EXHIBIT 4

APPROVED DEER MANAGEMENT PLAN

A Review of White-tailed Deer Management Options and Recommendations for Long-Term Population Control

Developed By:

Township of Mt. Lebanon
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In Cooperation with:

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Date Prepared:

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1.0 INTRODUCTION

White-tailed deer are common throughout the Commonwealth and the United States. The management of White-tailed deer (*Odocoileus virginianus)* is a true success story. Once on the verge of extirpation from the state, White-tailed deer are now common place in every county. Deer have proven to be highly adaptable to changes in their environment and have learned to thrive in our urban and suburban communities. Many people enjoy watching wildlife, including deer, but they do not enjoy the damage that overabundant deer can cause.

Deer browsing causes damage to natural flora, ornamental landscaping, human health and safety, and agriculture. Property damage and personal injury are commonplace in urban settings with high deer densities. White-tailed deer can also negatively affect other native fauna. Deer browsing can eliminate certain types of vegetation that other species use for habitat. The ecological destruction in urban areas is often intensified by higher than recommended deer densities and limited resource availability.

There is no doubt that some urban residents have developed emotional attachments to White-tailed deer. In fact, our urban policies governing green space and parks have helped create a close interaction between humans and deer. The habitats that we have created in urban environments provide the perfect conditions for population explosion (i.e., no measures to control deer, no hunting, etc). Ultimately deer populations should be managed based on biology, not emotion.

The primary debate for urban communities is whether to actively manage deer populations or maintain the status quo. The following report is a collection of information intended to help Township officials make an informed, educated decision about urban deer management based on biology, economics, science, and public perception.

1.1 General White-tailed Deer Population Dynamics

White-tailed deer are the most researched mammal in North America. As a result of that research, biologists are able to characterize the process of population changes in deer. White-tailed deer population dynamics in Pennsylvania are different than the population dynamics in the mid-west or Canada. Furthermore population dynamics are different in urban settings versus forested or farmland.

Female White-tailed deer usually give birth to 1-3 fawns (2 being most common) in May or June. Fawns typically spend the summer and fall months with their mothers before establishing home ranges of their own. Winter months in Pennsylvania can be stressful for deer depending on the amount of snow fall, days with freezing temperatures, and availability of food (browse, mast crops, supplemental feeding, etc.) Deer populations are normally at their lowest just following the winter months, before birthing. The change in population size from year to year is defined as the growth rate.

Biologists must balance the birth and death rates within a population to maintain herd health, reduce disease risks, protect ecosystems, and reduce damage. In natural settings deer populations eventually reach the biological carrying capacity, which is the point at which deer consume most of the browse in an area. At this point, the population is unable to sustain growth and reproduction. Each habitat has a different biological carrying capacity.

Although the biological carrying capacity is important to deer population dynamics, the social carrying capacity is more relevant in urban areas. The social carrying capacity is the point at which deer populations can coexist with the human population without negative impacts. Negative impacts on humans can include increased deer-vehicle collisions, deer damage to landscaping, ecological damage, and disease threats. Deer populations can also experience negative impacts in urban settings including stress, trauma from encountering dogs, pools, large glass windows, vehicle traffic, and the lack of adequate home ranges. Given these factors, the social carrying capacity may be lower or higher than the biological carrying capacity. It is important to understand that neither the biological or social carrying capacity is static.

White-tailed deer are incredibly adaptable and thrive in urban settings. Urban environments pose many challenges for traditional management and force local and state governments to think differently about deer management. Deer management throughout the Commonwealth is ongoing and necessary. Research has shown that deer populations can grow from a few pairs to more than 100 deer per square mile in less than 6 years. This adaptability and reproductive potential, coupled with the lack of natural mortality factors in urban environments makes urban deer management challenging at best. A long-term integrated management program is the only effective management option for urban situations.

1.2 White-tailed Deer Mortality Factors

The leading cause of mortality in White-tailed deer populations nationwide is hunter harvest. Other major factors contributing to mortality are disease, predation, malnutrition, weather, accidents, and deer-vehicle collisions.

Urban deer mortality differs significantly from "natural" habitats. Hunter harvest and predation are often extremely limited in urban settings. Hunting is commonly prohibited or restricted to the extent that hunters are no longer interested. Urban environments require wildlife species to be adaptable and able to function in small fragmented patches of habitat. Most large predators need large contiguous tracts of habitat; therefore urban environments are often void of significant predation. The leading mortality factors in urban environments are deer-vehicle collisions, malnutrition, and disease. All three of these factors are related to high deer densities.

Deer-vehicle collisions will always occur in urban environments, but the frequency of those collisions can be reduced with a good management strategy. Perhaps the more meaningful impact of deer and vehicle traffic are the instances where a human dies as a result of a collision with a deer or from an accident caused by swerving to miss hitting deer. The potential for these accidents can be reduced with management.

Malnutrition and disease are also significant causes of mortality in urban settings with high deer densities. Malnutrition results when the deer density exceeds the carrying capacity. Malnutrition can also be an unintended consequence of supplemental feeding by concerned citizens. The deer population continues to grow as a result of the supplemental feeding, but at some point there are too many deer and not enough available habitat. Populations that are dependant on supplemental feeding are also at risk if the citizen feeding the deer suddenly stops, moves from the area, or can no longer physically or economically continue to supply feed. Malnutrition as well as numerous environmental factors can lead to disease and parasite outbreaks in a population. Diseases are unpredictable and usually not a significant cause of mortality, but in a population with an elevated density some disease outbreaks can be catastrophic. Some diseases can also impact human lives (i.e., Lyme disease).

