OKANAGAN REGIONAL GOOSE MANAGEMENT STRATEGY

AND

ACTION PLAN

FINAL REPORT

Prepared for

Okanagan Regional Goose Management Committee
Kelowna, B.C.

Prepared by

Robertson Environmental Services Ltd.
Langley, B.C.

and

Ophiuchus Consulting
Oliver, B.C.

July 20, 2006

EXECUTIVE SUMMARY

Canada geese populations in the Okanagan Valley have increased dramatically since the 1960s. These increases are widespread and not limited to the Okanagan Valley. Goose populations have been the target of efforts to bring numbers under control, and reduce their concentrations where conflicts with public use take place.

Canada geese are congregating on beaches where water quality samples in summer show contaminant levels reaching threshold levels. A further increment and the health authority may force some beaches to be closed. To an economy geared to tourism this is an unacceptable scenario.

Instead of establishing a specific numerical target (tolerable population level) for Canada goose populations in the Okanagan Valley at this time, the study team recommends that the ORGMC review the findings of the first three years of monitoring (2007-2009) and revisit the topic. However, to address the numbers of geese in summer and the negative impact they have on water quality, the study team proposes a zero tolerance of geese on waterfront parks.

The proposed management strategy comprises the following elements: public awareness, goose dispersal away from beaches and other sensitive area, population control, monitoring, and responsible program administration geared to meeting annual program targets.

The anticipated benefits include improved management of geese on public and private lands, improved recreational water quality at beaches, reduced numbers of geese at beaches in summer, an eventual decline in the summer goose population Valley-wide based on egg addling, more attractive lawns within parks and playing fields, reduced complaints from the public, and ideally reduced costs directed to goose management,

A summary of the goose management Action Plan is laid out on the following page.

ACTION PLAN

The Action Plan is based on the five main strategies outlined above.

Public Awareness and Involvement

- Adopt a public information plan on management and control of Canada geese.
- Ensure that the messages being distributed are rational, scientifically defensible, reflective of humane values and are respectful of different positions regarding the management of Canada goose populations.
- Maintain public liaison

Reduced Goose Use In Conflict Areas

- Continue the coordinated application of deterrence and scare techniques to remove geese from sensitive public areas.
- Promote the modification of existing parks and public areas so that they do not provide the security features that geese require.
- Relocate geese away from sensitive areas by relocating them to approved areas.
- As a last resort, implement damage (lethal) control techniques where non-lethal techniques are insufficient.

Population Control

- Continue existing and local egg addling programs by expanding them to cover all Canada goose breeding locations in the Okanagan Valley. The objective is to reduce the summer Canada goose population, but no target population level has been set.

Monitoring

- Continue to monitor goose numbers at key public use areas where Canada geese concentrate.
- Monitor juvenile recruitment (brood counts).
- Continue annual surveys (June to September) to determine summer population levels.
- Monitor water quality to determine what level of impact geese have on water quality.

Program Administration

- Raise profile of ORGMC through signage, website, and other public information releases.
- Expand ORGMC membership to include First Nations and private citizens.
- ORGMC should regularly review results of different program elements, convene an annual program review meeting and other meetings as required, and release information through its website and other means at regular milestones.
- Keep accurate records on staff and contractor time spent on goose control.

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1.0 INTRODUCTION

1.1 Background

Since the 1960s, the Canada goose population in the Okanagan Valley has expanded from being virtually non-existent to now numbering in the thousands. The Okanagan Regional Goose Management Committee (ORGMC) originated in 1995 to share information from different parts of the Valley, and identify solutions to the goose problem (Appendix 1). In spite of the aesthetic appeal of these attractive birds, their high numbers were putting them in conflict with the public, particularly on playing fields and beaches where high fecal coliform counts, then and now, threaten the continued use of these areas.

Since the inception of the ORGMC, overpopulation of Canada geese in the Okanagan Valley has caused sufficient concern for local governments to initiate discussions on control measures. Under the direction of Parks and Public Works departments, staff and contractors have been working to facilitate necessary control measures. The measures employed include the following techniques:

- Control of population recruitment by egg addling and related methods;
- Dispersal of goose concentrations away from sensitive areas using a variety of harassment techniques;
- Monitoring the status of Canada geese via surveys of goose populations, particularly their numbers and distribution; and
- Sharing information with other municipalities via the Okanagan Regional Goose Management Strategy.

In spite of some localized success, the Okanagan Regional Goose Management Committee recognized that these achievements were largely restricted to municipal lands, airports, and those of a few private entities, particularly golf courses, but that the target goose populations ranged over a much broader valley landscape. Further, they realized that in spite of energetic harassment at beaches and playing fields, water quality levels during the peak of the summer season were approaching threshold levels for beach closures. Facing this uncomfortable scenario, the Committee has deemed now to be the right time to develop a valley-wide strategy to better deal with the Canada goose management issues.

1.2 Objectives

The objectives of this assignment are as follows:

- Assemble and analyze historic and current information regarding the Canada goose population in the Okanagan Valley;
- Identify the impacts of large Canada goose populations to the public;
- Invite participation of local stakeholders and the public in the development of the goose management strategy;
- Determine criteria for defining “tolerable” goose population levels within the Okanagan Valley;
- Confirm current control techniques being applied within the Okanagan Valley;
- List and evaluate employable control techniques to deal with problem geese; and
- Develop a management strategy and action plan that outlines steps for parks departments and other land managers to keep the goose population within a tolerable level.

The report structure comprises an Introduction (Section 1.0) in which the basic problem triggering this study is laid out, as well as an identification of project objectives and the study area. The Approach (Section 2.0) summarizes the methods employed in researching the various topics covered in this report. The known characteristics of the Canada goose population are summarized in Section 3.0. Impacts are described in Section 4.0, and a review of Employable Control Techniques is provided in Section 5.0. The recommended approach to goose management in the Okanagan Valley is laid out in Section 6.0. The Action Plan to implement the approach is described in Section 7.0. The report uses certain acronyms in the body of the text, and although these are identified with their first use, a glossary of acronyms and technical terms is listed in Appendix 2.

1.3 Study Area

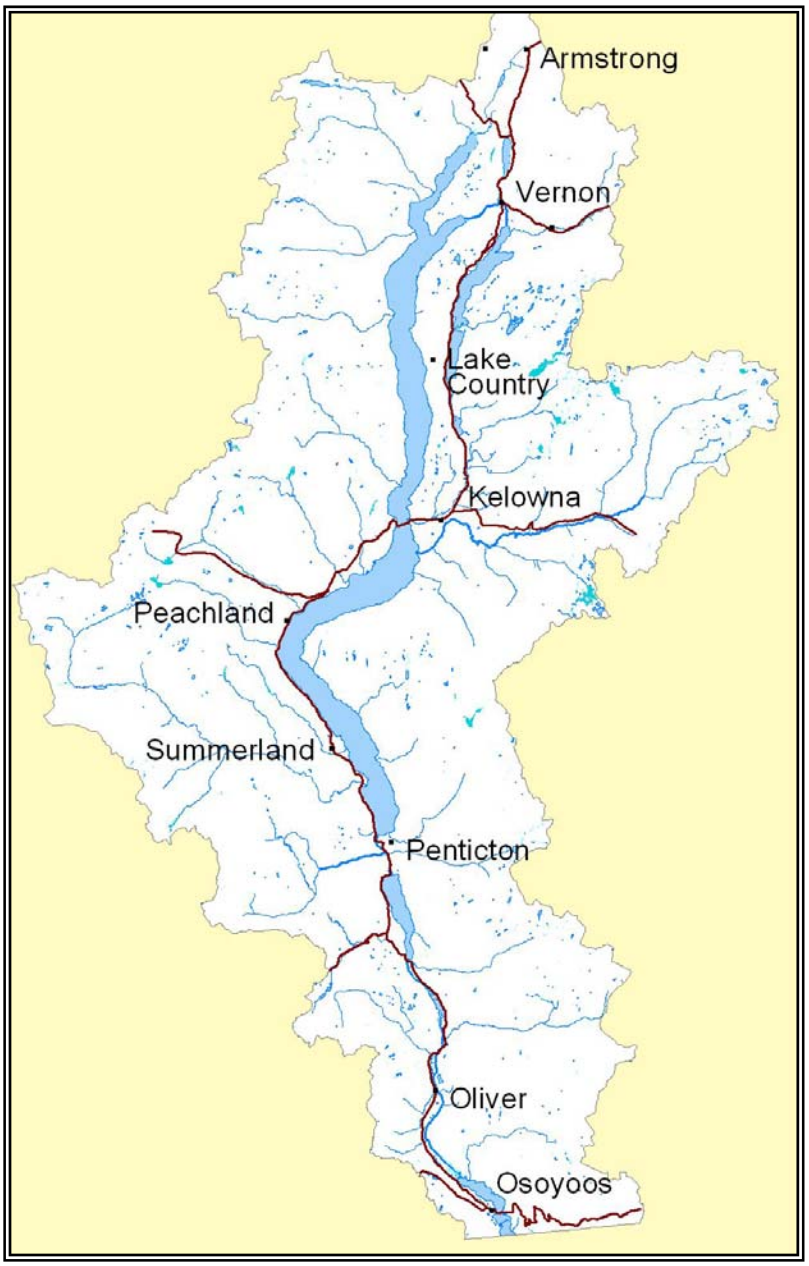
The study area for this project is the Okanagan watershed (8200 km^2), extending from Armstrong in the north to the International Boundary in the south (Figure 1). The Valley is typically hot and dry in the summers with cool, moderately dry winters. European settlement began in the mid 1800s and continues to rapidly expand. The major communities in the Okanagan Valley are Vernon, Kelowna and Penticton. Tourism, agriculture and logging are prevalent industries.

Canada geese typically use the valley floor, where various sized lakes and slow moving rivers are abundant. Lawned areas in urban and rural areas, as well as agricultural crops in the Valley bottom, are abundant and contribute to the availability of foraging habitat.

1.4 Acknowledgments

The Robertson Environmental Services Ltd. study team expresses its thanks to Ted Sophonow (City of Kelowna, Parks Department; Chair, ORGMC), John Penrice (City of Penticton, Parks Department; Vice Chair, ORGMC) for their direction and encouragement. Other ORGMC members and staff who contributed were Al McNiven (City of Vernon), Ron Doucette (Town of Osoyoos), Joe Creron (City of Kelowna), Phillip Rippin (City of Penticton), Pete Wise (Wise Wildlife Control Service), Don Gough (Lor Don Enterprises), Rick McKelvey (Regional Manager, Canadian Wildlife Service (ret.)) and Ian Wilson (City of Kelowna). Study team members were Ian Robertson (project manager, senior author), Mike Sarell (Ophiuchus Consulting), Mike Mackintosh (independent consultant), Allison Haney (Ophiuchus Consulting), and Susanne Sloboda (RESL).

