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The impact of *Branta canadensis* herbivory on shoreline restorations

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Introduction

Branta canadensis (Canada geese) were a welcome sight forty years ago when their United States population was only a few thousand (Smith et al. 1999). Today they are considered a nuisance on farms, golf courses, parks, lawns, and airports (Chasko and Conover 1988). Their high nutrient feces decrease water quality, and their large populations increase the transmission of avian diseases (Smith et al. 1999). *B. canadensis* herbivory also poses a threat to the success of recently restored shorelines (Bartodziej, Lerman, Peterson, Vigness-Pint – personal communications).

Lake and wetland shoreline restorations are a method of improving water quality, alleviating erosional problems, and creating a natural aesthetic look (Henderson et al. 1999). Creating a vegetated buffer area next to a lake or wetland is also a method of discouraging *B. canadensis* from congregating in the area (Henderson et al. 1999). The problem with this method is protecting the restoration from goose herbivory until it becomes established. Managers have put forth great effort to protect newly planted areas from devastation by *B. canadensis* (Bartodziej, Lerman, Peterson, Vigness-Pint – personal communications). This paper will identify the feeding habits and foraging behavior of *Branta canadensis* and their impact on plants in natural ecosystems and shoreline restorations. It will then discuss methods of control and their effectiveness in terms of restoration success.

Life History

The drastic population increase of *B. canadensis* is in part due to a series of laws passed by the government in order to increase the population of *B. canadensis*. First, the Migratory Bird Treaty Act of 1918 was passed, preventing the shooting of migratory and breeding birds. Then, in the 1930s, hunters had to release captive flocks of *B. canadensis* when the use of live decoys was prohibited. The *B.*

Figure 1. *Branta canadaensis*

canadensis were accustomed to human interaction and quickly acclimated to residential and urbanized areas. In the 1960s and '70s wildlife managers in several states encouraged the establishment of flocks that stayed in the same area year-round (Chasko and Conover 1988). The efforts to increase the number of *B. canadensis* in the United States have resulted in a population in the millions (Aukney 1996, Smith et al. 1999). Today *B. canadensis* are still protected under the Migratory Bird Treaty Act of 1918. Permits are required in order to destroy eggs or capture *B. canadensis* in most states (Smith et al.1999). Figure 2 depicts the distribution patterns of migratory *B. canadensis* in North America.

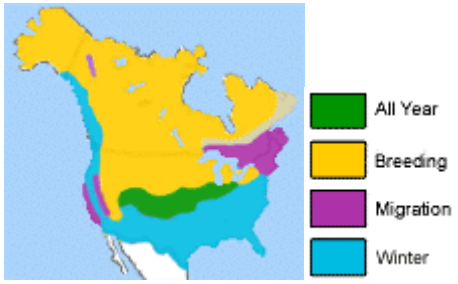

Figure 2. Distribution of migratory *B. canadensis* in North America (does not take into consideration year-round urban populations) (IHEA 2002)

Food Selection

B. canadensis are, for the most part, herbivores (Baldassarre and Bolen 1994, Owen 1975). In rural areas they feed on agricultural grains such as wheat, soybeans, and corn in the fall and winter. They will switch to native marsh vegetation, such as *Eleocharis* and *Polygonum*, in the spring (Baldassarre and Bolen 1994). In urban areas they often feed on large expanses of lawn grass. Prevett et al. (1985) found that geese ate primarily the shoots of grasses and sedges, as well as some roots and seeds in an arctic, coastal wetland. Zacheis et al. (2001) studied another arctic salt marsh and found that geese consumed portions of almost all wetland plant species, feeding primarily on aboveground parts. Vigness-Pint (personal communication) has observed non-discriminatory herbivory of grasses, sedges, and forbs in the transitional zone of a shoreline restoration. In restorations that Bartodziej and Petersen (personal communications) participated in they discovered goose herbivory of the emergent aquatic vegetation. In general geese appear to be non-discriminatory in their food choices, eating both forbs and grasses as well as aquatic vegetation. Also, they tend to consume mainly the aboveground portions of these plants.

