

WILDLIFE DAMAGE MANAGEMENT ON A PUBLIC WATER SUPPLY

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ABSTRACT: Wildlife populations can pose a variety of problems to managers of public water supplies. Further, new federal and state regulations governing the management and protection of drinking water supplies require greater consideration and mitigation of these problems. The Metropolitan District Commission (MDC) manages watershed lands that provide high quality drinking water to more than 2.4 million people in Massachusetts. This water originates from the central and western portions of the state, from 3 watersheds and 2 reservoirs that also provide habitat for a wide variety of wildlife species. In recent years, the MDC has evaluated the impacts of various wildlife species on water quality and watershed integrity, and has instituted control measures to deal with several wildlife problems. These include: 1) management of beaver (*Castor canadensis*) and beaver dams; 2) dispersion of gulls (*Larus* spp.) and Canada geese (*Branta canadensis*) that roost on the reservoirs; 3) a program to control white-tailed deer (*Odocoileus virginianus*) impacts on forest regeneration; and 4) control of small mammal burrowing activity in dams and dikes. The development of effective and successful programs for dealing with these problems has required careful assessment of the nature and extent of the impacts, including how they conflict with agency mandates, as well as an assessment of public opinions and concerns.

Key words: Wildlife damage management; water supplies; Massachusetts; Quabbin Reservation; Beaver; White-tailed deer; Gulls.

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Wildlife species can have significant impacts on water quality and watershed conditions. Such impacts are generally of a microbiological nature (Reinert and Hroncich 1990), although impacts on chemical and physical parameters (e.g., Brandvold et al. 1976) and watershed conditions (e.g., Naiman et al. 1988) can also be of concern. Further, new federal drinking water regulations resulting from the 1986 amendment to the Safe Drinking Water Act (Fed. Register 1989), provide new emphasis and monitoring requirements for several water quality parameters that are potentially influenced by wildlife. Thus, effective methods of wildlife damage management for water quality protection have become increasingly important to managers of public water supplies.

This paper provides an overview of the main wildlife-related problems on a drinking water supply reservoir and watershed in Massachusetts, and discusses the methods used to deal with those problems.

BACKGROUND

The Metropolitan District Commission (MDC) manages watershed lands that provide drinking water to almost half the population of Massachusetts. The 2 main reservoirs in the MDC water supply system - Quabbin and Wachusett - currently provide over 250

million gallons/day of high quality, unfiltered drinking water to the 2.4 million people who depend on the water supply system.

In addition to the reservoirs, MDC also controls over 80,000 acres of land area on 4 watersheds. Most of this land is forested, and is actively managed for water quality protection, and other values. A diverse and abundant wildlife community inhabits the watersheds, several of which have not been open to hunting or trapping since their creation in the late 1800's or early 1900's.

Since the water is unfiltered, watershed managers are particularly watchful of potential water contamination problems, including those resulting from wildlife activity. Animals that live on or in the water are of particular concern, since they are in direct contact with the water supply. However, other species (e.g., those that can alter watershed habitat conditions) are also of concern. On MDC watersheds, we're most concerned about 4 species or groups of species (Beaver; Gulls and Canada geese; White-tailed deer; and burrowing animals - e.g., *Microtus* spp., *Marmota monax*) that are capable of substantially affecting water, watershed or infrastructure conditions.

New federal and state regulations regarding drinking water supplies require regular monitoring, and

provide threshold standards for a number of water quality parameters, including turbidity, coliform bacteria, viruses and *Giardia lamblia* (a protozoan parasite found in a variety of animal hosts). These regulations provide added reason for careful monitoring and control of wildlife problem situations on the watersheds.

SPECIFIC PROBLEM SITUATIONS

The concerns related to wildlife activity on MDC watershed lands involve existing or potential impacts on: a) water microbiology (e.g., bacteria, viruses, protozoa); b) chemical and physical parameters (e.g., temperature, turbidity, color, nutrients); and c) the integrity of the watershed and the waterworks infrastructure (e.g., dams, roads, watershed cover).