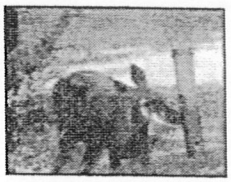
1.3 Legal Considerations and Ordinances

1.3.1 Anti-hunting Ordinance

The Township will need to amend any ordinance that prohibits recreational hunting or interprets projectiles as hunting related. Any ordinance which prohibits hunting or hunting related activities will limit the management options available for controlling White-tailed deer in the Township.

1.3.2 Feeding of Wildlife Ordinance

The feeding of wildlife, excluding small seed eating birds, squirrels, and chipmunks should be prohibited in the Township. An ordinance which is enforced would help reduce immigration of "new" deer into the population following control methods. Furthermore wildlife feeding only serves to unnaturally increase the density of deer in the Township which leads to more damage and increased risk of disease. Ordinance 7593 from Leavenworth, KS can be found at the end of this chapter as an example.



1.3.3 PA Game Commission Position on Deer Management in Urban Areas

Deer-human conflicts in developed areas are not easy to solve, nor do they appear overnight. Resolving deer-human conflicts requires a long-term commitment from residents and public officials to effectively apply available deer management tools. The Game Commission cannot solve deer-human conflicts in developed areas. Rather, residents and public officials must accept long-term responsibility to resolve deer-human conflicts in their community. If residents and public officials are willing, the Game Commission will provide technical assistance to resolve deer-human conflicts in developed areas.

1.4 Findings and Results of Deer Management in Neighboring Municipalities

The Borough of Fox Chapel and the Township of Upper St. Clair currently utilize an integrated approach to managing White-tailed deer. Both municipalities have decades of data to support culling as an effective management strategy. The Township of Upper St. Clair consulted with a wildlife biologist, developed educational tools, installed additional signage, installed Strieter-Lites, conducted density surveys, allowed controlled hunts,

and investigated PZP fertility control. After six years of investigation and research, Township officials agreed to implement an integrated management plan that included public education, controlled archery hunts, and a USDA APHIS Wildlife Services culling program. Now in its third year, the culling program has successfully halted population growth and has begun to decrease deer-vehicle collisions. Deer-vehicle collisions were over 200 annually before the culling program. This year deer-vehicle collisions are less than 100. The Borough of Fox Chapel is also successfully using culling and controlled hunts. Both of these municipalities recognize the importance of implementing an integrated program that includes controlled hunts and culling. Both municipalities have utilized culling to stop population growth and begin to manage the deer herd based on recommended deer densities appropriate for those sites.

ORDINANCE NO. 7593

AN ORDINANCE PROHIBITING FEEDING WILDLIFE

BE IT ORDAINED BY THE GOVERNING BODY OF THE CITY OF LEAVENWORTH, KANSAS:

Section 1. Feeding Wildlife Prohibited. It is unlawful for any person to feed a wild animal unless licensed to do so, with the exception of small seed eating birds, squirrels, and chipmunks. It is unlawful to place out mineral blocks or salt licks unless they are intended for authorized domestic livestock.

Section 2. Violation and penalties. Any person, firm or corporation violating any of the provisions of this title shall upon conviction thereof be fined a sum not to exceed one thousand dollars, or be imprisoned not to exceed thirty days, or be both so fined and imprisoned.

Section 3. That this ordinance shall take effect and be in full force from and after its passage, approval and publication in the official city newspaper of the City of Leavenworth, Kansas, as provided by law.

Passed and approved this 2nd day of March, 2004.

Laura Jamas Gasbarre

Laura Jamas Gasbarre, Mayor

ATTEST:

Carol Sadler

Carol Sadler, City Clerk, CMC

Passed and Approved: 03-02-04

Published: 03-08-04

2.0 OVERVIEW OF THE TOWNSHIP

2.1 Land Use and Habitat Characteristics

The Township of Mt. Lebanon, PA is largely an urban residential area just minutes from downtown Pittsburgh. The township consists of 15 public park areas, a recreational complex, and a 9-hole golf course. The 15 public parks have limited forested habitat for White-tailed deer and even more limited space for controlled hunts. Over 80% of the Township is residential development with another 10% being commercial or public use buildings. Most of the neighborhoods are a mix of ornamental vegetation and natural flora (i.e., oaks, mountain laurel, etc.). Although there are 15 public parks, most of them are either well manicured open space or are within the archery safety zone, excluding them from controlled hunting options. Based on an analysis of available habitat, numerous site visits to the municipality, education, training, and conversations with PA Game Commission officials, the Township should be able to maintain 1-3 deer per square mile.

2.2 Current White-tailed Deer Management within the Township

Currently there is no active management of White-tailed deer being conducted by the Township. This past spring the Township contracted USDA APHIS Wildlife Service to conduct a deer density survey, but no further action has been initiated to date. The Township would like to consider moving forward with the Long Term Management Plan outlined in this report.

2.3 Results of the White-tailed Deer Density Study

USDA APHIS Wildlife Services conducted 4 deer density surveys from 21 April – 27 July, 2006 using forward looking infrared (FLIR) technology. Deer density surveys using FLIR technology are conducted in a systematic, random pattern, with at least three unique survey events per project. The surveys were conducted between 2100 and 0500 hrs during a time period without rain and when wind was less than 15 mph. A randomly selected route was followed during each survey. One WS employee drove the truck at approximately 10 mph while the observer(s) searched for deer and recorded sex, age (fawn v. adult), cover type, location, and the distance of the deer from the road. WS drove 160 total miles, covered approximately 3.1 sq. miles of township property and observed a total of 39 deer. Based on survey methodology published by Dr. James Knoll in 1992, Wildlife Services is able to report the density of deer per square mile of area surveyed based on the amount of mileage driven and the distance observations were made from the vehicle. The average deer density within the Township of Mt. Lebanon is 15 deer per sq. mile. This density estimate is more than 5 times greater than the recommended deer density for Mt. Lebanon Township.

