Chapter 12 - Management Options Highlights

This chapter introduces management options, contributing to Goal 4.

An egg addling program began in our region in 2002 at the Englishman River estuary. Later, the program included Nanoose Bay and Marshall-Stevenson units of Qualicum National Wildlife Area, other parts of the Little Qualicum River estuary, parts of Errington, Canadian Forces Maritime Experimental and Test Ranges base in Nanoose Bay, Winchelsea and Yeo Islands, and some private properties. The addling program prevented at least 5,345 eggs from hatching, or at least 2,088 new breeding birds in the population.

Without an addling program or other coordinated intervention to curtail Canada Goose populations, there are typically more independent and often undesirable efforts to control geese, such as draining of wetlands, inhumane methods of killing, and harassment of non-target species.

A successful addling program is dependent on a very high proportion of nests being found and treated for many consecutive years. The success of the regional addling program has been constrained by several interrelated factors: manpower and funding; a long season, with early and late nesters; limited access to private properties; and the conspicuousness of Canada Goose nests.

Even the most successful addling program will have negative consequences. It may prompt birds to leave known nesting grounds to re-nest or nest in successive years in areas that are remote or inaccessible to addling crews. Failed nesters that stay in the area probably feed more often than they would while incubating eggs, increasing grazing pressure on vulnerable estuarine resources. Addling may also exacerbate problems elsewhere, by encouraging failed nesters to moult-migrate.

Senior governments tend to promote hunting as the best way to reduce populations of nuisance geese, yet many studies examined in the preparation of this strategy have concluded that hunting is insufficient on its own. Twenty-one percent of our marked Canada Geese were known to be shot by hunters, from 2008 to 2014.

Sixty-eight percent of all birds shot were killed within the study area. The remainder were shot elsewhere on Vancouver Island, on the Lower Mainland, in Alberta, and in the western United States.

Early fall hunting seasons are intended to harvest local geese, while later seasons target both residents and migrants. Three (18%) of 17 marked birds shot in the region in September were confirmed local resident (LR+) migrant types.

Chapter 12 - Management Options More Highlights

More than half of the marked geese shot by hunters were banded at the Little Qualicum River estuary. Seventy-two percent of marked geese that were shot outside of the region had never been observed on huntable sites here. Of local resident (LR) migrant types, all birds banded at the Little Qualicum River estuary were 'huntable', i.e., they were observed on huntable sites in the region. By contrast, one third of local residents banded at the Englishman River estuary and two thirds of those banded at the Craig Creek estuary were huntable in our region.

Hunting often moved Canada Geese into areas that were more protected, however geese may also be able to anticipate hunting seasons. A Quebec study found that many Canada Geese moved away from areas where hunting was allowed to places where firearm discharge was prohibited or hunter numbers were low, several weeks prior to the start of hunting season. Adults accompanied by goslings were more likely to move to safe sites, than geese without young.

CWS has asserted that further liberalization of hunting, enabled with an overabundant designation, would do little because the number of hunters and areas where people are allowed to hunt are declining.

Since 2000, the number of hunters and goose harvest estimates in our region have fluctuated. In the 1-5 management unit (Maple Bay north to the Little Qualicum River estuary), numbers were up (e.g., 170 hunters in 2012 when the bag limit changed, with nearly 1,600 geese harvested in 2011 and 2012), while in unit 1-6 (from the Little Qualicum River estuary north to Campbell River), numbers were mostly down (e.g., less than 40 hunters, and fewer than 100 geese harvested in 2012). Federal hunter surveys covering a large area of B.C. showed a dramatic decrease in hunter numbers from 1971 to 2013, yet harvest estimates were very similar in those two years (i.e., ~5000 birds harvested in both 1971 and 2013), with wild fluctuations in between.

Land grants in the late 1800s and early 1900s, together with increasing human populations and associated development have led to a preponderance of privately held lands that are closed to hunting. However, all farmers surveyed in the preparation of this strategy had hunted geese or allowed and encouraged others to hunt. One had been harassed for allowing hunting.

Some residents feed geese, even when they are aware of the adverse effects of Canada Geese and efforts to mitigate them. There are currently no bylaws to discourage people from feeding geese, despite the deleterious effects it may precipitate (e.g., aggressive birds and related injuries, poor nutrition and associated diseases).

Chapter 12 - Management Options More Highlights

There are many ways to foster 'goose unfriendly' habitats, keeping in mind that Canada Geese are highly adaptable and resilient. The Guardians installed exclosures and snow fencing on the estuaries, a temporary and experimental solution. The City of Parksville inadvertently reduced goose use of its community park by erecting fencing along the beach. A farmer altered the timing of seeding and harvesting of his forage crops. Other techniques, untested in our region, include using bamboo stakes, dense or tall plantings, suspended grids or parallel lines (of wire, for example), and steepened banks to reduce access, visibility, and opportunities to take flight. Planting coarse grass species, mowing less frequently, or applying approved chemical deterrents may reduce palatability.

Scare techniques achieved limited success and survey respondents understood they were simply moving the problem elsewhere. They used trained and untrained dogs, trained raptors, scare shells, laser light, and utility and all-terrain vehicles, mainly to protect properties from damage and fouling. The City of Parksville's Canine Goose Control Program, which operated from 2009 to 2011, included an awareness campaign to prevent the use of untrained dogs and to distinguish Canada Geese from Brant, a provincially blue-listed species present in large numbers during the spring migration.

There are many hazing techniques that have been used elsewhere with varying degrees of success. Some may be unlawful under local bylaws or require permits. Prior to use, all should be assessed for their impacts to other people, pets, and non-target species.

Hunting pressure may be increased by opening new areas to hunting, even for a day or weekend; creating incentives for hunters; encouraging landowners with geese to allow access to hunters; and further reducing hunting restrictions. A one-year exception prohibiting the discharge of firearms within city limits was granted by the City of Port Alberni, to allow designated, licensed hunters to shoot Canada Geese on the Somass River estuary. Currently, all of the estuaries in the region are closed to hunting; however parts of the LQRE, NBE, and even the ERE may be sufficiently far from residences to enable safe and legal hunting. Or, it may be necessary to move urban and otherwise protected Canada Geese into areas where hunting can occur (by hazing or roundup and transport).

From survey responses and interviews, it is apparent that scare, damage and danger permits have been used by most sectors. However, they are probably underutilized due to lack of awareness (i.e., some people do not know they exist) and onerous permitting processes (i.e., complicated applications, barrier-laden requirements, lengthy waiting times). Some respondents that had attempted addling found it to be neither feasible or successful.

Chapter 12 - Management Options More Highlights

Culling is a sensitive topic, particularly when people who believe that animals have rights similar to humans meet those who have lost all tolerance for nuisance geese. Most people hold positions somewhere in between, or none at all. Hunters may wish populations to remain high or to grow. Most people do not wish geese to suffer, and many reject wasteful or debasing treatment of carcasses. A standard operating procedure for preventing animal suffering while performing 'depopulations' was created by MFLNRO in 2014, but the use of carcasses remains largely unresolved. The logistical challenges of coordinated capture, transport, killing, and disposal have been led in the U.S. by government agencies but are only monitored by senior governments here. These concerns have relegated culling to a 'last resort' control measure.

In the U.S., the large-scale capture and euthanasia of resident Canada Geese began in 1996. It has since expanded into many jurisdictions, and is described as the most efficient and cost-effective way to reduce the size of an urban flock, second only to hunting. Still, some communities have been unable to afford to cull or have avoided culling to prevent polarizing their communities in conflict. Culled birds captured during the summer months can be processed for human consumption and donated to charitable organizations (i.e., food banks). Culling of Canada Geese has also occurred in New Zealand since 1993.

There is precedence for culling of birds in Canada. For example, in B.C., Barred Owls were culled to protect at-risk Spotted Owls. In Ontario's Point Pelee National Park, 'hyperabundant' cormorants were culled to protect ecosystems and species at risk. Canada Geese were culled on Vancouver Island's Saanich Peninsula in July, 2015.

Only one mid-island farmer had registered for the B.C. Ministry of Agriculture Wildlife Program, a free compensation program available to qualifying livestock and forage producers.

USDA economists found that for every dollar spent on wildlife damage management programs to control Canada Geese, \$1.31 to \$5.56 could be saved in damage and maintenance costs.

12.1 Status Quo



A gosling among addled eggs. Eggs that are close to hatching are not addled.

Chapter 12.2, No Action, describes the results of the egg addling program.

12.11 Egg Addling Program

To control rising Canada Goose populations and reduce grazing pressure on the ERE, an egg sterilization program was initiated in 2002. The Nanoose Bay unit of the Qualicum National Wildlife Area, encompassing the estuaries of the Nanoose and Bonnell Creeks (NBE), was added in 2003. The program was expanded to the LQRE and parts of Errington in 2004. City of Parksville staff joined the addling crew in 2004, but thereafter opted to pay Guardians members and hires to do the work. Hamilton Marsh was searched for nests in 2007. In 2012 and 2013, Guardians personnel also addled eggs at the **Canadian Forces Maritime Experimental and Test Ranges** (CFMETR) base in Nanoose Bay, Winchelsea Island, Yeo Island, and on some private properties (This timeline was derived from Manning, Cooper and Associates 2003, 2005, 2006; Lynch 2007; Morrison 2013; Guardians of Mid-Island Estuaries Society 2014 and email sources).

Addling was conducted by trained volunteers or paid personnel under permit from CWS (cf. Manning, Cooper and Associates 2003, 2005). The program typically operated through the incubating period of the nesting season, with most nest searches occurring during April and May. Addling crews observed geese on the nesting grounds as early as February and as late as June, to look for early nests and re-nesting pairs.