1) Beaver

Beaver dam construction and tree cutting can produce substantial changes in the hydrology and cover conditions of streams and riparian zones (Naiman et al. 1988), as well as impacts on roads, dams and other watershed infrastructure. Further, beaver have also been implicated as possible vectors in several waterborne outbreaks of Giardiasis (Erlandsen and Bemrick 1988). Thus, beaver can potentially influence all 3 of the impacts identified above.

Dam-building affects various aspects of water quality, such as turbidity, temperature, color and nutrient levels (e.g., Malben and Foote 1955; Naiman et al. 1986; Wilen et al., n.d.). Intact, stable dams and ponds can accumulate substantial amounts of sediments and nutrients, resulting in a "sequestering" of these materials up in the watershed, instead of down in the reservoir.

Over time, aquatic and emergent plant growth may stabilize these areas, thus "locking" the sediments and nutrients in place (Naiman and Melillo 1984). This is obviously very desirable for maintaining high water quality in the reservoir. However, dam-breaching episodes can release substantial amounts of these accumulated sediments and nutrients, resulting in significant water quality degradation downstream.

We deal with beaver problems in various ways. In the past, we've live-trapped and moved problem beaver to other parts of the watershed, but most suitable beaver sites are already occupied or exploited, and the Massachusetts Division of Fisheries & Wildlife

now discourages live-trapping and transplanting of beaver. Lethal trapping is now being considered in limited situations where non-lethal control measures are ineffective or impractical.

In many cases, we can deal with beaver problems through the regulation of water levels in the beaver ponds, and we have used and experimented with various designs of flow control devices over the years. Generally, we've had good success using these devices, although we've found that their use and effectiveness is often limited by the water depth and productivity of the pond.

Recognizing that the net impact of beaver activity is often related to the stability of the beaver dam itself, we're also experimenting with "stabilizing" dams that are prone to washout. This is especially important on "flashy" streams, or in areas close to the intake structures (where water is leaving the reservoir, heading towards the consumers' faucets).

We also recognize that beaver are a high-public-interest species, and that we need to know more about the relationships between beaver activity, water quality and watershed integrity. Thus, we plan to further study the role of beaver on our watersheds, and continue to refine our management policies to reflect the need for site-specific, ecologically-defendable decisions.

2) Gulls and Geese

Roosting gulls and geese are also a major concern to water supply managers - again, because most of their offending actions occur on or near the water surface. The concerns with these species relate primarily to microbial and chemical impacts.

Gull and goose problems mainly occur during fall and early winter months, when geese are migrating through the area, and gulls are moving inland from coastal breeding sites. We do have a resident goose population, but it is not very large and does not pose a significant water quality problem at this point.

The problem with these species relates to their tendency to defecate in or near the water. This results in increased bacteria and nutrient levels (Hussong et al. 1979; Benton et al. 1983; Portnoy 1990), as well as the possible introduction of disease organisms, such as Salmonella (Monaghan et al. 1985), into the water.

We're particularly concerned about the gulls since they congregate on the reservoir in much greater numbers than the geese and they spend their days at local landfills and sewage treatment facilities, where they can easily come into contact with various organisms that we'd rather not have in our drinking water. Three species of gulls - Herring (Larus argentatus), Great black-backed (Larus marinus) and Ring-billed (Larus delawarensis) constitute the majority of the birds using the reservoirs for roosting

We've dealt with these problems in several ways. First, we knew we'd have a difficult time keeping the birds off the reservoirs altogether, so instead, we established a "gull-free" zone near the water intake facilities. We then used a program of physical harassment, with people in boats firing shellcrackers to essentially "herd" the birds out of the gull-free zone. The boat crew attempted to move the birds just enough to keep them out of this zone. We've also experimented with other pyrotechnical devices, such as propane cannons, but have not found these to be particularly effective.

