An Evaluation of Deer Management Options

Northeast Deer Technical Committee

April 2008

AN EVALUATION of DEER MANAGEMENT OPTIONS

Acknowledgments

This publication was collectively developed by the New England Chapter of The Wildlife Society and the Northeast Deer Technical Committee. The Northeast Wildlife Administrators Association (composed of the Northeastern United States and Canadian Province wildlife agency heads) encouraged, examined and approved this publication.

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Production of the first printing of An Evaluation of Deer Management Options was coordinated and paid for by the Connecticut Department of Environmental Protection, Wildlife Bureau. The second and third printings were paid for by the U.S. Fish and Wildlife Service Federal Aid Administrative Funds, FY 89 and FY96, respectively.

Although numerous professional biologists have critically reviewed drafts, the following individuals have made notable contributions to the original document: Dr. James Applegate (Wildlife Dept., Rutgers University); Dr Arnold Boer (New Brunswick Fish and Wildlife Branch); Dr. Robert Brooks (U.S. Forest Service N.E. Exper. Station); James Cardoza (Mass. Div. Fisheries and Wildlife); Dr. Robert Deblinger (The Trustees of Reservations); Georgette Healy (Past Assist. To Jour. Wildl. Manage. Editor); Dr. William Healy (U.S. Forest Serv. N.E. Exper. Station); Paul Herig (Conn. Dept. Envir. Protect. Wildlife Bureau); William Hesselton (Fed. Aid, U.S. Fish and Wildlife Serv.); Jay McAnich (Institute for Ecosystem Studies); Ronald Regan (Vermont Fish and Wildlife Dept.); Dr. Steven Williams (Mass. Div. Fisheries and Wildlife); and Scot Williamson (New Hampshire Fish and Game Dept.).

This second edition was updated in 2007 by the Northeast Deer Technical Committee to accommodate advances in technology and methodology; Susan Predl (NJ Div. of Fish & Wildlife), Carole Kandoth (NJ Div. of Fish & Wildlife), and John Buck (VT Fish and Wildlife Dept.) editors. The committee thanks Bridget Donaldson (Va. Transportation Research Council) for permission to use her data on deer vehicle collisions.

The New England Chapter of the Wildlife Society is an association of professional biologists from Connecticut, Massachusetts, New Hampshire, Rhode Island and Vermont devoted to stewardship and enlightened appreciation of wildlife and its environments.

The Northeast Deer Technical Committee is comprised of professional deer biologists employed by their respective northeastern states and eastern Canadian provinces. The Committee is committed to the study and wise management of the white-tailed deer resource.

Introduction

The white-tailed deer *(Odocoileus virginianus)* is the most abundant and best-known large herbivore in the United States and eastern Canada. They are found anywhere from wilderness areas to urban parks and neighborhoods. Although whitetails are valued by many segments of society, considerable controversy exists concerning white-tailed deer management. Addressing the myriad of public values and often arbitrating the public controversies, state and provincial wildlife agencies have statutory responsibility for management of this invaluable resource. The objective of this booklet is to explain the rationale behind deer management decisions and to discuss the utility of various management options.

A Brief History of Deer Management in the Northeast

During colonial times, extensive tracts of mature forest dominated the Northeast. Early records suggest white-tailed deer were present in moderate numbers at the time. Deer populations were small and scattered by the turn of the 20th century, primarily as a result of habitat loss and unregulated market hunting. In the early 1900s, deer were so scarce in much of the Northeast that sightings were often reported in local newspapers. Concern for the loss of the species brought about laws that regulated the taking of deer. However, habitat protection and management and knowledge of deer biology were not a component of these early efforts until a stable funding source was created.

Hal Korber, PA Game Commission

Passage of the Federal Aid in Wildlife Restoration Act (better known as the Pittman-Robertson Program) in 1937 marked the beginning of modern-day wildlife management in the United States. This act earmarked income from an already existing excise tax on sporting arms and ammunition for use in wildlife management, restoration, research and land acquisition.

Early deer management efforts featured protection from unregulated exploitation. Today, efforts are directed toward the maintenance of deer populations at levels intended to: (1) ensure present and future well being of the species and its habitat, as well as with other plant and animal communities; (2) provide a sustained availability of deer for licensed hunters, wildlife photographers and wildlife viewers and (3) allow for compatibility between deer populations and human land-use practices.