Addling was usually performed in the first two weeks of incubation,

to prevent the embryo from developing and hatching; eggs that are just laid cannot be addled, as the membranes will not detach from the shell, and eggs that are shaken too close to hatching may result in injured or deformed young. Each egg was vigourously shaken until the membranes detached, then marked and replaced in the nest; often a sloshing was felt and heard.

The justification for addling, rather than removing or destroying eggs, is to prevent the geese from re-nesting. When the eggs are addled and left in the nest, the goose will continue to incubate them. If the pair stays with this nest late into the nesting season, they are unlikely to re-nest. Canada Geese have been known to incubate infertile or dead eggs for up to 91 days, while others have deserted the nest at 28 days, the length of a typical incubation period (Brakhage 1965; Cooper 1978); Cooper found an average of 42 days, for what he termed 'overtime incubation'.

From 2010 to 2014, the estuaries were thoroughly searched over many visits. In earlier years, visits were more sporadic. Nests were examined each visit to sterilize any new eggs or eggs that could not be addled previously, and to document whether nests had been depredated and abandoned. From 2010 through 2014, the eggs were measured for length and width with calipers. Egg and clutch sizes were explored to determine whether changes in estuarine vegetation or in disturbance (e.g., harassment) affected reproductive





There are risks associated with egg addling. Crews must defend themselves against aggressive birds and navigate difficult topography. output and subsequent juvenile survival (cf. Johnson et al. 1992). Locations were recorded with a Garmen handheld GPS unit.

Geese can be very aggressive when defending their nests. For safety, addling crews included at least two people. Any work on the estuaries, which frequently entails navigating uneven ground, a dendritic network of tidal channels, mudflats, and river crossings, were usually done in pairs or groups.

Although we did not have any serious health and safety issues, individuals working around geese and eggs should be aware of the risks, including risks of exposure to pathogens; the Public Health Agency of Canada's Fact Sheet: Guidance on Precautions for the Handling of Wild Birds is available at http://www.phac-aspc.gc.ca/ influenza/fs-hwb-fr-mos-eng.php.

Several survey respondents expressed interest in participating in the addling program. However, program success has been constrained by several interrelated factors, including 1) manpower and funding; 2) a long season, with early and late nesters; 3) limited access to private properties with nesting Canada Geese, and 4) the difficulty in finding nests, which are often concealed.

A successful addling program is dependent on a very high proportion of nests being found and treated for many consecutive years (J. Cooper, pers. comm. 2003). CWS (2010) suggested that addling programs continue until birds die naturally or leave the area due to failed nests.

Effects of Addling

Egg addling contributes to regional population control primarily by reducing the annual recruitment of young. However, the program itself may contribute to its own ineffectiveness as successive failed nests may motivate pairs to leave their preferred nesting grounds and move into other areas, some of which may be more difficult to find. Failed nesters may migrate to moult, lessening local impacts but increasing them elsewhere. On the upside, moult migrants may be exposed to greater hunting pressures than they would face at home (Sheaffer et al. 2007; Heller 2010). See Chapter 12.2, No Action, for additional information.

Addling Versus Other Hatch Prevention Techniques

CWS (2010) suggests that destroying eggs is less complicated and may be just as effective. It recommends using egg sterilization techniques, including addling and oiling, only where there is reason to believe that geese will re-nest if eggs are destroyed. *Best Practices for Sterilizing Goose Eggs* is available to addling permit applicants (CWS 2010).

Of three re-nests of marked pairs recorded prior to 2015, only one had incubated addled eggs; the other two nests were predated before any eggs could be addled. When eggs are destroyed, geese that do not re-nest are likely to do one of two things: 1) feed more often on vulnerable estuarine resources, or 2) leave the area. If geese remain on the estuary, sterilizing eggs is preferential to destroying them.

12.12 Hunting

Hunting is considered the most important source of mortality for adult geese (CWS 2010), and government agencies everywhere promote it as the best way to address nuisance problems involving migratory game birds. Many studies that have examined whether hunting is effective in reducing populations of temperate-nesting geese have concluded that, while an important control measure, it is generally insufficient as a standalone option (cf. Huang 2010; Beaumont 2014). Twenty-two percent of our marked birds were reported to have been shot by hunters, to September 13, 2014.

Early fall hunting seasons (i.e., September seasons), are intended to harvest local Canada Geese, whereas later fall seasons and spring hunting seasons target both residents and migrants (cf. Lindberg & Malecki 1994; Beaumont 2014).

Just over 30% of the 66 marked birds shot between October 10, 2009 and September 13, 2014 were killed in September. Of these 20 birds, 17 were shot within the study area. Three were local resident migrant types (i.e., LR+), 6 were emigrants, and the remainder were not assigned a migrant type due to insufficient information.

Huntability of Marked Geese

Goose populations that confine their movements to urban and other non-huntable areas cannot be controlled by hunting. Each marked Canada Goose was assessed to determine whether they had been observed on any sites deemed huntable within existing hunting regulations and local government bylaws. Huntability was not examined in terms of access, i.e., whether permission to hunt would be granted or not, or age. (See Chapter 10.32, Mortality, for a brief discussion of age-related mortality.)

Of the 66 birds shot, 48 (73%) were killed within the study area. Eight were killed elsewhere on Vancouver Island, 3 on the Lower Mainland, 1 in Alberta, and 6 in western U.S. states. Of the 66 birds, more than half were banded at the LQRE (Figure 12-1). These findings concur with reports from CWS (2010) that most marked birds are shot near to where they are banded.



Figure 12-1. Marked Canada Geese killed by hunters, by banding location (n=66).



Figure 12-2 suggests that local residents are more huntable than migrants. However, migrant Canada Geese may frequent non-huntable areas here, but are huntable elsewhere. In fact, 72% of our marked geese that were shot elsewhere had not been observed on huntable sites here (Figures 12-3 and 12-4).

Approximately one third of ERE local residents were huntable, while two thirds of CCE local residents were huntable, and all of LQRE local residents were huntable.

Figure 12-2. Huntability of Canada Goose Migrant Types (n=216). (See Chapter 6.4 for descriptions of migrant types.)



Figure 12-3. Regional huntability of marked Canada Geese (left) (n=296) and regional huntability of shot, marked Canada Geese (right) (n=66), by banding estuary.



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As a cohort, ERE-banded birds were far less huntable than Canada Geese banded at the CCE and LQRE. Still, slightly more non-huntable ERE birds were killed than those deemed huntable.

Limitations

Our survey sites excluded several private properties where hunting was known to occur, and possibly other huntable sites that have not yet been identified.

Figure 12-4. Regional huntability of Canada Geese banded at each estuary (upper) (n=296) and regional huntability of shot, marked Canada Geese (lower) (n=66).

In a study of radio-collared Canada Geese in Quebec, Beaumont et al. (2013) demonstrated that many geese moved from areas where hunting was allowed to places where firearm discharge was prohibited or hunter numbers were low. several weeks prior to the start of a special early hunting season intended to reduce populations of local geese. Furthermore, they were more likely to move to nonhuntable areas if they were accompanied by juveniles, or had abandoned or lost their broods.

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Huntability

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The birds stayed in non-huntable areas until late in the hunting season, when there were notably fewer hunters but still quality feeding opportunities in agricultural fields. The authors believed that Canada Geese have the ability to risk assess, based on prior knowledge and tradition.

In our area, geese moulting on the estuaries exhibited at least daily movements to both urban and rural habitats in late summer and early autumn, as soon as they could fly. Although hunting precipitated the movement of Canada Geese from agricultural areas to more protected (e.g., urban) environments, this did not appear to be as prolonged as movements observed in Quebec. As a result of the addling program, most pairs were not accompanying juveniles so they may have been less likely to stay in non-huntable areas. Most Canada Geese spent the autumn in and near the City of Parksville, and used the estuaries, regardless of whether it was hunting season (Figure 12-5).



Figure 12-5. Canada Geese re-sighted in autumn, by hunting season, 2008-2013 (n=944). Stacked dots have been digitally dispersed.

Hunters have pointed to the success of opening day, the first day of each hunting season, as evidence that many geese do not anticipate the hunt. In our area, hunters reported that the opening weekend in September was the best hunt of the year (survey respondent, 2014; hunter report to T. Clermont, pers. comm. 2014). In the eastern U.S., the effect of harvest on bird movement was strongest during the early days of the hunting season (Hestbeck, Nichols, & Malecki 1991), and hunting success declined as the season progressed (cf. Lindberg & Malecki 1994).

Hunter Numbers

According to CWS' National Wildlife Research Centre, the number of active waterfowl hunters in federal management zone 1 has dramatically declined since the 1970s; this zone encompasses most of the province, including our study area. Over the last decade, numbers stabilized at fewer than 2000 hunters (Figure 12-6) (Gendron & Smith 2014). Provincial data for management units 1-5 (Maple Bay north to the LQRE) and 1-6 (LQRE north to Campbell River) (see map, Figure 12-7) showed no obvious trends between 2000 and 2013 (Figure 12-8). Increased bag and possession limits, beginning in 2012, may have motivated more individuals to hunt in unit 1-5 that year.



Figure 12-6. Active waterfowl hunters in B.C. Zone 1, 1975 to 2013 (Gendron & Smith 2014).



Figure 12-7. Provincial fish and wildlife management units, available at http://www.env.gov.bc.ca/fw/wildlife/ docs/mu_maps/south%20western.pdf. Our study area lies within management zones 1-5 and 1-6.