Due to their ability to fly long distances between feeding and roosting areas, gull problems in southern New England are considered a regional issue, so we've started discussions with other state officials, and the operators of local landfill and sewage treatment plant facilities in an effort to reduce the availability of gull food in the region. Ultimately, we feel that this will be the most effective means of reducing our gull problem.

For goose control, we've used several habitat modification techniques to keep the geese away from the water's edge. Simply leaving grassy areas unmowed has reduced goose use somewhat, but we've also established a vegetational border (using Rosa rugosa) along the shoreline to block both the visual and escape paths of the birds to the reservoir. Public feeding of geese, and other wildlife, is also prohibited around the reservoirs.

3) White-tailed Deer

On the Quabbin Reservation, deer browsing has caused substantial alterations to watershed cover conditions. Until recently, the deer herd on Quabbin was unexploited for more than half a century. During this time, the herd grew to the point where it was

effectively eliminating a substantial portion of the woody regeneration on the reservation. This impact was obvious, but not considered to be a problem for many years, since the watershed forest was still fairly young and healthy, and the lack of regeneration actually increased water yields from the land (Spencer 1975).

However, in recent years, the existing forest has matured, stagnated and started to break up from wind, ice, insect and other forms of disturbance, and with the lack of regeneration, much of the watershed appears to be moving towards "savannah" conditions rather than the diverse, healthy forest cover that we feel provides the best long-term protection for water quality.

After documenting the nature and extent of the impacts on forest regeneration (Kyker-Snowman 1989), we then developed a deer impact reduction plan that would effectively deal with the deer impact problem, yet also minimize potential human impacts on the watershed, and incorporate the concerns of a wide range of special interest groups on how the reservation should be managed. This plan included several components, including controlled public hunting, smaller-group supervised hunts, experimental large-scale electric fencing, and several changes in the way MDC conducts land management activities on the watersheds.

Controlled public hunting constitutes the heart of the program, however, and we've had 2 extremely successful hunts during the past 2 years. We attribute much of this success to the combination of our program design (which included the use of multiple hunting segments and good hunter density and distribution), and good communication with the hunters - both during the hunts, and during mandatory orientation sessions prior to them.

We've also been experimenting with tree shelters, and have erected several electric fence enclosures in areas where deer population reduction is not an option.

4) Burrowing Animals

Finally, we occasionally must deal with the impacts of burrowing animals, especially in our dams and dikes, where the burrows can present serious threats to the integrity of these structures. So far, we've dealt with these problems by contracting with the local USDA APHIS ADC office for lethal control.

However, we're looking into more permanent control measures involving habitat modification to discourage burrowing activity in critical areas.

DISCUSSION

MDC views wildlife as an important component of its watershed lands - one that is of particular interest to the hundreds of thousands of people that visit those lands each year. But when wildlife problems arise, we recognize that our primary obligation is to protect the quality of the water supply. However, MDC is a public agency, and its watershed lands are public property, so management decisions must also consider the values, interests and needs of all the residents of the state.

In dealing with wildlife problems on our watershed lands, we've found it extremely important to clearly define the nature of the problems as well as why and how they pose conflicts with our agency mandates. Still, finding effective, publicly-acceptable and politically-viable solutions to our wildlife problems is often challenging. The tremendous diversity of public opinions and special interests regarding deer hunting for example, made the process of developing a plan to deal with deer impacts very long and difficult. Ultimately, the acceptance of that plan required striking a tenuous balance between the interests and concerns of a number of groups and agencies.

The future for wildlife damage management on MDC watershed lands will likely be one of continued intensive efforts to maintain animal populations, or their impacts, at levels compatible with watershed management goals and practices. Some problems will require inter-agency cooperation (e.g., working with the Massachusetts Division of Fisheries & Wildlife on the Quabbin deer hunts) or regional efforts (e.g., to reduce gull food sources). Others (e.g., beaver impacts) will require more research, aimed at more clearly defining that fine line between a benefit and a liability. All will require an objective, professional perspective that ties management proposals to agency mandates, and also incorporates the opinions of an increasingly concerned public.

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