Components of Deer Habitat

White-tailed deer, like all wildlife species, require adequate food, water, cover, and living space in a suitable arrangement to ensure their healthy survival. The white-tailed deer's feeding behavior is best described as that of a 'browser'. Although a lactating doe, or a buck growing new antlers, can consume up to 10 pounds of food per day, they won't do so in one location. Rather, they will slowly walk through an area and eat a little of one plant and then a little of another as, the doe with her offspring and the buck, usually by himself, cover that habitat. They often return to the site at a later time, sometimes the next day or maybe not for several days. From early spring until the first killing frosts of autumn, they feed on the variety of plant species that include grasses, herbs, agricultural crops, and ornamental plants. Water requirements are met through drinking from natural sources such as lakes, ponds, and streams. Water is also obtained through their food that has a high water content. Cover provides shelter from extreme temperatures and precipitation, as well as concealment from predators.

Optimum cover is best described as a mosaic of vegetation types that create numerous interwoven 'edges' where their respective boundaries intersect.

VT Fish and Wildlife

Throughout the northeast examples of good cover is found where forested and suburban landscapes are interrupted by powerlines, logging operations, agricultural activities, roadside mowings, green belts, and community parks. In northern New England and eastern Canada, special wintering habitat, consisting of a mixture of mature conifers, southern aspects, and dispersed deciduous openings, allows deer to reduce their energy loss and enhances survival over the long winter period. Wintering areas are also important because of the fidelity with which deer use them from year to year and generation to generation and is underscored by the fact that it rarely makes up more than 15% of the land base.

VT Fish and Wildlife

Population Growth and the Concept of Carrying Capacity

Deer populations have the potential for rapid growth. This is an evolved response to high mortality often related to predation. Under normal circumstances, does two years old or older produce twins annually, while yearling does typically produce single fawns. On excellent range, adult does can produce triplets, yearlings can produce twins and fawns can be bred and give birth during their first year of life. In the absence of predation or hunting, this kind of reproduction can result in a deer herd doubling its size in one year. This fact was illustrated on the 1,146 acre George Reserve in southern Michigan where biologists at the University of Michigan have been studying the deer population since 1928. The deer herd grew from six deer in 1928 to 162 deer by 1933 [27]. More recently, the George Reserve herd grew from 10 deer in 1975 to 212 deer in 1980 [28].

Hal Korber, PA Game Commission

There are natural limits to the number of deer that a given parcel of habitat can support. These limits are a function of the quality and quantity of deer forage and/or the availability of good winter habitat. The number of deer that a given parcel can support in good physical condition over an extended period of time is referred to as "Biological Carrying Capacity" (BCC). Deer productivity causes populations to exceed BCC, unless productivity is balanced by mortality. When BCC is exceeded, habitat quality decreases with the loss of native plant species and herd physical condition declines. Biologists use herd health indices and population density indices to assess the status of a herd relative to BCC.

The importance of compatibility between land use practices and deer populations in urban, suburban, forested, and agricultural areas justifies consideration of another aspect of carrying capacity. “Cultural Carrying Capacity” (CCC) can be defined as the maximum number of deer that can coexist compatibly with local human populations [13]. Cultural carrying capacity is a function of the sensitivity of local human populations to the presence of deer. CCC can be considerably lower than BCC.

Hal Korber, PA Game Commission

The sensitivity of the human population to deer is dependent on local land use practices, local deer density and the attitudes and priorities of local human populations. Excessive deer/vehicle collisions, agricultural damage and home/gardener complaints all suggest that CCC has been exceeded. It is important to note that even low deer densities can exceed CCC; a single deer residing in an airport-landing zone is too many deer. As development continues in many areas of North America, the importance of CCC as a management consideration increases.