By contrast, the number of goose hunters in B.C.'s Fraser Valley has increased by 50% over the last five years, from 2,000 to 3,000 (J. Evans, pers. comm. to T. Clermont, June, 2015).

Figure 12-8. Goose hunters in Management Units 1-5 and 1-6, 2000-2013 (M. Chutter, pers. comm. to D. Janz, December 29, 2014). Provincial hunter sample based on annual hunter questionnaires.



Harvest Estimates

The number of geese harvested in management unit 1-5 peaked in recent years (2011 to 2013), whereas there was a new low in unit 1-6 in 2012 (Figure 12-9). Peaks in unit 1-5 reflect the hunter numbers there (Figure 12-8), and suggest a comparatively larger goose population.

Figure 12-9. Geese harvested in Management Units 1-5 and 1-6, 2000-2013 (M. Chutter, pers. comm. to D. Janz, December 29, 2014). Provincial hunter sample based on annual hunter questionnaires. Canada Geese were not differentiated from other geese.



Federal harvest estimates for B.C. zone 1 reveal Canada Goose harvests in 1971 and 2013 were similar, however estimates fluctuated by thousands of birds over the intervening 42 year period (Figure 12-10).

Importantly, goose populations increased substantially over this period, whereas the federal hunter and harvest numbers did not.



Available Hunting Areas

A widely held belief is that hunters are limited by the number of available and accessible hunting areas (cf. E. Lok, pers. comm. December 1, 2004). East-central Vancouver Island is characterized by a preponderance of privately held lands, a consequence of land grants in the late 1800s and early 1900s. As the island has developed, more areas have been closed to hunting and the discharge of firearms (CWS 2010).

Our surveys found that most farmers hunt on their lands, or allow or encourage others to hunt. One Nanoose Bay farmer commented that more and more hunters are asking for permission to hunt. A farmer in the French Creek area had permitted hunting in the past, but found the cattle and horses were "greatly disturbed with guns around". An Errington couple would allow more hunting, if they could be assured they would not be harassed; they reported incidents where neighbours - not adjacent but distant neighbours, had disrupted their busy store, loudly complaining about hunting on the farm. Two farmers allowed goose hunting by hunting clubs. One set up a permanent blind and calls the Nanaimo Fish and Game Club when he sees geese during the hunting seasons. The other farmer

called the Hidden Valley Conservation Club "our most successful venture to date" [in controlling geese], while noting the hunting season is only 4 months of the year. (Note: The hunting season is limited to 3.5 months, or 107 days, by the *Migratory Birds Convention Act.*)

Local Hunter Report

In four years, a local hunter and his buddies shot 138 Canada Geese over 24 days in our region (Table 12-2). His hunting effort increased over time, partly due to increased bag and possession limits. His hunting areas were widespread, and included sites outside of the region. Table 12-2. Local hunter report. Some hunters reported bands, and others did not. Geese shot include White-fronted Geese and Cackling Geese.

Date	Number of Hunters	Number of Geese Shot	Hunting Area
2011 September 10	5	25 (limit)	Qualicum
2012 October 16	unknown (min 3)	23	Qualicum
2012 October 20	unknown (min 2)	17	Errington
2012 November 7	unknown (min 3)	27 (total 67 in 2012)	Gabriola island*
2013 September 7 (opening day)	unknown	4	Gabriola island
2013 September 8	unknown	9	unknown
2013 October 26	unknown (min 2)	15	Nanoose Bay
2013 October 29	unknown	8	Nanoose Bay
2013 late December	2	14 (total 50 in 2013)	Nanoose Bay
2014 January 4	unknown (min 3)	22	Gabriola island
2014 February 22	5	47	Gabriola island
2014 September 7	unknown	2	Qualicum
2014 September 9	unknown	8	Nanoose Bay
2014 September 13	unknown	2	Nanoose Bay
2014 October 11 (opening day)	unknown	10	Nanoose Bay
2014 October 25	unknown	1	Gabriola island
2014 November 15	unknown	1	Nanoose Bay
2014 November 16	unknown	2	Nanoose Bay
2014 November 17	unknown	1	Nanoose Bay
2014 November 23	2	1 (total 97 in 2014)	Nanoose Bay
Total hunting days: 21 from September 2011 through November 2014, 15 in our region; 6 in the September season	Total hunter days: at least 37, 24 in our region	Total CAGO shot: 239, 138 in our region	*Gabriola Island sites outside of our region





Natural barriers, in the form of Large Woody Debris, have protected an isolated stand of sedges on the ERE. One resolute goose was observed infiltrating the perimeter.

See also 12.31 Goose Unfriendly Habitats, in Additional Non-lethal Controls.

12.13 Use of Permits by Landowners

According to our limited surveys, scare permits and damage and danger permits (i.e., egg sterilization and kill permits) have been extensively used. The City of Parksville and others have acquired permits for addling, hazing using raptors, and reportedly for dog programs. (Federal permits are not required to use dogs to haze geese.) Most farmers used permits to scare and/or kill geese outside of the hunting season; two had arrangements with hunting clubs to manage geese.

The Fairwinds community/golf club addled eggs for several years, mainly on the small islands offshore from Schooner Cove. One farmer reported addling eggs whenever nests were found. A Parksville residents' association attempted egg addling once or twice, and found it to be neither "feasible" or "successful".

A common complaint regarding permits was remembering to apply in time; considerable damage was done while waiting for permits to be processed.

12.14 Goose Unfriendly Habitats

Creating goose unfriendly habitats is one of two non-lethal ways of controlling Canada Geese; the other is hazing (see Chapter 12.15).

No Feeding

Feeding may attract and sustain more animals in an area than would otherwise be supported by natural food resources (USDA 1999). However, it is unclear how much of a difference it makes in areas where

overall food resources are abundant.

The City of Parksville does not have a bylaw preventing the feeding of Canada Geese or any other wildlife, and the City staff I spoke with had not observed or received reports of residents feeding Canada Geese (A. Metcalf, W. Payne, pers. comm. November 2014).

However, some residents of Parksville's Craig Bay Estates feed geese, despite discouragement by their strata councils. To date, the councils have not instituted any penalty for feeding geese. According to one survey respondent, many people enjoy watching the geese, but few feed them, and the vast majority of owners are thankful for Canada Goose control efforts.

Feeding wildlife may have many detrimental effects (e.g., children being injured by geese habituated to approaching humans for handouts, poor nutrition from unnatural diets). Eckberg (2010), who studied Canada Goose issues in Rochester, Minnesota, noted that a debilitating condition called Angel Wing, thought to be the result of a nutritional imbalance from being fed too much bread, afflicts many urban Canada Geese and renders them flightless.

Barriers

Barriers can be effective if they exclose areas from geese, prevent geese from landing or taking flight, restrict movement when they are moulting and flightless, and/or cause them to feel more vulnerable by blocking escape routes or lines of site (cf. Conover & Kania 1991; Ray 2011).



Planted sedges protected by orange snow fencing outside of a fenced exclosure, Little Qualicum River estuary, summer 2014



Red-winged Blackbirds (*Agelaius phoeniceus*) perching on exclosure, Little Qualicum River estuary, June 3, 2014

Conover and Kania (1991) found that Canada Geese could be excluded by increasing the flight clearance angle to greater than 13° by planting trees around lawns or small bodies of water. Also effective was placing shrubs to reduce a bird's ability to detect predators at distances beyond 9 m - particularly when combined with distress calls and other forms of harassment.

Estuary Exclosures and Fencing

Experimental Canada Goose exclosures installed on the LORE and ERE (12 and 6 exclosures, respectively) in 2010 were constructed from green Bezinalcoated fencing supported by 7 and 8-foot painted metal t-posts, and crisscrossed at the top with white polyshock cord or twine. The fencing and cord were flagged to prevent bird collisions and entanglement (Clermont 2010, June; September). One exclosure required limited maintenance, when goslings were observed slipping under them. Monitoring plots were established inside the exclosures, but also outside of them on the upstream side. This deliberate act was based on the premise that the geese might avoid these areas if their lines of sight were limited by the fencing. Monitoring could then compare areas protected by exclosures, areas screened by exclosures, and open areas. As expected, nesting and grazing Canada Geese appeared to avoid using areas immediately behind the exclosures, on their upstream side. On the ERE, due to the loss of substrate/marsh platform, exclosures were installed only along the perimeter or along

its farthest upstream reaches; they were too far away from congregating Canada Geese to show visible differences in grazing and grubbing.

In May, 2013, bright orange snow fences were erected to protect plantings along the main dendritic channel at the LQRE marsh, anchored to existing exclosures. Again, geese avoided the areas upstream of the fencing, allowing natural regeneration of vegetation to occur. Although the fencing did not obstruct the channel, it provided a visual 'pinch point' along the channel beyond which most geese would not venture. Thus, the combination of the exclosures and snow fencing effectively protected the entire mid-upper marsh area above the fencing normally accessible from the channel. Based on this success, a larger fence was installed across the entrance to the main channel of the marsh in May 2014, to prevent moulting birds from accessing the area. Photo-monitoring showed some vegetative recovery in areas behind the fence. The recovery was short-lived, as the fence collapsed within a month due to the weight of accumulated algae.

All non-lethal controls will have unintended consequences for nontarget species, some positive, others negative. Exclosures on the LQRE were often used as perches by Red-winged Blackbirds (Agelaius phoeniceus), a positive effect. Other species may avoid the exclosures.

Fencing

The City of Parksville installed fencing along the beach, primarily to restore foreshore vegetation, but



Fencing along the beach, designed to restore foreshore ecosystems, also restricted Canada Goose access to upland habitats, particularly during the flightless moulting period. also to discourage Canada Geese from walking from Parksville Bay onto the grass in the community park. Since the fencing was erected, there has been less fecal matter on the walkway along the beach (A. Metcalf, W. Payne, pers. comm. November 2014).