Figure 1-1 Map of Study Area.



2.0 APPROACH

2.1 Public Consultation

It was recognized at the start of the project that the existing information base for this project included sources outside the public domain. Further, it was apparent that the success of goose control in the Okanagan Valley would require support from interested stakeholders and the public both now and in the future. Primarily for these two reasons, the project plan was to have information meetings throughout the study area.

The public consultation component involved addressing the following tasks:

- Define the objectives of public and stakeholder consultation;
- Identify the venues for public consultation and confirm appropriate arrangements;
- Determine what information would be provided and what would be expected in return at public information meetings;
- Provide a meeting agenda which incorporated a combination of open houses, and information presentation and exchange;
- Publicize the information meetings;
- Draft a press release and provide to selected media to publicize the meeting;
- Liaise with stakeholders in advance of the information meetings; and
- Identify project contacts for follow-up information on the goose control program.

To provide appropriate geographic coverage, it was decided to hold information meetings in Osoyoos, Penticton, Kelowna, and Vernon. It was also decided that the information to the public on the progress of the project to date would be provided via a PowerPoint presentation, supported by similar information displayed on posters. The presentation would help focus the content of the project, and thus provide an information base from which the public could address questions, provide the team with additional information, and/or suggest alternate approaches. Appendix 4 provides a list of organizations and individuals contacted regarding the public information sessions held throughout the Okanagan Valley.

2.2 Canada Goose Populations

The approach to determining the status of the Canada goose population combined population information from earlier sources, and aerial surveys conducted in the summer of 2005. Early population estimates were made by Peatt (1989). These were based on survivorship estimates for each age class and results from Christmas Bird Counts. These early counts suggest that virtually all the overwintering birds were resident geese. Peatt surmised that the population doubled every five years until 1981, reaching a population size of about 5000 birds, after which population estimates derived mainly from Christmas Birds Counts.

The ORGMC, in an attempt to get more current estimates, conducted three aerial flights in 2005 that focused on the shorelines of the large lakes, small waterbodies and open, grassy areas. Geese numbers and locations were recorded for each flight.

In addition to these flights, recent data from Christmas Bird Counts (Audubon Society 2005) was incorporated into Peatt's 1989 summaries to provide Valley-wide overwintering geese totals for every year where data were available.

2.3 Determining Potential Impacts of Geese

Potential impacts of Canada Geese were determined by:

- Identifying any public health or safety risks, and summarizing the nature of complaints regarding Canada geese; and
- Estimating the current expenditures of dealing with the Canada goose problem.

At a time when media are saturating the airwaves with coverage of the risk to the world's human population from avian borne diseases, this report would not be fulfilling its objectives if diseases in which Canada geese could be vectors are not identified and acknowledged. At the same time, the risks represented by Canada geese as opposed to other similar threats must be distinguished, and be put into perspective.

To research information on these questions, the study team:

- Consulted with parks staff regarding impacts from geese;
- Discussed these problems with goose control contractors;
- Derived annual cost estimates in the study area from parks staff;
- Addressed health concerns with officials from the Interior Health Authority (IHA);
- Consulted with the Ministry of Environment and IHA regarding goose feces as a water quality hazard;
- Consulted with both the Ministry of Environment and the Canadian Wildlife Service on habitat destruction by Canada geese; and
- Consulted relevant literature on avian disease threats.

2.4 Employable Control Techniques

The approach within this section was to:

- Summarize current knowledge on urban Canada goose management techniques, focusing on the following:
    - Habitat management;
    - Reduction of Population Recruitment;
    - Scare and Dispersal Techniques;
    - Hunting and Lethal Control Options;
- Review current Canada goose control practices employed throughout the Okanagan Valley; and
- Evaluate and prepare recommendations on appropriate techniques that will be effective and appropriate for the ORGMC to employ in the Okanagan Valley.

To generate information to adequately describe these techniques the study team:

- Consulted with Okanagan municipal and regional staff regarding currently employed techniques;
- Liaised with wildlife control staff in the Okanagan Valley to gain perspective on the nature and scope of the goose management challenge; and
- Provided information on the current and proposed techniques at the four public meetings held in Osoyoos, Penticton, Kelowna, and Vernon.

2.5 Limitations of Control Techniques

The Okanagan Valley is a large and biologically diverse area. Appropriate techniques will vary depending on the region and to a large extent, the degree of urbanization.

A valley-wide unified and coordinated management program presents many challenges:

- Management techniques to reduce recruitment must be carried out on a Valley-wide scale. There are many different nesting locations that must first be identified and plotted. This will require a well-organized program with sufficient contractors or staff to do the job as thoroughly as possible;
- Timing of these activities will be critical due to short windows of opportunity and large areas for coverage; and
- Cost may be a limiting factor. Staff and contractor costs for control programs, public education and awareness, review and evaluation all need to be included.

Goose overpopulation issues in urban areas pose significant challenges:

- Resident geese habituate readily to urban settings. Reducing their population through hunting in these areas is therefore not an option as discharge of firearms may violate local bylaws;
- Humans and Canada geese often have similar habitat preferences. Many public parks in the Okanagan Valley feature open, lush grassy spaces, close to fresh water. Most park managers would agree that major habitat changes would not be viewed favourably by the public;
- Many techniques for reducing conflicts in urban areas are not acceptable due noise and/or other disturbances to the public;
- Management and control measures must not only be biologically based but also have a social perspective. A vocal and active segment of the public may oppose particular actions being taken to manage goose populations if these appear inhumane.

A successful goose management program will require recognition of the following:

- An integrated approach using several techniques in an unpredictable format is essential otherwise the geese will anticipate the next control steps;
- The public needs to be well informed and contractors need to employ common sense in dealing with public concerns;
- Appropriate permits and regulations must be obtained and followed;
- A large area for coverage requires exceptional organization and coordination of resources;
- The management program will be most effective if directed primarily at areas where Canada geese occur in areas of high public use in summer;
- Information on goose numbers in summer is limited and thus provides limited basis for establishing target population levels; and
- Program targets may need to be reevaluated when sufficient monitoring information is available to the ORGMC.

3.0 CANADA GOOSE ECOLOGY AND DISTRIBUTION

3.1 Origins

Historically, the Western Canada goose (*Branta canadensis moffitti*) was the resident subspecies of the Okanagan Valley (Campbell et al. 1990). Currently, the Okanagan hosts an ensemble of races from numerous transplants of flightless young and breeding stock from a variety of sources in the 1960s and 1970s (Cannings et al. 1987, Campbell et al. 1990), which were far too successful attempts at increasing Canada goose populations. The origins and current status of the goose population are important to understand because they help influence management policies, and provide in some instances a better understanding of their likely limitations.

3.2 Population Trends

Historically, nesting Canada Geese were only found south of Okanagan Falls, in the Vaseux Lake area and along the Okanagan River between Oliver and Osoyoos Lake. Prior to 1967, there were only three records of geese nesting north of Penticton (1926, North Arm of Okanagan Lake – "first in area", 1946 Swan Lake; 1951 Rutland), although other nests were reported near Enderby, north of the Okanagan drainage (Cannings et al. 1987).

Numerous transplants of flightless young and breeding stock from a variety of sources in the 1960s and 1970s established a large resident population (Cannings et al. 1987, Campbell et al. 1990). During the 1970s, the population apparently doubled with a frequency of five years. Based on 5-year averages, resident flock size was reported to have increased from 20 during the period 1960-64, to about 5000 birds (Peatt 1989). Band recoveries in the 1980s indicated that the breeding population in the Okanagan had recently been recruited from over-wintering geese (Peatt 1989). Peatt's (1989) estimate of 5,000 was apparently based on the 5,934 Canada geese counted during Christmas Birds Counts over the 1988-1989 Christmas season and the assumption that winter numbers were not dissimilar to summer numbers. No systematic spring and summer counts were available to test this assumption, which appears to no longer be true based on data collected in the summer of 2005.

Three aerial surveys in 2005 (Table 3-1) yielded an average of 1470 geese, including young of the year (Penrice et al. 2005). It is unknown what proportion of the population was missed, as surveys conducted during the growing season confront the limitation of abundant cover capable of hiding the intended targets. Adding to the potential for error, Canada geese are not easily frightened by small survey planes and therefore may not move, increasing the likelihood of being missed. Based on the experience of the study team, an estimated 2,500 to 3,500 geese likely reside in the Okanagan Valley in summer, including young of the year. The distribution of geese (Figures 3-1, 3-2 and 3-3) does not suggest any valley-wide preference of use, but local concentrations are evident (e.g. Osoyoos Lake, Vaseux Lake, OK Falls, Penticton Oxbows, Mission, Vernon Arm, North Arm and north Okanagan grain fields in late summer).

Figure 3-1: Goose Population Distribution in North Okanagan Valley.