Consequences of Deer Overpopulation

As previously indicated, deer populations have the ability to grow beyond BCC. When BCC is exceeded, competition for limited food resources results in overbrowsing [7,8]. Severe overbrowsing alters plant species composition, distribution, and abundance, and reduces understory structural diversity (due to the inability of seedlings to grow beyond the reach of deer). These changes have a negative impact on other wildlife species, which also depend on healthy vegetative systems for food and cover. In time, overbrowsing results in reduced habitat quality and a long-term reduction in BCC. Coincident with overbrowsing is the decline in herd health. This decline is manifest in decreased body weights, lowered reproductive rates, lowered winter survival, increased parasitism, and increased disease prevalence [14]. In the absence of a marked herd reduction, neither herd health nor habitat quality will improve, as each constrains the other. Such circumstances enhance the likelihood of mortalities due to disease and starvation.

Deer overabundance leads to excessive damage to commercial forests, agricultural crops, nursery stock, and landscape plantings [24,25] as well as a high frequency of deer/vehicle collisions. In addition, some studies suggest that a correlation exists between high deer densities and the incidence of Lyme disease (http://www.cdc.gov/ncidod/dvbid/lyme/), a tick-born disease that, if left untreated, can affect the joints, heart, and nervous system of humans [1].

John Buck VT F&W

A Justification for Deer Population Management

The potential for deer populations to exceed carrying capacity, to impinge on the well-being of other plant and animal species, and to conflict with land-use practices as well as human safety and health necessitates efficient and effective herd management. Financial and logistical constraints require that State and Provincial deer management be practical and fiscally responsible.

DEER MANAGEMENT OPTIONS

Option 1
ALLOW NATURE TO TAKE ITS COURSE

In the absence of active management, deer herds grow until they reach the upper limit at which they can be sustained by local habitat. Herds at the "upper density limit" consist of deer in relatively poor health [(8)]. High-density herds such as these are prone to cyclic population fluctuations and catastrophic losses [(27)]. Such herds would be incompatible with local human interests and land-use practices. Disease and starvation problems in the Great Swamp National Wildlife Refuge, New Jersey [(40)]; damage to ornamentals on Block Island, Rhode Island; vegetation destruction at Crane Beach, Massachusetts; deer-vehicle collisions in Princeton, New Jersey [(21),] increased abundance of Black-legged, or "Deer" Ticks (Ixodes scapularis)[(9)] that spread Lyme disease, Ehrlichiosis (a newly recognized bacterial disease that is spread by infected ticks) and Babesiosis (a rare parasitic disease that is transmitted to people by infected ticks) are but a few examples of the negative impacts of a "hands off" deer management policy. Forest regeneration difficulties on Connecticut's Yale Forest is another counter-productive effect that a "hands-off" policy has on industrial forest and private woodlot management. Allowing nature to take its course will result in a significant negative impact on native plant and animal species that readily leads to the loss of these species. In addition, the local deer herd suffers from impaired condition [(41)].

Deer have evolved under intense predation and hunting pressure. In pre-colonial times many Native American tribes hunted deer year-round and depended on deer as their primary food source [(26)].

Mountain lions, wolves, bobcats, and bears all utilized the pre-colonial deer resource. The high reproductive capability of present day herds likely reflects an adaptation to intense predation and hunting in the past. As a consequence, it would be inaccurate to describe a deer herd in today's environment, with few or any predators and no hunters, as "natural".

In almost all cases, allowing nature to take its course through deforestation and starvation will not achieve modern deer management goals to ensure sustainable deer populations, sustainable habitats, and compatibility with human land-use practices and values. There are significant costs associated with the "hands off" approach to deer management including local herd decimation and habitat degradation for deer, people, and other wildlife; and a significant increase in deer-vehicle collisions and agricultural damage.

It is important to note that humans have had a dramatic impact on the ecology of North America. Among other things, they have altered landscapes, changed and manipulated plant communities, displaced large predators, eliminated a variety of native species, and introduced numerous exotics. Natural systems and regulatory processes have changed as a result of these impacts. Adopting a "hands off" policy will not restore North American ecosystems to a pristine state.

Option 2
USE FENCING AND REPELLENTS TO MANAGE CONFLICTS WITH DEER POPULATIONS

Fencing and repellents can address site-specific problems. Economic, personal, and aesthetic considerations typically restrict the use of these techniques. When considering fencing or repellents, it is important to understand that effectiveness will vary and what works for one area, may not work in another.