By contrast, owners at Craig Bay Estates have built short fences along the water to deter geese from leaving the ponds, but this has had little effect (survey respondent, November 2014).

Drainage

Two out of the five farmers surveyed had taken steps to prevent geese from depredating their crops and pasturelands by improving drainage to ensure there was no standing water to attract them. Despite reporting few Canada Goose problems at the Qualicum airport, the Town of Qualicum Beach intended to fill a depression to avoid ponding and attracting waterfowl near the airport (B. Weir, pers. comm. November, 2014). While it is important to reduce risks to aircraft from geese, drainage for most other purposes may be inappropriate. The USFWS (2002) considers draining waterbodies to be unreasonable and "aesthetically unacceptable" (p. II-2). A majority of the world's wetlands have been lost to drainage (Biebighauser 2007; 2011; Davidson 2014), and even seasonal wetlands are considered important for their ecological values and ecosystem services.

Inaccessible or Unpalatable Food Sources

To discourage geese from foraging crops to bare ground, a Nanoose Bay farm now times the harvest of its rye/wheat forage crops to ensure plants grow taller before winter. This practice also provides more forage in spring, allowing the farmer to feed his cattle, rather than graze them on wet fields.

The sports field in Parksville's community park had been a favoured grazing spot for Canada Geese. Yet, after the grass turf was replaced, few geese visited the field. What changed? The drainage was much better than before. The new substrate under the grass turf was sand, not organic matter, and the grass, a ryegrass and Kentucky Bluegrass mix, was kept green with fertilizer. Since these grasses are known to be highly palatable to geese (Conover 1991; Washburn & Seamans 2012), City staff speculated that the new grass may taste different due to the sandy substrate. As organic material built up over time, it would become more attractive to geese (A. Metcalf, W. Payne, pers. comm. November 2014).



Urban goose, City of Parksville



Roundups, such as this one at Craig Bay in July 2012, provide a good indication how much effort it takes to move geese. Many people, all along the shoreline and in boats, were necessary to herd the flightless geese. Photo by Charlene Lee. 12.15 Hazing

Some survey respondents reported using a wide range of techniques to scare geese (e.g., one had used dogs, raptors, scare shells, laser light, and utility vehicles), while others had used only one or two techniques. All reported limited success.

Hazing with Dogs

More than any other hazing method, dogs have been used to deter and chase geese on both public and private lands. The City of Parksville Canine Goose Control Program began early in 2009. The program was deemed 'pretty successful'. A dog trainer managed ~50 volunteers with pairs of dogs, to chase, but not harm geese. Owners were identified with an ID badge. The dogs, wearing bright yellow scarves to identify them as goose control dogs, were required to be on leash (consistent with local bylaws) except when working in the community park, Springwood Park playing field, City Hall and Parksville Community and Conference Centre. The \$8,700 program (\$2,400 annually, less in the final year) was initially funded in 2008, and ran until 2011 when the trainer became unavailable (City of Parksville 2009; A. Metcalf, W. Payne, November 2014). Importantly, an advertising campaign preceded the program, to generate interest and participation, to help ensure untrained canines would not be chasing geese as a result of the program, and to raise awareness of the differences between Canada Geese and Brant.

Brant are a provincially bluelisted species that rests and feeds on the foreshore of the PQBWMA and Rathtrevor Park during their spring migration to Alaska. During the months of March and April, these beaches are closed to dogs, as the Brant are highly sensitive to the presence of dogs and take flight at the least provocation.

A similar control program was developed to chase Canada Geese off grassy areas and footpaths in a Parksville residential development, forcing them to take flight or find refuge in the strata's settling ponds. A dog trainer was paid for one weekend course each year, and dogs were trained to promptly and consistently return to their owners when called. They were allowed to be off leash only when chasing geese, and were required to wear a red bandana to identify them as goose patrollers. The program was in abeyance when the geese are moulting. Interest in the program has waned, as the dogs become dirty with feces and there was a growing feeling that they may be getting ill or diseased from participating. As an alternative, residents sometimes 'walked' the geese to the water from the grass (survey respondent, 2014).

Administrators at Parksville Elementary School explored the possibility of using trained dogs to chase the geese from school property, but could not proceed without the support of the School Division's Operations and Maintenance Department (survey respondent, 2014).

A Nanoose Bay golf course employs a falconer with a border collie, while a French Creek course has a dog that chases geese off of the course.

All farmers had dogs, and used them to chase geese, with varying

See also 12.32 Hazing, in Additional Non-lethal Controls.



Geese become accustomed to people, traffic, and other sights and sounds of urban environments.

levels of success. Every survey respondent that reported using dogs to scare geese also used human power (employees, farm kids) to harass them. One farmer acknowledged that he was merely moving the problem elsewhere.

Dog programs to control geese have been employed in many other jurisdictions. In New Jersey, Dow Jones & Co. eliminated Canada Goose problems on its property this way, after finding other harassment techniques were aesthetically unacceptable or too expensive. The company used border collies yearround, for 15-30 minute sessions, 1-3 times per day. The dogs received no special training, instinctively herding the geese into a pond, then swimming into the pond to encourage the geese to take flight. 'Invisible fencing' was used to enclose the dogs. The cost of implementation in 1990 was \$9,400 for dogs and fencing, with annual maintenance costs of \$2,000 paid for dog food and veterinary

care (Castelli & Sleggs 2000).

Hazing with Raptors

The City of Parksville employed a falconer with "Eddy the Eagle" to harass geese from 2010 to 2012, spending nearly \$26,600. City staff noted the dogs covered more space in a given time, when compared with the eagle (A. Metcalf, W. Payne, pers. comm., November 2014). A Nanoose Bay golf course spends more than \$3,000 per month employing a goose control person with an eagle and a border collie (survey respondent, 2014). Unlike hazing with dogs, hazing with raptors requires a federal permit.

Hazing with Equipment

Survey respondents reported using utility vehicles and All Terrain Vehicles to move geese, and laser light or cracker shells to scare them. Cracker shells are typically employed using a firearm, and so require a permit from Environment Canada.

12.2 No Action

With 'no action', any current programs to curtail Canada Goose population growth would be discontinued. Hunting would be the primary means of control, augmented by piecemeal damage and danger permits and hazing techniques used by private landowners.

To measure the effectiveness of 'no action', we can simply examine how effective the egg addling program has been. The estuary-focused addling program removed at least 5,345 eggs from local Canada Goose populations from 2002 through 2014 (Figure 12-11).

Approximately 80% of eggs produce viable young (cf. Cooper 1978; Dawe & Davies 1975), about 66% of goslings survive their first year (a conservative estimate, cf. Brakhage 1965; Bellrose 1976; Smith, Craven, & Curtis 1999; Heller 2010; Beston et al. 2014), and ~74% survive to their second year (USFWS 2002; Heller 2010; Beton et al. 2014). Assuming Canada Geese have the potential to breed at age 2 (cf. Brakhage 1965), at least 2,088 breeding-aged Canada Geese were removed from the population over the twelveyear period. In other words, by addling 2.6 eggs, one adult was prevented from breeding.

An additional 585 eggs were addled in 2015, at the LQRE and ERE only (T. Clermont, pers. comm. 2015).



The number of eggs addled has increased over recent years (Figure 12-11), however this is not entirely related to a growing number of breeding geese. Addling effort fluctuated over time, becoming more consistent from 2010-2014 (Figure 12-12). Data were missing for 2008 and 2009.

Figure 12-11. Canada Goose eggs addled at all sites, 2002-2014 (n=5,345). Data were missing for 2008 and 2009.



When funding for addling crews was not a limiting factor, the level of effort was directly related to the number of nests and eggs found. More nests and eggs require more person hours. Additional searching may also find more nests, with diminishing returns as the season progresses.

Figure 12-12. Addling effort at the ERE, LQRE, Nanoose Bonnell estuaries (NBE) and other sites, 2002-2014. Unknown effort = -1, no effort = 0.

In 2009, the addling dataset for the LQRE was largely unusable due to a well-intentioned person operating without an addling permit. Here, one marked egg was replaced in the nest, together with a rock, and other eggs were likely removed.





ERE: Goose productivity high and rising

The ERE, as the largest estuary (~115 ha), has consistently supported more nests and eggs than the LQRE or other sites (Figures 12-13 and 12-14). In 2015, there were 73 nests, 2 re-nests, and 461 eggs found, surpassing the fecundity record of the previous year. There were also five broods observed on the estuary during the nesting season, suggesting some nests were missed (T. Clermont, pers. comm. 2015).

Figure 12-13. Nests found at the ERE, LQRE, NBE, and other sites, 2002-2014 (n=1,069). Data are missing for 2008 and 2009.



Figure 12-14. Canada Goose eggs at the LQRE, ERE, NBE, and other egg addling sites, 2002-2014 (n=5,681).

LQRE: Goose productivity down

Since 2010, the number of nests discovered on the LQRE has decreased (Figures 12-13 and 12-14). In 2015, there were 25 nests, 1 re-nest, and 149 eggs (T. Clermont, pers. comm. 2015).

NBE: Goose productivity up

By 2014, the nest count at the NBE had nearly equaled numbers at the LQRE, with less search effort on the NBE (Figure 12-13). There were also 104 goslings observed at the NBE during the 2014 moult count, suggesting ~20 nests were undetected.

