

THE QUABBIN CONTROLLED DEER HUNT 1991 – 2001: LIMITATIONS OF A CONTROLLED HUNT

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Abstract: The Quabbin Reservoir, built in the 1930's as a water supply for Boston, is an unfiltered source of water. The agency responsible for managing the reservoir wants it to remain unfiltered. As a result, human activity is kept to a minimum, including (until recently) a prohibition on hunting. The lack of natural predators and the ban on recreational hunting allowed the deer population to explode, which resulted in the forest being overbrowsed. Overbrowsing leads to sparse forest cover and soil erosion, thereby jeopardizing the quality of the water. Managers had to develop a politically acceptable solution to the deer overpopulation problem. After much debate, a controlled deer hunt was implemented. The controlled hunt had certain criteria including hunting in a group of two to six, hunting in assigned zones and hunting on specified days. Initial hunter interest was very high and in 1991, 7444 hunters applied for the 1020 slots. Over the past ten years the number of applicants has decreased to 993 applicants for 1055 slots in 2001. The declining trend in applicants is becoming a concern to managers as they strive to maintain the deer population at its current level so as to maintain an unfiltered water supply.

Introduction

The residents of Boston receive more than half of their drinking water from the Quabbin Reservoir, located 75 miles to the west. At 18 miles long, up to 150 feet deep and capable of holding 412 billion gallons of water, the Quabbin Reservoir is one of the largest bodies of fresh water in New England. The forest surrounding the reservoir filters precipitation before it reaches the reservoir. Therefore, the water that is sent to customers does not need to be filtered. The agency responsible for managing the reservoir, the Metropolitan District Commission (MDC), wants it to remain unfiltered because the installation of a filtration facility would be a very costly prospect. In order to ensure a healthy watershed, and as a result an unfiltered source of water, the MDC strives to minimize human activity within the reservation. Until recently, this included a prohibition on hunting.

Before 1991, the lack of natural predation and a ban on hunting allowed the deer population to grow immensely. The extraordinarily large deer population began to overbrowse the forest. An overbrowsed forest, because it is less efficient at filtering and buffering precipitation, would

endanger the water supply and force the MDC to ultimately install a multi-million dollar filtration system. This would be costly to those who receive their drinking water from the Quabbin as well as to Massachusetts state taxpayers.

In the late 1980's the MDC realized the deer herd needed to be thinned and discussed various options amongst themselves, with the Massachusetts Division of Fish and Wildlife, and with various stakeholder groups at several public meetings. In the end, it was decided that the most practical, fiscally responsible and politically acceptable option was a controlled deer hunt. The first annual controlled deer hunt was held at the Quabbin in 1991, after more than 50 years without hunting.

People interested in participating in the hunt had to fill out an application. Then, participants were chosen by lottery. Initial interest in hunting the Quabbin was extremely high and more hunters applied than were needed. Over the years, however, hunter interest has declined. Most recently, the number of hunters who applied is less than that needed to keep the deer population in check. The MDC is concerned with this trend because if the deer population were not controlled the surrounding forest would be in danger of again being overbrowsed, which would negatively impact the quality of the water in the reservoir. This paper will examine the history of the Quabbin controlled deer hunt and why it was the chosen method for culling the deer herd. Furthermore, the limitations of the current design of the hunt as well as potential designs for future deer management efforts at the Quabbin will be discussed.

Public Perceptions

Some recreation activities, such as hiking, biking, bird watching and fishing, are allowed at the Quabbin. However, many others are prohibited. For example, visitors are not allowed to walk dogs in the reservation, off-road bicycle, cross-country ski, snowmobile, swim or until 1991, hunt.

The combination of minimal human activity and the huge expanse of undeveloped land, in the populated state of Massachusetts, led many to view the Quabbin reservation as an untouched, pristine wilderness. Here was a place they could go to really connect with nature, stroll through the woods and leave their cares behind, take the kids for a picnic, observe rabbits and blue jays and deer and even, if they were lucky enough, the first pair of breeding eagles in the state of Massachusetts in over 80 years. Many people also placed a high symbolic value on the forest and wildlife of the Quabbin. For them, it was a symbol of nature the way nature is supposed to be. That is, nature in perfect balance and harmony without interference from people.