There are many fencing options including woven wire or polypropylene mesh, high-tensile electric fencing, and polytape electric fences. Woven wire fences of 6 or 7 feet are adequate deterrents for most homeowners, but may not provide complete exclusion. An eight-foot woven wire fence would be expected to cost $6 to $8 per foot to install. A polypropylene mesh grid deer netting can be staked around most small gardens at a cost to the homeowner of $2.00 to $3.00 per foot, plus labor. High-tensile electric fencing requires regular maintenance and is best suited to areas of good soil depth and moderate terrain. Electric fences suffer from seasonal problems associated with poor grounding due to heavy snows and dry soil conditions. Electric fences are not appropriate for use in areas where frequent human contact is likely. In 2001, multi-strand, high tensile, electric fence had an initial installation cost of $882 plus $0.31 per foot [(31)].

Several types of electric fencing provide a less expensive, yet effective alternative to the multi-strand, high tensile electric fence. Polytape livestock electrical fencing coated with peanut butter can be effective for home gardens and small nurseries or truck crops up to 40 acres. This simple, temporary fence works best under light deer pressure during summer and fall. The peanut butter on a poly-tape fence entices deer to sniff the fence. Then, when the deer make nose-to-fence contact they receive a substantial shock and quickly learn to avoid such fenced areas. Polytape fences are portable, and can be installed with an initial installation cost of $365 plus $0.10 to $0.25 per foot [(31)].

Effective repellent programs require frequent applications because rapidly growing shoots quickly outgrow protection and repellents weather rapidly. Spray repellents can only be applied effectively during mild weather, so their value during winter months is restricted. Potential problems with repellent use stem from plant damage concerns, labeling restrictions, equipment problems (heavy binding agents and repellent slurries clog equipment), and difficulties resulting from noxious and/or unaesthetic product residues. Repellents vary in cost from $25 per gallon to $45 per gallon, which would treat approximately 200 small trees or shrubs. Repellents are usually not recommended for field crops because of their high cost, limitations on use, and variable effectiveness [(6)].

Maryland DNR

Repellent performance is variable and seems to be negatively correlated with deer density. This seems to result from the fact that repellents are behavior modifiers; they perform well under moderate pressure but may be ignored when alternative deer foods are scarce.

Another option that has been used by some commercial nursery operations is dogs contained by underground fencing. In these situations, a couple of dogs can reduce deer damage across tens of acres. Specific guidelines on how to best implement this type of deterrent are available from a number of commercial vendors.

Fencing and repellents may reduce deer impacts on a particular area, but they do not address deer population abundance. As a consequence, they are best employed within the context of a comprehensive deer management program. Without deer population management, deer damage will increase in severity and the efficacy of abatement techniques will decline.

Option 3

USE OF NONLETHAL TECHNIQUES TO REDUCE DEER - VEHICLE COLLISIONS

Various nonlethal mitigation measures have been studied and techniques continue to be developed to reduce or prevent deer-vehicle collisions (DVCs) where deer population control is considered unacceptable, impractical, or inadequate. The complexity and variability of the DVC problem often create difficulties in designing studies that will provide conclusive results. The following table summarizes the known utility of 16 potential non-lethal techniques in reducing DVCs based on two recent comprehensive reviews [15, 20]. Many measures show potential, but require additional research before deriving conclusions regarding their effectiveness. While these devices may reduce deer–vehicle collisions, they do not reduce deer populations.

Wildlife crossings (underpasses and overpasses) and exclusionary fencing, particularly when used in conjunction with one another, were the only methods with sufficient scientific evidence to be regarded as effective countermeasures. Technology-based deployments, such as animal-detection driver-warning systems, is one area that shows potential in reducing DVC incidents, but that requires further research before becoming applicable for general use. Only two mitigation techniques, deer whistles and deer flagging models, have been studied sufficiently to confidently categorize as ineffective.

Several techniques either appear to be ineffective, or may be somewhat effective in specific situations, but are impractical to implement. Deer repellants and intercept feeding, for example, may be effective over a limited duration in localized areas, but would be difficult to consistently implement and ineffective as a long term strategy.