Without an addling program or other intervention to curtail Canada Goose populations, independent actions to control geese will inevitably increase. The USDA (1999) predicted an increase of undesirable, cumulative impacts (e.g., draining of wetlands, inhumane methods of killing, harassment of non-target species) with any decrease in government assistance (as governments had taken the lead in the U.S.), primarily because independent initiatives would be poorly monitored and those taking action would have low accountability.



Figure 12-15 shows the level of effort, nests found, and eggs addled for all addling program sites from 2002 through 2014.

Figure 12-15. Total numbers of nests and eggs addled, with addling effort (person hours), 2002-2014 (n=1,069 nests and 5,345 eggs). Data were missing for 2008 and 2009.

12.3 Additional Non-lethal Controls

Those attempting to control Canada Geese typically use multiple methods applied with trial and error. However, there are numerous reviews describing non-lethal (and lethal) techniques, sometimes with conflicting opinions; see Ray (2011), CWS (2010), as well as many of the federal and state CAGO control reports or web pages (e.g., Maryland **Department of Natural** Resources, n.d.; USDA 1999; USDI 2005). The following provides a snapshot of common approaches.

12.31 Goose Unfriendly Habitats

Modifying habitats to be less inviting to geese can reduce the overall ability of the landscape to support geese, i.e., its carrying capacity for geese. However, Canada Geese are highly adaptable. They have been known to nest in woodlands, in flower gardens, and on rooftops, for example.

Barriers

Bamboo stakes may have some promise as Canada Goose deterrents on the estuaries. The stakes guard preferred feeding areas, and birds are reluctant to navigate through them (K. Ashley, pers. comm. December 2014). Bamboo has been used in the restoration of eelgrass beds (Boyer & Wyllie-Echeverria 2010), albeit not to deter geese.

Dense plantings, tall enough to prevent adult geese from seeing over them, can deter Canada Geese from moving upland along shorelines or from ponds (CWS 2010). This is

particularly effective during flightless periods (USDA 1999). Although a frequently suggested management technique, vegetative barriers may not be supported everywhere. An online petition protesting a vegetative buffer along a Minnesota lake was signed by more than 600 people, who argued that crippled geese could not access food onshore (Eckberg 2010). And for some people, the aesthetics and enjoyment of lawn adjacent to water are more important than preventing Canada Geese from using these areas (USDA 1999).

Grids or parallel lines of wire, cable, twine, rope, or tape can be suspended above the surface of ponds or over new plantings. These and other visible deterrents (e.g., strung CDs that



This feeding area is weedy and has not been fertilized.

move in the wind) can be used to block flight paths and make areas less desirable (CWS 2010). It may be helpful to take prevailing wind directions into account, as geese prefer to take off into the wind (cf. Martin & Guignion 1983).

Making Feeding Areas Inaccessible or Unpalatable

There are several ways to make terrestrial habitats such as grassy areas less attractive to geese. Canada Geese like short, tender, young shoots, so planting coarse grass species, fertilizing less, and/or mowing less frequently to allow grass to become tall and coarse, may lead them to seek more palatable food elsewhere. Canada Geese prefer gentle slopes from aquatic to upland areas, so steepening these slopes and allowing vegetation to grow tall along the slope can discourage geese while protecting the bank from erosion. Breaking up vast grassy areas into smaller sites enclosed by shrubs or other tall structures can encourage geese to go elsewhere (cf. Maryland **Department of Natural Resources** n.d.). These techniques work best if there is a good alternative feeding source nearby (Conover 1991).

Chemical goose repellants have been used with varying degrees of success to prevent feeding on grass and other vegetation (USDA 1999; Ayer 2009; CWS 2010; Huang 2010). Ideally, the product will affect only the taste of vegetation, and not be harmful to wildlife or humans; it is important to check with the product supplier as a permit may be required for its use (CWS 2010). Frequent mowing may influence the longevity and efficacy of chemical deterrents on grassy areas (Ayers 2009).

Methyl anthranilate, a registered repellant for Canada Geese in Canada and the U.S. (USDA 1999; Health Canada 2012), is marketed under the trade names Rejex-It[™] Migrate for Agriculture and Turf Bird Repellent, and as ReleX-iT[™] (Health Canada 2012). It repels Canada Geese when it comes into contact with eyes, nostrils and mouth. It has low toxicity to terrestrial organisms, including mammals and birds, but may adversely affect aquatic organisms (USDA 1999; Health Canada 2012). Methyl anthranilate is naturally occurring in grapes, and is used to produce the sugar-substitute saccharin (International Agency for Research on Cancer 1999). When assessing its effectiveness, the USDA (1999) reported mixed results.

Anthraquinone is a digestive irritant, and is sometimes combined with a plant growth suppressant to make it more cost-effective (USDA 1999; Ayers 2009). Accepted for use as a bird repellant at American airports since the late 1990s, anthraquinone is also used for textile dyes and as a pulp and paper additive. It was phased out of use by the European Union in 2008 and is "possibly carcinogenic to humans" (International Agency for Research on Cancer 2012, p. 66).

Ray (2011) suggested lime as a potential grazing repellant for Canada Geese. For a short time, it produces a caustic effect on the oral mucosal lining (Belant et al. 1997 in Ray 2011).

Hesse, Rea, & Booth (2009), in

their discussion of wildlife management around airports, documented the use of chemical deterrents on nesting and roosting sites. I was unable to find any examples where repellants were used on goose nesting and roosting sites.

Removing Domestic Waterfowl

Birds learn to locate food resources by watching other birds. Domesticated waterfowl act as decoys, luring Canada Geese into ponds and other areas. Domesticated waterfowl may be farmed, kept for aesthetic reasons, or congregate and stay in areas where they are fed, all with similar results. Importantly, concentrating domestic and wild birds in an area has been known to spread diseases (USFWS 2002).

There are discrepancies in the literature as to whether Mute Swans attract or repel Canada Geese; some say the territorial nature of the swans make them an effective deterrent, while the U.S.D.A. and others maintain they are only territorial while they are nesting. There are also other reasons to refrain from keeping swans, such as the potential proliferation of exotic species, damage to aquatic habitats, and aggression towards people (USFWS 2002). Such rationale can be overcome by using swan decoys; the sellers of these claim they are successful Canada Goose deterrents (e.g., http://shop.tjbinc.com/floating-white-swandecoy-for-canada-geese-controlin-water-gardens--ponds-<u>p1335.aspx)</u>.

Bait and Lure Crops

Bait and lure crops may appear out of place in this section, as they are not 'goose unfriendly habitats'. However, they are 'carrot' habitat modification tools meant to discourage geese from using more vulnerable habitats, and so act in much the same way as 'stick' tools (e.g., barriers, goose repellants). It is important to note that bait in this context does not refer to baiting to lure birds for hunting (which may be permitted as a special provision should Canada Geese be designated as overabundant). Rather, lure crops may be planted, or bait (usually grains) deposited to attract wildlife away from more valuable resources. Baiting may also be used with capture nets to round up geese for banding, relocation, or extermination, within the conditions of a federal permit.

Lure crops are known to be largely ineffective where food resources are plentiful (USDA 1999), and are only available for short periods of time (USFWS 2002), so are considered inappropriate for most year-round urban goose problems. The effectiveness of baiting is also limited by the availability of alternative food resources (USDA 1999), and geese must be kept out of the vulnerable habitats (e.g., by hazing or with barriers) (USFWS 2002).

A key question remains, how available are alternative food sources in our region, and does this differ by season? CWS (e.g., CWS 2011) has stated that the rise in Canada Goose populations can be attributed, in part, to everexpanding food resources as humans modify the landscape, whereas the Guardians and others (e.g. MVIHES 2009; Dawe et al. 2011) have determined that once plentiful estuarine food sources have been dramatically diminished.

Bait and lure crops are sure to draw others species of waterfowl and their predators. Bait pads require frequent cleaning to prevent illness among its users. And such areas concentrate animals, making them more susceptible to pathogens and parasites.

12.32 Hazing

Most hazing programs have met with little success, as geese readily habituate to scaring techniques, move to other areas where they are not wanted (including areas where owners may suffer significant damages that they can ill afford), and then return once hazing is suspended (CWS 2010; Huang 2010; Ray 2011). Preusser et al. (2008) in Ray (2011) found that geese usually moved less than 2 km from hazing sites and often returned multiple times after hazing. Effective hazing requires that geese be chased every time they arrive, and employs multiple techniques to overcome habituation (CWS 2010); this is time-consuming and can be expensive. Certain types of hazing (e.g., chasing by dogs) may not be appropriate when geese are nesting or flightless during the moult, as the birds may be harmed if they cannot fly away or stay to defend their eggs. Migrants are

generally (but not always) more responsive to hazing than resident birds (cf. USDA 1999), therefore Cackling or Dusky Canada Geese may be targeted.

An experiment conducted in Scotland assessed hazing as a tool to manage Barnacle Geese (Branta leucopsis) depredating agricultural lands. Human 'goose scarers, supported by gas guns and plastic tapes, hazed geese from 'scare fields' to 'refuge fields' where farmers received payment to allow the geese to graze. Working in daylight hours over a 4 month period, 7-8 scarers were able to reduce the number of geese in scare areas by 50%; despite all efforts, a core group of geese remained faithful to the scare area. The scheme cost more than it saved in crop yields. Recommendations included using fewer people over a more focused time period, while monitoring birds for body condition and ensuring refuge areas were sufficient (Percival, Halpin, & Houston 1997).