The MDC was more than happy to promote this view of the Quabbin as an accidental wilderness as it bolstered their reasoning behind limiting many recreational activities. They would explain to children on class trips that the Quabbin is a "haven" for wildlife. The friendly rangers would spend at least fifteen minutes chatting with visitors

about where they spotted moose or eagles and the best time of day to go to try to spot them.

People seemed to quickly forget that the expanse of woods and water had existed only since the 1930's. That men had come and removed all of the original trees, bushes, shrubs and man-made structures for the sole purpose of creating a drinking water supply. Strolling through the woods or gazing upon the seemingly endless expanse of water it was hard for people to entertain the thought that something was amiss. Thus, when the MDC was left with no choice but to control the deer herd by lethal means it was a hard sell.

History of the Deer Problem

After more than 50 years without being preyed upon by either natural predators or hunters, the deer population inside the Quabbin reservation was estimated to be between 20 and 50 deer per square mile for an approximate total of 1500 to 3000 deer. The Massachusetts statewide average was 8 to 10 deer per square mile (MDC, 1989). The costs associated with an overabundance of deer are high. Not only is a high density of deer correlated with a high incidence of Lyme disease but also with an unhealthy forest. When there are too many deer, they eat young hardwood trees before the trees can become established, thereby preventing forest regeneration. This alters and reduces the variety, distribution, and abundance of plant species and of the animal species that are dependent on those plants and endangers the water supply by reducing filtration effects of the forest.

If left unchecked, the end result of the deer alterations would be an 80-year-old, even-aged forest with sparse cover and much soil erosion. This type of forest is unacceptable for a drinking water supply. Even-aged forests are more prone to natural disasters, such as hurricanes, disease, pests and air pollution. If all of the mature trees are destroyed, as occurred in 1938 due to a hurricane, there would be no new growth to replace them. Furthermore, trees are a vital part of maintaining the quality of the water in the reservoir.

Tree roots are deep and form an interlocking network across the slope. These anchor the soil and stabilize stream banks [by] reducing erosion. They increase infiltration and water storage capacity within the root zone. Standing trees and large debris in riparian zones hinder water flow during stream flood stage . . . Forest vegetation can deter rapid melt and runoff of the snow pack and reduce soil freezing and frost heaving, which maintains high infiltration rates (Carlton, 1990).

Trees also absorb nutrients from the soil, thereby preventing the water from becoming eutrophic (MDC, 1989).

By 1989, parts of the forest surrounding the Quabbin reservoir were in danger of succumbing to the deer alterations. Of the 81,000 acres of the Quabbin watershed owned by the MDC, 36,500 were in a heavily browsed zone and approximately 12,000 of those acres were in need of immediate regeneration (MDC, 1989). MDC managers

knew that the costs of doing nothing were too high. They felt that in order to allow the heavily browsed species to regenerate, deer density had to be reduced to fewer than 10 deer per square mile.

Deer Management Options

MDC wildlife managers began to examine their options for managing the deer herd. Both lethal and non-lethal alternatives were considered. There were many facets of each option to be looked at including the pros and cons, cost, effectiveness and social acceptability. The pros, cons, cost and effectiveness can be obtained from the professional literature, on-site studies or from other natural resource managers who have used various methods to control deer populations. The level of social acceptability, which is neither static nor always applicable from one area to another, is more difficult to obtain. It depends on the stakeholders and their values. Stakeholders of the Quabbin reservoir include former residents and their descendants, members of a group called Friends of Quabbin, residents of towns bordering the reservoir, MDC employees, the Massachusetts Division of Fisheries and Wildlife, people who receive their water from the Quabbin, people who recreate at the reservoir, those who value the reservoir without using it, hunters, animal rights activists, and future generations. All of these stakeholders value the Quabbin differently and all base their desires for the various management options on their values.

