive control (surgical and/or chemical)**
- **Lethal reduction with firearms**
- **L lethal reduction without firearms**

Lethal Action Would Impair MNHP Wildlife for Future Generations

By definition, directly causing the death, wounding, or crippling of an animal within the boundaries of a National Park qualifies as an impairment.

The indirect impacts of shooting are pernicious and long-term. National Wildlife Refuge System managers rate hunter-caused mortality and disruption the primary cause of "disturbance" to refuge wildlife.[33] As noted by the U.S. Fish and Wildlife Service:

Direct effects of hunting on waterfowl are death, crippling and disturbance. Bélanger and Bédard (1995) conclude that disturbance caused by waterfowl hunting can:

1) Modify the distribution and use of various habitats by birds (Owens 1977; White-Robinson 1982, Madsen 1985);
2) Affect their activity budget and reduce their foraging time and consequently their ability to store fat reserves necessary both for migration and breeding (Raveling 1979; Thomas 1983); and
3) Disrupt pair and family bonds and contribute to increased hunting mortality (Bartelt 1987).

Knight and Cole (1995) concluded that hunting alters behavior, population structure, and distribution patterns of wildlife. Hunting can also affect the diversity and number of birds using a site (Madsen 1995).[34]

The U.S. Fish and Wildlife Service literature review, "Managing Visitor Use and Disturbance of Waterbirds,"[35] lists hunters, boats, pedestrians, researchers, anglers, aircraft, and general recreational activities (listed in decreasing order of citations) as "important disturbance sources based on Dahlgren and Korschgen's 1992 review of 211 waterfowl/human interaction publications (Dahlgren and Korschgen 1992 summarized by Morton 1995, Table 1)."

Northeastern managers report "lowered productivity, aberrant behavior, reduced use of preferred habitat, reduced use of refuge lands, and mortality to be consequences of human disturbance on their refuges (Purdy et al. 1987)." [36]

Purdy et al. (1987) and Pomerantz (1988) categorized destruction and disruption of refuge wildlife and habitat as a direct result of hunting and other human uses:[37]

1) Direct mortality: immediate, on-site death of an animal;
2) Indirect mortality: eventual, premature death of an animal caused by an event or agent that predisposed the animal to death;
3) Lowered productivity: reduced fecundity rate, nesting success, or reduced survival rate of young
4) before dispersal from nest or birth site;

[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Ibid.
[37] Ibid.

5) Reduced use of refuge: wildlife not using the refuge as frequently or in the manner they normally would in the absence of visitor activity;
6) Reduced use of preferred habitat on the refuge: wildlife use is relegated to less suitable habitat on the refuge due to visitor activity; and
9) Aberrant behavior/stress: wildlife demonstrating unusual behavior or signs of stress that are likely to result in reduced reproductive or survival rates.

Citations for the most frequent sources of human disturbances of waterfowl in 211 journal articles (Morton 1995 adapted from Dahlgren and Korschgen 1992) rank hunting first, yet the activity is now a "priority public use" on refuge lands:[38]

1) Hunting 71
2) Boating 66
3) Human activity (pedestrians) 58
4) Research/investigator 55
5) Fishing 55
6) Aircraft 47
7) Recreation: general & aquatic 43
8) Development 24
9) Noise 22
10) Roads/traffic 21

The federal literature review holds that "[I]nappropriately managed visitor use can lead to degraded habitat conditions or reduced wildlife use of refuges, as demonstrated by various studies cited in this document."[39]

National wildlife refuges in the northeast report that twenty species, including shorebirds, waterfowl, great blue herons, deer, eastern bluebirds, loggerhead turtles and herons, were negatively impacted by hunting and other human use of refuges.[40] Managers characterized the impacts to be of "great importance 58.5% of the time, of moderate importance 22.1%, and of minor importance only 19.5%" Exploring on foot, driving on beaches, hunting and driving on roads, feeding and petting wildlife and other recreation were disruptive.