Hazing on the Estuaries

Hazing on the estuaries is difficult at any time of year, and especially during high tides, because geese can access water at multiple points or across broad expanses. Once pairs establish territories and build nests on the estuarine marshes, the stage is set for ongoing damage. Hazing is less effective when geese are nesting or raising broods, as parents are less likely to leave eggs or young behind (CWS 2010). During the pre-moult period, the birds often swim along the shorelines to their favourite moulting sites. Geese

that are hazed during the moult will not be able to travel very far (CWS 2010). Therefore, mitigating damage from Canada Geese from March through August by hazing would require nearly constant vigilance, and possibly alternative measures such as baiting in less ecologically sensitive areas in proximity to present moulting sites (cf. CWS 2010). Hazing on the nesting grounds will move breeding geese onto other sites, some of which may be much more difficult for egg addlers to find.

To haze the geese from the estuaries to huntable areas during autumn, winter, and early spring hunting seasons will require simultaneous hazing efforts in other non-huntable areas, of which there are many. A wellcoordinated, pilot effort would be necessary, ideally with several days of pre-observation to study birds movements, cooperation from landowners, and substantial manpower employing a variety of hazing techniques.

Hazing Techniques

Hazing techniques mentioned in the literature and not used by our survey respondents are described here. They have been applied with varying degrees of success, and what works for one site may not work for another. The effectiveness of a given technique will depend upon the nature of the problem, the character of the landscape, and the skill with which it is applied.

Hazing techniques may be visual, auditory, or both. Visual techniques include dead Canada Goose decoys (e.g. at <u>http://</u>

www.wildlifecontrolsupplies.com/ animal/NWSDG01K.html), swan

decoys (mentioned in 9.31 **Removing Domestic** Waterfowl), statues of owls or eagles, helium balloons and kites with graphics of large eyes or shaped like large birds of prey, scarecrows of predators or guntoting humans, flashing or strobe lights, lasers (e.g., http:// www.wildlifecontrolsupplies.com/ animal/NWSV000/BPL001.html, http://aviandissuader.com), waving flags, shiny banners, streamers, flagging, and reflective tape (Smith, Craven, & Curtis 1999; USDA 1999; Blackwell, Bernardt, & Dolbeer 2002; CWS 2010; Eckberg 2010; Huang 2010; Ray 2011; K. Ashley, pers. comm. to C. Wightman, May 2014).

Auditory techniques include goose alarm and alert calls, predatory calls, propane cannons, air horns and sirens (CWS 2010; Eckberg 2010). Scare devices requiring a permit from Environment Canada include those discharged from a firearm, such as cracker shells, screamers, and bangers (Smith, Craven, & Curtis 1999; USFWS 2002; CWS 2010).

Audio-visual techniques include pyrotechnics and remotecontrolled boats (USFWS 2002; Eckberg 2010). The City of Nanaimo uses a remote-controlled vehicle (K. Bridges, pers. comm. February 10, 2015). In some areas, motion-activated water sprinklers may be an effective hazing tool (CWS 2010).

Each technique must be considered for safety and legal implications, and public acceptance. It is important that birds are not touched or handled. Hazing with firearms or with aircraft (e.g., drones) requires a permit. Some hazing techniques may contravene local government noise bylaws, or meet with public disapproval. Pyrotechnics, for example, may be prohibited in certain areas, and may cause injuries, start fires, and upset people and pets (USDA 1999). Hazing methods should also be assessed for their impacts to other species, particularly at-risk or sensitive species.

12.33 Adult Sterilization

In the U.S., Canada Geese have been baited with oral contraceptives during the breeding season. Nicarbazin, sold in the product OvoControl™, decreases egg production and hatching rates. Its use is limited to urban nesting sites where geese can be regularly fed. To be effective, geese must consume at least one ounce of bait per day for at least 21 days prior to nesting, and throughout the nesting period. Its effects dissipate within a few weeks (USDA 2011).

Also in the U.S., ganders have been "vasectomized" to reduce recruitment. It is probably best suited for reducing small resident populations, as males must first be identified, then captured and surgically treated (Hundren et al. 2000 in Ray 2011). As this method typically affects only reproductive output from one female per gander, its effectiveness is limited (USDA 1999).

12.4 Additional Lethal Controls

Sometimes, non-lethal control methods are employed when lethal controls would have been more effective and biologically sound (USDA 1999). Lethal methods are sometimes necessary to reduce goose-human conflicts (CWS 2011). Lethal controls may enhance the efficacy of non-lethal controls; for example, when some members of the flock are killed, it scares remaining geese into other areas and may make them easier to scare in general (CWS 2011). (Often, though, surviving geese move to the estuaries or other areas where they are unwanted.)

12.41 Additional Hunting

There are two ways to increase hunting pressure on Canada Goose populations: 1) to expand hunting opportunities, and 2) to move Canada Geese into areas where hunting can occur.

Hunting opportunities can be expanded in several ways: 1) open

areas currently closed to hunting, even for a short time; 2) increase the number of hunters through encouragement programs or hunter incentives (including financial incentives); 3) encourage landowners with geese to allow access to hunters; and 4) further reduce hunting restrictions (extend seasons, increase bag and possession limits, allow equipment and techniques that are currently prohibited). Birds can be moved into huntable areas by hazing, or by roundup and transport.

The LQRE, ERE, CCE, and NBE are currently closed to hunting, However, parts of the ERE, LQRE, and NBE may be far enough from residences to enable safe and legal hunting. DUC secured an exception to a Port Alberni bylaw prohibiting the discharge of firearms within city limits. Designated, licensed hunters are allowed to shoot Canada Geese for one year, starting in September 2014, on DUC conservation lands at the Somass River estuary. There is an option to extend following a report on conservation work in the estuary (Plummer 2014; D. Buffett, pers. comm. November 2014). Further afield, in Rochester, Minnesota, an early season Canada Goose hunt inside of the city's game refuge earned the city national acclaim, including a title as one of the best cities for hunters to live in (Eckberg 2010).

Additional hunting opportunities may also be considered for golf courses, if there are areas where proximity of neighbours is not a concern. In Connecticut, 16 golf courses had active hunt programs; hunting occurred daily on 4, weekly on 4, and whenever geese were present on the remaining 8. Seventy-five other courses had requested state assistance to develop a hunting program (Huang 2010). Ray (2011) suggested archery and entanglement (i.e., snares and nets) followed by removal as a way to take birds off of golf courses and other sites where discharge of firearms may be wholly inappropriate.

Also in Connecticut, a survey of farmers found that some were unaware that hunting was allowed on their lands, and subsequently initiated contact with hunters. Most farmers that were already hunting or allowing hunting wanted expanded seasons and bag limits (Huang 2010).

12.42 Additional or Expanded Kill Permits

There are at least two ways to ramp up the effectiveness of kill permits: 1) expand the egg addling program into new areas, and 2) encourage other landholders with Canada Geese to use kill permits. The Guardians have been asked on several occasions to addle eggs on properties currently outside of the program. A local hunter, on behalf of several farmers, contacted a Guardians member to determine how to secure kill permits to manage geese (pers. comm. October 2014). A campaign to raise awareness of these control options, and additional funding for addling will be needed if these methods are to make a marked reduction in the regional Canada Goose population.

12.43 Culling

Culling - the selective, lethal removal of wild animals, has collective benefits that most other control methods do not have. Like

hunting and permits to kill adult birds, it decreases the adult population, and so eliminates many costly and labour-intensive years spent addling eggs and chasing geese from one area to another. It typically targets a larger number of birds at one time, can be applied directly to a problem (sub)population, and its effects are obvious and immediate (cf. USFWS 2002, USDI 2005). There are also fewer risks that surviving members of the flock will return or cause problems elsewhere. Still, repopulation is anticipated, as nearby populations continue to grow and suitable habitats remain available. Females that escaped capture because they had moultmigrated (or for other reasons) will return to nest.

Ethics

Culling is a sensitive topic, sometimes motivating impassioned discussions and even organized conflict. Animal rights advocates have fiercely defended animals threatened with selective extermination, be they Canada Geese, deer, rabbits, wolves, or any other species, because they believe these animals have rights similar to humans. They may be opposed to any form of stressor or control, including hazing (USDA 1999), believing that humans should learn to tolerate and even appreciate these animals (USDA 2004). The U.S. organization, Love Canada Geese, supports a webpage entitled Canada Goose Hall of Shame, which lists the worst offending communities in Canada: Kelowna, Osoyoos, Penticton, and Vancouver, B.C.; Vancouver made the list because it relocated juvenile geese, while Kelowna threatened, but did not undertake, a cull (LoveCanadaGeese.com 2014). Although most animal welfare organizations do not oppose wildlife damage controls (USDA 1999), the B.C. Society for the Prevention of Cruelty to Animals (BC SPCA n.d.) and others promote non-lethal methods and a respectful attitude towards urban geese.

On the other hand, there are people who have lost all tolerance for the nuisance animals, and are willing to reduce the problem by any means necessary (cf. Huang 2010). Most people hold positions somewhere in between, or no position at all. Hunters may wish populations to remain high or even grow.

These are ethical discussions about humaneness and justice, and individuals perceive them differently. Most people don't want the geese to suffer, and some are focused on determining the most humane extermination method. One survey respondent rejected the use of firearms for culling, but only as a public safety issue. A hunter viewed his participation in depopulation efforts as helping the City contain maintenance costs, assisting affected farmers struggling to make a living, and supporting local food initiatives. Disposal has come up repeatedly in meetings; many people reject any wasteful or debasing treatment of carcasses and will accept culling only as long as the birds are used for food. All of these factors, along with the logistical issues of coordinated

capture, transport, killing, and disposal, make culling a challenge. In the U.S., senior governments manage and oversee culls, whereas here they only participate as monitors. Not surprisingly, culling is generally seen as a control measure to pursue only when all others have been exhausted.