Non-lethal Options

Most likely, the spraying of a chemical repellent, onto the plants and applying extra fertilizer to the plants to speed up their growth would not have raised much public outcry. However, there was a danger of contaminating the water supply as any chemicals applied within the watershed would eventually find their way into the reservoir. Also, the total cost of these methods would have ranged from \$1.4 to \$6 million dollars (MDC, 1989).

Placing plastic shelters, called tree tubes, around young trees until the leaves of the trees are beyond the reach of deer creates a microclimatic condition beneficial to the seedling which stimulates growth. However, drawbacks included the large amounts of plastic that would have been introduced into the ecosystem, human interference with the process of natural selection as managers would have decided which trees would be protected and which would be browsed and the possibility of vandalism, natural disasters, deer impacts and/or decomposition of the tubes. The total cost for this method would have been \$12 million to \$26.4 million (MDC, 1989).

Fencing, because it is seemingly non-lethal, does not conjure up a lot of protest. On the other hand, it was possible that extensive fencing of areas that had been highly browsed would cause deer to overbrowse adjacent medium browsed areas, thereby turning those areas into highly overbrowsed pockets. Also, as with tree tubes, there was concern about unnaturally altering the genetic diversity of the forest, vandalism and severe weather. The amount of

time for which the fences needed to remain erected was another challenging aspect. If managers wanted to create an uneven-aged forest, the number of fenced-in areas and the length of time the fences would have had to remain up would have been between 15 and 20 years. Maintaining miles and miles of fence for 15 to 20 years against vandalism, severe weather and the impact of deer pressure was a daunting prospect. Furthermore, the estimated cost was \$600,000 - \$4.8 million (not including the cost of maintenance and deer driving) (MDC, 1989).

Another method examined was chemosterilization (also called reproductive intervention or birth control). This method, which consists of trapping does and injecting them with a chemical sterilant was highly appealing to many members of the general public. There were, however, major drawbacks to this method. First, although effective drugs were available, a delivery system that was adequate in administering the drug to a large enough percentage of the Quabbin deer herd was not available. Second, because the Quabbin is a public water supply, there were concerns and liabilities involved with using drugs that inhibit reproduction. This method was costly as well, at an estimated cost of \$1,000 per doe (MDC, 1989).

The capturing and translocation of deer involves live-trapping deer in the Quabbin and releasing them in other parts of the state. The barriers to this method included the probable inability to capture enough deer to reduce the herd, the lack of suitable release sites in the state and the high amount of stress placed on the deer which results in high mortality of relocated deer. The total cost of this method was estimated to be \$60 million to \$198 million (MDC, 1989). In addition to being costly, none of the aforementioned methods had been proven effective at controlling a deer herd as dense as that of the Quabbin or on an area as large as that of the Quabbin.

Stakeholders who were in favor of these non-lethal options included a faction of Friends of Quabbin, some residents of the surrounding towns and animal rights activists. Those who supported these options did so based on the intrinsic value they held for the deer. They believed deer, because they are living creatures, were born with inherent value just as are humans. For them, the deer had this value in and of themselves and this value would have existed even if humans were not around to value them. They strongly believed the deer had a right to live, or alternatively, that people didn't have a right to kill them.

Lethal Management Options

The only lethal method for managing the deer herd, considered by the MDC, was hunting. The fact that effective hunting programs on areas as large as the Quabbin had been well documented was beneficial to the process of instituting this method of control. Still, hunting was perhaps the least well received and most controversial of the management options considered by the MDC. There existed (and still does) a wide spread anti-hunting sentiment that pervades modern urban and suburban life. In modern times, "most people without struggle or

bloodshed procure meat nestled on a styrofoam plate and wrapped in clear plastic. The role of the hunter is being challenged, and wild animals are regarded by many as having legal rights similar to those of humans" (Bolen, 1999). The idea that wild animals have these rights is based on the intrinsic value assigned to the animals by those who hold this view. Furthermore, those who held symbolic values for the wildlife and the forest were opposed to the hunt. Nonetheless, hunting appears to be, from the professional literature and experience of other managers, the most efficient and cost effective method for managing an overabundance of deer.