Schummer and Eddleman (2001) report that recreational disturbances (primarily hunting) of waterbirds at Tishomingo National Wildlife Refuge, Oklahoma, accounted for 87 percent of all disturbance while natural natural predation accounted for only ten percent.[41]

Hunting and other human activities cause "two times greater" disruption than do natural predators.[42] At Sacramento National Wildlife Refuge, Wolder (1993) found that 'disturbances by humans caused both longer duration of alert and flight behavior in northern pintails than compared to disturbances caused by raptors or other animals. Bélanger and Bédard (1995) found that human related disturbances of greater snow geese were more frequent than natural or unidentified disturbances in both spring (72% vs. 28%) and fall (81% vs. 19%)." [43]

With unknown but apparent frequency, hunters shoot into crows' nests:

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[38] Ibid.
[39] Ibid.
[40] Purdy, K. G., G. R. Goff, D. J. Decker, G. A. Pomerantz, and N. A. Connelly. 1987. A guide to managing human activity on National Wildlife Refuges. Human Dimensions Research Unit, Department of Natural Resources, Cornell University, Ithaca, New York/U.S. Department of Interior, Fish and Wildlife Service, Office of Information Transfer, 1025 Pennock Place, Suite 212, Fort Collins, Colo. 80524. 57 pp.
[41] DeLong, A. K. 2002.
[42] Ibid.
[43] Ibid.

> Hunters who shoot out nests of crows and black-billed magpies in May to reduce predation of these birds on waterfowl nests have an effect opposite that intended, for flocks of non-breeding crows entering the empty territories.[44]

According to the U.S. Fish and Wildlife Service literature review:

> The immediate response by wildlife to recreational activity is behavioral changes or death. The long-term effects on individuals are altered behavior, vigor, productivity, or death. The long-term effects on populations are altered abundance, distribution, or demographics; and the long-term effects on the communities are altered species composition and interactions. Burger (1995) describes the nesting and foraging patterns of Atlantic coastal waterbirds (herons and egrets, gulls, terns, and shorebirds) and human recreational activities, including fishing and calming, waterfowl hunting, boating, swimming, sunbathing, picnicking, jogging and walking, photography, and bird-watching. Considerable temporal and spatial overlap of waterbird use and recreational activities existed (Burger 1995).[45]

Also:

> Human disturbance (one cause alone or many types acting synergistically) may reduce the overall carrying capacity of a given staging area for waterfowl and other waterbirds (Pfister et al. 1992). Disturbances may affect an individual's energy balance (Fredrickson and Drobney 1979), and in the long-term may affect an individual's reproduction or survival (Knight and Cole 1995). However, long-term effects of human disturbance are difficult and expensive to study.[46]

Acknowledging the gravity of the situation, the U.S. Fish and Wildlife Service proposes opening more refuges to gunning.

<u>Physiological Response to Hunting</u>

Human predation can cause distinct physiological fight or flight or passive response in other animals present in the area, setting in motion a cascade effect:

> Gabrielsen and Smith (1995) characterized the "active defense response" or "fight or flight response" by birds and mammals as a physiological response that includes increased heart rate and respiration, increased respiration depth, increased blood flow to skeletal muscle, brain, and heart, increased oxygen consumption, increased body temperature, elevation of blood sugar, increased metabolism, and reduced blood flow to the skin and digestive organs. Lowered body reserves have negative effects on the individuals concerned. When combined with other factors, such as a stressful winter, the animals could die or fail to reproduce. In such cases, populations would decline. The passive defense response involves profound physiological adjustments. Some of the major physiological adjustments for animals exhibiting the response include inhibition of activity, decreased blood flow to skeletal muscle, reduced blood flow to digestive system, reduced heart and respiratory rate, and a reduction of body temperature"

> Anderson (1995) held that "while all impacts on animals cannot be documented, it is clear that loss of body reserves has negative effects on the individuals concerned. When combined with other factors,

[44] Reichholf, J. 1976. The influence of recreation activities on waterfowl. Pages 364-369 in M. Smart, ed. Proceedings of the international conference on conservation of wetlands and waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December, 1974. International Waterfowl Research Bureau, Slimbridge (Glos), England.
[45] DeLong, A. K. 2002.
[46] Ibid.

such as a stressful winter, the animals could die or fail to reproduce. In such cases, populations would decline."[47]

Federal researchers acknowledge short-term negative impacts; address damaging long-term effects of curtailed feeding and reproduction, and acknowledge that much needs to be learned:

> Some instances are obvious and easy to observe, such as when shooting occurs on a hunt day and birds immediately stop feeding and disperse. In other cases vigilant observation and study may be required, such as interruption of a particular seasonal songbird species while feeding along a well-used trail that is open year-round.[48]

Displacement; Reduced Feeding

In response to open-water scull-boat hunting in California, brant left the bay and flew to the ocean where food was scarce.[49] Other birds flee to feed on private lands and agricultural fields:

> Thompson (1973) reported that waterfowl use was inversely related to human hunting, fishing, and boating; Thornburg (1973) described the local movements of migrating diving ducks as a morning flight at dawn from highly disturbed (hunter, fishing, and boating activity) sections of During this time, 90 percent of waterfowl were located on 28 percent of the study area in areas with lower abundance of invertebrates, or food.[50]

Disturbance limits access to food:

> Kahl 1991 suggested that reduced forage access may decrease survival of canvasbacks by causing birds to remain on a staging site longer and forage under suboptimal conditions, or by causing birds to migrate in shorter flights with more frequent stops (Korschgen et al. 1988, Serie and Sharp 1989). Kahl concluded that the frequency of disturbance (boating associated with hunting and fishing) and limited access to food resources documented in his study in Wisconsin suggested that human disturbance is an important management concern.[51]

This displacement is directly related to reducing the birds' vital intake of food.