3.0 WHITE-TAILED DEER MANAGEMENT OPTIONS

3.1 Non-Lethal Deer Management Methods

Non-lethal techniques to reduce deer damage have an important role in any White-tailed deer management strategy. Most non-lethal techniques are widely available to everyone in the community, are easily implemented, and are usually socially acceptable. Non-lethal methods such as education programs, reduced speed limits, and additional signage in critical areas are utilized by most municipalities long before considering lethal control. The principle problem is that non-lethal techniques can reduce damage, but if deer populations continue to persist uncontrolled the damage will continue and likely increase over time.

While non-lethal damage management techniques are popular among the anti-hunting or anti-management citizens, there are numerous disadvantages to broad application of non-lethal methods. Disadvantages of some non-lethal methods include: (1) cost of initial acquisition; (2) need for regular maintenance; (3) poor esthetic qualities; (4) improper application; (5) gimmick products; and (6) unrealistic expectations. The largest disadvantage to non-lethal methods is that they are not proven to reduce or control the number of deer in the population and most non-lethal methods only have a temporary localized effect.

3.1.1 No Action

Historically White-tailed deer have coexisted in the ecosystem with large predators and hunting pressure from Native Americans and settlers. The "no action" approach would entail letting the deer population continue to grow unchecked by these natural checks and balances. Choosing no action means that the citizens accept the damage to landscaping, increased deer-vehicle collisions (including potential deaths), the spread of disease (i.e., Lyme Disease), and potential malnutrition of the deer themselves. Urban deer populations are especially susceptible to disease and malnutrition because the population often exceeds the biological carrying capacity of the municipality.

It is important to recognize that there is nothing natural about an urban environment. Human influence (i.e., development) has altered the ecosystem and we are now responsible for its management. A "hands off" approach is both ecologically and ethically ill responsible. In fact, it could be argued that active management is more natural than no action.

Estimated Cost: $0.00

3.1.2 Predator Reintroduction

Pennsylvania White-tails evolved with large predators and hunting pressure, both of which are absent in most urban situations. Some citizens may feel that the reintroduction of large predators (i.e., mountain lions, wolves, etc.) into the ecosystem would be a natural way of controlling deer populations. While this may be an interesting debate, most of the eastern U.S. is unsuitable habitat for

large predators. Urban areas in particular do not offer the large, contiguous habitat required by these species. The reintroduction of large predators would also threaten both human and domestic animal safety. This method is simply not legal and biologically unsound.

Estimated Cost: Immeasurable

3.1.3 Supplemental Feeding

Supplemental feeding is often discussed as a non-lethal option to improve deer herds and protect them against management. Supplemental feeding of wildlife is not natural and in the end is a self-defeating policy. Feeding programs allow the population to continue to grow unmanaged and will likely lead to more damage (i.e., increased deer-vehicle collisions) in the future. Assuming that a supplemental feeding program was successful, municipalities would have to prepare for increased deer survival, increased population growth, and an ever-increasing demand for supplemental feeding. Although individual properties may notice a temporary reprieve from damage, this is not a long-term solution. Furthermore, supplemental feeding concentrates populations around a food source making that population more susceptible to disease and parasite transmission. These disease concerns are not only important to herd health but also to human health (i.e., Lyme disease)

Estimated Cost: $400-600 per deer (dependent on market prices)

3.1.4 Public Education Programs

Every municipality should have information available to the public concerning urban wildlife. Most state and federal agencies can assist local governments with education programs and literature. It can also be helpful for municipalities to offer assistance to landowners who want recommendations for "smart landscaping" or other non-lethal methods for their property. Information related to White-tailed deer biology and management can be made readily available via the World Wide Web or public meetings. There are no disadvantages to a good public education program.

Estimated Cost: $3,000 per year (largely administrative)

3.1.5 Exclusion, Repellents, and Deterrents

Exclusion methods prevent deer from eating vegetation. Exclusion methods include fencing, electric fencing, and individual plant protection. Fencing is generally considered a viable option for individual property owners assuming that it is installed and maintained properly. Exclusion is not practical or economically feasible when attempting to manage damage on a township wide scale.

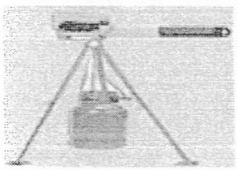
Exclusion is also not viable for reducing deer-vehicle collisions within the Township. The only application of this method would be as part of the education program for individual property owners.

Estimated Cost: $6-$12 per linear ft.

Repellents can provide damage relief for individual properties if used properly. Repellents work best when deer densities are low to moderate. Most repellents are applied to vegetation and emit some type of odor or have a foul taste. To be effective repellents often require re-treatment at prescribed intervals or after rain events. In order to maximize the effect, citizens should periodically change repellents to prevent any type of conditioning. As the repellent looses effectiveness (i.e., wears off) deer may learn to tolerate them, especially with high densities.

Estimated Cost: $70-$400 per acre

Deterrents include the use of scare devices, electronic deer repellents, and the use of dogs. The use of trained dogs is not applicable to the Township and will not be discussed. A combination of visual and audio deterrents is the most effective approach. Visual deterrents include inflatable scare devices, strobe lights, balloons, Mylar flagging, etc. Auditory deterrents include propane cannons, whistles, and ultrasonic devices. As with most non-lethal options, there is an endless supply of scare devices on the Internet. Citizens should be cautious when contemplating which device to purchase as there is no scientific research that has proven scare devices to be effective against deer. In fact, deer have shown the ability to adapt to scare devices and over come any fear of them. Deterrents are not practical on the Township scale.