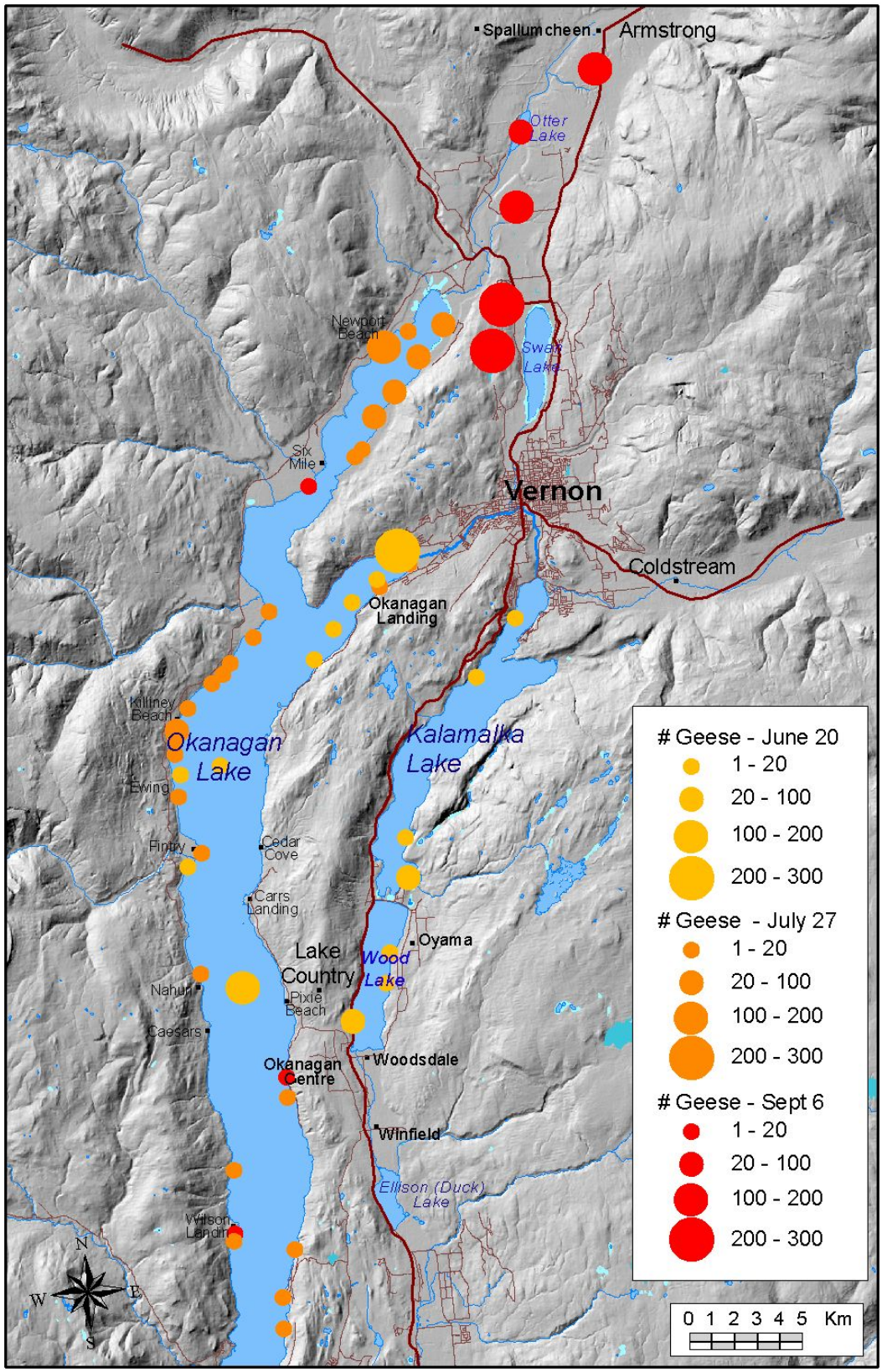


Figure 3-2: Goose Population Distribution in Central Okanagan Valley.

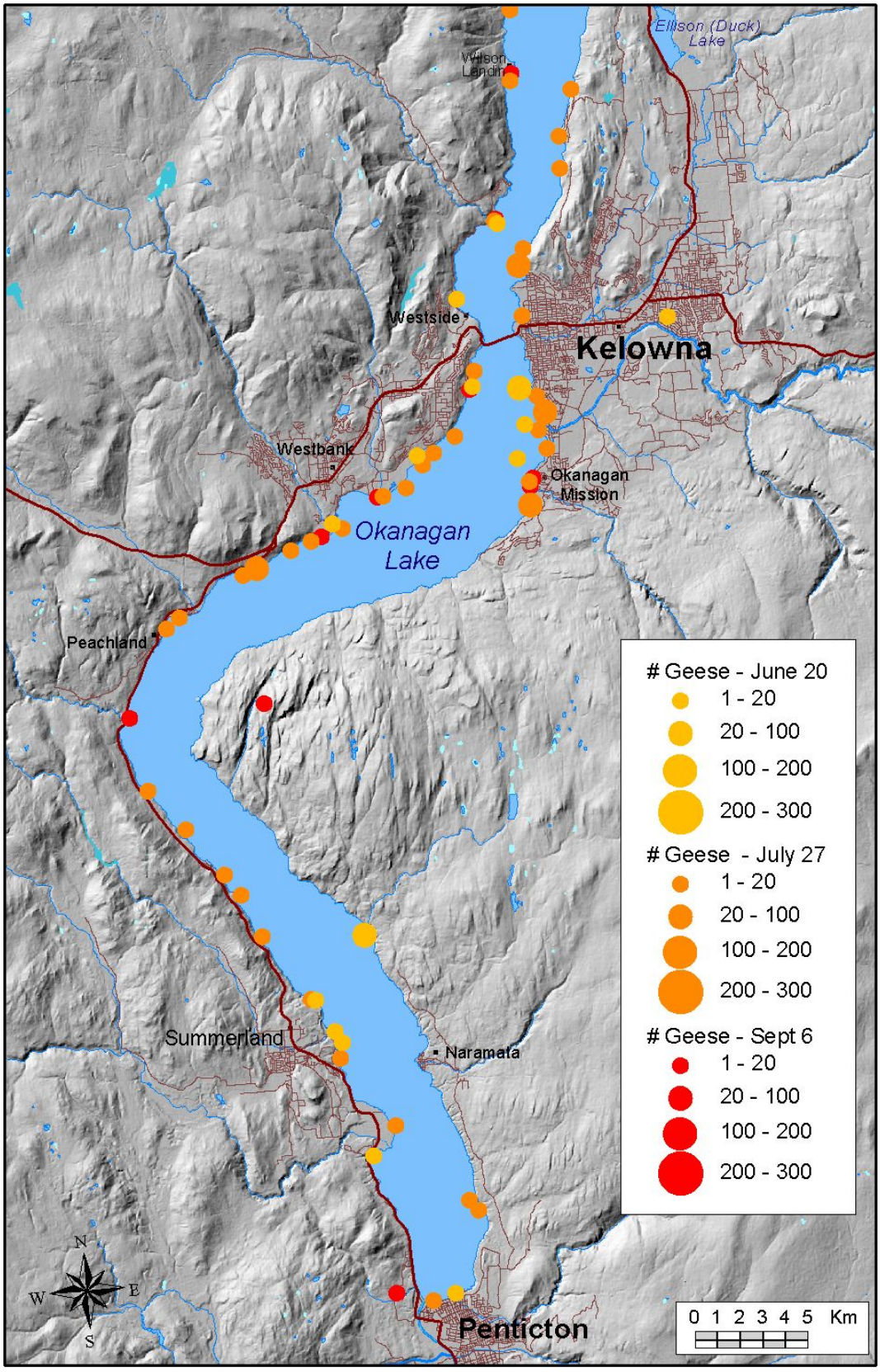


Figure 3-3: Goose Population Distribution in South Okanagan Valley.

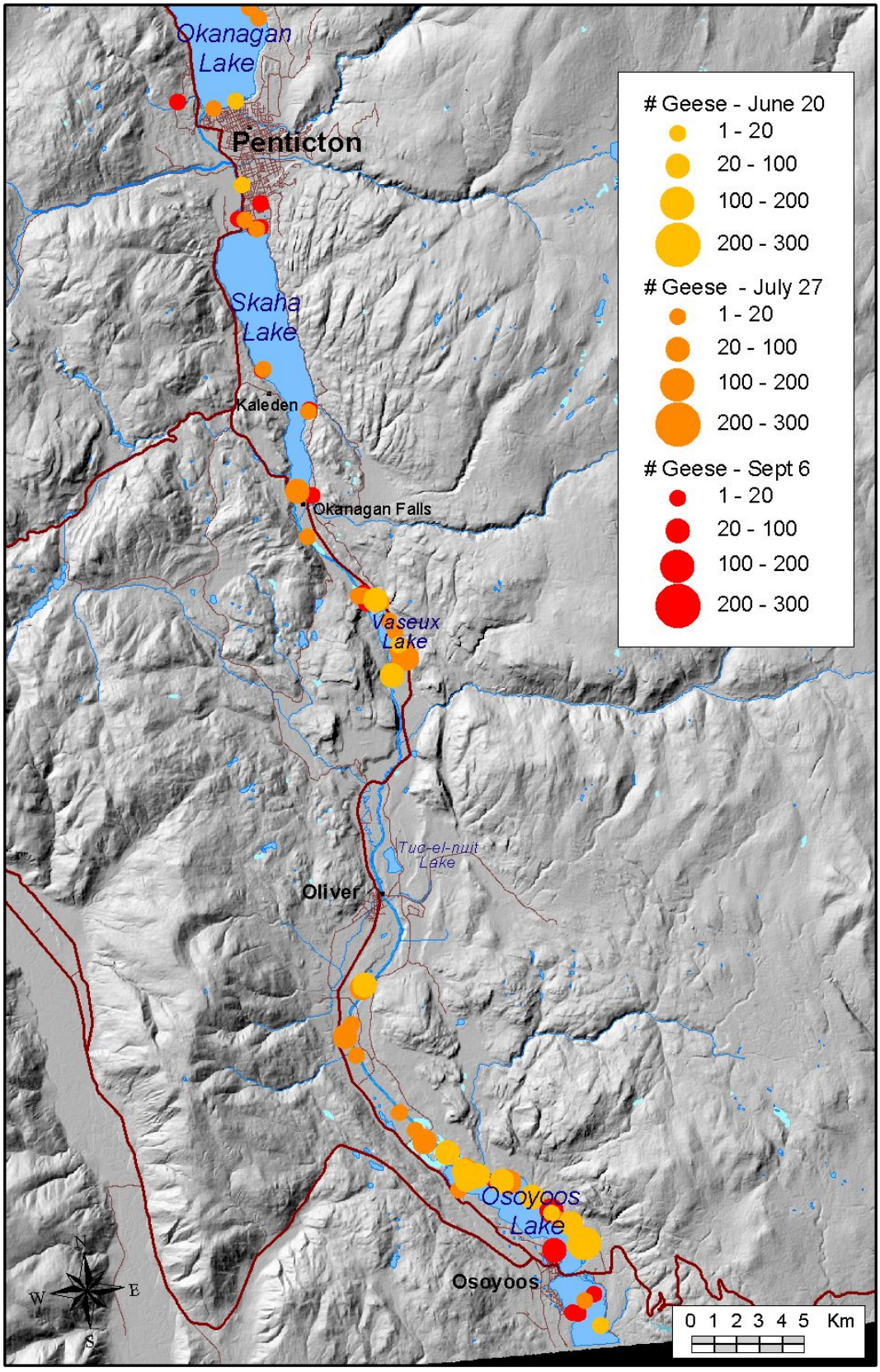


Table 3-1: 2005 Aerial counts of Canada Geese in the Okanagan Valley.

Date	Total	Comments
20-Jun-05	1607	includes Kalamalka and Wood lakes
27-Jul-05	1497	Does not include Kalamalka or Wood lakes
6-Sep-05	1304	Does not include Kalamalka or Wood lakes; large flocks on grain fields in north

Recommendation: The Canada goose aerial surveys of 2005 should in the future be repeated in a similar manner and at regular intervals to monitor population changes to be reported to the ORGMC.

Locally, animal control officers make counts of Canada geese at specific beaches, fields, and other goose congregating areas throughout the Okanagan Valley. Recent (2005) counts at certain Westside beaches provide an example of such counts, summarized into monthly totals (Table 3-2). One feature of note is that with higher beach use by people, goose counts went down from July to August.

Table 3-2. Daily Counts of Canada Geese at beaches at Westside, source: Central Okanagan Regional District.