Hunting Depletes Survivor Energy Reserves

The cumulative, taxing effect of displacement, subsistence feeding, and heightened, frenetic activity -- reduced intake, increased expenditure - caused by hunting is less immediately apparent, but no less real, than outright killing. When hunting routinely forces migrating birds to forsake high quality feeding areas on refuges, an unknown percentage cannot survive the winter and simply die. Others are too disabled to breed:

> Henry (1980) concluded that denying brants an undisturbed feeding place during the day could result in a loss of energy and lowered body weight when the birds need to prepare for northward migration and breeding. Hunting activity may increase movements and reduce time for foraging, thereby increasing energy use (Fredrickson and Drobney 1979). Disturbance due to hunting has reportedly reduced time spent in feeding and/or resting activities for several species of wintering or migrating waterfowl (Cronan 1957: lesser scaup; Paulus 1984a: gadwall; Thompson 1973, Thornburg 1973, Korschgen et al. 1985: canvasback; Morton et al. 1989a, Morton et al. 1989b: black duck; Bélanger and Bédard 1995).[52]

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[47] Ibid.
[48] Ibid.
[49] Ibid.
[50] ibid.
[51] Ibid.
[52] Ibid.

For example, a mallard would need "three days of foraging to replenish fat reserves following an eight hour flight if caloric intake were high."[53] The researchers note:

> However, if caloric intake was less (only 390 kcal/day), as provided among poor quality habitat types, then the mallard would need eight days to replenish the same reserves. With additional flight time from disturbance, foraging time is correspondingly decreased and prolongs the time necessary to meet nutritional needs. This becomes increasingly important as weather conditions get colder, requiring greater food intake to maintain body condition and weight" (Bias et al. 1997 after Fredrickson and Reid 1988).

> At Chincoteague National Wildlife Refuge, Morton et al. (1989a) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Black ducks consumed 10.4 times more energy in flight than at rest, and 1.8 times more energy in alert behavior or swimming than at rest (Wooley and Owen 1978 as cited by Morton 1995). Morton et al. (1989a) suggested that human disturbance of wintering black ducks impaired their physiological condition, thereby reducing winter survival and/or nutrient reserves carried to the breeding grounds.

> In Louisiana, Paulus (1984a) suggested that increased foraging time by gadwalls was insufficient to counterbalance disturbance factors (primarily hunting), reduced forage quality, and adverse weather conditions. Paulus reported that time spent feeding increased from 44 percent in October to 77 percent in April and noted that gadwalls spent significantly more time feeding during the night than during the day. Peak feeding activity during day and night usually occurred when daily temperatures were lowest and costs of thermoregulation were greatest.[54]

Fishing results in reduced waterfowl breeding in some areas (Keith 1961, Barngrover 1974, Bouffard 1982).[55] Anderson (1995) stated that "during the waterfowl breeding season, anglers contributed to a serious decline in breeding waterfowl."[56]

Researchers in Germany recorded a 90 percent decrease in waterfowl breeding over ten years.[57] The investigators found that a single fisherman "can prevent ducks from establishing territories or selecting nest sites when the area of open water is less than one hectare. Disturbance was less of a problem on larger bodies of water. Intensive angling reduced the number of waterfowl nests by 80 percent, and the remaining nests were found only in areas inaccessible to anglers" (Reichholf 1976).[58]

The biologists observed that "breeding success is also much lower in areas with anglers because of clutch losses to crows (Corvus sp.) and black-billed magpies (Pica pica); the same is true for boating. Also the motor boat's bow wave tips over exposed nests."[59]

At Seney National Wildlife Refuge in Michigan, managers reported low waterfowl use of refuge wetland areas where fishing was allowed. When fishing was discontinued, "a marked increase in number of broods and adults was observed (Beard 1953)."[60]

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[53] Ibid.
[54] Ibid.
[55] Ibid.
[56] Ibid.
[57] Reichholf, J. 1976.
[58] Ibid.
[59] Reichholf, J. 1976.
[60] DeLong, A. K. 2002.

