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Abstract: Management of white-tailed deer (*Odocoileus virginianus*) herds at the landscape scale is increasingly difficult. The future of eastern hardwood forests is threatened by inadequate regeneration of valuable timber species, due in large measure to deer browsing. In the northeast, deer damage to crops, landscaping, and vehicles costs more than 640 million dollars annually. Nationally, hunter ranks are decreasing. In the east , white-tailed deer numbers are increasing; state wildlife agencies have expanded season lengths, and increased deer bag limits. While venison is still a highly prized meat, the average hunting family wants to use about 2 deer per year. Studies indicate that even with longer seasons, ample "doe" tags and intensive public education, there may be too few hunters to reduce deer populations to desired levels. Many suburban deer herds are essentially un-huntable because of legal or social constraints. In Fairmont Park PA, one of the world's largest urban parks, professional shooters reduced the herd by well over a thousand deer by shooting over bait at night. Has deer "management" been too successful? Is it time to turn the clocks back, admit we may have too much of a good thing? Have herd densities risen to the point that their long-term impact on habitat is unacceptable? Can financial incentives reduce the societal costs associated with overabundant deer? Can we restore habitat while providing revenue for private industry by reinstituting "market hunting" in the east? Biologically, we can do it; the social, cultural, and political constraints may be far tougher to overcome. Nevertheless, we believe it is time to put the issue of restricted market hunting on the table.

Key words: deer, deer damage, hunters, market hunting, white-tailed deer, wildlife agency

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INTRODUCTION

When settlers first came to North America, wildlife was abundant and there were no rules or regulations. In Europe, wildlife belonged to the ruling class and the common people had little access to it. In America, wildlife became a "common property" resource and while everyone owned it, no one took responsibility for wildlife management. Individuals took what they needed and there was little worry about wildlife populations because of the abundance of game and fowl. Passenger pigeons were in such numbers that their movements would block the sun from view. Buffalo, elk, and deer were also found throughout the east. Soon villages became cities, commerce and trade grew, and many hunters were replaced with storekeepers and tradesmen. To feed the cities and make money, market hunting was common from 1850-1900 (McCabe and McCabe 1997).

Passenger pigeons were killed by the thousands, deer were jack lighted, and this abundant wild game was sent to market by the wagonloads. We virtually wiped out the early abundance of wildlife by the end of the 19th Century. The last passenger pigeon died in the Cincinnati zoo in 1914 (Moran et al. 1980). During the same time period, extensive logging was taking place and land was being cleared for farming. Removal of the primeval forest had devastating impacts on wildlife. Counties in central New York and northern Pennsylvania had around 20% forest cover or less at the turn of the century. These same areas are now 65-70% forested and abandonment of agricultural land continues.

Deer herds in the eastern part of the United States were at record low numbers in the early 20th Century (McCabe and McCabe 1997). Even seeing a deer track was cause for great excitement because they had become so scarce. In Pennsylvania, the deer herd was less than 1000 and some reported that it was below 500 animals. In New York State, the herd was estimated to have less than 20,000 deer. New Jersey's deer population prior to 1900 most likely mirrored the population trends common to the eastern United States, resulting in severely reduced deer numbers in New Jersey by the early 1900s (Howard et al. 1974). State wildlife agencies Game Commissions were protecting deer to increase their numbers. Pennsylvania and New York were importing deer from other states, and trap and transfer programs were common within states. Where hunting seasons were allowed, it was bucks only. Regeneration of the forest and agricultural crops provided deer with an extensive smorgasbord. Deer in good habitat will produce on average more than 1.7 fawns a year. Deer abundance exploded early in the 20th Century and deer once again became common in the east. Hunters and state agencies had been successful in re-establishing deer and other wildlife populations. To maintain the herds, the bucks-only hunting seasons and protection of does continued. Herds continued to grow with winter snow depth being the major negative impact on the population (McCabe and McCabe 1984).

In the first three decades of the 20th Century, deer herds in Pennsylvania had grown to such a level that farmers were complaining about agricultural damage. In 1928, Pennsylvania had a doe's only hunting season in many of its 67 counties (Kosack 1995). This action outraged the hunters who had worked so hard to bring the herd back from the brink of disaster just a generation ago. Hunters, who supported the state wildlife agency through license purchases, were a vocal and large segment of the population and they felt betrayed. For the most part, this squeaky wheel was greased and doe hunting opportunities were decreased in most states.

Hunting has always been part of the American tradition; and up until the last quarter of the twentieth century, venison was an important supplement to the family food supply. As the nation became more industrialized and farming became more efficient, fewer people made their living from the land and food production no longer required a significant portion of our population to be farmers.

As we have moved off the farms and into the cities, our need to supplement the family food supply with wild game also diminished. Hunting was still an important tradition, but no longer the necessity that it once was. Each new generation has fewer and fewer individuals that earn their living from the land base and appreciation for the balance of land, plants, and animals is more blurred. Hunting has become less important in our culture, and fewer youth are being recruited into this tradition. In the northeast,

the number of hunters has continued a slow decline during the last 20 years, while the average age of hunters has increased.