Effectiveness of DVC reduction techniques (15, 20)

DVC Reduction Technique	Determined Effective	Requires Additional Research	Limited Effectiveness or Appears Ineffective	Determined Ineffective	Comments
In-Vehicle Technologies (infrared vision or sensors)		✓			Potential to reduce DVCs appears to exist.
Deer Whistles				✓	
Roadway Lighting			✓		May have limited effectiveness in specialized situations.
Speed Limit Reduction			✓		Appears ineffective
Deicing Salt Alternatives			✓		May have limited effectiveness in specialized situations.
Deer-Flagging Models				✓	
Intercept Feeding (feeding stations outside roadway)			✓		May have limited effectiveness in specialized situations.
Passive Deer Crossing Signs			✓		
Temporary Passive Deer Crossing Signs and Active Signs and Technologies		✓			Appears promising in specific situations.
Roadside Reflectors or Mirrors			✓		Most studies found little long term effects.
Deer Repellants			✓		Unlikely to be useful.
Public Information and Education		✓			Regular education is necessary, though its effects are difficult to assess.
Roadside Clearing		✓			
Exclusionary Fencing	✓				Effective when combined with wildlife crossings.
Wildlife Crossings	✓				Effective, particularly when combined with fencing
Roadway Maintenance, Design, and Planning Policies		✓			Appears that planning decisions may help mitigate DVC problem.

Option 4
PROVIDE SUPPLEMENTAL FOOD TO ALLEVIATE CONFLICTS WITH BCC AND CCC

Properly managed deer herds in good physical condition do not need supplemental food to survive winter in temperate climates. In jurisdictions without die-offs due to severe winter weather, supplemental feeding of over-abundant and malnourished deer will encourage additional population growth[7] which is counterproductive if the goals are sustaining healthy deer and habitats.

Michigan DNR

Supplemental feeding on a region wide basis is not a practical method to reduce deer mortality.

Michigan DNR

Feeding deer to prevent catastrophic winter mortalities has been tried in many states. Michigan used surplus corn during four separate winters (1961-62, 1964-65, 1968-69 and 1970-71) to help deer survive on over-browsed deer range [22]. In these situations, supplemental feeding was not effective. The cost of large-scale, emergency, feeding projects did not offset the increase in deer population due to higher survival and reproduction. It cost $82.69 per deer to supplementally feed deer throughout the year and about $36.75 per deer through the winter [22].

A supplemental feeding program for mule deer in Colorado did reduce winter deer mortality, but it failed to eliminate substantial losses. Colorado researchers concluded that supplemental feeding can be justified for use during emergency circumstances (e.g. exceptionally severe winter weather) but not as a routine method for boosting local BCC [3].

Michigan DNR

The ineffectiveness of reaching significant portions of the winter deer population is a major factor in reducing the effectiveness of emergency feeding [35]. Researchers in Michigan concluded that "nutritional supplementation" had potential value as a management tool but that it would only work within the context of "strict herd control" [37]. In many areas of North America, supplemental feeding would lead to conflicts with CCC because it encourages increased deer population growth, negative impacts on habitat and other wildlife, and greater deer-human conflicts. Winter feeding can also lead to the perception that maintenance and protection of quality deer wintering habitat is not important for deer survival

Disease transmission is very real threat to deer in areas where they are being concentrated by artificial feeding activities. Ready exposure to agents responsible for fatal diseases such as Chronic Wasting Disease (CWD) and tuberculosis (Tb) are greatly facilitated through abnormal accumulations of urine, feces, and saliva at the feeding site. Once established in a wild population, a disease is rarely eradicated even after lengthy and costly treatment.

Option 5
TRAP AND TRANSFER EXCESS DEER TO OTHER LOCATIONS

This option would include the use of trapping, netting and/or immobilization for the purpose of capturing and relocating deer. Trap-and-transfer efforts are complex and expensive operations. Attempts to capture deer require substantial financial and logistic commitments in trained personnel and equipment to ensure safety of people and deer. Capture and relocation programs have recorded costs ranging from $400 to $3200 per deer [5, 12, 17].

Trap-and-transfer programs require release sites capable of absorbing relocated deer. Such areas are often lacking. The negative impact that translocated deer could have on BCC and/or CCC and questions of liability concerning translocated deer are additional concerns. For example, what happens if a translocated deer is hit by a vehicle and the driver is injured or killed? Or, if translocated deer are seen damaging crops or ornamental plantings?