Entanglement in fishing line and trammel nets results in waterfowl fatalities (Thompson 1969) and "degradation of wildlife habitat (Liddle and Scorgie 1980).

Viewing and Hiking

Even seemingly innocuous, non-violent activities such as bird-watching (and competitive birding contests), hiking, and photography were impactful. Quick movement, location, noise, distance from an animal, the method of movement, predictability of movement, the number of people, the time of year, "can negatively impact wildlife by altering wildlife behavior, reproduction, distribution, and habitat (Purdy et al. 1987, Knight and Cole 1995)":

> "Nature viewing by its very definition has great potential to negatively affect wildlife. Avid wildlife viewers intentionally seek out rare or spectacular species. Some types of wildlife viewers have a reputation for striving for the most viewing opportunities in the least amount of time (e.g., bird listing). Because these activities may occur during sensitive times of the year (e.g., nesting), and because they often involve close approaches to wildlife for purposes of identification or photography, the potential for negative effects is large."

By any reasonable extension, given serious disturbance caused by relatively mild human activity, any lethal operation within Morristown National Historical Park will not leave the park's wildlife unimpaired. Lethal disturbance will limit viewing and visibility; possibly across species; park visitors report they "enjoy" the deer. Disturbance applies to avian, reptile, and other species present at MNHP, and it extends to method of kill, by firearms, or "lethal reduction without firearms."

Bow killing is a particularly cruel, and inaccurate, form of hunting. The animal dies by hemorrhage or infection.

In 2006, the Texas Parks and Wildlife Department confirmed that bow hunting is neither efficient nor humane:

> "Archery: [P]ublic deer hunt data suggests that hunter success is usually much lower with this method compared to firearms hunting. Additionally, archery hunting is commonly perceived to result in higher wounding losses and increased travel distances before deer succumb to their injury (Kilpatrick and Walter 1999). This could lead to possible conflicts with nearby residents and should be considered prior to employing this technique. (Deer Management within Suburban Areas. April 2006. Texas Parks and Wildlife Department.)

Biologists place the wounding rate in Canada and the U.S. from 20 to 40 percent.

> Hunter 'crippling losses', or unretrieved kill, probably range from 20% to 40% of all ducks hit by gunfire. However, this major mortality factor in duck populations has been largely ignored by waterfowl policymakers and managers. An economic analysis of 'crippling losses' for prairie Canada and the USA was conducted, based on 1992 harvest statistics. The analysis is based on current levels of spending on habitat programmes designed to bolster declining North American duck populations, with reference to the North American Waterfowl Management Plan.[61]

Hunters are declining, sharply, nationwide; .in New Jersey, the number is halved.

Despite federal and state taxpayer subsidies to retain and recruit hunters, for socio-demographic reasons, further decline is inexorable.

[61] Michael R. Norton and Vernon G. Thomas, "Economic Analyses of 'Crippling Losses' of North American Waterfowl and Their Policy Implications for Management. Environmental Conservation", 21: 347-353 doi:10.1017/S037689290003366X.(2006).

The key to fewer deer is lower fertility.

The systematic killing deer based upon a shrinking minority is folly: it is short-term, and it is counterproductive, arresting deer at peak reproduction.

Current deer policy, if we may be blunt, centers on having it both ways: exploiting artificial abundance created by trade and client "demand" to de-regulate, gain client access, reverse the decline, and retain power -- over purse-strings, federal and state taxpayer dollars, policy, and land use. In a quest for public dollars, game departments and manufacturers share power, partially, and on a probationary basis, with "partnered" conservation groups as real hunter numbers plummet. The arrangement is premised on "business as usual"; hunting and game management practices are untouchable. Management for non-hunted species must "complement game management." Ergo, early succession. Participants are fully aware that current seral policy will yield more deer.

That will not do, not in behalf of the public trust, and certainly not from a coherent public wildlife and land policy perspective. Since 1911, from the critical seven-year delay in setting bag limits for drastically depleted migratory birds, the adhesion and complicity of conservation groups closely allied with gun manufacturers has brought us all to this point in time. The trade's definition of conservation – that wildlife does not possess intrinsic worth, and should be managed as crops – turned public lands into what conservationist William Temple Hornaday called "shooting hotels" and deer farms. An authentic ecological approach does not encompass the domination of commercial interests whose bottom line is selling ammunition, or the tailoring of nature to, before all else, accommodate industry demand and client "satisfaction."

Force-bred, its natural gender ratio skewed beyond recognition, its habitat "manipulated," the white-tailed deer requires time for recovery. A civil society's obligation is to provide a bridge to normalcy via non-lethal means, beginning with a gradual diminution of deliberate habitat enhancement that both draws deer and stimulates reproduction.