2005	Pritchard	Rotary	Dog Beach	Willow Point	Powers / Yacht Club	Marina	Monthly Total
February	52	0	0	30	0	47	129
March	12	0	0	25	8	12	57
April	94	4	0	16	25	14	153
May	91	0	0	34	20	28	173
June	913	185	79	368	92	247	1884
July	895	401	34	226	62	251	1869
August	140	167	37	36	21	100	501
Total	2197	757	150	735	228	699	4766

Recommendation: Canada goose counts from the ground at selected sites should be continued, and summary results should be tabulated and accompanied by a brief descriptive report to be submitted to the ORGMC after the end of the recreational beach use period.

The wintering population, which includes both resident and migrant geese, peaked during the 2003-2004 Christmas season with 17,138 (Figure 3-4), as documented through the Christmas Bird Counts (Audubon Society 2005). These numbers have since fallen to 11,807 (2004-2005), and 9,145 (2005-2006). If one were to exclude the 2003-2004 count, the numbers between 1997 and 2005 are relatively stable. This drop in numbers in the last two years does not necessarily mean a decline in the winter goose population. The high numbers over the 2003-2004 Christmas season was probably an anomaly.

3.3 Breeding Ecology

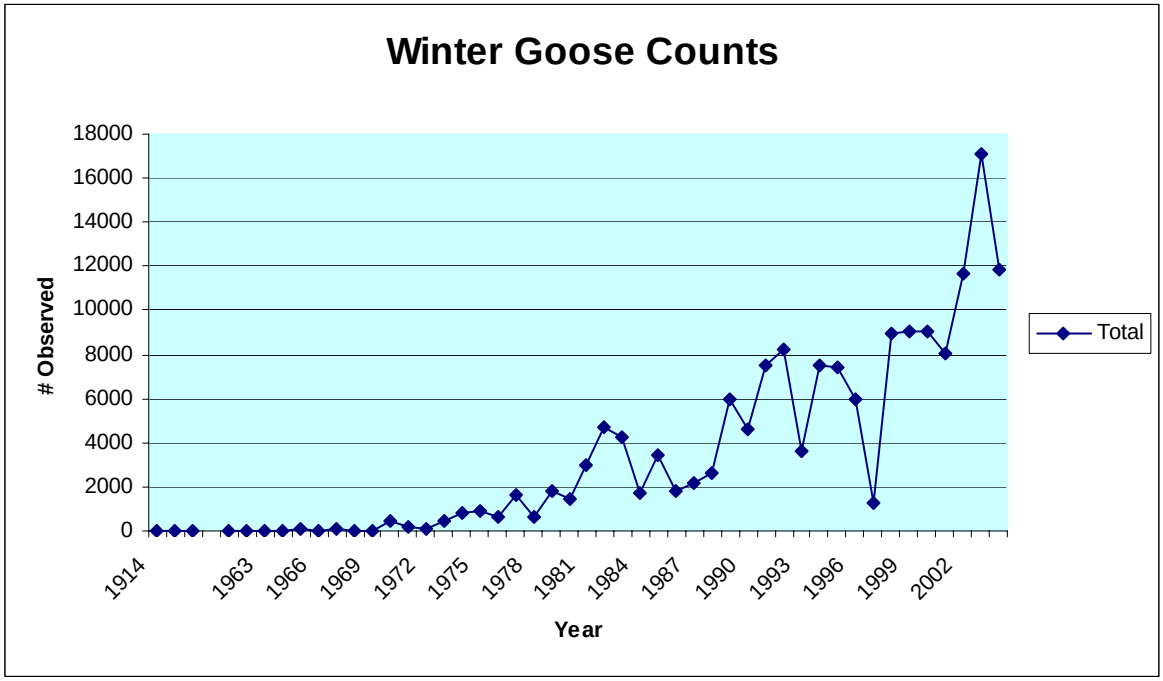
Pair formation occurs in late February (R. Cannings, pers. comm.). The average clutch size in the Okanagan is 5.3 eggs, although egg dumping does occur, producing a few much larger clutches. Eggs are laid mid-March to mid-April and incubation takes approximately 30 days (Cannings et al. 1987). Hatching success has been shown to range from 70-80%, although nest failures can occur (Peatt 1989). Young start to fledge mid-June (Cannings et al. 1987) and there is a survivorship of goslings of about 80% (Peatt 1989). Peatt (1989) assumes a maximum life expectancy of 8 years, although longevity in the Lower Mainland is suspected to be nearly twenty years with reproduction occurring up to the age of 15 (M. Mackintosh, City of Vancouver, pers. comm.). Breeding sites in the Okanagan are not well documented. Table 3-3 identifies those breeding sites that have been reported from a number of sources (e.g. Cannings et al. 1987, Peatt 1989, Pete Wise pers. comm.), but this list is not considered complete.

Table 3-3: Reported nesting locations of Canada Geese

General Area	Location
South Okanagan	Osoyoos bridge island
	Osoyoos Lake north end
	SOWMA oxbows
	Vaseux, Hatfield Island
	Vaseux Lake, north end & lagoons
	Christie Island, OK Falls
	Skaha Lake Railway Grade
	Clay banks northwest of Penticton
	Trout Creek point
Central Okanagan	Rattlesnake Island
	Squally Point Cliffs
	Rose Valley Reservoir
	Mission Creek
	Duck Lake
	Whiskey Island (Carr's Landing)
North Okanagan	Kalamalka Lake (Cougar Canyon)
	Okanagan Landing
	Swan Lake
	Vernon Creek
Enderby Area	Shuswap River near Ashton Creek
	Shuswap Islands

Recommendation: In advance of and as a prerequisite for an expanded egg addling program a Valley-wide survey of Canada goose nest sites must be conducted during the early phases of the nesting season. This survey will require repetition later during the fledgling period of that year, and should continue for several years into the future until count organizers are satisfied most or all Canada goose sites have been identified. Results would be submitted to the ORGMC.

Figure 3-4: Chronology of Winter Goose Counts in the Okanagan Valley.



4.0 PUBLIC CONSULTATION

As part of the public consultation process, the ORGMC & RESL hosted four public information meetings geographically dispersed throughout the Okanagan valley. The meeting dates and locations were as follows:

- Penticton (Penticton Trade & Convention Centre) – September 20, 2005
- Kelowna (Kelowna Public Library) – September 21, 2005
- Osoyoos (Sonora Centre) – September 22, 2005
- Vernon (Centre of Performing Arts) – October 5, 2005

The objectives of this series of meetings were to inform the public of the ORGMC, its initiative to produce a goose management strategy, provide background information on Canada geese specific to the valley region, welcome stakeholders including those not previously known to the ORGMC, and document information on local goose populations from community members. Various stakeholders, including government agencies, chambers of commerce, recreation and tourism industries, stewardship and naturalist groups, post-secondary institutions and the general public were invited to take part in this consultation process (Appendix 3).

The modes used in delivering notification of these public information meetings included telephone and email communications, media coverage (press release, community calendar postings, and radio announcements), municipal websites, and posters advertising the event at appropriate locations (Appendix 4). These announcements led to both television and radio interviews which may have helped in publicizing the meetings.

The presentation consisted of a comprehensive powerpoint presentation, plus large colour posters summarizing the key components of Canada goose ecology and distribution in the valley.

The first meeting was in Penticton, on September 20th. In addition to study team members, a total of seven people attended, representing local governments, the provincial Ministry of Environment, and the South Okanagan Naturalist Club. There were several comments: 1) that crop damage as well as habitat destruction were important negative effects of high goose numbers; 2) that hunting was a better tool in controlling goose numbers than indicated so far; 3) that translocation of geese had only temporary benefits; and 4) by laws against feeding geese were required.

The second meeting was in Kelowna on September 21st. The turn out was twelve, beyond study team members. Though most were private citizens there was a reporter from the *Courier*, Don Plant, and Ted Sophonow, chair of the ORGMC. The comments were varied, and included concerns that 1) claims of damage by Canada geese were exaggerated; 2) Canada geese are missing on local flyways where they were once common; 3) egg addling was inhumane; 4) goose control was necessary, and 5) the City of Kelowna might solve the goose problem on its own parks and beaches, but might just export it to private lands.

The third meeting was in Osoyoos on September 22nd. The turn out was eleven, which included one representative from the Town of Osoyoos, Ron Doucette. Two new topics were raised: 1) lethal control, authorized through a damage permit from Canadian Wildlife Service to Osoyoos though not used in 2005 (see further discussion below, particularly Section 6), and 2) the threat to water quality from goose concentrations (see

Section 5). Other comments included: 3) that the proposed strategy must provide an implementable solution for private landowners, 4) that the impact poster exaggerated impacts from Canada geese, and 5) that more input from the general public was needed.

The last meeting was held in Vernon on October 5th. The turnout (12) was comparable to Osoyoos and Kelowna. One new topic was raised: 1) the threat to potable water (estimated 300 homes in the Vernon area obtain water from Lake Okanagan) posed by Canada geese. An issue raised without fanfare in Kelowna and Osoyoos dominated the discussion: 2) the tendency of Canada geese scared away from locations in Vernon to move outside municipal boundaries, particularly to Parker Cove. A suggestion was made to encourage greater hunting on private land.

The comments were highly useful, and a number of them have influenced recommendations made in this report.

5.0 IMPACTS

5.1 General

The impacts of high numbers of Canada geese range from the nuisance level (e.g. noise, aesthetic) to the more substantial (e.g. costs to local governments, beach closures, public health). This section summarizes some of the key issues, with some emphasis on water quality, deterioration of which has a high potential to lead to beach closures and related effects on the local economy.

5.2 Aesthetic

Most of the complaint calls received by public authorities in the Okanagan Valley relate to the deposit of goose feces on beaches, playing fields, cemeteries, golf courses, and private lands characterized (except in the case of beaches) by regularly mowed lawns. A few relate to damage to the grass or turf. Most of the complaints come during the warm weather months when the public most wishes to use these facilities. The history of these calls goes back at least to 1978, when Penticton, Peachland, Kelowna, and Vernon recognized that the number of geese on park and beach areas was becoming excessive (Peatt, 1989).

The problem then and now is made worse when members of the public feed the geese at parks or from their private homes, thereby increasing goose fidelity to these and adjacent locations. The geese become relatively tame, and the result is that human settlements become safe for geese, sometimes attracting large flocks, which is what has happened in much of developed North America in the last fifty years.

The aesthetic problem posed by high goose numbers is that it discourages or threatens to discourage public use of public parks and beaches. It also threatens use of revenue-generating facilities such as golf courses. Thus, while the aesthetic effect prompted the initial complaint, other impacts frequently follow.