Estimated Cost: Highly Variable

It is important to note that there is no exclusion, repellent, or deterrent that can reduce a deer population to manageable conditions. In fact, high deer densities can make the use of repellents and deterrents ineffective regardless of how they are used. These methods simply attempt to alleviate damage; they do not address the cause of the problem. Any reprieve gained from the use of these products is temporary.

3.1.6 Fertility Control

The study of deer fertility control has been and continues to be one of the most intensely researched aspects of deer control. Many citizens feel that fertility control is a viable alternative to population reduction. It is vitally important to understand that there is a significant difference between implementing fertility control in a captive or isolated population compared to a free ranging deer population. Secondly it is critical to understand that even if effective in reducing recruitment, fertility control does not immediately address the issue of deer overabundance. Contraceptive in White-tailed deer may be a viable method

for stabilizing a population at a desired level in the future (best estimate is 10-20 yrs for FDA approval). The following is a brief review of the various types of fertility control and there application.

Surgical Sterilization

Surgical sterilization is effective in preventing reproduction in the targeted animal. The process requires that individual deer are captured and a licensed veterinarian performs a field surgery. For surgical sterilization to be effective at the population level, the Township would have to capture and treat at least 75-85% of the females. The Township would also have to assume that there is no immigration into the population. This process would need to be repeated each year, targeting the reproductive females in the herd. Surgical sterilization is not a viable form of fertility control in a free ranging herd because there is no way to eliminate immigration into the population. This process is also not cost effective as the average cost of capturing one deer exceeds $400 which does not include the cost of veterinary services.

Synthetic Steroid Hormones

Synthetic Steroids can be delivered orally and are proven to inhibit ovulation in female deer. This type of fertility control is only effective in captive herds where the animals can be handled daily. At best the interval between doses is 15 days for orally delivered steroids. Subcutaneous hormone implants are another type of steroid treatment. Scientific research on various types of subcutaneous hormone implants has revealed that the drugs do not prevent reproduction for more than two years. In several published field trials the treatment was ineffective.

Immunocontraception

Immunocontraception works by stimulating the target animal's immune system to produce antibodies against proteins involved in reproduction. The antibodies interfere with the function of the protein in the reproductive process preventing the sperm from penetrating the ovum. One of the advantages of immunocontraception techniques is that the vaccine can be delivered remotely (i.e., dart). This reduces the problems associated with capturing and handling free ranging deer. The remote delivery system also has several disadvantages. The experience and skill of the technician, access to animals, and the quality of the equipment all impact the success of this fertility control method. If the technician misses with a dart it may never be recovered and could be a potential human exposure, especially if found by a child. Due to the large amount of private property in the Township, access to the deer herd would be localized.

Perhaps the most popular immunocontraceptive is PZP, or Porcine zona pellucida. There are several notable disadvantages to PZP. PZP treated females often demonstrate prolonged estrous, extending into March. Prolonged breeding seasons can have a negative effect on intersexual behavior. Mature males normally lose as much as 25% of their body weight during the rut. Extending the rut for another six months would reduce the animal's chance of survival and make them more susceptible to disease. This extended breeding season will also

likely increase deer-vehicle collisions as most deer-vehicle collisions occur during the breeding season. PZP can also result in late-born fawns. There are numerous studies that have documented late-born fawns as a result of an incomplete vaccination. Incomplete vaccinations cause antibodies to decrease toward the end of the extended breeding season, allowing females to conceive in late winter. The result is fawns being born in early fall. Late-born fawns are at a competitive disadvantage and may not have ample time to prepare for harsh winter weather. Township residents should know that a population decline cannot be achieved with PZP unless 100% of all females in the population are successfully treated. The deer population in the Township is fluid, making 100% treatment impossible. Furthermore, the recently approved (FDA) commercial form of PZP has been altered so much for registration that the effectiveness has been reduced from 85% to less than 15%.

A relatively new immunocontraceptive called GonaCon is currently being developed by USDA APHIS Wildlife Services. GonaCon is a single-shot, multiyear vaccine that creates antibodies that block GnRH. GnRH is the hormone that signals the production of sex hormones. GonaCon eliminates the production of sex hormones whereby eliminating many of the disadvantages of PZP. Current research suggests that GonaCon treated deer are safe for human consumption and do not suffer from the stress associated with other immoncontraceptives. The fertility control lasts for 2-4 years in research animals. GonaCon is currently not approved by the FDA for noninvestigational use. USDA APHIS Wildlife Services continues to conduct research on GonaCon to pursue registration as a new animal drug. If the registration is approved, GonaCon may be an effective form of population control where hunting and sharpshooting are not acceptable. The approval process will likely take 5-10 years.

Estimated Cost: $400-$1,100 per deer

The difference between fertility control in individual deer and population control in a free ranging population cannot be overstated. There is no evidence to suggest that fertility control can effectively reduce deer populations at state recommended densities. Fertility control does not remove any deer from the population; it only reduces recruitment into the population. Therefore whatever damage is currently occurring (i.e., property damage, deer-vehicle collisions, etc) will likely continue, if not worsen.

3.2 Lethal Methods

Removing deer from only a small area within the Township will not be as successful as utilizing multiple methods to have a Township-wide effect. No single method is a silver bullet, but when implemented properly the Township can maximize the effectiveness, selectivity, and efficiency of a long-term integrated deer management plan.

3.2.1 Live Capture and Relocation

Live capture and relocation is traditionally described as a non-lethal method, however; it has been included in the lethal methods section due to the greater than 50% mortality that results from its implementation. Although many citizens may feel that this option is less invasive and more desirable,

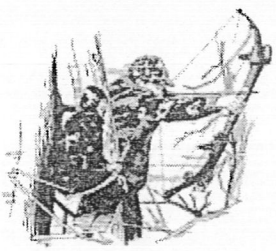
it is actually the most inhumane of all the lethal options. This method has four major disadvantages: (1) capturing deer is an expensive and inefficient process; (2) there are no suitable areas to relocate deer in the state of Pennsylvania; (3) only about 15% of relocated deer actually survive more than one year after relocation; and (4) relocation of deer is not permitted in Pennsylvania.