If the Park Service maintains, as it will, that deer numbers must be reduced, without first addressing the myriad counter-productive practices at work in the immediate region, we strongly suggest contraception. We want to be clear: white-tailed deer were pushed to artificial abundance. We believe that, given proper steps to undo the damage, the white-tail will not require substantial intervention. Given the intensity of what has occurred, and is still occurring, the species may require assistance. Diminution of habitat enhancement for deer should be gradual, but determined. Lethal removal causing peak production should cease.

It is no secret that recreational hunters, not to mention archery, gun, and ammunition manufacturers, opposed former Maryland governor Parris Glendenning's panel on non-lethal wildlife management. The leader of the U.S. Sportsmen's Alliance assailed its existence as a "war on sportsmen and conservation." Such bellicosity was heard in the halls of government wildlife agencies partnered with trade. Conservation groups have echoed, word for word, the commercial rationale: "inefficient and ineffective." Qualifiers to the effect that contraception should be used in conjunction with hunting, or "integrated management," are political. Scientifically, this makes no sense: contraception lowers fertility; killing increases it, or keeps the rate high.

There is another reason why killing, and killing first, is counter-productive. Dr. Brian Underwood assessed the viability of contraceptive use within MNHP. In addition to stating that contraception was viable, Dr. Underwood wrote:

Then fertility control would be used to maintain the population at that level. However, a danger in using another method to reduce a population to a lower level is reducing it to such a low level that fertility control cannot be used efficiently. Our results indicate that treating the necessary number of females in small populations is unpredictable and time-consuming due to highly variable and generally low encounter rates

(Fig. 22). Moreover, the ability to affect treatment is highly dependent on the behavior of females and if population density has been lowered previously through culling, for example, deer behaviors are likely to be at lower levels. It has been found in several studies of hunting on deer behavior (Grau and Grau 44 1980, Holsworth 1973, Roseberry et al 1969) that hunter success and kill rate decline as the season progresses. This is in part due to the decreased density, but also to the increased wariness of deer toward humans. The response of deer to people is greatly modified by experience; deer are more weary and run more frequently when hunted than when not hunted (Behrend and Lubeck 1968). Attempting to remotely deliver contraception to a population that has recently been hunted may require more time due to the increased avoidance behavior of the deer. These factors inhibit the application of fertility control by exponentially increasing the time necessary to treat the number of females required to reach population reduction goals, and thereby greatly increasing the cost of the program.

In general, deer in high density populations will be higher on the behavior scale, while at lower densities behavior diminishes and then at very low densities, plummets. In Figure 22, this phenomenon would be depicted by a line coming from the back right corner of the graph and arcing over to the front left corner.[62]

(End of excerpt)

Larry Katz, a Rutgers professor and proffered deer committee "adviser" known for vocal opposition to contraception is a self-described "activist" who sat on the boards of animal-use trade associations, including shooting, "blood sport," and vivisector interests. Authors of other negative appraisals were consultants to the Archery Trade Association. Recreational shooting or bow hunting is the first preference of shooting associations. The second, as it sustains the inevitability of lethal action, is sharp-shooting. The U.S. Department of Agriculture (USDA) says otherwise, with the "integrated management" caveat.

Contraceptives require and merit a chance, and long-term trials, to work, and to bring costs down. That said, "controlled" hunts and sharp shooters, are hardly inexpensive. Reportedly, Essex County has spent approximately $500,000 in killing South Mountain, Eagle Rock and Hilltop deer using volunteer hunts in 2008, 2009, 2010 and 2011 (OPRA), with partial use of Open Space funds. We stipulate that given time constraints, we have not been able to directly view these documents.

The Environmental Protection Agency (EPA)-approved GonaCon™ is a Gonadotropin-releasing hormone (GnRH) single shot vaccine registered for use in New Jersey. The success rate reports USDA, ranges from 88%-68% for the first year. That is 88—68% more effective than hunting, which raises fertility, or maintains animals at peak reproduction. Contraception does not immediately reduce the number of animals through killing; it lowers the fertility rate. There is a distinction, especially going forward.