Today, white-tailed deer populations are thought to be at historic levels in most eastern states. Some states allowed hunters to take a deer a day during a long hunting season or provide the opportunity to take a doe, check it in and get another tag as many times as wanted. In many states, deer hunting regulations have been liberalized with a 91 day deer archery season, reduced safety zones for archery hunting, earn a buck programs, and increased required doe harvest (Kilpatrick et al. 2005). In Pennsylvania, moving from a three day doe season by permit only to a two week concurrent doe season by permit with buck season has been a difficult change and is still a topic of rancorous discussion. The Pennsylvania Game Commission estimated the deer population at about 1.3 million before the hunting season in 2004. In addition, they established antler restrictions for the third consecutive hunting season. A small, but vocal segment of the less than 850,000 deer hunters complained that these policies were destroying the deer population, and that they were not seeing enough deer. Harvest numbers were down 12% in Pennsylvania, down 17% in New York, and down 14% in West Virginia in the 2004 hunting season. (Bob Boyd personal communication).

A study where ground positioning satellite (GPS) units were placed on hunters utilizing the Sproul State Forest in north central Pennsylvania and using aerial observation to locate hunters found that most hunters did not travel far from roads. Hunters were also asked to show on a map where they hunted and how far they walked during their hunt. On average hunters reported walking more than 2.5 times farther from the nearest road than they actually did, according to data. The average maximum distance moved from an access road was .84 km (.52 mi) and hunters walked an average of 5.4 km (3.3 mi) during their hunt (Stedman et al. 2005). Elevation of the terrain also reduced the distance traveled creating hunter densities that were not evenly distributed across the habitat. These factors seemed to allow refugiums for the deer and probably helped support the belief that there were fewer deer on public land. The study also indicated that the average age of hunters was in the mid 50-year range (Stedman et al. 2005).

In Pennsylvania on average 3 deer tags must be issued to hunters in order to harvest one deer. Studies indicate that the families of a deer hunter only want to utilize about 2 deer a year (Curtis et al. 2000, Enck and Brown 2001). In New York, Riley et al. (2003) found that hunters did not take sufficient numbers of antlerless deer to cause the herd to decline. Given the number of deer a family can use, and the success rate hunters have even with unlimited doe tags, it is questionable whether hunting alone can control deer numbers (Brown et al. 2000).

While hunters have an inherent interest in deer numbers, deer have a tremendous impact on all segments of our population. Conover et al. (1995) estimated that car collisions with deer cost over 1.1 billion dollars, with more than 211 human fatalities and 29,000 injuries each year. In the 13 northeastern states the estimated economic impact from deer-vehicle collisions and damage to a variety of crops, landscape plants, orchards, and nursery stock is almost 640 million dollars annually. This is a conservative and increasing estimate (Drake et al. In Press).

As the population in the United States has grown in the last 25 years, many city residents have become “exurbanites” (Eberts and Merschrod 2004). They have moved outside of the urban centers into suburban and rural areas. These individuals

relish the space and esthetic amenities of the country, but demand the conveniences and security of city life. Many of these new communities and neighborhoods are carved out of forest habitat or developed on former agricultural land. This construction has several negative and a few positive effects on wildlife species especially deer. The construction fragments and removes valuable habitat, but it also creates diversity and early-successional habitat for wildlife in these areas. The lush lawns, well-maintained landscape plants and the reduction of natural predators has provided excellent habitat for deer. Residents that would like to feel more linked with nature and their ancestors may feed and enjoy the presence of deer in their yards—up to a point. When deer numbers approach 30 deer per square kilometer (80 deer/mi^2), homeowners cannot grow shrubbery and many have been involved in deer/car interactions (often more than once), their attitudes towards deer may shift (Stout et al. 1997).

Many foresters believe that we are cutting more timber than our forests are able to sustain into the future because of reduced regeneration of native hardwood species. It was estimated by Marquis (1981) that the losses due to deer browsing were $5.26/ha/year ($13/acre/year) based on the stumpage value of an 80-year-old clear cut in the Allegheny Plateau of Pennsylvania. They blamed a lack of fire, the increased dominance of soft maple, acid rain, and the over abundant deer population as primary causes. Changing the role of fire in the ecosystem and reducing acid deposition require a more long-term approach on a landscape basis. Reducing the deer population could perhaps more easily be accomplished on a relatively short-term time frame.