Research has shown that relocation of wildlife is not an effective or efficient method of managing a free ranging population. The capture stress often results in death or serious injury. Relocated deer could also introduce a disease or parasite into its new environment that was not previously present.

Estimated Cost: $400-$800 per deer

3.2.2 Controlled Public Hunting

Controlled hunts can be tailored to meet a variety of objectives and special consideration. A group like Whitetail Management Associates has established guidelines for marksmanship, hunting methods, hunting times, hunting locations, sex and age of deer targeted, and background checks for participants. In addition, all arrows are marked so that inefficient or dangerous hunters can be removed from the program. Due to the limited amount of habitat not affected by safety zones, controlled hunting alone will not be able to bring the population under control. Controlled hunting is an important part of an integrated management plan and should be implemented where feasible. Controlled hunting is the cheapest lethal control method.



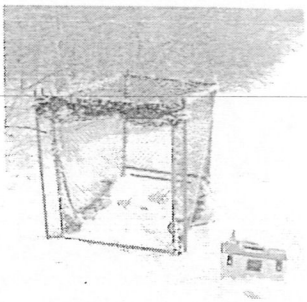
Estimated Cost: $80-200 per deer

3.2.3 Sharpshooting/Culling

Sharpshooting can be an effective method to reduce deer populations in urban areas. Sharpshooting has been implemented successfully in numerous urban communities throughout PA and the U.S. One of the major advantages to sharpshooting is that it is 100% selective and is a safe and effective tool. Concerns about using firearms in city limits are understandable, but there is no evidence to suggest this activity is unsafe. Sharpshooters are extremely well trained and use specialized equipment (i.e., suppressed firearms, night vision, etc.) to maximize safety. Shooting activities are well planned and conducted at predetermined locations, often using bait. Shooting is done from elevated positions to ensure that there is a safe backdrop for the shot. Sharpshooting activities are conducted using small caliber center fire rifles which are sound suppressed. Most sharpshooters use night vision, forward looking infared, spotlights, and high magnification scopes. USDA APHIS Wildlife Services conducts urban deer culling throughout the Commonwealth and only takes head or high neck shots to ensure a quick death and reduce the chance of injured deer. Head or neck shots are widely considered to be the most human lethal control method. Once deer have been removed they are processed and donated for human consumption. Proper planning, solid communication, and good cooperation are vital to the success of a sharpshooting/culling program.

Estimated Cost: $150-$500 per deer

3.2.4 Live Capture and Euthanasia



Trapping and euthanasia can also be an effective tool in urban environments. This method can be used in areas where sharpshooting is not safe due to lack of backdrop. Trapping can also be more efficient because the trap works all the time so long as it is set. Large baited box traps are commonly used to capture the animal. The animal is then euthanized by a head shot using a firearm. The disadvantages to trap and euthanasia are that traps are not selective and are generally less humane than sharpshooting due to capture stress. Interestingly however, trap and euthanasia is 10 times less stressful than capture and relocation according to blood cortisol levels. Live capture and euthanasia can be an effective tool if implemented properly and used as part of a larger integrated management plan.

Estimated Cost: $400-$600 per deer

4.0 RECOMMENDATIONS FOR LONG-TERM DEER MANAGEMENT

The Municipality recognizes that the White-tailed deer population requires active management to reduce damage and maintain a healthy herd. Continual long-term management is the only solution for urban deer overabundance. Based on the information collected in this document, the Municipality proposes the following integrated approach to efficient and effective long-term population management.

1) The Municipality will develop educational materials that will provide citizens with information on urban deer population dynamics and non-lethal methods that can be implemented on private property to reduce damage. This may include site visits to determine the most cost effective landscaping alternatives or exclusionary devices.

2) The Municipality will amend local ordinances to allow for Municipally controlled hunts or culling activities. Supplemental feeding ordinances should also be considered to prevent population concentrations and increased disease risk.

3) The Municipality will begin collecting data on the location of deer-vehicle collisions to be mapped using GIS for further review and potential revision of posted speed limits and signage.

4) The Municipality will conduct deer density surveys at least once every 3 years when engaged in active population management. Density surveys will allow for the Municipality to measure success of current management strategies and make adjustments where necessary. Additional information (i.e., deer-vehicle collisions, damage reports, etc.) should also be used to evaluate success or failure of management options.

5) The Municipality, in cooperation with USDA APHIS Wildlife Services will apply for a political subdivision permit from the PA Game Commission.
    - permit will run uninterrupted from November-March and shall cover all private (additional agreements may be required) and public land within the Municipal boundary
    - permit will call for the removal of not more than 75 deer per year
    - removal will be done by trained and certified professionals as approved by the PA Game Commission
    - sharpshooting over bait at night and trap and euthanasia will be the only methods of take
    - all deer will be processed and donated for human consumption

6) The Municipality will update the White-tailed Deer Management Plan annually with progress reports and new research if applicable.

7) The Municipality will create a Deer Management Committee consisting of Municipality leaders, PA Game Commission personnel, and others (i.e., PGC, USDA APHIS Wildlife Services) as appropriate. This committee

shall meet annually to discuss ongoing management strategies and evaluate program goals. The management goal shall be to implement measures to manage the herd at 1-3 deer per sq. mile as recommended.

8) The Municipality will require all parties engaged in active management to submit annual reports of activities for evaluation by the Deer Management Committee.