USDA addresses the efficacy of GonaCon,™ including studies that in Morris County labeled "inefficient and ineffective":

Development of Injectable and Oral Contraceptive Technologies and Their Assessment for Wildlife Population and Disease Management

GonaCon™
New GnRH Single Shot

2010 Colorado Governor's Award for High Impact Research (GonaCon)
Questions and Answers: GonaCon™–Birth Control for Deer

Recent studies with free-ranging California ground squirrels, captive Norway rats, domestic and feral swine, wild horses, and white-tailed deer have demonstrated the efficacy of the single-shot GnRH vaccine as a

[62]Underwood, B. Exploring the Feasibility of White-tailed Deer Fertility Control Programs Technical Report NPS/NER/NRTR—2007/087.

contraceptive agent. Infertility among treated female swine and white-tailed deer, for example, has lasted up to five years without requiring a booster vaccination.

Recent studies have examined the practicality of administering GonaCon™ to free-ranging white-tailed deer as well as the efficacy, toxicity, and safety of the vaccine. Field studies in Maryland and New Jersey evaluated the efficacy of GonaCon™ as a contraceptive agent for free-ranging female white-tailed deer. In Maryland, an overpopulated deer herd on a completely fenced site was initially reduced in density by Wildlife Services sharpshooters at the request of property owners. Once the population size was reduced to a level that could be supported by the available habitat, contraception was applied to adult females. Forty–three does were captured, marked, and released at their capture sites during July 2004. Of those does, 28 were injected with GonaCon™ vaccine, and 15 were maintained as unvaccinated control animals. Data show the vaccine to be 88 percent effective the first year and 47 percent effective the second year in treated deer.

In July 2005, a similar field study involving another 28 deer was started in Morris County, NJ, that showed 67 percent effectiveness the first year and 48 percent effectiveness the second year. NWRC scientists collaborated on this study with White Buffalo, Inc., a non-profit, Connecticut-based research organization dedicated to conserving ecosystems through wildlife population control.

(End of excerpt)

We urge restraint: given the unhunted or natural characteristics of the MNHP population, the park is better off leaving the animals alone and addressing outside influences. A "reduction" of 50%, by lethal or non-lethal means, is excessive.

Unquestionably, the National Park Service holds a duty to protect our forests and the wildlife therein. As certain, that duty encompasses protecting both from demagoguery and systematic destruction that may not be in the long-term best interest of either.

Sincerely,

Susan E. Russell
Wildlife Policy Specialist
LEAGUE OF HUMANE VOTERS OF NEW JERSEY
Animal Protection League of New Jersey

S2649

WITH A WINK AND A NOD, DEER FARMING PRACTICES CONTINUE AS ANIMALS ARE KILLED BY HISTORICALLY UNETHICAL MEANS

Excerpt from Full Report

By Susan Russell
Wildlife Policy Specialist

Farming Deer, and Killing Them, Too - S2649

The latest in a cascade of de-regulatory and hunter access bills is S2649, sponsored by Senators Bob Smith (D-17) and Jennifer Beck (R-12).

The legislation legalizes poaching and banned marketing hunting practices long considered unethical, unsafe, and unsporting.

New Jersey Senate Bill 2649 permits killing animals at point-blank range over food, with "a firearm or weapon of any kind," to "kill, destroy, injure, shoot, shoot at, take, wound, or attempt to take, kill, or wound, a deer, or have in possession or control any firearm or other weapon of any kind for such purposes." Participants may "utilize an illuminating device or devices, including but not limited to a spotlight, flashlight, floodlight, or headlight, whether portable or fixed to a motor vehicle or any other kind of vehicle, to locate and stun deer," and shoot from vehicles.

S2649 expands the forested ground subject to a depredation permit to include lands under the Forest Stewardship Plan or Woodland Management Plan.

Left untouched for political purposes are ongoing habitat enhancement projects on government and private lands that stimulate white-tail reproduction for gunning.

Nationwide and irrespective of deer, the National Rifle Association and the National Assembly of Sportsmen's' Caucuses, an industry-sponsored (firearms, archery, and equipment manufacturers) lobby, are promoting model de-regulatory and hunter access legislation to reverse dramatic declines in hunter-clients. Under a separate organization, Teaming with Wildlife, the trades are partnered with the Audubon Society, national and state.

S2649 Applies to Lands Managed for "Trophy Bucks," Deer Productivity, and Hunting

An unknown yet significant portion of the acreage to which S2649 applies is directly, or indirectly, managed for deer productivity and recreational shooting opportunities under the Forestry Stewardship and Woodland Management Plans.

Hunting clubs lease or own large tracts for shooting. Generally, landowners or lessees manage leased lands "for deer," through woodlots, thinned stands, edge cuts or openings, and food plots.