Foraging behavior and efficiency

B. canadensis spend the majority of the daytime hours foraging for food. Owen (1975) found that *B. canadensis* will spend up to 90% of the day feeding. Gawlik and Slack (1996) found similar rates where *B. canadensis* were feeding 82% of the time. They also discovered that *B. canadensis* feed while in motion 70% of the time, moving from plant to plant, rarely staying in one spot for very long. This continuous feeding behavior is the result of low digestive efficiency. Food will pass through their digestive system in an hour, and at times, in as little as 30 minutes (Owen 1975). In a study done by Buchsbaum et al (1986), *B. canadensis* only digested an average of 37% of the total organic matter ingested, as evidenced by the large amounts of feces left behind once a flock has moved out of an area.

Site Selection

In urban settings, *B. canadensis* prefer to inhabit areas with a large lawn next to a water body having few obstructions to hide potential predators (Smith et al. 1999, Conover and Kania 1991). Conover and Kania (1991) suggest that *B. canadensis* do not select a site based on the vegetation present but instead select a site where there is a low risk of predation. In their research they found that *B. canadensis* preferred lawns and water bodies with lower "flight clearance angles" over vegetation and larger open areas. The priority of a protected site over site vegetation may be the reason for their lack of food preference.

Impacts on shoreline restorations

While vegetation in an established shoreline habitat will likely rebound after goose herbivory, plant material in a new restoration is much less likely to survive. The process of a typical shoreline restoration will include grading of the site, the addition of seed to the site, securing of erosion control fabric, and the

installation of plant plugs (Bartodziej – personal communication). After the initial installation, most plants need the whole growing season for roots to expand and become established (Bartodziej, Lerman, Peterson – personal communications). Prior to plant establishment *B. canadensis* can remove whole plants from the ground with ease because roots have not had a chance to expand and anchor the plant. This seems to be unintentional as they move along from plant to plant attempting to crop off the tops. Even though they do not eat the roots, however, the completely uprooted plants are not likely to survive.

The foraging behavior and low digestive efficiency of *B. canadensis* are detrimental to a restoration because they will likely sweep through an entire planting if nothing is in place to control them. *B. canadensis* stay away from areas of tall, dense vegetation because of predation fear, but plant plugs are small and usually spaced from 30-60 cm apart leaving space for geese to move between them. Once the vegetation gets taller and fills in, they will not go near the area (Conover and Kania 1991). Initially, shoreline restorations are typically large open areas next to the water with small healthy plants -- a goose paradise. After one growing season the plants will be established enough to minimize the impact of goose herbivory. *B. canadensis* must be kept away from a new restoration until it is established or it could result in a failed project (Bartodziej, Lerman, Peterson – personal communications).

Evidence of goose impacts

North St. Paul Urban Ecology Center – Julie Vigness-Pint

In the fall of 2000, a shoreline restoration was attempted on an urban pond in North St. Paul, Minnesota in order to restore native vegetation and stabilize the shoreline. The emergent and transitional zones were planted with plugs of sedges, grasses and forbs. The transitional zone was also seeded with a wet meadow mix. Cages were placed around the emergent plantings because geese were known to congregate in the area. Within a week of the initial planting, *B. canadensis* moved through the transitional zone and pulled out 75% of the plugs while attempting to crop the plants. They did not favor one plant over another, nor did they discriminate between grasses and forbs. As soon as the uprooted plants were discovered they were replanted. Unfortunately, most of the plant roots had already dried out. The caged emergent plants were unharmed.

Lower Penn Lake – Leilani Peterson

A city park on Lower Penn Lake in Bloomington, Minnesota was having problems with shoreline erosion as well as a large population of geese making a mess of the area. In the summer of 2001, a shoreline restoration was planned to alleviate these problems. A fence was placed around the upland vegetation but the emergent zone was not enclosed. The geese in the area pulled up the emergent plants consisting mostly of *Scirpus spp.*, while attempting to eat the tops of the plants. These plants were unable to be saved and the emergent zone had to be replanted with new aquatic vegetation. The fence was removed after the first growing season. The geese no longer inhabit the park; however, they have moved across the lake where they congregate on lawns and have become a nuisance to several homeowners.

