DEER POPULATION MANAGEMENT

DEER POPULATION TREND OBJECTIVES

A deer population trend objective in each WMU is limited to one of three options; 1) increase, 2) decrease, or 3) remain the same. A decision on whether a population should increase, decrease, or remain the same will depend on deer management goals of healthy deer, healthy forest habitat, and acceptable levels of deer-human conflicts.

ROLE OF REGULATED HUNTING

The Game Commission uses hunting as the principal method for controlling deer numbers and deer impacts in the Commonwealth. Regulated hunting of deer has been proven to be an effective management tool, and the most efficient and least expensive technique for removing or managing deer numbers (Ellingwood and Caturano 1988). The Game Commission, as the state agency responsible for wildlife management, is directed by law to use hunting for management of game populations, including deer (34 Pa. Code, Section 103). Additionally, an important legal duty is to promote Pennsylvania's hunting heritage and provide adequate opportunities to hunt in the Commonwealth. At times, when regular hunting seasons prove insufficient or ineffective in adequately managing deer herd impacts, special laws, regulations and programs are used to facilitate the taking of additional deer.

CONSEQUENCES OF HARVEST MANAGEMENT OPTIONS

The long-term consequences of most deer management strategies are predictable based on what is known about the population ecology of deer and historical management practices. This section discusses deer harvest management strategies that are frequently suggested and/or endorsed by various groups.

No deer hunting

Unless winter weather conditions frequently impact deer thereby regulating their population (this happens along the northern fringe of their range), hunting is absolutely necessary to keep deer herds from growing beyond their biological carrying capacity (McCullough 1979). The "No deer hunting" strategy is promoted most by people and groups that do not support hunting. Farmers and foresters concerned about economic losses, all deer hunters, taxidermists, meat processors, and people concerned about deer-vehicle collisions or habitat and landscape damage typically do not support the "no hunting" alternative.

Antlered-only deer hunting

Similar to no deer hunting, bucks-only hunting results in the deer population quickly growing to its biological carrying capacity (McCullough 1987). This is because male deer are promiscuous breeders and one antlered male can breed with multiple females. Harvest of females is necessary to control population growth. Although hunters would see many antlerless deer, their success rates likely would be low as a result of diminished fawn recruitment rates that occur when deer numbers are near or beyond their biological carrying capacity.

Regulated deer hunting

Regulated deer hunting, which includes harvesting both antlered and antlerless deer, has long been the primary tool used by wildlife agencies to manage deer populations (Woolf and Roseberry 1998). Regulated deer hunting provides a unique opportunity for those who participate, and is the most fiscally-responsible, effective technique available for controlling deer herd sizes given the technology available and regulations in place today.

A common argument against regulated deer hunting is that it increases deer reproduction rates. In other words, it is counter-productive to reducing deer populations, because deer will increase reproduction to compensate for fewer deer.

This may be true for individual deer, but not for a population. For example, if a population is at 50 percent of biological carrying capacity, individual females may produce 1.6 fawns per female (Downing and Guynn 1985). If the population is reduced to 30 percent of carrying capacity, individual females may produce 1.8 fawns per female. As a population is reduced in relation to biological carrying capacity, individual deer can produce more fawns. However, this increase in individual reproduction does not compensate for fewer deer.

A smaller deer population will produce fewer fawns. For example, if a population is at 50 percent of biological carrying capacity with 50 adult females, the population can produce 88 fawns. If the population is reduced to 30 percent of biological carrying capacity and contains 30 adult females, the population may produce 70 fawns (Downing and Guynn 1985). The smaller population produces fewer fawns, despite an increase in individual female reproduction.

Regulated deer hunting is an ongoing management action. For regulated deer hunting to be effective in managing deer populations at levels where impacts are acceptable, it must be done on a regular basis. Finally, hunting is not counterproductive to an objective to reduce deer populations. Although fewer deer may result in increases in individual reproductive output, this increase in reproductive output cannot compensate for lower deer numbers.

TRAP AND TRANSFER

Back in 1906, the Game Commission launched a deer stocking program to accelerate restoration of the deer herd. At the end of the 19-year program, 1,200 deer from Kentucky, Maine, Michigan, New Hampshire, New Jersey, North Carolina, Ohio, and Pennsylvania had been trapped and transferred throughout Pennsylvania (Kosack 1995).

Today, requests to transfer deer are still heard. But the times have changed. Although market killing and unregulated harvest reduced most game in Pennsylvania at the previous turn of the century, our last century turned with deer in every corner of the state. The need to move deer from one location to another to reestablish a population is long gone.

The call to move deer usually stems from the desire to preserve individual deer in urban and suburban environments. Excessive deer populations in these areas and lack of a strong hunting heritage prompt requests for moving deer out of neighborhoods where they are causing problems or are perceived to be in danger.

Over the last 100 years, our knowledge of deer biology, behavior, and disease has grown by volumes. Translocating deer moves the needs of those deer to the new location; a location that already supports deer. Unlike 1906, there are no areas devoid of our state animal, and no empty or excess habitat to support a new population. Moving deer places more stress on the existing habitat to support those additions.