The fact is known to former bill authors and present supporters: The statement for forestry stewardship bill S1648 (2006), sponsored by Senator Robert Singer (R-Burlington, Mercer, Monmouth, and Ocean):

> "*This bill would remove that statutorily-induced inhibition with respect to hunting as well as fishing and trapping on and would, thus, limit the potential liability of landowners (as well as lessees and occupants of the lands) who open their forest lands to hunting, fishing, or trapping activities for a fee or pursuant to a lease given to, for example, a hunting club.*"

Habitat management and hunting influence doe fertility rates.

Leased Lands Managed for Hunting

"Intensely Managed Property"

An ad posted on njhunter.com (January 3, 2011):

- Right now 800 acres of continuous farm land in old wick NJ [sic], perfect big buck land, corn, beans, thickets, carefully laid out food plots. 45 preset lock on and ladder stands.
- On January 13: Tree Farm for Rent – This property is part of the New Jersey Forestry Stewardship Program.
- May 30, 2009: 77 acres of great hunting land in Hunterdon County, Zone 41 for deer and turkey hunting with bow or gun. Another ad offered 350 acres in Hunterdon County.
- The Burlington Sportsmen's' Club in Hunterdon County manages "1000 acres of hunting properties in New Jersey" on separate tracts of land. Tract locations are not published.
- American Whitetail LTD, in Burlington County, manages 2300 acres on leased or owned properties with "food plots," "productive wood lots" and deer-preferred crops.
- Under the Wildlife Habitat Incentive Program, "small game" hunting clubs also manage lands for early successional species – bobwhite quail and eastern cottontail rabbits. The habitat creates optimum breeding ground for white-tailed deer.
- Hunters also manage the lands for pheasant – a non-native species exempted from conservationist "non-native" campaign.
- Washington Township in Morris County is leasing parcels of open space to hunting clubs. Readington Township in Hunterdon County has been leasing township-owned open space to hunt clubs for eight years.
- The Sunday Hunting Law, publicly justified as a deer control measure, in fact applied to Wildlife Management Areas (WMAs), annually managed, through edge, forest openings, prescriptive burning, and deer-preferred crops, for maximum production of white-tailed deer.
- The Division of Fish and Wildlife manages nearly 64 percent of New Jersey deer range for stabilization or increase. Neither the Sunday Hunting nor the Perimeter Law, which permits bow hunting 150 feet from occupied homes, has targeted specific zones, regions, or forests, allowing instead broad recreational access.

Managing Hunting Areas
For Trophy Whitetail Deer

Trophy deer management has come a long way since serious hunting laws were first established in the early1900's.

> Today, not only do state agencies manage deer hunting areas; private hunting land is also being managed by hunters themselves. The managing of hunting areas for trophy whitetail deer has become a commercial industry in it's self [sic]. Serious deer hunters who own or hunt private hunting land, and hunters who hunt the same public lands year after year have trophy taken deer management to another level for themselves Archery hunting in portable hunting blinds next to a food plot can be very productive. Today with the use of A.T.V.'s (All Terrain Vehicles), a hunter can use small farming implements designed for planting deer food plots that benefit the growth and quality of deer in their hunting areas. Companies have researched and marketed deer food plot seeds that not only have higher nutritional benefits for whitetail deer, but the deer actually prefer them over crop seeds developed for the cattle industry. Seeds like clover, alfalfa, chicory and others are now planted in fields as small as 100 square feet (10 feet by 10 feet), to create that little spot so sweet that whitetails come to it time after time. Of course larger fields are also planted; one acre and much larger are common practices for the serious trophy whitetail deer hunter.
>
> **— The Deer Hunting Guide, 2010**

Managing Habitat for Wildlife

Successional changes in the landscape affect the population dynamics of hunted and non-hunted species.

Early-to-mid-successional habitats, forest openings, and crops near woodlands, provide optimum nutrition and breeding conditions for white-tailed deer. For related reasons (food), commercial hunting, unless performed on an elimination basis, elicits the same effect. Combined, habitat and hunting allow for "maximum" or "optimum sustainable yield."

Mature forests do not support large numbers of deer, as tree canopies prevent growth of forage-level herbaceous plants, forbs, and grasses for deer.[1] Deer thrive near edge, where early-growth meets forest or woodland. Edge and early succession are the foundations of enhancing, or developing, habitat for deer.

Artificial Surplus

Natural disturbances caused by storms and fires create forest openings. Under federal deer habitat development projects, state wildlife departments open canopies, allowing sunlight to reach the forest floor; thin stands, and sustain permanent edge by cutting, bulldozing, burning, mowing, and planting deer-preferred crops.

The U.S. Fish and Wildlife Service disperses federal wildlife restoration excise revenues to each state for hunter recruitment, shooting ranges, fencing, winter feeding, hunter blinds, buildings, parking lots and construction, public relations, and propagation, and habitat development.