Three types of hunting programs were considered: hiring sharpshooters, a recreational hunt, and a controlled hunt. Sharpshooting would have involved about 8 to 10 experienced marksmen covering specific areas in a systematic, drive-like manner. On the plus side, this method would have minimized the number of people on the watershed and the MDC would have been able to closely supervise and regulate the sharpshooters (MDC, 1989). Also, this method would have potentially provided greater selectivity of the deer taken. This was important because in order to reduce deer populations it is essential to reduce the number of females.

However, as author Jan Dizard points out, there were three main problems with this method. First, sharpshooters are trained to hit targets, not live animals moving through the woods. Second, deer become wary of bait or salt licks after the shooting begins. After the initial shooting, "killing deer becomes a matter of *hunting* as opposed to shooting" (Dizard, 1999). A knowledge of terrain and the habits of deer, in addition to the ability to shoot accurately, are necessary for successful hunting. The third, and perhaps most insurmountable obstacle to hiring sharpshooters was the Massachusetts Division of Fisheries and Wildlife. By law, the deer of the Quabbin are under the jurisdiction of the Division, and they were adamantly opposed to sharpshooting. The opposition stemmed mainly from the high cost involved, the fact that by hiring sharpshooters the public would be denied access to a public resource and that this method was tried on Crane's Beach, Massachusetts and failed (Dizard, 1999).

The cost of this method was estimated to be \$31,200, with costs increasing as deer density decreased (MDC, 1989). The effectiveness was highly doubtful because, as already mentioned, once deer become aware of what is going on, they avoid bait or licks. They must then be hunted, which sharpshooters are not trained to do.

A recreational hunt was also considered. One benefit of this method was that there would be much interest on the part of hunters to hunt the Quabbin as it had not been hunted in over 50 years. Nonetheless, there were major obstacles. First, this method would have allowed unlimited public access and afforded the MDC very little control. In striving to maintain the reservoir as an unfiltered source of water it is necessary for the MDC to maintain control over areas that are accessed. Furthermore, this would have allowed for public access to the Prescott Peninsula, which

had been off limits to all but those with special research permits and MDC laborers. The MDC feared that opening the Peninsula to recreational hunters would motivate other special interest groups to petition for access to the Peninsula as well (MDC, 1989). Lastly, and perhaps most importantly, for various reasons, this was the most controversial of the lethal options and it would have been extremely difficult to garner public support. The idea of hunters "killing for fun" in the Quabbin, of all places, was unthinkable to many. Even many of those who accepted that the deer herd needed to be culled were against recreational hunting. Paul Lyons, an MDC biologist, said "we should be doing what we feel is needed here in the most efficient way possible, without adding this recreation or fun or sport aspect to it" (Dizard, 1999).

Adding to the unacceptability of this option was the fairly wide-spread anti-hunter sentiment. Hunters, as a group, are not held in the highest regard by non-hunters. As Jan Dizard explains, whether it is fair or not, many non-hunters perceive hunters as unkempt, armed men who look like roughnecks and renegades and lack common sense and common decency (Dizard, 1999).

This led the MDC to consider a more politically acceptable option, a controlled hunt. This method would have involved Massachusetts licensed hunters being given a permit to hunt the Quabbin. The positive aspects of this method were many. Such hunts have been held in many areas of the country for large-scale deer population reductions with a high rate of success. Furthermore, stringent control measures could be placed on the hunters. This would serve to lessen the effects of opening the area to increased public usage and make this option more acceptable by distinguishing it from a recreational hunt. Such control measures would include limiting the number of people selected to participate in the hunt, assigning the hunters to certain zones, keeping certain areas such as shorelines and unique wildlife habitat areas off-limits, and requiring that hunters hunt in groups of two to six so as to lessen traffic. Also, those hunters selected would be required to attend an orientation at which they would be told the goals and objectives of the hunt, given an overview of the area, hear a review of safety issues and receive their area assignments. Only after attendance at an orientation session would a hunter receive his or her Quabbin hunting permit.