5.3 Water Quality, Public Health and Safety

Beyond the cosmetic insult of goose feces deposited on public and private property, some of the impacts may be more substantial. In their notice on *Managing Recreational Water Quality*, the Interior Health Authority (IHA) launched an initiative regarding recreational water, especially bathing beaches (July 25, 2005 letter from Dr. Paul Hasselback, Senior Medical Health Officer, IHA, to Barry Gagnon, Chief Administrative Officer, North Okanagan Regional District). The IHA pointed out that it has been reviewing *Bathing Water Quality and Human Health* (World Health Organization, 2001) and recommends that Okanagan authorities adopt the best management practices from the World Health Organization to manage their beaches to limit potential human health risks. These practices comprise eight elements, one of which is “limiting wild animal and bird access to public beaches”.

This letter was not specific about which wild animal and bird species might present the greatest risk and from them what pathogens IHA might target in its proposed recreational water program. Further, the letter itself did not refer to any local data which might have triggered their concern, but the City of Kelowna, for example, regularly tests the water quality at its beaches as part of its responsibility to protect its citizens. This study was not intended to evaluate a complex topic such as water quality, but water quality sampling clearly indicate levels of fecal coliform units and *Escherichia coli* (e-coli)

are approaching threshold levels of acceptability for recreational use. E. coli is a common enteric bacterium that might get to high concentration levels where human and animal fecal contamination may be high. Whether or not high fecal coliform and E. coli levels at Kelowna beaches are primarily caused by Canada geese is not confirmed, but it is the one of the prime suspects to the Interior Health Authority (Dr. Hasselback July 25, 2005 letter, cited above).

In addition to E.coli other pathogens may include various forms of *Salmonella*, sp., and *Campylobacter* sp. Both of these can and probably do lead to digestive upsets or diarrhea, and may be picked up by beach users. Wild birds can be the vectors of other wildlife diseases such as avian cholera and fowl plague, but these are not known to be problems for humans. Instances of these diseases in Canada geese are rare but they can have significant impacts on wild waterfowl populations. There have been limited occurrences of zoonotic (animal originating) diseases which can be transferred to humans, but health professionals remain vigilant to prevent these occurrences in public areas.

At Buntzen Lake beach in Port Moody, BC, high concentrations of goose feces resulted in increased levels of fecal coliform levels in the past (Clive Wilson, BC Hydro 2006, pers.comm.). In this particular case, a brief beach closure occurred until further sampling confirmed coliform levels had declined to an acceptable level.

In a 1991 study of the relationship between waterfowl presence and fecal coliform concentrations in a New York City reservoir, a direct correlation was made between high concentrations of birds occupying an area and elevated levels of fecal coliform (Alderisio and DeLuca 1999). The study also concluded that sites without waterfowl typically contained low coliform counts. This prompted New York City's Department of Environmental Protection to develop a waterfowl mitigation program. Seasonal fecal coliform levels dropped upon the elimination of waterfowl at the reservoir.

Human health risks arising from high coliform counts include gastrointestinal distress, severe diarrhea, dermal infections (such as swimmers itch), and even infantile meningitis (King County 2005 and NWRC 2005). In an avian disease study conducted by the National Wildlife Research Center in Colorado, Canada goose feces contained a prevalence of 25% disease-causing *E.coli*, comprising four potential pathogens (NWRC 2005).

In New York, Alderisio and DeLuca also examined fecal coliforms originating from gulls and Canada goose, and found a greater concentration of coliform bacteria per gram in gull feces than in geese. Though this was offset by the average weight of fecal samples being 17 times heavier for Canada geese than for gulls, it alerts us to the potential for gulls to contribute to the water quality problem along Okanagan shorelines.

Recommendation: During the regular Canada goose population monitoring by animal control staff and contractors gulls should be added to the counts.

There is evidence casting doubt on Canada geese as a primary contamination source. In Vancouver, the Coastal Health Authority put pressure on the City to remove Canada geese congregating near Kitsilano Beach, where water quality results were approaching threshold levels (Mike Mackintosh, 2006, pers. comm.). Reluctantly, the City trapped the offending geese and relocated them up the Fraser Valley. The levels of contaminants continued to rise with no discernable change in the upward curve of contaminated water levels for recreation use, and the beach had to be closed. In this case, the removal of

the prime suspect in the contamination did not alleviate the problem, indicating the bulk of the contamination originated from an unknown, alternative source.

In Lake Winnipeg, Williamson et al (2004) found that along foreshore beaches and bathing water only 8% of elevated e-coli counts originated from humans, while animals accounted for 73-83%. There are many other possible sources of such contamination in the Okanagan, including cattle having free access to many of the tributary streams in the Okanagan system.

Recommendation: There are now tests which can identify the origins of specific pathogens and thus differentiate between those contributed by Canada geese from other sources. Assuming these tests can be feasibly applied at beaches vulnerable to this type of contamination, such tests should be conducted and the uncertainty reduced.

Around the Okanagan basin, the large lakes are a source of potable water. In Vernon alone, 352 homes are supplied through two private water authorities (Brad Chapman, Adventure Bay Waterworks Ltd., pers. comm.). These authorities monitor water quality continually, and have to adjust the levels of purifying chemicals when necessary. According to Brad Chapman, a decline in water quality is frequently associated with a large flock of geese roosting around the water intake structures. These geese are quickly dispersed when found. Whether or not private owners can and do respond so quickly and whether there is a health risk is not known.

Public safety also applies to civil aviation. Certain birds are attracted to the mowed grounds around airport runways. Among these are Canada geese, and they represent a significant hazard (Transport Canada, 2002). The hazard from this source is significant enough that the Canadian Aeronautical Regulations require airport authorities to manage this threat using appropriate scare techniques.

5.4 Economic Costs

Economic costs include out-of-pocket costs directed to Canada goose control, as well as the threat to expected revenues from tourism. The former includes costs for Canada goose control contractors, capital costs for equipment, plus staff time directed to these activities. While these are largely borne by municipal staff (parks, public works), equivalent costs are borne by golf course operators, airport authorities, and other private landowners. Recent estimated costs by selected Okanagan municipalities are clearly exceeding $100,000 annually (Table 5-1). Capital cost may be incurred by acquiring a new technology shown to be successful elsewhere.

In practice, the actual costs for goose control are not always separable from other problem wildlife control expenditures, as well as broader parks and public works staff time and expenditures. Further, the municipal governments do not categorize their expenditures in exactly comparable ways.

Recommendation: The ORGMC should generate a Canada goose cost tracking form, and transmit it to member local governments, to be returned annually to the ORGMC.

Table 5-1: Recent Goose Control Costs by Selected Local Municipality.

City	Year	Operating Cost	Capital Cost
Kelowna	2004	$73,300	$0
	2005	$81,700	$16,300
Osoyoos	2004	$2,000	0
	2005	$5,000	0
Penticton	2004	$12,000	$1,200
	2005	$9,500	$15,000
Vernon	2004	$16,000	$0
	2005	$16,000	$3,000

5.5 Natural Resource Impacts

Other natural resources negatively impacted by the overpopulation of Canada geese, include soils and vegetation, wildlife habitat, and wildlife health.

5.5.1 Soils and Vegetation

Soils and vegetation are affected by Canada geese in several ways. They contribute to soil compaction, overgrazing, trampling, and denuding vegetation through fecal contamination. As can be seen in the attached photographs concentrations of Canada geese can lead to damage to vegetation and subsequent soil erosion. In Vancouver, such damage has occurred at Sunset Beach, Seaforth Park, and Stanley Park (Lost Lagoon, Lumberman's Arch).

5.5.2 Wildlife Health

Canada geese can contribute to fish kills by depleting dissolved oxygen levels in the water as a result of fecal deposition. Avian diseases, such as Duck Virus Enteritis (DVE) may be transmitted by Canada geese to other waterfowl (USFW 2002). Though a prescriptive method in controlling Canada goose populations, increased hunting efforts have the potential to kill other non-target waterfowl species (USFW 2002).

The US Fish and Wildlife has reviewed the effects of large Canada goose populations and concluded these effects are negative in terms of wildlife habitat (damaging wild and cultivated vegetation important to other species) and waterfowl health ('creating a reservoir for disease and … a health threat to migrating waterfowl'), and are concerned about the effect on federally protected species (USFW 2002). The effect of Canada geese on species at risk in the Okanagan is currently unknown, although some small, very rare plants that grow along Okanagan shorelines (e.g. *Ammannia robusta*, *Rotala ramosior* and *Lipocarpha micrantha*) have the potential to be grazed or trampled by geese.

5.6 Goose Complaints in the Okanagan Valley

Over the past twenty to thirty years, the driving forces spearheading local government awareness of Canada goose management concerns were public complaints, primarily due to unsightly goose droppings on public beaches, parks, and private lands. It is only more recently that water quality concerns, with their potential to lead to beach closures, have become the more important driver in goose management.

Complaints are received and responded to immediately in most cases. Across the member local governments, the number of complaints is not consistently documented, limiting the study team's opportunity to tabulate the most recent complaints as a baseline. The study team has drawn up a prototype complaint form which could be used for goose management (Appendix 5), and the monitoring of complaint levels over the next few years.

Recommendation: A Canada goose complaint form, such as the one proposed, should be used by ORGMC member local government to monitor complaints. These can serve initially to provide baseline information, and subsequently as a monitor on the success of the program.

6.0 EMPLOYABLE CONTROL TECHNIQUES

6.1 Control Objectives

For many people Canada geese are attractive and symbolic representatives of our natural heritage. Some people enjoy hunting them but most others simply enjoy observing geese and other waterfowl in their environment. A comprehensive control program must be considerate of the variety of public perspectives.

The objectives of Canada goose control include:

- employing a range of population control techniques that are effective and publicly acceptable for the area;
- using a combination of deterrence techniques to reduce goose numbers and impacts from them in specific areas;
- employing techniques that are humane and approved by permitting agencies; and
- establishing a cost-effective program of management and control.

The desired outcome is to reduce the population of Canada geese to publicly acceptable levels for selected areas of the Okanagan Valley particularly in summer, and maintain geese at manageable levels that significantly reduce pollution and health concerns in public areas. In this chapter the control technique options are described and reviewed.

6.2 Elements of a Comprehensive Control Program

Canada geese are resilient and adaptable birds. Over the years many studies have been directed at how to reduce their numbers and have examined many different techniques of deterrence, or harassing them away from areas where they are not wanted.

The results of these studies and the experience of teams attempting to implement their recommendations indicate that there is no one single method that can be used everywhere and that will be universally effective in controlling goose populations. A comprehensive control strategy needs to include approaches that are both short and long term in nature, and not predictable to the geese. They must also be publicly acceptable, and suitable to the nature of the area in which control is required.