Lakeside Pond – Bill Bartodziej

A small wetland adjacent to Round Lake in Little Canada, Minnesota was planted with native vegetation in the summer of 2002 in order to improve the water quality of the lake. *B. canadensis* frequently visited the area likely due to the large expanse of turf that was next to the lake. Emergent areas were planted with *Scirpus, Sparganium, and Sagittaria*. The transitional zone was planted with plugs of various forbs, *Eleocharis*, and some grasses. During the hour that managers and volunteers left for lunch geese effectively cropped and pulled out all of the emergent plantings. The plants could not be saved and new plants were brought in adding an unexpected expense. In an attempt to save the restoration the emergent and transitional zone plantings were surrounded with three levels of fishing line tied on stakes. Mylar tape was tied on the fishing line to scare geese away from the area with no effect. *B. canadensis* remained at the site and managed to crop the plants that they could reach through the fishing line.

Gervais lake – Bill Bartodziej
A homeowner on Gervais Lake in Maplewood, Minnesota worked with the local watershed district to restore his lakeshore with native vegetation. The lakeshore was planted in the spring of 1999. The homeowner had a dog that was effective in keeping the *B. canadensis* away from the new planting. The homeowner and the dog were gone for one week early in the summer, at which time *B. canadensis* cropped and removed 25% of the transitional zone planting. The herbivory was discovered early enough that most of the cropped plants were able to survive after they were replanted. The dog managed to keep the geese away for the rest of the growing season.

Control Methods
There are several management strategies for *B. canadensis* control. Some of the most commonly used techniques include scare tactics, fencing, chemical repellants, and removal. Although these techniques were not designed for restoration protection specifically, restoration managers utilize them regularly. The most efficient control method or methods differ depending on the characteristics of the site and whether or not *B. canadensis* are already present.

Scare tactics
The scare tactics that are used to discourage *B. canadensis* from inhabiting an area include several visual and noisemaking devices (Smith et al. 1999). One example of a visual scare tactic is mylar tape. Mylar tape (also commonly called bird scare tape) is shiny and reflective and its purpose is to discourage *B. canadensis* from landing in an area. Restoration managers frequently use mylar tape in conjunction with other techniques such as fencing (Bartodziej, Lerman, Peterson – personal communications). Managers have reported mixed results of the effectiveness of mylar tape. It is less effective in areas where *B. canadensis* are already established and they will often acclimate to the visual stimulation (Smith et al. 1999). The use of mylar tape on a restoration might be an efficient method when used in conjunction with other techniques. However, it should only be used if the goal is to discourage *B. canadensis* from flying into the area and not if a flock has already established itself there.

Noisemaking devices are another form of scare tactic. 15mm signal pistol launchers are now sold specifically for bird and wildlife control at airports, golf courses, and city parks. The pistol launchers can fire both "bangers" and "screamers" (Diegnau – personal communication). Bangers sound like a gunshot and screamers sound like screeching brakes. If used correctly they can be very effective at keeping *B. canadensis* off of a site (Aguilera et al. 1991, Diegnau-personal communication). The drawback to this technique is that it can be time intensive. In order for the pistol launchers to be effective they need to be shot as soon as a flock flies into a site. Therefore a site needs to be monitored continuously for several weeks. *B. canadensis* infestation is not likely after several weeks of firing, however, the site should still be monitored sporadically and the pistol used if needed (Aguilera et al. 1991, Diegnau-personal communication). It is unknown whether this method has been implemented in a shoreline restoration project. One way to utilize this technique for a restoration project would be to use the pistol at the site for several weeks prior to planting. A fall planting, in this case, would be unadvisable, as fall migration will bring in more flocks and the pistol will need to be continuously fired to keep new flocks away. Managers should keep in mind that this technique could be disruptive in an urban area. Local residents and authorities should be contacted prior to their use.

Swan decoys have been used in an attempt to keep *B. canadensis* from inhabiting an area. Swans are naturally aggressive towards *B. canadensis*, subsequently *B. canadensis* are frightened by them (Smith et al. 1999). Swan decoys may scare *B. canadensis* initially, but they quickly acclimate to a decoy's presence once they learn it is not a threat (MN-DNR 1998). Although swan decoys may be effective in the short-term, using them as sole protection of a restoration would be risky.

The use of dogs to scare *B. canadensis* on golf courses is a common technique that has had some success (Chasko and Conover 1988). This method is probably not appropriate for restorations in public areas but can be very effective for a small private shoreline restoration (Bartodziej – personal communication).