Joe Kosack, PA Game Commission

Translocation may not be a "non-lethal" alternative. Deer are susceptible to traumatic injury during handling. Trauma losses average approximately four percent during trap-and-transfer efforts. Capture myopathy, a stress-related disease that results in delayed mortality of captured deer, is thought to be an important (and often overlooked) mortality factor. Delayed mortality as high as 26 percent has been reported [39].

Survival rates of relocated deer are frequently low. The poor physical condition of deer from an overpopulated range predisposes them to starvation. Trap-and-transfer efforts in California, New Mexico and Florida resulted in losses of 85, 55 and 58 percent, respectively, from 4 to 15 months following relocation [36]. A six-year study of translocated deer from the Chicago Metropolitan Area showed a higher annual survival rate of resident adults than for those translocated deer. Deer-vehicle accidents were the largest source of mortality among the translocated does and presumably resulted from unfamiliarity with the release site [18].

An additional concern associated with relocation of deer, especially from an overpopulated range, is the potential for spreading disease. The presence of Chronic Wasting Disease, Lyme Disease, Tuberculosis and other communicable diseases in some areas of North America makes this a timely consideration (http://www.aphis.usda.gov/vs/nahps/cwd/) and possibly an illegal activity depending on state or provincial regulations.

In conclusion, trap-and-transfer options are generally impractical and prohibitively expensive and have limited value in management of free-ranging deer. They may have more value in the control of small, insular herds where deer are tame and/or hunting is not applicable.

Option 6
USE FERTILITY CONTROL AGENTS TO REGULATE DEER POPULATIONS

Recent advances in wildlife contraception have facilitated remote delivery of antifertility agents to deer via dart guns. Immunofertility agents have been successfully employed to control deer reproduction in both captive and free-ranging deer herds. Advances in delivery systems, coupled with improvement in the efficacy of antifertility vaccines, improve the prospect for limited applications of wildlife contraception. The cost of manpower and materials (estimated at $1,000 per deer), and the practicality of treating an adequate number of deer, will likely limit the use of immunocontraceptives to small insular herds habituated to humans.

Joe Kosack, PA Game Commission

The most commonly used method of inducing infertility in deer is by immunocontraception, in which the deer is immunized against a protein or hormone needed for reproduction [34]. Traditional immunocontraceptive research in mammals has concentrated on the use of a vaccine extracted from the ovaries of pigs, called porcine zona pellucida (PZP) [32]. When this vaccine is injected into a doe, her immune system forms antibodies against the PZP. These PZP antibodies also recognize and attack the doe's own ZP. After the doe ovulates, the PZP antibodies attach to her ovum and block fertilization [44], which causes the female to experience multiple estrous cycles and extends the breeding season. An extended breeding season will increase deer activity at a time of year when conservation of calories is important, and may result in increased winter mortality. Lengthened breeding activity of bucks may also lead to an increase in the number of deer–vehicle collisions [34]. The original PZP vaccines required an initial dose followed by a booster dose, and annual vaccines thereafter. The need for annual vaccinations is a significant drawback to the PZP vaccine. A new formulation of PZP, called SpayVac™, developed by ImmunoVaccine Technologies Inc., is a single-dose immunocontraceptive vaccine that has been shown to control fertility in female deer for multiple years.

The National Wildlife Research Center developed a new gonadotropin-releasing hormone (GnRH) immunocontraceptive vaccine, named GonaCon™. GnRH vaccines have an advantage over PZP because they prevent eggs from being released from the ovaries, thereby eliminating multiple estrus cycles. Recent studies demonstrated the efficacy of the single-shot GnRH vaccine as a contraceptive agent for up to four years [33]. Ongoing studies are examining the effectiveness and practicality of administering GonaCon™ to free-ranging white-tailed deer. Preliminary results using free-ranging deer have provided poor results.

An adjuvant is a compound that improves the immune response, causing higher levels of antibodies. Freund's Complete Adjuvant (FCA) was combined with PZP to form the original vaccine. FCA has been popular with immunologists because it is very effective with all types of antigens. The United States Food and Drug Administration (US FDA) has objected to the use of Freund's Adjuvant due to concerns related to target animal safety and human consumption. Because of these concerns, the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) National Wildlife Research Center began testing Johne's vaccine as a replacement for Freund's adjuvant. Mycopar™ is approved for use in food animals and is therefore not a concern for use in deer [(34)].