When a deer is relocated, it's not just the deer. Disease agents and parasites also are relocated. Meningeal worm was introduced to Florida and Georgia from deer that were moved from Wisconsin and Pennsylvania in the 1920s (Keel 2009, Davidson 2006). Chronic Wasting Disease (CWD) which is a contagious, environmentally contaminating, and always fatal disease to deer and elk species was introduced into Saskatchewan in 1989 from an imported elk. It wasn't detected until 7 years later (Keel 2009). CWD has been found in New York and West Virginia and is believed to have been introduced from an outside source as well. Deer can be reservoirs for bovine brucellosis and tuberculosis, which have implication for not only deer, but also livestock. Deer also carry parasites like ticks, which serve as vectors of the human diseases such as Lyme disease and ehrlichioses.

Finally, transporting live deer is very stressful to them, and results in high mortality both during transfer and after release. Several studies document this, some demonstrating fewer than half of deer transferred survive more than a year in their new surroundings (Jones and Witham 1990, Mayer et al. 1995, Cromwell et al 1999, Missouri Conservationist 1999, Beringer et al. 2002). Of the 1,200 deer purchased between 1906 and 1925, the number that actually survived the release and contributed to the state's whitetail recovery is unknown. In addition to these low survival rates, deer captured from urban/suburban areas usually seek out comparable residential locations defeating any justification for this type of the program (Beringer et al. 2002, Cromwell et al. 1999).

As a result of the disease risk, stress and mortality risks, and lack of need for population restoration, the Game Commission does not permit the use of trap and transfer as a deer management option. For areas where deer impacts exceed acceptable levels, other population reduction methods exist, such as hunting or sharpshooting. Where more deer can exist in balance with habitat, wildlife, and people, the deer population can be increased by reducing antlerless deer harvests. Trap and transfer neither protects individual deer from stress and mortality, nor is it a needed method for deer population restoration.

FERTILITY CONTROL

Research on wildlife fertility control agents is more than four decades old. It has been fueled by desires to control overabundant wildlife causing conflicts with humans. Changing landscapes and increased interest in nonlethal methods of population control have spawned a debate over traditional wildlife management techniques and the role of wildlife fertility control agents. Some members of the public believe fertility control to be more humane and morally acceptable than lethal management techniques. However, these perceptions do not take into account the efficiency, practicality, or safety of these drugs.

Fertility control agents for white-tailed deer are known as immunocontraception vaccines. These vaccines use the animal's immune system to produce antibodies that prevent pregnancy by interfering with proteins and hormones essential to reproduction. Currently, there are 2 types of immunocontraception vaccines that can be used in white-tailed deer: Porcine Zona Pellucida (PZP) and Gonadotropin Releasing Hormone (GnRH) (Fagerstone et al 2006). Advantages of PZP include: 1) breakdown in the gastrointestinal tract which precludes its entry into the food chain, 2) normally reversible when the antibody level declines in the body, and 3) reduced fertility in most female mammals. A single-shot has been effective in reducing fertility in white-tailed deer females for at least 5 years in some animals. Disadvantages of PZP are that it must be applied as an injection (no effective remote delivery) and it results in multi-estrous cycles (up to 7 cycles in treated deer) which could result in late season births if antibody levels fall below a critical threshold (Fagerstone et al 2006). Advantages of GnRH are that it: 1) is normally reversible when the antibody level declines in the body, 2) it is not sex specific and reduces fertility in most mammals, and 3) does not result in multi-estrous cycles. Disadvantages of GnRH are that it must be applied as an injection and it affects social behavior by reducing the sexual activity of both sexes. A single-shot of GnRH is effective for 1 to 2 years in reducing fertility (Fagerstone et al 2006). PZP remains experimental and has not been approved by the Food and Drug Administration (FDA) or Environmental Protection Agency (EPA). GonaCon was registered with the EPA as a restricted use pesticide in September 2009.

Although fertility control agents can stop reproduction in individual animals, effect on populations is the most important measure for deer management. Population modeling comparing the relative efficiency of reproductive control and lethal control in wildlife populations has been conducted. Results show that fertility control agents would be most effective in managing smaller wildlife species (rats and cowbirds) with high reproductive rates and low survival rates. Conversely, to achieve population reductions in those species with a low reproductive rate and high survival rate lethal control is more efficient (Fagerstone et al 2006). Deer have a low reproductive rate, compared to smaller wildlife species, and a life span of 10-12 years. Fertility control alone would probably not be effective in reducing the population. Modeling has shown that maintaining deer populations at a desired level is possible with long-lasting contraceptives (lasting 4 years) but reducing populations would be difficult without some lethal control (Fagerstone et al 2006).