"Depopulations"

A number of stakeholder groups in the province have requested permits to cull, or conduct local 'depopulations', leading senior governments to address some of the aforementioned logistical issues (BC MFLNRO 2014; CWS 2011b).

In May 2014, in response to requests from the Capital Regional District, the B.C. MFLNRO produced the standard operating procedure (SOP) for performing depopulations of resident Canada Geese. The main intent of the SOP was to prevent animal suffering. The described procedures must be performed by veterinarians or individuals who have had training in wildlife handling and management specifically related to humane euthanasia techniques. Appropriate permits must be obtained from Environment Canada and the B.C. MFLNRO. The SOP recommends herding Canada Geese into an enclosed area during the moult period, described as mid-May to late July, then transporting them to a location away from pubic access to avoid 'aesthetically displeasing' the public. Another document, Best practices for capturing, transporting and caring for relocated Canada Geese, necessary for capturing and moving the birds to a location that avoids distressing the public, is available at <u>http://</u> www.ec.gc.ca/mbc-com/ default.asp?

lang=en&n=07368A95-1. It is noteworthy that we have conducted four separate roundups for marking geese in early July, a busy tourism period, with little fanfare.

There have been several methods used for the euthanasia of geese, with no single option that stands out as the best choice. Recommended methods include cervical dislocation with mechanical assistance, and the use of a non-penetrating captive bolt device, the latter delivering a large concussive force, rendering the animal irreversibly unconscious. If not used for food, the carcasses must be buried at an approved site or incinerated at a facility with adequate capacity for the size of depopulation that is performed. All personnel should be comfortable with these tasks and trained to carry out their roles correctly and safely. Alternatively, a mobile poultry processing unit may be used; this method may be more cost-effective, safe and efficient than training new staff (BC MFLNRO 2014).

CWS developed *Best Practices* for Killing Birds and Disposing of Carcasses (CWS 2011b), available at https://www.ec.gc.ca/ Publications/ 95FAFB79-3856-4752-8309-1F95D 0E4101D%5CCOM1425_BP-fordisposing-of-carcasses-(EN)march-2012.pdf. Gunshots, a carbon dioxide chamber (i.e., inhalant gases), stunning and decapitation, and commercial poultry processing were preferred methods for killing Canada Geese. If pharmaceutical agents were used to dispatch geese, carcasses must be incinerated or limed and buried; they cannot enter the food chain (CWS 2011b).

Culling in Other Jurisdictions

Large-scale capture and euthanasia of Canada Geese in urban settings first began in the U.S. in 1996 (cf. Maryland **Department of Natural Resources** n.d.; T. Smith, pers. comm. February 17, 2015), and have since expanded into many jurisdictions. The U.S. Department of Interior's Fish and Wildlife Service (2005) described culling and delivering the birds to food banks as an efficient and cost-effective way to reduce the size of an urban flock, second only to hunting. It requires a federal permit from the USFWS that documents other control techniques attempted, and their results. Landowners are encouraged to hire USDA Wildlife Services or a state-licensed control company to do the work (Maryland Department of Natural Resources n.d.; USDI 2005).

Roundups and culling have precipitated a generalized mild resistance, and spawned a few well-organized advocacy groups (such as Love Canada Geese, mentioned above) (Eckberg 2010). The provision of birds to food banks, and the airplane crash into the Hudson River in 2009 appear to have tempered opposition to Canada Goose culling in America (cf. Smith, Craven, & Curtis 1999). Huang (2010), who studied the societal acceptance of aggressive



Double-crested Cormorants (*Phalocrocorax auritus*). Photo from Trudy Chatwin.

population control techniques in Connecticut, found that all stakeholder groups surveyed agreed that population reduction was "not only acceptable, but needed" (p. 34); importantly, Huang's groups did not include the general public. Nineteen towns wanted to reduce populations but found lethal control costprohibitive. Five other towns felt that the State should provide grants or conduct roundups and euthanize birds. Two towns rejected culling to avoid polarizing their communities. Huang concluded that there was a general lack of fortitude to implement controversial management techniques in the face of vocal minorities, yet asserted that population reduction through aggressive means was the only long-term solution.

Culling has occurred overseas as well. For example, in New Zealand, the Department of Conservation and Ministry of Agriculture and Forestry granted \$100,000 to set up a moult cull program throughout the country. Up to 18,000 birds were culled on public conservation lands by Federated Farmers, using a variety of site-specific methods (Cogle 2012). This was the latest in a series of culls dating back to 1993 (Spurr & Coleman 2005). At least one of the culls resulted in conflicts with organized groups, such as the Goose Guardians (Win 2001).

Cormorants

While cormorants are not protected by the *Migratory Birds Convention Act*, the culling of 'hyperabundant' Double-crested Cormorants (*Phalocrocorax auritus*) on Middle Island in Lake Erie and Ontario's Point Pelee National Park

provides some valuable lessons. There are also some parallels between Carolinian Canada and east-central Vancouver Island; many ecosystems and species are at the northerly extent of their range. When survey data collected by CWS, Ontario Parks, and nearby universities showed the cormorants were damaging the ecosystems and associated species at risk, Parks Canada invested \$380,000 to implement the Middle Island Conservation Plan (Dobbie 2008). Culling was one of three management approaches, the other two being removal of nests and nest-building material to protect species at risk and discourage nesting around them, and installation of scarecrows to discourage nest building (Dobbie 2008; Parks Canada 2010).

Culling began in 2008 and is expected to carry on through 2015. Prior to hatching, small number of Parks Canada personnel shot cormorants associated with nests in trees using sound-suppressed, small calibre rifles. Carcasses were not removed, to avoid disturbing sensitive flora. Follow-up monitoring and carrying capacity modeling were important aspects of the plan (Dobbie 2008; Parks Canada 2010). According to **Cormorant Defenders International** (n.d.), less than 250 birds were killed in 2008, 1,600 in 2009, and 3,300 in 2010.

The plan was supported by the local Humane Society and SPCA (Parks Canada 2013). However, Cormorant Defenders International prepared a 93 page document refuting the rationale for the culls, including the term



Barred Owl (Strix varia)

'hyperabundance' (Kent MacKay & White 2008). The authors argued that there was no evidence that few cormorants existed on the island prior to the 20th century. Shooting was described as cruel, while cervical dislocation was "morally reprehensible" and possibly illegal under the Criminal Code of Canada (pp. 47-50).

Other Avian Species

In 2013, the Province initiated a control program for Barred Owls *(Strix varia)* deemed necessary to protect a handful of remaining pairs of Spotted Owls *(Strix occidentalis)*. The Barred Owls had been outcompeting the Spotted Owls, which are federally endangered and provincially red-listed. By the time the program was announced, it had already relocated 73 and authorized the shooting of 39 Barred Owls within a 5 km radius of confirmed

Spotted Owl sightings (CBC 2013). While culls are never popular and this was no exception (cf. Wilderness Committee n.d.), the remainder of the initiative proceeded with little fanfare. (Note: It is beyond the scope of this paper to discuss the myriad examples of animal culls for conservation or other purposes.)

Social License

In this section, I have elaborated on the challenges of obtaining the social license to cull Canada Geese. This is not to suggest that culling is an inappropriate management tool, but to inform managers that, should they choose this option, awareness-building and education will be necessary, and there is always a possibility that no amount of justification will be enough to dissuade activism.

12.5 Renewable Resources

Pioneering farmers raised Canada Geese for food, although they were probably not a preferred species, and for down and as live decoys to lure migrating geese for hunting (cf. University of California 1977). Farmed flocks provided stock for introductions and relocations (see Chapter 1, Background), and it is likely that flocks of live decoys were released after the practice was outlawed in the U.S. in 1935 (USFWS 2002).

Today, domesticated Canada Geese are for sale in the U.S. (see, for example, <u>http://</u> <u>www.efowl.com/</u> Canada_Goslings_p/1080.htm or http://www.metzerfarms.com/ CanadaGeese.cfm? Breed=Canada&BirdType=Goose&I D=CAN&CustID=17075). Sellers provide non-transferable permits. (Federal legislation prohibits the sale, barter and purchase of wild geese (USFWS 2002)).

Here in B.C., raising Canada Geese without a permit will land you in trouble (CBC News 2012, January 17). Aviculture permits are available, but the birds must be bred in captivity. Conditions of the permit include requirements to control flight through pinioning and wing clipping, as well as use of pens and facilities maintenance (E. Lok, pers. comm. January 9, 2015).

Yet, there is, or could be, a demand for Canada Goose products. Local farmers were interested in producing goose sausage and in marketing whole birds (survey respondent, 2014).

Down is considered a byproduct for poultry farmers, albeit a lucrative one (Downmark n.d.). Hutterites raising geese on the Canadian prairies are renowned for their down, which is derived from mature, free-ranging small flocks (Robertson 2010).



Canada Goose™ apparel cashes in on the iconic bird, without using its down.

Interestingly, clothing manufacturer Canada Goose™, a company that has been in existence for nearly 60 years, uses goose and duck down from Hutterite birds - not Canada Geese, but white domestic varieties. Over the past decade, its sales grew 4000% to \$200 million (Financial Post 2014, October 16).

In the U.S. geese captured within the conterminous U.S. during the summer months can be processed for human consumption and donated to charitable organizations. Feathers cannot be sold (USFWS 2002). Keefe (1996) reported costs of \$18 to \$25 per goose, for capture and processing for human consumption; these did not include holding captured geese for any length of time prior to processing.

Currently, wild-sourced Canada Geese cannot be raised or sold for human or pet consumption in Canada, nor can culled birds be offered to food banks. Canada Goose feathers are considered wildlife parts, and cannot be sold by anyone other than some First Nation members.