An added plus to this method was that a program fee could be charged so as to help defray the costs of the hunt and help with conservation efforts. Some of the revenue from this fee would be used to fund measures which prevent degradation of the watershed (MDC, 1989). Lastly, the Division of Fisheries and Wildlife was amenable to "adjusting its management zones and distribution of doc permits to accommodate a controlled hunt at Quabbin" (MDC, 1989). This type of hunt also gave the MDC leverage in denying special interest groups access to the Prescott Peninsula because they could argue that the hunters were there for management purposes only, not recreation.

Controlled hunts have proven to be effective at reducing the density of deer populations over large areas of land. Additionally, this was a practical option because it would allow the MDC to closely monitor and minimize the impacts of the activities of the hunters. Also, it was fiscally responsible because it would be the lowest cost option in the long run and revenue would be generated from the permit fee to offset the cost. The estimated total cost of the initial controlled hunt was \$43,200, including the value of staff time necessary for administration, supervision and research, and the cost of necessary supplies (MDC, 1989).

After much consideration and debate, the MDC decided to implement a controlled deer hunt. Stakeholders who favored this method of control included the Massachusetts Division of Fisheries and Wildlife and a large majority of hunters. The MDC would have preferred to use sharpshooters because that option was more acceptable to the Friends of Quabbin and they didn't particularly enjoy the idea of using hunters, given their reputation, fair or unfair (MDC, 1989).

Hunter Ethos

Perhaps as much as the MDC did not relish the idea of using hunters as "tools of management," many of the hunters themselves did not love the implications of being tools of management. The MDC wanted managers, people who shared their goal of reducing the deer herd in as timely a manner as possible. Sport hunters are after more than simply killing a deer. "To be tools of management meant that the Quabbin hunters had to become preoccupied with the kill, something they had come to believe was almost an afterthought, not the point of the whole endeavor. Many were uncomfortable with the role of 'deer killer' as opposed to 'deer hunter'" (Dizard, 1999).

Today, many hunters strive to maintain the "sportsman ideal." Included in this ideal is a certain level of "etiquette and respect for game laws, a thirst for knowledge about nature, an identification with the prey and a commitment to utilize the bounty in ways that honored the wildness and uniqueness of the quarry" (Dizard, 1999). From the beginning, many hunters felt that by hunting the Quabbin, they would not be allowed to live up to the "sportsman ideal."

Nonetheless, those hunters who saw themselves as vanguards of nature and true environmentalists, were willing to hunt the Quabbin so that deer could once again exist in their natural condition. According to many hunters, the natural condition that predation keeps deer in is one of dignity, shyness,clusiveness, and the wherewithal to disappear into the landscape at the slightest hint of danger (Dizard, 1999). Other hunters wanted to hunt the Quabbin because it was an area their fathers or grandfathers had hunted and they too wanted to hunt there. Some applied because they were interested in hunting this area which hadn't seen hunters in over 50 years. Whatever their reasons, in the early years of the hunt, hunters applied in large numbers.

The Quabbin Controlled Deer Hunt

1991 was the first year the hunt was held, and it has been held every year since. The first year 7,444 hunters applied for the 1,020 spots and 575 deer were taken. While some stakeholder groups protested the hunts, no major problems arose within the hunted areas. The water quality was not affected, the portable toilets were well used, no erosion was spotted around the roads and no automobile or hunting accidents occurred (MDC, 2000). In fact there have been no major negative consequences to the Quabbin because of the hunts, only positive results. Deer population densities have been reduced, the population is beginning to have a more balanced sex ratio and is becoming composed of more animals in younger age classes. Most importantly, the impacts of the deer on the forest have been reduced to a level that "allows and promotes the development of a healthy, resilient, diverse forest that can adequately and continuously protect water quality" (MDC, 2000).