A new adjuvant, AdjuVac™, contains a small quantity of Mycobacterium (as does Freund's complete adjuvant), which is a bacterium found in many species of domesticated and wild animals. The combination of AdjuVac™ adjuvant and GnRH conjugate produces a much longer-lasting contraceptve effect than was produced by earlier efforts that combined Freund's adjuvant with the same GnRH conjugate. GnRH and PZP vaccines, have been classified by the US FDA as investigational drugs and may only be used in rigidly controlled research studies.

As of February 2008, no fertility control agents have been federally approved for management of wildlife populations in the United States. Results from pivotal studies have provided mixed results. Deer used in contraceptive programs should be identified as an experimental animal until a fertility agent is registered, so that the deer are not consumed. This is a concern in the event of the deer leaving a study area to where it could be hunted, or killed in a vehicle accident. Identification is also important for monitoring deer behavior, movements, and populations. Individually marked deer reduces the possibly of retreating the same doe several times.

Furthermore, this drug is being reviewed by the EPA for use as a nuisance animal control means. Much like controlling rat populations, chemicals (i.e GonaCon™) used to control deer populations will be reviewed under different and less stringent human health standards and will be available to a broad range of users in need of deer damage relief.

Since fertility control has no short-term effect on population size, pre or post treatment culling will be an essential part of the timely resolution of deer problems with fertility control agents.

In conclusion, fertility control in deer is a rapidly advancing technology that continues to require additional research. Fertility control may have value for use on small insular deer populations under carefully regulated conditions, but will not provide an alternative to hunting for the control of free-ranging herds [(19)]. Although effective fertility control agents have been identified, their use on large free-ranging herds would be impractical.

Option 7
REINTRODUCE PREDATORS TO CONTROL DEER POPULATIONS

In moderately fluctuating environments, a complement of effective predators can maintain stability in a deer herd [28]. However, in general terms, predator-prey interactions are highly variable[30], and tend to stabilize populations at relatively high densities [27]. Wolves and mountain lions are examples of efficient deer predators, which have been eliminated from much of the United States and eastern Canada. Both species are frequently suggested as candidates for reintroduction to control deer herds.

Restoration of wolves and mountain lions is infeasible in much of the United States because it is too densely populated by humans to provide suitable habitat for these species. In addition, it is unlikely that rural residents would tolerate large predators at levels dense enough to limit deer populations because such predators also readily consume livestock. Predation of non-target species including other native wildlife, livestock and pets, as well as concerns for human safety, are but a few examples of the conflicts that would arise as a result of predator reintroductions.

VT F&W

Predator-prey relationships are complex and the impact of predators on herbivore populations is variable. Although many answers are lacking, several points can be made concerning deer and their predators. Coyotes, bobcats, and bears are potential deer predators that currently reside throughout much of North America. These species appear to be opportunists that capitalize on specific periods of deer vulnerability. None of these predators has demonstrated a consistent ability to control deer populations. Where coyotes, bobcats and bears are common, deer herds often exceed BCC and CCC. Coyote populations have increased and their range has expanded in North America during the past 20 years. In many areas, deer and coyote populations have increased simultaneously. In some northeast jurisdictions, some biologists do suspect coyotes are partly responsible for declining deer numbers. Yet in other areas, changes in deer populations appear unrelated to coyote density. In many circumstances, coyotes and bears represent serious agricultural pests. As a consequence, they are frequently less welcome than white-tailed deer.

Heavy predation coupled with year-round hunting by Native Americans was the norm for pre-colonial deer herds. It has been estimated that approximately 2.3 million Native Americans occupied the pre-colonial range of the white-tail and that they harvested 4.6 to 6.4 million white-tails annually [26]. The human species clearly constitutes an efficient and natural deer predator. Ecological and social constraints preclude the reintroduction of large predators in much of North America.

Option 8
CONTROL DEER HERDS WITH SHARPSHOOTERS

A typical sharpshooting program involves the systematic culling of deer by skilled marksmen who are highly trained wildlife professionals. Although expensive relative to regulated hunting, sharpshooting programs may be useful in urban and suburban areas by reducing the size of the local deer population where there is not sufficient undeveloped land to support traditional regulated deer hunting programs. Urban deer removal programs conducted in New Jersey cost between $200 and $350 per deer killed. Local taxpayers bear the cost of sharpshooting programs. Venison harvested by sharpshooting programs is generally donated to local food banks.