Regulations and policies regarding the use of non-hunted wild game for consumption are discussed in Chapter 4.9, Processing Non-hunted Wild Game for Consumption.

12.6 Compensation

There has only been one program registrant on the midisland for the B.C. Ministry of Agriculture's Agriculture Wildlife Program, from the community of Hilliers (G. Fowler, pers. comm. January 12, 2015). This is a free compensation program available to qualifying livestock and forage producers for low value livestock forage crops, grown mainly for silage, hay, or pasture (BC Ministry of Agriculture and Lands (MAL) 2008); G. Fowler, pers. comm. January 12, 2015). Damage associated with Canada Geese, and any other waterfowl species, includes plant removal, plant yield reduction (grazing), weed introduction and infill, soil sealing (ponding, reduced drainage), minor excavations (root grubbing), and grit consumption. In the

Hilliers case, waterfowl and ungulate damage were both assessed (G. Fowler, pers. comm. January 12, 2015).

Most wildlife damage to forage grasses occurs over the winter months, and fields must be assessed prior to harvesting or other field activities (e.g., harrowing, manure spreading, aerating, fertilizing) that may mask the damage. Generally, assessments are conducted from February to April, prior to the first cuts in May or June. Later damage may be assessed, but there is generally less damage due to waterfowl migration and the availability of alternative foods (G. Fowler, pers. comm. January 12, 2015).

Silage corn assessments are conducted from June to October,

and are generally based on a single inspection per field. While geese are one of the first animals to damage corn crops, later damage by other animals such as bear, deer, and elk is typically greater (G. Fowler, pers. comm. January 12, 2015).

Damages to crops grown for human consumption are not covered by this program, as these fall under the Crop Insurance/ Production insurance program. Crop insurance programs have coverage premiums, production (yield) guarantees, and are delivered on a crop scale, versus an individual field scale. Human food crops are considered to be at greater risk from weather events, disease, and pests (G. Fowler, pers. comm. January 12, 2015). By contrast, the South Dakota Department of Game, Fish, and Parks instituted a \$250,000 program in 1996 to reduce crop damage by geese. The program was funded by a \$5 surcharge on all hunting licenses. Landowners were given free access to State-led abatement techniques such as egg addling (Dieter & Anderson 2009).

National Wildlife Research Center economists (USDA 2011, November) showed that as resident Canada Goose populations increased, so did the costs associated with damages and control measures. They discovered that for every dollar spent on wildlife damage management programs to control Canada Geese, \$1.31 to \$5.56 could be saved in damage and maintenance costs.

Table 12-3 provides a SWOT (strengths, weaknesses, opportunities, threats) analysis of management techniques discussed in this chapter.

Table 12-3. SWOT analysis of management options	Table 12-3. SWOT	analysis of managed	gement options
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Technique	Strengths	Weaknesses	Opportunities	Threats
egg addling	reduces annual recruitment; lowers re-nesting rates; established program with significant experience and leadership	must continue for many consecutive years; failed nesters may moult-migrate; failed nesters may nest or re-nest in more remote or isolated areas; effectiveness is constrained by availability of manpower, funding over a prolonged period (may be expensive (\$)); limited access to private properties; addling crews difficult to populate due to time of year and physical demands; inexperienced crew members	failed nesters that moult-migrate and linger in more northerly areas may be exposed to greater hunting pressure; access to private properties and successful nest searches may be increased by building awareness, leadership, and training	crews may be exposed to safety and health risks; opponents prevent access to properties or harrass crew members
hunting	increases mortality rates; four seasons and increased bag and possession limits have precipitated greater harvests in management unit 1-5	some geese confine their movements to non-huntable sites; season designed to target local resident geese; exclusivity and costs of hunting clubs may prevent new and lower income hunters from hunting geese, reducing hunter numbers overall; farmers reluctant to open properties to hunting because of stress to farm animals	temporarily open areas to hunting or encourage landowners to allow hunting; promote goose hunting to encourage people to hunt, or hunt more often; encourage hunting in jurisdictions where our marked birds were shot; reduce hunting restrictions; move geese into huntable areas	hunting moves survivors into non- huntable areas, including vulnerable estuaries; hunting opponents and NIMBYism vilify hunters and discourage landowners from allowing access; perceived safety issues prevent hunting in estuaries and peri-urban settings

Technique	Strengths	Weaknesses	Opportunities	Threats
use of permits by landowners	addling reduces reproductive outputs, use of kill permits increases mortality rates	scare permits move birds to other areas; some are unable to addle or dislike doing it; some cannot implement a kill permit without help	assist people who don't know how to access or use permits; reduce or eliminate processing times; connect potential permit- holders with addling crews and hunters to implement them	processing times are prohibitive
no feeding policies or bylaws	feeding may sustain more geese than would be supported by natural food resources, injure people, or cause debilitating conditions in geese (e.g., Angel Wing)	require enforcement, which may be time- consuming and \$	introducing feeding bylaws and/or policies may help raise awareness of the problem of local overabundance	
barriers	prevent geese from landing or taking flight, restrict movement when flightless, cause them to feel vulnerable by blocking escape routes and lines of sight	no effect on population size; may be expensive (\$), may block waterfront views or be unsightly	natural barriers may have multiple benefits (e.g., as habitat for other species, flood protection)	goose unfriendly habitats may be detrimental or hazardous to other species (e.g., bamboo stakes may prevent access by other waterfowl, grid lines may entangle)
drainage	reduces features that attract geese	no effect on population size; reduces seasonal or permanent wetlands, which are rare and have many important values; \$		goose unfriendly habitats may be detrimental or hazardous to other species (e.g., other species that use the wetlands)

Technique	Strengths	Weaknesses	Opportunities	Threats
inaccessible or unpalatable food sources	discourage geese from feeding	no effect on population size; some solutions may be temporary (e.g., new turf); \$	altering the timing of harvests may provide additional benefits to farmers	goose unfriendly habitats may be detrimental or hazardous to other species; some chemical deterrents may be toxic or carcinogenic to humans, also; some alternative plantings suggested in the literature are invasive plants
removing domestic waterfowl	prevents concentrations of mixed domestic and wild fowl, known to spread diseases			
bait and lure crops	draw geese away from sensitive habitats and other sites where they are unwanted	effectiveness limited by the availability and quality of alternate food resources; attract other species and predators	may also be used to round up geese for banding, relocation, or extermination	without regular cleaning, bait pads may cause illness; bait and lure crops concentrate animals, making them more vulnerable to pathogens and parasites
hazing with dogs	scares geese from patrolled areas; canine programs have been successful in our area and other jurisdictions	moves birds to other areas; dogs not allowed on the PQBWMA during March and April and now have to be controlled at all times; bureaucratic gridlocks (e.g., for schools); requires willing trainers and dogs; \$	hazing may move geese into areas where hunting can occur or kill permits may be used	hazing activities may be detrimental or hazardous to other species (e.g., dogs may chase Brant); dogs may become ill from contact with goose feces; geese may move to areas where they cause significant damage; nesting or flightless birds cannot travel very quickly or very far, and may be injured by dogs

Technique	Strengths	Weaknesses	Opportunities	Threats
hazing with raptors	scares geese from patrolled areas	less effective than dogs per unit area; \$; raptors are not permitted to injure or kill geese but have the instinct to do so	hazing may move geese into areas where hunting can occur or kill permits may be used	goose unfriendly habitats may be detrimental or hazardous to other species; geese may move to areas where they cause significant damage
hazing with equipment (e.g., vehicles, predator decoys and calls, lasers, reflective tape, alarms and alert calls, cracker shells, propane cannons, drones, etc.)	scares geese from targeted areas, at least temporarily	geese readily habituate to some hazing techniques; certain geese may remain faithful to a site, returning again and again; techniques may work on one site but not another; may be time-consuming and \$; may upset people and pets	hazing may move geese into areas where hunting can occur or kill permits may be used	goose unfriendly habitats may be detrimental or hazardous to other species; geese may move to areas where they cause significant damage; some techniques may be unsafe. illegal, or unacceptable to the public in certain contexts
adult sterilization (i.e., oral contraceptives, gander vasectomies)	gander vasectomies prevent offspring from the mated pair	oral contraceptives must be added to bait and consumed every day for 21 days prior to nesting and throughout the nesting period, and its effects wear off in a few weeks; vasectomy involves capture and surgery, and only affects one female per gander		bait pads require regular cleaning to prevent illness; bait pads on the nesting grounds may attract predators and non- target species

Technique	Strengths	Weaknesses	Opportunities	Threats
culling	decreases a goose population, eliminating the need for many costly and labour-intensive efforts; when applied to a large number of birds at one time, the effects are obvious and immediate; fewer risks that survivors will return or cause problems elsewhere	logistics (e.g., capture, transport, killing, and disposal) are often challenging; \$	generates ethical discussions centred on humaneness and justice; carcasses may be used for food; sound- suppressed, small- callibre firearms may be safely used by experienced shooters on a well-defined site within a specific time period (see Cormorants)	repopulation is likely to occur, as moult- migrants return to nest, and as nearby populations grow and suitable habitats remain available; there may be considerable opposition, or a small but vocal one; safety issues if firearms are used in areas typically closed to hunting
renewable resources			demands for goose products (e.g., meat, down); new regulations for First Nations	
compensation	pays farmers for damage to forage crops	other field activities may mask damage; damage to crops grown for human consumption are covered by crop insurance programs, which are administered differently and require premiums	a portion of hunting license fees may be used to fund compensation programs (and restoration efforts on estuaries and other damaged sites); wildlife damage management programs may save damage and maintenance costs	