The hunt was divided into two phases: deer reduction and deer maintenance. The deer reduction phase was aimed at reducing the total number of deer at the Quabbin. During this phase, intense hunting pressure was placed on the herd each year in order to achieve the reductions. The pressure consisted of three 3-day hunting segments in each block. A block is one of 5 areas into which the Quabbin was divided for hunting purposes. This phase ran from 1991 to 1994, at which time the herd was reduced to a level that would allow forest regeneration to begin. The number of deer taken, during this phase, ranged from 474/year to 673/year (MDC, 2001).

In 1995, the MDC began to shift from the reduction phase to the current maintenance phase. The goal of this phase was (and still is) to maintain the number of deer at a relatively stable population using low-intensity hunting pressure, which consisted of one 2-day segment per block. Between 1995 and 2000, the number of deer taken was between 106/year and 293/year (MDC, 2001).

Maintenance of the Herd

Maintenance is an ongoing process because deer have the ability to reproduce and are therefore a renewable resource. Reproduction leads to the growth of a population. It is this growth that must be harvested in order to maintain the deer population at a steady state. Upon shifting to the maintenance phase, the MDC had to make sure that the growth of the species was being harvested. If less than the growth were to be harvested, the population would increase, thereby jeopardizing the regrowth. If more than the growth were to be harvested, the population would eventually get too low.

From the MDC's perspective, it is important for the maintenance phase of the hunt to continue. Although the area is beginning to regenerate, there is a lack of diversity of species. Specifically, white pine and black birch are the main species regenerating while oaks, hemlock, and ash still need to regenerate in larger numbers. Species diversity

is important in maintaining the quality of the water and in protecting the forest from natural disasters, disease, and pests. Forests that lack diversity of species are more prone to being wiped out by such things. One such example occurred in 2000 and 2001 when the entire forests on Mts. Pomeroy and Curtis, which were composed of a single species of tree, was completely wiped out by gypsy moths.

The deer population can only be kept in check if there are enough hunters who want to hunt the Quabbin. However, there is evidence that interest in hunting the Quabbin is declining. Initial hunter interest was very high and 1991, over 7,000 hunters applied for just over 1,000 slots. Over the past ten years the number of applicants has decreased and, as can be seen in Table 1, 62 slots remained unfilled in the 2001 hunt.

The MDC is aware of the necessity of the hunters and their decreasing interest in hunting the Quabbin. In recent years (2000 – 2001) they instituted various measures in the hopes of keeping hunters interested. First, the deer hunt application became available online for printing to make applying easier. Previously, applicants had to send a self-addressed stamped envelope to the MDC Quabbin office to receive an application. Second, in response to the difficulty in scouting the large areas where the hunts were held, a 1-day vehicle scout was offered. Third, a new check-in/check-out procedure was implemented. In previous years hunters had to give their access permits to the check station attendant in the morning and collect it in the afternoon as they checked out. The new procedure used numbered, perforated cards which the hunters were able to tear off and hand to the attendant thereby avoiding the lengthy delays and traffic problems encountered with the other method. Fourth, through an agreement with MassWildlife, hunters were allowed to exclude antlerless deer taken at the Quabbin from their bag limit. This meant that an antlerless deer taken at the Quabbin did not count toward a hunter's 2-deer bag limit. The MDC reported that the response to the new procedures, from the hunters who participated in the hunt, was "overwhelmingly positive" and hoped the long-term results would be "greater hunter satisfaction and increased long-term hunter interest" (MDC, 2001). Although these measures were well received by those who participated in the hunt in recent years they did not attract an abundance of hunters. Thus, it would behoove the MDC to examine the motivations and expectations of hunters as neither of these is apparently being met by the controlled hunt offered by the MDC.