The best results are achieved when several management techniques are integrated. These combinations could include population control techniques such as egg addling, whose effects are measurable after several years, and visual deterrence using laser lights and auditory deterrents whose effects are meant to be immediate.

6.2.1 Site Evaluation

A successful program for Canada goose management will depend on having a sound ecological approach. The factors that attract geese to congregate in certain areas need to be understood, and include the following topics.

Food sources

Canada geese are grazers and favour short lush grasses, especially those often found in urban parks, golf courses and residences with mown lawns. Large numbers of geese can often cause trampling and compaction of soils, resulting in loss of habitat and

erosion, but the key point is that if lush high nutrient grass, often used in urban parks, is available then geese will likely be attracted.

Habitats Used by Geese

Geese tend to select open areas with unobstructed views to ensure their safety from predators, or human related threats, such as dogs off-leash. They also frequent land areas close to water bodies that afford them safety and an alternate food source. Water sources are important for several reasons including preening and safety. Water bodies also serve as protection for parents with young broods of goslings.

Persistence of Geese in the Area

Since the 1970s many parts of northern North America have experienced the phenomenon of resident flocks, geese that have chosen to remain in breeding and nesting areas, year-round. These largely urban environments provide safety and security for the birds, due to minimal hunting and a reduced risk of natural predators. In the Okanagan, goose numbers have increased due to the altered landscape of human settlement and a series of mild winters that have provided a more favourable environment. The resident Canada geese flocks can also serve as decoys for migratory geese resulting in periodic increases in numbers.

Predation

There are few natural predators for adult geese, especially in urban environments. The most significant period for goose mortality occurs within the first year but these numbers are relatively low. One estimate for gosling mortality in the Columbia Basin region from hatching to fledging was 19% (Ball et al 1981). In a 1991 study it was estimated that 77% of urban goslings survived to their first moult (Smith et al 1999).

Coyotes may be the most effective natural predator because they also have adapted to urban environments. Crows, ravens and birds of prey may also take young birds and eggs.

Increased hunting pressure remains the most effective direct means of reducing adult populations. However, geese adapt well to changing conditions and many flocks will often seek refuge in non-hunting areas. Basically, geese are safe where fire arms cannot legally be discharged, i.e. in the growing urban and suburban areas of North America. The argument could be made that this disparity between settled areas and rural North America where wildlife can be hunted under regulated conditions have influenced the evolving distribution of Canada geese towards the former.

Nesting Activity

Canada geese usually nest close to water with strategic viewing opportunities. Many nest sites are elevated, with geese selecting earthen mounds, tree stumps, or in some urban cases, balconies of apartments and condominiums. In non-urban areas goose nests are often effectively camouflaged which makes them challenging to locate. Nests are usually bowl-shaped, somewhat less than half a metre in diameter. They will often choose unusual sites and use the surrounding vegetation or material for their nest. Canada geese will also return to nests sites from year to year if the location has proven to be successful.

If the nest is destroyed or the eggs are removed, Canada geese may re-nest, especially if this occurs during the early phase of the incubation period. After hatching, the parents will often move their broods to areas with suitable food, water and protection. Both parents will protect the family as they grow to fledging age, at approximately 10 weeks. Several broods of goslings will often join together to form large "nursery" broods usually in the company of several adults. Nursery broods may include from 20 to 100 goslings and usually occur in areas of high nest densities.

Patterns of Goose Behaviour

Adult geese undergo a moult each summer in which the flight feathers are replaced over a period of 3 – 4 weeks. During this period of flightlessness, the birds are more vulnerable and will select areas near water. Adults with young will also moult at the brood rearing areas. This flightless period is particularly critical if roundup and relocation options are to be considered for population management.

Canada goose movement in the Okanagan Valley has not been intensively studied. Resident flocks tend to live near urban parks and beaches over the winter months and will move further out as the human population grows through the summer months. These birds will take advantage of the feed provided, in some cases by private citizens, and will move throughout the valley at will (Peatt 1989). No regular pattern of movement has been detected, but then again it has not been systematically investigated.

Recommendation: In view of the unknowns in Canada goose ecology referred to above, the ORGMC might encourage filling some of these knowledge gaps by supporting qualified students from post-secondary institutions in the Valley to undertake specific projects related to Canada goose ecology.

6.2.2 Review of Control Program

Resolving some of the conflicts between geese and people in the Valley will involve limiting goose concentrations at certain beaches and other sensitive sites, plus reducing flock size over time. A successful management plan will require an integrated approach comprising the following factors:

- Qualified contractors to carry out the work;
- A sound understanding of the biology and management of Canada geese;
- Agreeing upon a series of techniques that are effective, acceptable and within reasonable cost expectations;
- Applying control measures in a very time sensitive manner; and
- Ensuring community support for the program and employing practitioners with good public relations skills.

The ORGMC would take a leadership role in setting the direction for the program. However, community involvement and review of the management plan is an important part of the process. In the course of this study the team has had an opportunity to meet with the public to outline the program. It will be necessary to continue this dialogue through a variety of methods in order to gain community input and commitment to the overall aims of the program in the future.

A range of control techniques have been defined and rated (Section 6.3). (For example, some deterrence techniques, such as auditory deterrence which violate noise levels

acceptable to the public, may not be useful.) A variety of options must provide for the flexibility of response, depending on the circumstances.

In some situations wildlife managers may recommend forms of lethal control. Culling, i.e. the regular application of lethal control measures to reduce population size, has been rejected by the ORGMC. Damage control, which may be lethal and for which permits are required, differs by being incident or condition specific. This may be necessary in certain circumstances, such as where geese are contributing to elevated contaminant levels in water with beach closures imminent to protect the public.

An important part of the program will be to create awareness and understanding within each community. With accurate biological information and technical support from professionals there is an improved chance of employing sound management practices with broad-based community support.

6.2.3 Program Timing

A successful management program must consider and respond to the annual cycle of geese, and specific milestones during which specific control measures might be applied. For example, there are key (and often limited) time periods to employ control methods. Key times and activities include:

➢ Annual Meeting (Oct)	Goose Control Program Review
➢ Annual Mtg. Follow-up (Oct/Nov)	Submit Permit Applications to CWS
➢ Pre-Field Planning (Jan/Feb)	Identify goose control crews
➢ Pre-Field Meeting (Feb)	Confirm Annual Program Elements
➢ Prior to Nesting (Mar.)	Locate Canada goose nesting areas;
➢ Onset of Nesting (Apr.)	Egg shaking the primary population control measure;
➢ Prior to Moult (early June)	Gosling transfers from sensitive areas to reduce chance of recurrent generations:
➢ During Moult (late June to late July)	Adult and sub-adult roundup and relocation where deemed necessary (e.g. health, water quality Issues); and
➢ During Migration (Sept. to Oct.)	Increased hunting pressure to discourage migrants from staying.

6.2.4 Permits

Canada geese are regulated under the *Migratory Bird Convention Act* in Canada. Prior to initiating any control program, local governments and other institutions (e.g. golf courses, airport authorities) require permits issued by the Canadian Wildlife Service (CWS) of Environment Canada. These permits are issued for egg addling, goose deterrence, translocation of adults and goslings, and damage control (Table 6-1). In the above subsection we have identified the permit application phase as a logical and important follow-up to the annual program review meeting, recommended for October of each year, to recap activities for that year and identify targets for the next.

On occasion, a provincial permit administered by the Ministry of Environment, under the *Wildlife Act*, may be required where geese may be translocated to provincial lands.

In some cases private landowners may also encourage hunting on their property. Where this occurs, compliance with existing bylaws and other regulations of the area must be maintained. Golf courses and other businesses must also apply for goose permits for harassment, damage control or dispersal activities.

As a last resort, municipalities may apply for a damage permit, referred to above. Such a permit allows for the legal removal of geese, or any other permitted species, to limit a specified damage.

Table 6-1: Permits Issued to Okanagan Municipalities by CWS.

Municipality	Type of Permit	Activity	Period
Armstrong	Damage [2]	Raptor control [2]	Unknown
Central Okanagan Regional District	Damage [2]	Unknown	2005 (Summer) [2]
Kelowna	Addling [2]	Addling [2]	2002-2005 [2]
	Damage [1]	Canine control; pyrotechnics; decoys; laser [1]; killing	>2000-2005 [1]
Oliver	Addling [3]	Addling (no action [3]) Killing	2004 [3]
Osoyoos	Addling [3]	Addling (no action [2])	2000-2005 [1]
	Damage [1]	Killing (no action[1)]	Unknown
Peachland	Addling [1]	Addling [1]	Unknown
	Damage [3]	Canine control; pyrotechnics [1]	2004 [1]
Penticton	Damage [3]	Canine control [2]; pyrotechnics; laser [1]	2004-2005 [2]; ~1996-2005 [1]
Summerland	Damage [3]	Canine control; pyrotechnics [1]; killing	2000-2005 [2]
Vernon (GVS)	Addling [2]	Addling [2]	1999-2005 [1]
	Damage [1]	Canine control; laser [1]	~1997-2005 [1]

*Information Sources: [1] Municipality / Regional District (RD)
[2] Canadian Wildlife Service (CWS)
[3] Confirmed by Municipality / RD and CWS

6.3 Control Techniques: Reducing Recruitment

Techniques to inhibit reproduction require a long term commitment. Over time they can reduce flock size and lower the reproductive output of Canada geese. As a form of birth control, the overall effect is to reduce recruitment of young geese into the population.

6.3.1 Egg Addling

Eggs in nests are vigorously shaken to render them infertile, and then returned to the nest. If nest or eggs are removed, geese will usually re-lay in the same location. Parent geese will remain with the unviable eggs for up to 10 days, and then disperse until the following breeding season.

Birth control through addling must be very comprehensive. Even a small number of missed eggs may be sufficient to offset losses due to adult mortality. Steps required for a successful egg addling program are:

a) Location and Identification of nest sites. Once located, nest sites are recorded and/or mapped for future reference. The eggs are vigorously shaken, marked and returned to the nest. The nest is re-visited after 7 days to check for further egg deposition. The goose and gander will stay with the nest for varied amounts of time (usually less than 10 days) post addling.
b) In urban areas it is important to establish a good public information program and develop rapport with property owners where geese are observed. This approach can also prove challenging as large urban centers move to gated communities with increased security measures.
c) Canada geese will return to the same site annually for many years. All nest sites and treated eggs should be recorded, not only for permit compliance but also for future management planning.

Egg addling is relatively time consuming, requiring wildlife staff to locate and treat all eggs at the nest sites. However, it is considered to be the most humane method of achieving manageable numbers over time, and if well organized can be conducted in each location with only several days work annually.