GnRH
Deer Population Control

NATIONAL WILDLIFE RESEARCH CENTER

U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services

Overabundant deer herds, particularly those in urban or suburban settings, present serious problems for wildlife managers, landowners, and the general public. Problems include increased numbers of deer-vehicle collisions, increased damage to ornamental and native plants, aggressive behavior toward humans by bucks during the rut, greater potential for disease transmission among deer, and reduced nutritional status of deer. Traditional methods of population control, such as hunting, often are impractical or illegal in such settings. The development of safe and effective wildlife contraceptives is needed to control overabundant wildlife populations in situations where traditional management tools cannot be employed.

NWRC Contraceptive Research—The National Wildlife Research Center (NWRC) in Fort Collins, Colorado, has been active in the development and testing of wildlife contraceptives since 1992. To be an effective and useful wildlife contraceptive, a compound should:

- be safe for the target animal and free of undesirable side effects,
- not affect nontarget species adversely,
- not cause treated food animals to become unsafe for human consumption,
- cause little or no negative social effect on target animals, and
- induce complete and long-lasting infertility that, ideally, is reversible.

Though many compounds have been tested at NWRC, including some that were highly effective in sterilizing wild mammals and birds, failure to meet the above criteria precluded their use in many management situations. Additionally, a contraceptive agent may cause undesirable reactions in one target species but not in others. For example, an immunocontraceptive vaccine developed from the zona pellucida of pigs (porcine zona pellucida, or PZP) has been used to temporarily sterilize dogs, coyotes, baboons, burros, wild horses, and white-tailed deer. The PZP vaccine is a highly effective contraceptive, but unfortunately it causes multiple estrous cycles in female deer. These multiple cycles and the recurrent sexual activity (and deer movements) associated with them may increase deer-vehicle collisions and other deer-human conflicts. The PZP vaccine does not seem to cause multiple estrous cycles in other species on which it has been tested, and it may prove to be a highly useful infertility agent for other wildlife.

A Single-shot Vaccine—As part of its program to develop tools for managing populations of overabundant wildlife

species, NWRC scientists have developed a new gonadotropin-releasing hormone (GnRH) immunocontraceptive vaccine (named GonaCon™) that shows great promise as a wildlife infertility agent. (For a technical discussion of GnRH immunocontraception see last page.)

Two major obstacles had to be overcome during the development of this vaccine. First, a new adjuvant had to be developed (an adjuvant is a compound that improves the immune response, causing higher levels of antibodies). U.S. Food and Drug Administration (FDA) concerns about the commonly used Freund's adjuvant prompted the search for a replacement. Accordingly, NWRC scientists developed a new adjuvant, AdjuVac™ (see sidebar) that is more effective than Freund's adjuvant but lacks the negative side effects.

The second major obstacle to the development of a new immunocontraceptive vaccine for wildlife was the need for a single-dose contraceptive, because of the impracticality of capturing free-ranging wild animals twice to vaccinate them. Previous contraceptive vaccines required at least two injections (an initial dose followed by a booster dose). Although it was originally developed as a two-injection contraceptive treatment, NWRC's GnRH vaccine was subsequently tested in a single-injection form that is much more practical as a field delivery system. Development of the single-injection vaccine was possible only because of the creation of AdjuVac™ adjuvant.

The usefulness of a single-shot immunocontraceptive vaccine depends, among other things, on the duration of the contraceptive effect that the vaccine produces. The combination of AdjuVac™ adjuvant and NWRC's GnRH conjugate produces a much longer-lasting contraceptive effect than was produced by earlier efforts that combined Freund's adjuvant with the (same) GnRH conjugate. (See next page for technical discussion of NWRC vaccine conjugate design.)

AdjuVac™ Adjuvant

Although the U.S. Food and Drug Administration has objected to its use on several grounds, including concerns related to target animal safety and human consumption of treated animals, the most popular (and controversial) adjuvant is Freund's Adjuvant. This adjuvant, widely used since 1945, has long remained popular among immunologists because it is so effective with all types of antigens. It is now known that the addition of *Mycobacterium* (as in Freund's complete adjuvant, FCA) provides a critical "danger signal" to the immune system that is the key to Freund's success. Although many other adjuvants have been developed since the initial appearance of Freund's, none has matched the effectiveness of FCA.

A typical disease vaccine primes the immune system to be on the alert for an infection caused by organisms with properties similar to those of the vaccine. Antibodies to the disease may be few in number or absent until the infection occurs. The infection then serves as a booster that stimulates an immediate immune response, protecting the vaccinated animal. For an immunocontraceptive vaccine to be effective, however, it must continually produce a high contraceptive antibody titer, so the booster effect must come from a different, nondisease mechanism—the adjuvant.

NWRC has modified and tested a USDA-approved Johne's vaccine called Mycopar™ as a replacement for Freund's adjuvant. Mycopar™ has already been approved for use in food animals by APHIS. The new adjuvant, which NWRC scientists have named AdjuVac™, contains a small quantity of *M. avium*, a common, generally nonpathogenic bacterium found in many species of domesticated and wild animals. NWRC scientists are testing AdjuVac™ in numerous wildlife species, and it appears to be an effective replacement for Freund's as an adjuvant for contraceptive vaccines. The GnRH vaccine GonaCon/AdjuVac™, developed by NWRC, has a USDA/APHIS patent-pending status.

Pen and Field Studies of GonaCon™— Recent studies with free-ranging California ground squirrels, captive Norway rats, feral cats and dogs, domestic and feral swine, wild horses, and whitetailed deer have demonstrated the efficacy of the single-shot GnRH vaccine as a contraceptive agent. Infertility among treated female swine and white tailed deer, for example, lasted up to two years without requiring a booster vaccination.