Table 1 Number of Hunters and Number of Deer Taken from 1991 - 2001

Year	Applicants	Elected	Hunters	Surplus/ Shortage	Deer Taken
1991	7,444	1,020	1,020	6,424	575
1992	9,503	2,089	2,089	7,414	724
1993	7,052	2,303	2,303	4,749	474
1994	3,418	2,348	2,348	1,070	673
1995	4,846	1,702	1,702	3,144	284
1996	2,742	1,503	1,503	1,239	129
1997	1,790	1,525	1,525	265	293
1998	2,086	1,338	1,338	748	123
1999	1,522	1,311	1,311	211	112
2000	1,143	1,020	1,020	123	106
2001	993	993	1,055	(62)	101

Declining Interest

Contrary to the belief of many non-hunters, the taking of an animal contributes to overall hunter satisfaction, but it is not the only facet. The large majority of hunters do not bag an animal on any one trip and some do not bag an animal at all during the hunting season. As a result, "the satisfactions associated with other wildlife-related elements are likely to increase in importance" (Vaske, 1986). These other elements include being outdoors, the feeling of being one with nature, enjoying a change of pace from the daily routine, escaping, social companionship, experiencing new things and the challenge and skill involved in the hunt (Vaske, 1986).

While hunters at the Quabbin still get to be outdoors, one must wonder how much of an escape it is when there are so many constraints placed on the hunters. To reiterate, a limited number of hunters are chosen, they must hunt in groups of 2 - 6, they are told where they must hunt, and they must attend an orientation session (once every five years). Furthermore, the deer density at the Quabbin is much lower than it was initially. Many hunters, regardless of whether or not they are successful, are more satisfied with the hunting experience if they believe they have a fairly good chance of bagging an animal. The amount of game seen and the number of shots taken indicate, to hunters, their chance for success (Vaske, 1986).

Another element that affects hunter satisfaction is hunter density, which can either add or take away from hunter satisfaction. While other hunters flush out deer thereby increasing the chances of success for everyone, they also increase competition and may result in perceived crowding. While it is known that during the 2000 hunt, hunter density was approximately 17 hunters per square mile, it is not

known whether or not the hunters were satisfied with that number. Finally, it may be that overall interest in hunting is declining. As one study indicated, the number of male U.S. hunters declined between 1980 - 1990 (Heberlein, 1996).

Discussion

If the MDC wishes to continue using hunters as "tools of management," it must find a way to increase hunter satisfaction. A number of steps have been taken to accomplish this, including making the application more readily available, offering a 1-day vehicle scout, easing traffic during check-out and offering a "bonus deer." Nonetheless, Quabbin managers may be forced to reconsider the deer herd management plan.

In the end, the other options for managing the herd may have to be revisited. One such option is the recreational hunt. It is unlikely that a full recreational hunt could be implemented for a variety of reasons. First, this option would be unacceptable to many of the stakeholder including Friends of Quabbin, animal rights activists and even some MDC employees. Second, the MDC may have to give up control over the zones that are hunted as they may not be able to tell hunters where to hunt. This is a potential problem because in order to ensure regeneration in certain areas, the deer in that area need to be hunted.

Next, if the Quabbin were to be open for recreational hunting, other recreation groups such as cross-country skiers and snowmobilers would demand access as they would view it unfair that recreational hunters can hunt but they cannot do what they want. The MDC cannot allow uncontrolled access to the reservation as this increases the risk of disease causing biological borne agents contaminating the water supply. Additionally, an increase

in automobile traffic could destroy the roads and lead to soil erosion.

Perhaps the MDC can continue to use a controlled hunt, but ease certain restrictions so as to make it more like a recreational hunt. For example, no longer requiring hunters to hunt in groups may make the hunt more attractive to those who like to hunt alone. Second, the zones could be increased so hunters have more freedom of choice as to where they will hunt. Also, the number of applicants may increase if the Quabbin hunting season is extended. Finally, if it is possible to allow deer density to increase slightly, without endangering the regrowth, hunter satisfaction may increase.

Clearly MDC-Quabbin employees must find an option for managing the deer herd which is acceptable to both themselves, the hunters on whom they rely as "tools of management" and various stakeholder groups. In order to facilitate their task, they could survey current and previous hunters of the Quabbin and different stakeholder groups. This would allow them to figure out what has or has not kept hunters interested in hunting the Quabbin and how stakeholder groups would react to alternative management options. The results of the survey would allow the MDC to design the best possible management plan that controls the deer herd and meets the current needs of various interested parties.

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