In addition to population modeling, field studies of fertility control agents on deer populations have been conducted. The 2 largest and longest running field studies have occurred on Fire Island National Seashore in New York and National Institute of Standards and Technology (NIST) in Maryland. Fire Island National Seashore started using PZP in 1993. Population density on the most heavily treated area saw a 50% decline in the population by 2002. Initially, this area experienced a population increase after initiation of the study (Rutberg 2005, Underwood 2005). In other treated areas of Fire Island, population effects were not as clear. "One conclusion is perfectly clear, however; management horizons of at least a decade are not unreasonable when attempting to evaluate fertility control for managing free-ranging deer"

(Underwood 2005). The NIST PZP study began in 1993 as well. From 1993 to 1997, the deer population increased by 10.6% per year. From 1997-2002, the deer population decreased by 7.9% per year (Rutburg et al 2004). So after 10 years, the population and deer-vehicle collisions were the same as when the study was initiated. This population decline was precipitated by high mortality due to deer-vehicle collisions and low reproductive rates of untreated females associated with high deer densities (Rutburg et al 2004). As a result, effects of fertility control on deer populations remain ambiguous.

Stabilization or modest population reductions under relatively ideal conditions (i.e., small areas of 1 square mile or less, access to nearly all deer, isolated deer populations, and resources to support intensive field work) do not prove fertility control as a practical deer management tool. On Fire Island, deer population reduction occurred in one area but not in others (Underwood 2005). At NIST, factors other than fertility control, such as deer-vehicle collisions and high deer density, influenced deer population changes (Rutberg et al. 2004). And in both cases, fertility control was shown to be a multi-year process to stabilize deer populations.

Current fertility control agents are not timely deer management tools. By the time communities initiate action to manage local deer populations, conflicts are typically at crisis level. The questions regarding fertility control agents in these situations not only center on biological and financial feasibility but also timeliness. For a community contemplating use of contraceptives for deer management, a number of questions must be asked. First, do deer impacts exceed safe and acceptable levels? An affirmative answer to this question is a prerequisite for a community to take action to manage deer impacts. Otherwise, the debate will not focus on a solution, but rather on whether or not there is a problem. Second, can a community suffering unacceptable deer-human conflicts wait 10 years for the population and deer-human conflicts to stabilize? If a deer population can be stabilized using fertility control agents, populations still need to be reduced to alleviate deer-human conflicts. Is reducing a deer population via deer-vehicle collisions acceptable? “From a wildlife conflict resolution viewpoint, if you can’t stabilize or reduce a deer population with a contraceptive—no matter how well it works on treated individuals—you don’t have a management tool” (Rutberg 2005). Additionally, if this stabilization or reduction does not occur in a reasonable timeframe, you also do not have a management tool.

The Game Commission is struggling to control urban/suburban deer populations and continues to search for effective and practical tools to reduce these deer populations and thus deer-human conflicts. In Pennsylvania’s most developed areas, survival rates and reproductive rates create a situation where there is little room for error if contraceptives were to stabilize deer populations. For example, to stabilize a deer population with average non-hunting survival and reproduction rates, 95 percent of all adult females would need to be treated with a fertility control agent that was 90 percent effective to stabilize a deer population. It took 7 years to reach this level of treatment on the 570-acre NIST study site (Rutberg et al. 2004). Again, fertility control agents are not a short-term solution. Although the Game Commission understands the desire by some to use fertility control agents as an alternative to lethal methods, fertility control agents have not demonstrated an ability to reduce deer-human conflicts.

CONCLUSION

Different stakeholders want different deer densities for different reasons. These reasons range from individual beliefs and self-gratification to economics and environmental concerns. Table 9 also depicts the impracticality of pleasing everybody. The overarching goal is to create an effective deer management program that strives for a deer population that will preserve, protect, and enhance ecological communities, while striking a balance between the positive and negative impacts deer have on Pennsylvania's economy and residents.

Table 9. Deer densities that would likely be preferred by various stakeholders in Pennsylvania. Preferences are based on how each stakeholder is impacted by deer, and what is known about deer population ecology. Concept derived from Roseberry and Woolf (1991).

	Deer Density		
Stakeholder	**Low**	**Intermediate**	**High**
Anti-hunter opposed to recreational hunting	Unsatisfied	Unsatisfied	Satisfied
Hunters who want antlered-only hunting	Unsatisfied	Unsatisfied	Satisfied
People who want to see a lot of deer	Unsatisfied	Unsatisfied	Satisfied
Hunters who want high antlered harvests	Unsatisfied	Satisfied	Unsatisfied
Hunters who want high success rates	Unsatisfied	Satisfied	Unsatisfied
Deer processors and taxidermists	Unsatisfied	Satisfied	Unsatisfied
People interested in a healthy deer herd	Satisfied	Satisfied	Unsatisfied
People who are concerned about the environment	Satisfied	Unknown	Unsatisfied
Commuters concerned about deer-vehicle collisions	Satisfied	Unknown	Unsatisfied
Farmers concerned about crop damage	Satisfied	Unknown	Unsatisfied
Foresters concerned about forest regeneration	Satisfied	Unknown	Unsatisfied