In many urban areas, and in major city and county parks, deer have stripped the understory vegetation to the bare ground. Residents once rather reluctant to allow hunting have changed their minds (Lauber and Knuth 2000). In areas where public hunting was not allowed, sharpshooters have been brought in to reduce the population by professionals using bait, special ammunition, and night vision scopes. Animal activists and hunters often challenge these practices. Animal welfare advocates believe that nature will bring a balance, or contraceptives will reduce the population eventually (Baker and Fritsch 1997). Hunters want the *opportunity* to harvest these deer which they believe belong to them by virtue of purchasing hunting licenses, even if they only need 1 or 2 per year to eat. Contraception has not proven cost-effective for herd reduction in free-ranging deer (Cowan et al. 2002). Deer are not the sole purview of hunters as all wildlife is a "common property" resource owned by all the citizens of the state, the city of Princeton, NJ spent more $1 million to harvest about 1,000 deer over a three year period using sharpshooters. Princeton subsequently saw deer-vehicle collisions drop by 50% after the three year program. In Philadelphia's Fairmont Park, one of the world's largest urban parks, sharpshooters removed more than 1,100 deer in the last several years. Docents in the park indicate that they are seeing plants that have been absent in the understory for many years. All of the deer were processed at the local high school and the venison used in local shelters and food bank kitchens.

Venison when compared to farm raised meat has less fat, fewer calories, and no antibiotics (Medeiros et. al 2002). As the health awareness of the American public increases, the demand for organically grown meat and vegetables has also risen. Wild venison has many of the attributes that health conscious individuals may want in their meat. Farm raised venison has long been considered a delicacy and commands a

high price in specialty restaurants. Due to exploitation under the auspices of market hunting during the late 1800's, state laws prevent wild venison from being sold.

White-tailed deer numbers are at record levels in many states; hunter numbers are on the decline; deer are causing extensive damage to forest, agricultural, and urban communities; wild game has health benefits; and families only want so many deer a year. Given these factors, might there be other ways to bring the number of deer in line with stakeholder acceptance capacity? In other words, is it time to investigate new methods to bring deer into balance with their habitat, and with the wishes and desires of many stakeholder groups? Is it time to utilize financial incentives and the free market economy to overcome the social and political aspects of controlling our deer herds in selected areas?

While we are not advocating the return of market hunting as it existed in the 1800s, we do want to raise the question of controlled hunts for the purpose of managing deer impacts, and using the sale of the meat to fund the process. Several situations might be created to encourage an effective and profitable situation where the state would make money to further their management programs, individuals could make a profit and restaurants and connoisseurs could gain a highly prized and healthy meat product for the table. Such practices could be used on a limited basis with a closely monitored set of regulations and standards.

One possible scenario might be to allow a group of individuals (i.e., deer harvest company) to purchase the rights to kill a fixed number of deer in an area where numbers were beyond stakeholder acceptance capacity. This company would purchase the right, for example, to kill 100 deer using the most effective and humane method available to collect the animals. They would have the meat processed in a USDA-inspected processing plant and be able to sell it to individuals or restaurants for whatever price the market would bear. Methods used by the companies would be certified by the state wildlife agency, and might include the use of bait, night-vision scopes, elevated stands, and special ammunition. Each member of the company would pass a police background investigation and a proficiency and marksmanship test. Deer could be taken at night and at the most opportune times during the year for population reduction and meat quality. The number of deer taken would be verified by wildlife conservation officers. Company operations would be subject to random inspections by governmental agencies.

Each state wildlife agency would decide the types of areas in which these deer harvest companies could operate. Only specific situations where traditional regulated hunting has been ineffective at reducing excessive damage and other problems would be targeted. Examples include private lands with excessive damage, urban areas with unacceptable levels of deer-vehicle collisions, or on public land where deer are negatively effecting re-establishment of hardwood forests for the future.

Deer populations could be brought under control especially in areas where it would be unsafe to have regular hunting seasons. Public lands where traditional hunting was the common practice would not be utilized nor would private land unless the owner would sanction the reduction of the deer population. Such operations would remove primarily does. Programs could be tried on a very limited basis to prove the validity of the concept and gain public support.

Key factors for success of this idea include acceptance by state wildlife

agencies, deer hunters, and the general public. Wildlife agencies would have to be willing to take on the additional responsibilities of certification and inspecting the deer harvest companies in return for increased effectiveness at managing the negative impacts of deer. The agencies would in no way abrogate their authority to manage deer, but would maintain control over allocation of the deer resource by determining the number of 100-deer units that could be purchased by harvest companies, and would improve their ability to manage deer as a resource to be used rather than just a pest to be eliminated. Deer hunters would have to accept that traditional regulated hunting has not been able to meet the management needs of the public in some places. Their concerns about fair and equitable allocation of the deer resource would need to be heard and addressed in the context of separating allocation of hunting opportunity to individual hunters from the allocation of venison to members of the broader community. Citizen support for the commercialized state endorsed hunts would have to be established and maintained for the process to pass acceptance in the public eye and the public would have to find a commercial need for the marketed wild venison.

This is but one possible scenario of many that could be devised to accomplish the goals and objectives of deer herd reduction. While this is a radical departure from the long-standing tradition of hunting in America, it is one that may require some scrutiny in the future. Biologically, it is clear that our deer herds can sustain significant harvest without damaging the reproductive potential. The social and political barriers surrounding this idea could be substantial, but not insurmountable with careful planning and design. While the need for a new "market hunting" system may not be needed, feasible or attainable at this time, we thought that the question, "Hunters—Can they do the Job?" was a valid and germane question for our profession and the hunting public.

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