6.3.2 Harvest Techniques

Urban flocks of Canada geese can be difficult to hunt. With regulations in effect to protect migratory waterfowl and increasing urbanization the traditional hunting of geese becomes increasingly challenging. The use of traditional waterfowl seasons to reduce geese numbers has become less effective. Resident geese habituate easily to urban areas and will often populate areas where hunting is restricted, especially in hunting season. Hunting can enhance other control measures, especially as there is an increase in the overall disturbance for the geese. Hunting also reduces the availability of protected areas for geese to move to, and theoretically reduces the adult population which results in lower population growth.

Traditional hunting

Traditional hunting is theoretically the most cost effective method for managing goose numbers. In practice, as human populations have grown there are increasing restrictions on firearms use and restrictions on areas that can be hunted.

Special Canada goose hunting seasons are specifically designed to target resident populations. Techniques to improve hunting success have been employed in the Okanagan Valley, including modifying the open hunting days (e.g. early season) and having special openings for areas in which the discharge of firearms is normally restricted (B. Harris, MOE, pers. comm.). Table 6-2 identifies the current hunting periods in the Valley. The seasons are well planned as they are intensive during the arrival of migrants and then via two short seasons target birds that remain and will venture back into areas where hunting is permitted.

Table 6-2: Canada Goose Hunting Seasons in Region 8 (Okanagan)

Season Timing
Sept 3 and 4 (Waterfowler Heritage Days)
Sept 20 – Nov 28
Dec 20/2005 – Jan 5/2006
Feb 21/2006 – Mar 10/2006

The Canada goose hunting season regulations limit the daily bag limit to 5, and the possession limit to 10. During instances when members of our team were able to discuss the situation with hunters, they indicated they were hampered by the daily bag limit of 5. They mentioned that under the right circumstances it is easy to reach the daily bag, and that if population control is an objective, the current limit is counter productive.

Recommendation: The study team recommends the daily bag limit in the Okanagan Valley be raised to 10, and the possession limit to 20.

The other characteristic of the hunt is that most of the harvest occurs on the opening day. More frequent openings and closings might lead to an increase in the local harvest rate.

Recommendation: The study team recommends more frequent openings and closings.

Encouraging landowners in control of larger properties to allow hunting for a fee may provide a venue to open up additional hunting territory and in doing so increase success in reducing the goose population.

Special Purpose Damage Permits

This option has been used to deal with localized concentrations of geese in problem areas. The purpose is dispersal away from sensitive areas, and in this sense if applied under appropriate circumstances reinforces other scare techniques in dispersing geese. Damage permits have been issued in special circumstances for specific areas. This approach, which may involve lethal means, may be required for populations of geese that frequent beaches and watercourses, possibly golf courses. There are obvious safety considerations for the implementation of these special permits, usually involving limited numbers of trained individuals and special firearms requirements. This explains why in several municipalities, though permits were approved, they were not used or only rarely used. Scare and kill permits generally are only awarded after other management techniques have failed.

6.3.3 Relocation

Relocation involves the removal of goslings without adult parents to areas outside of the problem sites. It is imperative that adults not be present, otherwise they will lead the young back to the originating location. If done early there is an improved chance that the young will identify with the new location as home in preference to the originating area.

Adult and Sub-adult Roundups. Adult geese annually replace their flight feathers during a three week period, sometime between June and August, probably concentrated in early July. Along with the young birds, they will be flightless during of this time. Thus, geese can be physically herded and rounded up in secured areas. There, they can then be physically captured, inspected, banded and relocated.

For relocation, a standard poultry transport vehicle or trailer is used. This is a temporary phase only. At the relocation site, geese will be able to fly again within weeks. At this point, some of the birds will migrate or move on. Federal permits for moving geese will be required and approvals from the provincial ministry will be required for release at the relocation site.

Relocating geese has shown mixed success as a means of permanent removal from the originating site. The reasons are varied. Many geese that are translocated during their flightless phase will return to the originating area. In Minnesota, relocating flightless juveniles to distant areas without adults did not result in appreciable declines in numbers. Few juveniles returned but the adult geese continued to return and breed at the original site (Cooper 1986).

Relocating geese in the Okanagan Valley may have temporary value only. In the case of removing geese from selected areas such as beaches and foreshore parks, especially where they may be a primary cause of water pollution, temporary removal, in terms of weeks, may be sufficient and a reasonable policy target. Due to human population growth and development, there are few sites that would be appropriate to relocate geese to, but this is a question that must be addressed by park planners and provincial wildlife (MOE) staff. Although there are no assurances that the geese would remain at the translocation site, temporary removal may be justified if it extends to the end of the high beach-use period. The act of removal will also be noticed by neighbouring geese, and possibly reduce their interest temporarily in the affected area.

Recommendation: If the ORGMC wishes to accept relocating Canada geese as a potential management option, it must cooperate with CWS and MOE to identify potential translocation sites within a reasonable distance from Canada goose concentration areas.

6.4 Control Techniques: Goose Dispersal

6.4.1 No Feeding Bylaws

Many people enjoy feeding wild waterfowl under the impression that they are doing the birds a favour. Unfortunately, this can encourage wild populations to congregate in large numbers in urban areas. In the case of geese, supplemental feeding during southward migration may also encourage geese to stay when they might otherwise have continued south. Habituated populations may behave aggressively toward people and other animals. Even worse, crowding can make geese and other birds susceptible to avian diseases such as fowl plague and avian cholera (*Pasteurella multocida)*. By limiting the opportunities for easy food sources in urban areas geese will be less likely to choose these sites for forage. Several municipalities have passed bylaws prohibiting the mass feeding of nuisance wildlife. A coordinated effort on the part of all regions would strengthen the overall commitment.

Recommendation: All local government members of the ORGMC with significant goose populations should have by-laws prohibiting the mass feeding of nuisance wildlife.

Recommendation: By-laws prohibiting the feeding of wildlife should be enforced.

Bylaws alone will not resolve the issues of public feeding of wildlife. Informative signage that explains the problem and the reasons to let wildlife “act naturally” will also be required. A very important part of a comprehensive program will be to develop signage and information about the goose program that is consistent throughout the Okanagan Valley. The signage must be simple, direct and clearly identifiable with the program. Regular and recurrent exposure to the message will be an important part of engendering public support. In addition, brochures and an interactive website will expand the opportunities for public awareness. The outline of a signage program is presented in Appendix 6.

6.4.2 Habitat Modification

Geese prefer habitats that are open, with unobstructed views, and have lush grass and proximity to fresh water. Public parks, golf courses and many other urban landscapes including residential dwellings provide this type of environment for geese. Wherever possible environmental and landscape planning should take wildlife management problems into consideration during the design phases. Habitat modification techniques include reducing, modifying or eliminating the elements that attract geese. Unfortunately, humans and geese may favour the same environmental features such as grassy approaches to watercourses. Many people are reluctant to change their landscaping preferences. In a study of urban respondents in the Fraser Valley, 84% were unwilling to change their landscaping practices to control geese (Breault and McKelvey 1991).

Habitat modifications are usually costly but may provide value over time. Aside from the human design factors, care must be also taken to ensure that the proposed changes do not adversely affect other desirable wildlife. Changes that are not regionally coordinated may also force geese into neighbouring properties, becoming someone else's problem.

Some of the approaches that can be employed include:

- Vegetative barriers. Geese tend to avoid these areas as reduced visibility makes them more susceptible to attack by predators.
- Installing (temporary) fencing barriers that restrict access from water to grazing areas. Fences are more effective when used in the summer moulting periods and while the geese have young that are flightless.
- Rock barriers make it more difficult for geese to access and leave water.
- Trees will often reduce the desirability of an area to geese as they restrict vision and reduce ease of access to a grazing site during the moult.
- Modifying grazing areas will help to reduce the use by geese. Geese prefer tender young short grass shoots. Fertilized lawns are preferred. Where possible, reduce lawn areas bordering water bodies. Longer grass is tougher and less palatable. Some species of grass and ground cover are also less attractive to geese (See Appendix 7).
- Modify shoreline to reduce secure habitat for geese, as described above.
- Placement of walking paths near water can disrupt goose behaviour by making their transition from land to water more difficult. However, geese will tend to adapt easily to large numbers of people and there is also the problem of human feeding in these areas.

These techniques are not entirely practical for all locations and there are always side effects that minimize the desired result. Encouraging residents and supporting responsible land planning activities will help to reduce the desirable nature of urban settings for geese. A complementary idea might be the provision of refuge areas away from human settlement and parks where Canada geese may be welcome.

6.5 Control Techniques: Deterrence / Scare Techniques

6.5.1 Pyrotechnics

Pyrotechnics describes techniques that are visually and/or aurally unsettling. Screamer shells and bangers have commonly been used to disturb goose flocks. Disadvantages of pyrotechnics in public areas include safety issues, concerns over the loud and alarming noise in urban communities, and habituation of geese to the disturbance with regular

and recurrent treatments. Pyrotechnics are becoming increasingly expensive due to recent US regulations, and that has reduced their use for bird control.

6.5.2 Air Horns or Sirens

Not acceptable in residential areas, these noisemakers must be employed on a random basis if they are to be effective.

6.5.3 Laser Lights

A laser light can be used on its own or in association with other scare techniques to move large flocks of geese. The laser system is used at night or in the early morning (pre-dawn). At night the geese are easily alarmed by this unusual effect and will react quickly. Laser units are expensive but work well to disperse flocks.

6.5.4 Canine Control

Herding dogs, especially Border Collies, have been a popular method of moving geese. Employing dogs on open park surfaces and beaches is effective, particularly in the early morning hours. Drawbacks include some minor resistance from the public to unleashed dogs and the cost of training and handling. Dogs have proven to be one of the most effective treatments currently in use, particularly when used consistently and in conjunction with other practices. As with other techniques, the key is to maintain an unpredictable program. Dogs can lose effectiveness as geese become familiar with their presence. Consideration could be given to permitting the public to run their dogs on beaches during set times, providing dog excrement is removed. Dogs have been used with beneficial results in the various areas of the Okanagan Valley.

6.5.5 Birds of Prey

Professional falconers are contracted to fly birds of prey at goose flocks. The desired effect is to unnerve and disperse the birds. Disadvantages include the cost of the service and restricted times that the activity can take place, and the fact that geese are not easily deterred by predators many times smaller than they are.

6.5.6 Decoys

Coyote and dead goose decoys are occasionally used in management programs. They can be used in some cases to reduce the chance of nesting and encourage geese to fly over. They need to be moved regularly and be used with other deterrence techniques.

6.5.7 Distress Calls

Taped Canada goose alarm calls played at loud volume have shown mixed success. Generally they are a short term deterrent that geese quickly become familiar with. Alarm calls can be used in conjunction with other techniques to improve effect.

In the Valley, distress calls have not been successful in dispersing geese. Individuals have quickly become familiar to the calls and respond by moving only a short distance from the call source.