Fencing

Fencing is the most common and effective way of controlling *B. canadensis* in a shoreline restoration situation (Bartodziej, Lerman, Peterson, Vigness-Pint – personal communications). There are several types of fencing that can be used but openings should be less than 8 cm wide and the height should be at least 80 cm (Smith et al. 1999). Fenced areas should also be compartmentalized so that areas are too small for *B. canadensis* to fly into them (Lerman – personal communication). Mylar tape tied to the fence will also decrease the likelihood of this. Visual appeal and goose safety should be considered when choosing a type of fence. Unsightly fences can be an eyesore and *B. canadensis* can get their heads stuck in fence openings of certain sizes. Both situations can cause unrest among citizens, leading to a bad impression of the restoration (Lerman – personal communication). Minneapolis Parks in Minnesota uses a black plastic fencing (Figure 3) with 2 cm. openings, both unobtrusive and safe for *B. canadensis* (Lerman – personal communication). One drawback to fencing is that, depending on the scale of the restoration, it can be costly and labor intensive.

Figure 3. Fencing and compartmentalization in a shoreline restoration on Lake of the Isles, Minneapolis, MN.
Photo taken by Mary Lerman – Minneapolis Parks

Removal

Physically removing *B. canadensis* from a site will involve either live trapping and relocation or harvest. Harvest or hunting is not likely to be permitted in urbanized areas, although special permits have been given to airports and golf courses (Smith et al. 1999). Live trapping and relocation is another method that involves capturing the geese, usually with a large net, and releasing them in another location (Smith et al. 1999). The success of this method has been variable. *B. canadensis* have strong instincts and will often find their way back to a highly sought after site (Cooper 1986). Flightless juveniles are more likely to stay in the new location than adults (Cooper 1986). This method of control can also be very costly because trained personnel with federal and state permits are the only individuals allowed to transport Canada geese (Smith et al. 1999). Managers for the Lakeside Pond restoration detailed above have used this method of goose control at their site at great cost and with little success (Bartodziej – personal communication). *B. canadensis* find this site particularly appealing and managers are moving on to other methods of control. A less costly technique is harvesting that involves capture and processing for food shelves (Smith et al. 1999). This method eliminates the possibility of geese returning to the site. Concerns for this method include the possibility of pesticide or toxin contamination of geese in urban areas.

Chemicals

Chemical repellent sprayed on vegetation is another method of goose aversion. Conover (1985) studied the effectiveness of methiocarb, a chemical that causes birds to get sick but does not kill them. *B. canadensis* foraged significantly less in areas sprayed with the chemical when compared to control sites

that were not sprayed. This difference was observed for eight weeks following the application. Methyl anthranilate (MA) is another chemical that is actually sold as a goose repellent. Belant et al. (1996) found MA to be ineffective. They did not observe a decrease in feeding on MA plots when compared to control plots.

Chemical repellents such as methiocarb that are effective at goose aversion might be an appealing method of *B. canadensis* control. It seems logical to control *B. canadensis* by impacting the behavior that they exhibit most of the time. However, little is known about the effect that these chemicals might have on newly planted vegetation or how it might impact the water. This method of control should probably be avoided until further research has been conducted on the consequential impacts.

It is important to realize that most of these methods of *B. canadensis* control, other than harvest, only lead to the displacement of geese. As populations increase and habitat decreases, control will become more and more difficult. This problem is likely outside the scope of a restoration manager's abilities, as they only deal with geese on a local scale. In the long run, this problem will need to be dealt with on a much larger scale.

Conclusions

The large numbers and lifestyle of *Branta canadensis* make them a threat to the success of any shoreline restorations. Managers have recognized this threat and have implemented goose control methods into their restoration plans (Bartodziej, Lerman, Peterson, Vigness-Pint – personal communications). Currently fencing is the most common and efficient method of goose control. As shoreline restorations become more and more common, unobtrusive and efficient ways of controlling goose herbivory will be sought. In order to fully realize the effectiveness of all control methods, restoration managers need to document and report the results of goose control methods that they utilize. New shoreline restorations also present an opportunity to experiment with various control methods.

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