Hal Korber, PA Game Commission

An evaluation of techniques employed to control an enclosed deer herd in Ohio revealed that sharpshooting was a less efficient method of deer removal than controlled hunting [38]. The use of sharpshooters can be controversial in situations where regulated hunting could occur, because it denies citizens access to a renewable public resource. Local economies may also experience a loss of income from hunters.

Option 9
USE REGULATED HUNTING AS A DEER MANAGEMENT TOOL

Regulated hunting has proven to be an effective deer population management tool (16, 27). In addition, it has been shown to be the most efficient and least expensive technique for removing deer (38), and maintaining deer at desired levels. Wildlife management agencies recognize deer hunting as the most effective, practical and flexible method available for regional deer population management, and therefore rely on it as their primary management tool. Through the use of regulated hunting, biologists strive to maintain deer populations at desirable levels or to adjust them in accordance with local biological and /or social needs. They do this by manipulating the size and sex composition of the harvest through hunter bag limits and the issuance of antlerless permits, season type, season timing, season length, number of permits issued, and land-access policies.

Forest Hammond, VT F&W

Controlled deer hunts are an alternative management technique in areas where people find traditional sport hunting intrusive, or where specific objectives of the landowner/manager require limited or directed hunter activity. Controlled deer hunts limit hunters to a modified season which is usually more restrictive than traditional hunting in terms of hunter density, methods of take, and size of huntable area than do deer hunting seasons in surrounding areas. One example of a controlled hunt involves the Richard T. Crane Memorial Reservation and the Cornelius and Mine' Crane Wildlife Refuge in Massachusetts, which total approximately 2100 acres. A 9-day shotgun season was increased to 90 days for participating hunters. Hunters received a special permit allowing for a two deer, either sex bag limit. Hunters were required to be residents of one of the bordering towns, have 5 years hunting experience, attend a pre-hunt seminar and pass a shooting proficiency test. Between 1985 and 1991, between 49 and 76 hunters participated in the controlled hunt. During the first seven years of the hunt, a total of 443 deer were harvested, reducing the deer population from approximately 350 to 50 deer (10).

Another controlled hunt at the Bluff Point Coastal Reserve in Connecticut required hunters to complete a 12-hour Conservation Education Firearms Safety Course and attend a pre-hunt meeting. Hunters harvested 226 deer and seven additional deer were removed by Wildlife Division personnel in January 1996, thereby reducing the Bluff Point deer population by 80 percent (29). In some cases, simply improving hunter access while restricting participation to bow hunters may satisfy public concerns and deer management objectives within traditional season frameworks.

Values associated with white-tailed deer management are diverse and extensive (23). Ecological benefits derived from regulated hunting include protection of our environment from overbrowsing (2,3), protection of flora and fauna that may be negatively impacted by deer overpopulation (4,11,42) and the maintenance of healthy viable deer populations (16,27) for our benefit and that of future generations. Social benefits that result from regulated hunting include: increased land-use compatibility stemming from fewer land-use/deer conflicts, human safety benefits resulting from reduced deer/vehicle incidents, diverse educational and recreational opportunities, and emotional benefits associated with a continued presence of healthy deer herds. Regulated hunting provides economic benefits in the form of hunting-related expenditures. Researchers estimated the expenditures of the nation's 10,272,000 deer hunters to be nearly $10.7 billion in 2001 (43). An economic evaluation of regulated deer hunting should also include costs that would be incurred in the absence of population management. As an example, the cost of agricultural commodities, forest products, and automobile insurance would likely increase if deer populations were left unchecked.

One hundred years of research and management experience throughout the United States and eastern Canada has shown regulated hunting to be an ecologically sound, socially beneficial, and fiscally responsible method of managing deer populations. Options routinely suggested as alternatives to regulated hunting are typically limited in applicability, prohibitively expensive, logistically impractical, or technically infeasible. As a consequence, wildlife professionals have come to recognize regulated hunting as the fundamental basis of successful deer management.

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