The latter involves modifying habitat by "controlled burning, chemical usage, seeding and planting, mechanical, water development, water maintenance and timber harvest."[2]

- Systemic habitat development for deer is policy on state Wildlife Management Areas (WMAs), Bureau of Land Management tracts, Department of Defense lands, and through interagency agreements between wildlife bureaus and state and federal forestry departments; in county and state parks, through private landowner conservation incentive programs, and on private lands leased and managed for hunting.

Habitat management for deer continues, even as the State kills deer as pests. The New Jersey Statewide Development Project "manages habitat on State lands so as to maximize wildlife populations," especially deer.

- The western half of Great Swamp Refuge is intensively modified to maintain optimum habitat and breeding conditions for white-tailed deer and Canada geese.
- Throughout New Jersey, woodlands and farmed tracts leased or owned by hunting clubs are managed for deer reproduction and baiting through thinning, opened canopies, food lots and wood lots. A food plot can be an agricultural field or small lots of clover.
- The New Jersey Audubon Society vigorously lobbies for unprecedented hunter access and the destruction of deer to protect "forest systems." As vigorously, the Society encourages the creation

of sizable early successional or prairie habitat in New Jersey – the latter primarily for prairie-range species that flourished during the agricultural, slash-and-burn periods following European colonization – or for hunted quail that share habitat with white-tailed deer. (New Jersey Wildlife Habitat Incentive Program or WHIP.) WHIP emphasizes early succession," the habitat that yields more deer. The resultant deer are expendable, justify more liberal "hunter access," and de-regulated methods of kill.

- Bull-dozing and prescriptive burns for prairie species are in heightened, if not hyper, vogue on privately held conservation lands, as is burning to supplant invasive plants. The practice creates ideal breeding habitat for deer.[3] Perpetual management and altering of natural landscapes, retarding succession, is poised to become an industry – in substantial government grantsmanship and technical consulting fees, before the full repercussions are known.
- New Jersey's 2009 Forestry Stewardship Law, which erases the tax-incentive benefits of cutting and fragmenting forests, may mildly diminish excessive cutting. The law does not apply to institutional culprits: deer management on Wildlife Management Areas and private lands deliberately managed for deer. Unfortunately, interpretations of the law may require landowner toleration of recreational hunting, which is counterproductive, and trapping as a prerequisite for certification. Hunting groups who state that they are working with New Jersey Audubon say that the forestry initiatives will "maximize hunting, fishing, and trapping opportunities."

Deer Reproduction and Food

The basis of habitat management – clear cuts, early succession and grasslands, forest openings and edge, food plots and woodlots – is the white-tail's breeding ecology.

Scientists uniformly report that well-fed does breed earlier, and have more fawns. [4] Ranking deer biologist Rory Putman explains that in natural populations, birth and death rates "reach a balance, so that the net rate of increase becomes zero and the population numbers stabilize at some equilibrium level."[5]

Mature forests do not support large numbers of deer, as tree canopies prevent growth of forage-level herbaceous plants, forbs, and grasses for deer.[6] Deer thrive in what is called edge habitat – the meeting of forest and early-to-mid succession and grasslands. State wildlife departments and private landowners create edge by clear-cutting, burning, mowing, and planting deer-preferred vegetation to stimulate breeding. This type of low-growing habitat is called early succession, and it is the key to managing habitat for deer.

Describing the benefits of clear-cutting, the Ontario Ministry of Natural Resources notes that "habitat has a major influence on deer reproduction" because clear-cutting forces earlier breeding. At higher numbers, "deer may not be bred until the 2nd or 3rd estrus." As the number of does increases, births decline, because "there is relatively less food available per deer."[7] The percentage of fawns and yearlings who breed early depends on their physical development, "which is based on food supply (Verme 1967)." Maintenance involves mowing, minor cuts, and controlled burns to retard forest re-growth.

Step One: Prioritize: Cease Farming Deer

The key to naturally fewer deer is a reduced fertility rate. Hunting raises fertility rates, or keeps rates high. Actual reduction is best achieved, where feasible, through habitat change, and certainly by a gradual diminution of white-tail breeding habitat. The opposing errors of managing public and private lands for deer (early succession, food plots, burns), and vastly increased killing programs and hunter access is largely political.

In the absence of hunting, birth rates decline. In areas where managers halt habitat development (deer-preferred crops, early succession), the result is fewer deer. White-tailed deer on poorer range showed ovulation rates 67% of those attained by deer on good range (Julander et al 1961).[8] In practice, New Jersey continues to improve deer habitat.

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