The NWRC GnRH Vaccine Conjugate Design

The GnRH vaccine generally provides a longer-lasting contraceptive effect in females than in males, probably because the females' demand for GnRH antibody is cyclic, in contrast to the males' constant demand. GonaCon™ contains a GnRH peptide conjugated to KLH combined with adjuvant AdjuVac™.

A single-shot vaccine that provides a multi-year contraceptive effect requires: (1) optimization of the vaccine structural design, (2) optimization of the dose for each target species, (3) use of the best adjuvant available, and (4) development of a delivery system that will protect the injected antigen from rapid destruction by the animal's immune system. Design of multiple-shot vaccines is much less demanding.

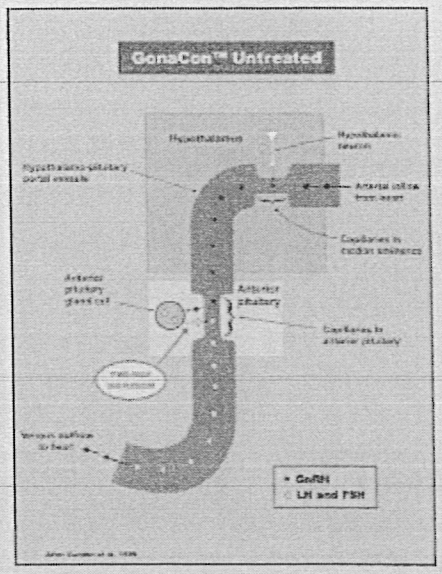
The design of the GnRH vaccine mimics the repetitive epitopes found in many pathogens. Pathogenic viruses and bacteria typically exhibit rigid, highly-organized, highly-repetitive protein epitopes. High epitope density in a highly-organized, repetitive arrangement is important in ß-cell responsiveness. Although ß cells are unresponsive to repetitive epitopes that are poorly organized, repetitive epitopes of proper spacing can stimulate multiple surface receptors of similar spacing. The repetitive epitope pattern permits a cross-linking activation of ß-cell receptors, providing an extremely strong, long-lasting immune response. Mimicry of the repetitive nature of pathogen epitopes is an important aspect of the KLH-GnRH conjugate design. The GnRH peptide, which is analogous to the repetitive epitope, was designed to ensure consistent alignment of the peptide when coupled to the KLH carrier.

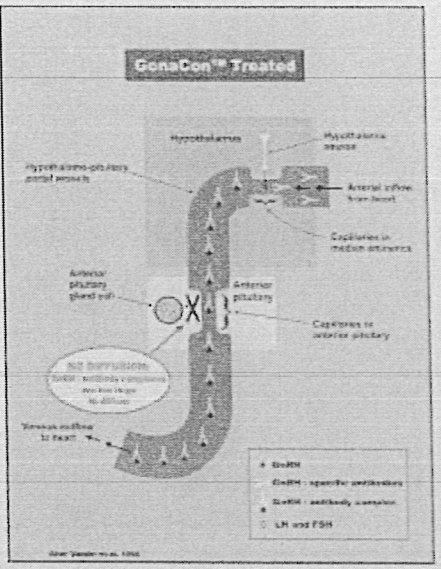
Ongoing studies initiated during July 2004 are examining the practicality of administering GonaCon™ to free-ranging white-tailed deer as well as the efficacy, toxicity, and safety of the vaccine. Near Silver Spring, Maryland, an overabundant herd of white-tailed deer on a completely enclosed site that is owned by the U.S. General Services Administration has provided an excellent opportunity to test the efficacy and practicality of GonaCon™ on a free-ranging deer population. In this field study, 28 adult does were captured, equipped with ear tags and radiotelemetry transmitters, and injected with GonaCon™ immunocontraceptive vaccine. The reproductive behavior and performance of these does will be monitored for two years and compared with those of 15 adult does (unvaccinated, control animals) that inhabit an adjacent, enclosed parcel of similar habitat. NWRC scientists are working closely with Maryland Wildlife Services to complete this field study.

In an ongoing study of captive white-tailed deer at Pennsylvania State University, NWRC researchers are collaborating with university faculty to assess the toxicity and safety o f GonaCon™. Responses of treated and control groups of deer will be compared via analyses that will include blood chemistry, hematology, and histopathology, as well as assays of circulating progesterone, luteinizing hormone, and GnRH antibodies.

FDA Registration of GonaCon™—No fertility control agents have been approved for non-investigational use on wildlife populations in the United States. Several materials, however, including GnRH and PZP vaccines, have been classified as investigational drugs that may be used (only) in rigidly controlled research studies. The two GonaCon™ studies underway in Maryland and Pennsylvania are being conducted as pivotal studies that are required as part of the FDA's approval process for a New Animal Drug. The approval process for GonaCon™ vaccine began in 1998 when the FDA established an Investigational New Animal Drug (INAD) exemption for the GnRH vaccine. All research studies of GnRH vaccine have been conducted under this exemption (INAD – 10006).

Advantages of GnRH—NWRC scientists are hopeful that the GnRH vaccine will soon be developed and approved for use for wildlife fertility control. GnRH vaccines have an advantage over PZP because they prevent eggs from being released from the ovaries, thereby eliminating estrus and some undesirable behaviors (e.g., bucks chasing does across roads) associated with it. In addition, GnRH vaccine has promise for reducing or eliminating certain undesirable behaviors in companion animals. For example, fighting, scent-marking, caterwauling and wandering by cats, and unruly behavior in horses, could be reduced by GnRH vaccine because the vaccine indirectly blocks the production of sex hormones (e.g., estrogen and





Control of Reproduction by GnRH —Gonadotropin-releasing hormone, which is produced in the hypothalamus at the base of the brain, controls the release of the pituitary gonadotropins LH (luteinizing hormone) and FSH (follicle-stimulating hormone). These gonadotropins regulate hormones that drive sperm production in males and follicular development and ovulation in females. Excitation of the GnRH neurons results in the release of stored GnRH peptide from its secretory granules in the hypothalamus. After it diffuses into the surrounding capillary blood, the GnRH travels via the hypophysial portal system to the anterior pituitary, where it diffuses from the capillaries and binds to and activates the LH and FSH gonadotrophs. This activation causes the release of stored gonadotropins, which diffuse back through the capillaries into the bloodstream. The gonadotropins then travel to and activate the reproductive organs, resulting in steroid synthesis and normal sexual activity.

GnRH Immunocontraception—The GnRH vaccine stimulates the production and release of GnRH-specific antibody from the B-cells into the bloodsteam. The antibody circulates throughout the body, and when it reaches the capillary region of the hypothalamus, it comes into contact with GnRH that has diffused into the capillaries after being produced in the hypothalamus. Binding of GnRH to the specific antibody forms large immune-complexes that travel down the hypophysial stalk. Because of their large size, however, the immune-complexes are unable to diffuse out of the blood at the pituitary capillaries. Instead, they remain in the venous blood and leave the pituitary without stimulating the release of LH and FSH. Without the LH and FSH that normally stimulate the synthesis of steroids in the reproductive organs, animals of both sexes remain in an asexual, nonreproductive state. As long as there is sufficient antibody to bind all GnRH circulating in the hypothalamic/pituitary portal system, all sexual activity will be suspended and animals will remain nonreproductive.

testosterone) that contribute to the expression of such behaviors.

The single-shot, multiple-year GonaCon™ vaccine will be a useful tool for the management of enclosed or urban/suburban wildlife populations, such as deer. GonaCon™ still has limitations, however, especially the need to capture and inject each animal. NWRC scientists hope to eventually produce an oral GnRH vaccine that will be attractive only to the target species. For additional information on reproductive control research at NWRC visit the website at:

http://www.aphis.usda.gov/ws/nwrc/research/reproductive_control/index.html

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11/04/04

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POLITICAL SUBDIVISIONS

§ 147.321. Scope.

This subchapter regulates the activities of persons, as defined in section 102 of the act (relating to definitions), who apply for, receive or conduct activities under a deer control permit issued under the authority of section 2902 of the act (relating to general categories of permits) or this part.

Source

The provisions of this § 147.321 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.322. Application for deer control permit.

(a) An application for a deer control permit shall be completed in conjunction with the Commission and submitted by an authorized officer or employe of the political subdivision in the form required by the Director and contain the information requested by the Director.

(b) An application for a deer control permit shall contain the following information:

(1) A complete map showing the boundaries of the area being considered and indicating the land use within the area, cover types, huntable areas, damage areas, deer concentration areas, safeaty zones and proposed control areas within the municipal boundary.

(2) A deer management plan shall be submitted with each application which provides deer density estimates and requesting the number of animals to be removed.

(3) Each application shall substantitate the background and scope of the deer problem and include alternative approaches to the problem and propose what action is recommended to be taken under the permit.

Source

The provisions of this § 147.322 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.323. Permit.

An application shall show the name, address, date of birth and telephone number for each permittee and subpermittee.

Source

The provisions of this § 147.323 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.324. Privileges authorized under the permit.

Deer may be taken:

(1) Outside the established hunting seasons as set by the Commission in § 139.4 (relating to seasons and bag limits for the license year).

(2) Regardless of age or sex.

(3) From February 1 to September 30, unless otherwise authorized by the Director and listed on the permit.

(4) At any hour, day or night, and with or without an artificial light.

(5) With any lawful firearm for big game as described in section 2322(a) of the act (relating to prohibited devices and methods).

(6) Only in areas designated by the political subdivision.

Source

The provisions of this § 147.324 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.325. Special conditions of permit.

(a) Special conditions specific to the applicant's area will be listed on the permit.

(b) Permits shall list the applicant's name, who shall be an authorized officer or employe of the political subdivision responsible for the activities conducted under this permit and list not more than five subpermittees who shall be licensed hunters or law enforcement officers, or both.

(c) A copy of the permit shall be carried by the permittee and subpermittees when engaged in activities granted by the permit. The permit shall be shown to any officer of the Commission or person empowered to enforce the act or this part.

Source

The provisions of this § 147.325 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.326. Carcass handling.

(a) Each deer harvested shall have the entrails removed at a suitable location away from where the animal was taken.

(b) Each deer shall be tagged or marked with a tag supplied by the Commission.

(c) Due care shall be taken with each carcass to preserve the meat for human consumption.

(d) Deer suitable for human consumption shall be utilized through a food bank or needy family or as otherwise determined by the Director.

(e) Antlers from deer taken under the authority of this permit shall be submitted to the Commission for disposal by the Director.

Source

The provisions of this § 147.326 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.327. Reports.

(a) Deer taken under the authority of this permit shall be reported to the Director on forms supplied by the Commission.

(b) Reports shall be submitted on a monthly basis when deer are taken.

Source

The provisions of this § 147.327 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.328. Permit renewal.

(a) Permits will be issued on a fiscal basis of July 1 to June 30 next following.

(b) Renewal of the permit will be subject to the review of progress towards deer management plan objectives.

Source

The provisions of this § 147.328 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.

§ 147.329. Violations.

The Director may revoke a permit for a violation of this subchapter, conditions of a permit, or if a report is not received, as required, upon written notice to the permittee.

Source

The provisions of this § 147.329 adopted July 29, 1994, effective July 30, 1994, 24 Pa.B. 3716.