6.5.8 Visual Deterrents

Visual frightening devices including mylar tape, balloons painted with large eye, flags and scarecrows have been tried. A variety of human and animal figures (scarecrows) have had some success. One scare device made in England is a motorized inflatable figure that operates on a timer. The scare figure moves about wildly with the air rushing in and lights and sound increase the effect.

Visual frightening devices are usually inexpensive, quiet and can be used in most urban areas. They are more effective if combined with other hazing techniques. However, geese will habituate to these devices quickly if there is no other dispersal technique involved. Keeping these devices unpredictable is another critical factor in preventing geese from becoming acclimated to these techniques. These devices have been used in the Valley, with relatively low success rates.

6.5.9 Sprays

In limited areas the non-toxic chemical, methyl anthranilate, can be sprayed on grass surfaces. The grape-like taste is unattractive to geese and is a deterrent to grazing. The chemical is expensive, requires extensive spraying and will only be effective for a short time. Chemical repellents have been used in the Valley and are not considered effective as they wash away with the onset of irrigation activities or rainfall.

6.5.10 Alternative Feeding Areas

Alternate feeding areas are designed to attract geese away from areas where they tend to cause a public problem. The technique is most effective for rural areas. If combined with deterrence techniques it can be effective for keeping resident geese out of parks (Smith et al. 1999).

6.5.11 Overhead Placement of Grid Wires

Some locations have used a grid of multiple parallel lines of wire or mylar tape suspended from poles. The grid includes poles at waters edge and several more located approximately 50 feet out in the water. Heights can vary but one successful example was at a man-made park at Kelso, Ontario (Burchett, B. pers comm.) Geese tended to stay away presumably because of the concern over landing.

Table 6-3 provides an evaluation of the various control techniques, documenting the period most likely to produce favourable results, the location options where these activities may occur, the advantages and disadvantages of each practice, associated costs and permitting requirements.

Table 6-3: Summary of Various Control Techniques.

Awareness/ Information	When/ Where	Advantages	Disadvantages	Cost	Timing	Permits
Bylaws to discontinue public feeding	Everywhere Anytime Throughout	Direct public approach. Authoritative Geese less likely to congregate	Authoritative Many people will ignore rules Limited bylaw enforcement	Low (Signage) (Leaflets)	Year round	No
Signage / Educational material	Everywhere Anytime Throughout	Improved public awareness/acceptance Develops visible, recognizable program	Many people ignore signs Some of the public will resist the message	Moderate Signs for all areas ~ $10K Brochure<$3K	Year round	No
Web Site (Informative, Interactive)	Everywhere Anytime	Worldwide audience. Easily accessible information. Can be interactive, quick updates	Can be lightning rod for criticism	Low (<$21K)	Year round	No
Population Reduction	**When/ Where**	**Advantages**	**Disadvantages**	**Cost**	**Timing**	**Permits**
Egg Addling	Throughout Annual Long term	Birth control, relatively benign Adult geese continue life cycle Reasonably high public acceptability Reduces recruitment of new generations Annual, short program Involvement of stakeholders and post-secondary students	Nests - hard to find and access. Large areas to cover Short window of opportunity. Need well organized teams. Population reduction is slow Needs thoroughness and consistency year to year	Low - Mod Labour intensive Labour ~$20K/yr Equipment ~$5K/yr	Spring nesting ~3weeks	CWS Addling permits
Relocation of goslings	Beaches, golf courses, parks, public use areas	Temporary reduction of numbers Reduced habitat damage at limited sites Improved appearance. Less mess Goslings may not return in future	Short term solution only Few places to send geese Adults will return in future Large number of personnel required	Moderate Contractors $2000 per relocation	Early June each year	CWS Relocation Permits MOE Permits
Relocation of Adults/sub adults	During moult Beaches, golf courses, parks, public use areas	Geese are flightless for ~ 4 weeks Temporary reduction of numbers Improved water quality Improved appearance. Less mess Adults may not return in future	Short term solution only Few places to send geese Adults will return in future Large number of personnel required	Moderate Contractors $2000 per relocation	Discreet timing	CWS Relocation Permits MOE Permit

Regular Hunting	Seasonal	Reduce adult population Remaining geese leave area Coordinate and adjust hunting dates within Valley Discourages migrants from overwintering	Growing urban base – reduced hunting areas Fewer hunters Reduced effectiveness Current bag limit too small	Low Hunters pay fees and contribute to local economy	Fall /winter	Prov. hunting permit
Damage control	Response to high numbers at sensitive areas where the public may be affected	Rapid reduction of local goose numbers Geese will likely avoid the area Water quality improved Conforms to Interior Health Authority concerns Acceptable to regulatory agencies	Killing geese, however few, is risky public relations Limited management option Application must be supported by clear rationale	Low Hunters pay fees and contribute to local economy	Summer	Municipal/ Reg Dist application ORGMC support CWS & Permit
Culling	Regular application of lethal control measures	Rapid reduction of goose no's Geese will likely avoid the area Water quality improved Conforms to Interior Health Authority concerns	Not acceptable to ORGMC; Questionable public support Poor public relations	Low Hunters pay fees and contribute to local economy	All seasons	CWS & MOE permits
Scare Devices	When/ Where	Advantages	Disadvantages	Cost	Timing	Permits
Pyrotechnics – Bangers, Screamers	Open areas, rural, some urban parks, golf courses. Year round	Used in combination can deter geese from public areas Improved water quality at specific beaches Reduced mess, habitat damage	Geese habituate to regular applications Noise and disturbance in urban areas upset people Results are short term	Low-Mod Equipment – variable Staff in all regions ~ $50K	Spring – Fall	CWS, MOE Permits
Air Horns / Sirens	Rural areas, some urban sites	Used in combination can deter geese from public areas, parks Improved water quality at specific beaches Reduced mess, habitat damage	Noise and disturbance can upset public Geese can habituate. Results are short term	Above expenses apply to all scare devices	Spring – Fall	CWS, MOE Permits, IPM Permit
Goose distress calls	Rural areas, some urban sites	Used in combination can deter geese from public areas, parks Improved water quality at specific beaches Reduced mess, habitat damage.	Geese habituate quickly if technique used in isolation Results are short term	As above	Spring – Fall	CWS, MOE Permits, IPM Permit

Decoys / Scarecrows	Urban parks, golf courses	Used in combination can deter geese from public areas, parks Improved water quality at specific beaches Reduced mess, habitat damage.	Geese habituate quickly if technique used in isolation Results are short term Move frequently for effect.	As above	Spring – Fall	CWS, MOE Permits, IPM Permit
Balloons / flags/mylar tape	Urban parks, golf courses	Effective scaring techniques in combination with other hazing techniques Improved water quality at specific beaches	More labour intensive than most effects. Geese habituation	As above	Spring – Fall	CWS, MOE Permits, IPM Permit
Laser lights	Beaches, urban parks, golf courses	Effective scaring technique. Quiet, non-intrusive Improved water quality at specific beaches	Must be done in pre-dawn hours	As above	Spring – Fall	CWS, MOE Permits, IPM Permit
Chemicals - Methyl anthranilate	Small urban lawns, golf courses	Geese do not like the taste Improved water quality at specific beaches	Expensive, labour intensive, short-lived, possibly toxic to fish	Expensive ~$150/5 gal	Spring – Fall	CWS, MOE Permits, IPM Permit
Canine control	Beaches, golf courses, parks	Regular, trained dogs can effectively keep some areas free of geese Improved water quality at specific beaches	Requires well-trained dogs. Regular visits needed to keep geese away. Dogs off leash may be problem for some	Moderate	Spring – Fall	CWS Canine Control Permit
Birds of prey	Open areas, undisturbed	Natural system for driving away geese	Canada geese not easily intimidated Expensive, labour intensive. Limited effectiveness	High / Unit time	Spring – Fall	CWS, MOE Permits, IPM Permit
Habitat Modification	When/ Where	Advantages	Disadvantages	Cost	Timing	Permits
Physical barriers	Parks, beaches shorelines	Reduced use in conflict areas (small flocks do not like obstacles and view barriers)	Limited application on public beaches and open spaces Can be costly	Moderate	Spring – Fall	None
Alternative feeding areas	Rural areas removed from public beaches and parks	Draw geese away from areas of high public use. Can be effective with hazing elsewhere and public feeding ceases.	Creates another location for overpopulating geese. May increase survivorship.	Moderate/High	Spring – Fall	None

6.6 Current Goose Control Activities

Goose management and control has been practiced by Valley municipalities since before the creation of the ORGMC in 1995. Currently, municipal staff and contractors employ many of the techniques summarised above (Table 6-4).

In terms of public awareness, while most local governments do not have by-laws prohibiting the feeding of waterfowl, the cities of Kelowna and Penticton do. Two recommendations on this issue have been made (Section 6.4). Similarly, public information on goose control is mostly limited to those municipalities that have a goose management program, i.e. Kelowna, Osoyoos, Penticton, Summerland and Vernon.

Population reduction activities, specifically egg addling, relocations, and damage (lethal) control, are practiced actively by most of the larger municipalities (Table 6-4). Egg addling is practiced in some communities where nesting takes place. As stated above it is the least intrusive way to reduce populations, and if widely applied can lead to summer population declines over time. Relocations of flightless adults and/or young are not regularly employed by any local governments, partly because of the expectation, borne out by experience elsewhere that the geese quickly return once they have regained flight. Damage control permits allow the permit holder to use lethal means to control specified damages. It is a method of last resort, and to our knowledge lethal control in the past two years has only been employed in Oliver, Peachland, Summerland, and Kelowna (Table 6-4). Osoyoos obtained such a permit for 2005 but did not use it (Ron Doucette, Town of Osoyoos, pers. comm.).

Habitat modification appears to have been actively pursued at only two municipalities: Kelowna and Pentiction (Table 6-4). Both have installed fence barriers, and Penticton has employed selective planting to deter geese.

The main class of techniques employed by Okanagan local governments are scare techniques designed to move geese away from a specific site, such as a park, playground, beach, or other public use area. These techniques are successful only in the short term. Six governments actively employ these techniques, which include canine control, lasers lights, decoys, sprays, balloons, distress calls, and various pyrotechnics. This variety indicates that Okanagan municipalities have tried most of the available technology; the persistence of the problem is not owing to a lack of current technology. Although the initial cost is notable, laser light technology is now regarded as the most favoured method (J. Penrice, City of Penticton, pers. comm.). The limitation of most of these methods is that the geese are scared away for hours only, and the deterrence must be repeated almost daily.

Because of the concern over disturbing the public, application of these techniques in high public use areas must be completed before 0700 hours.

Recommendation: Short term control of goose numbers at specific sites should emphasize scare devices, and employ lethal control as a last resort.

Recommendation: Long term control of goose numbers can be achieved by an energetically managed, Valley-wide egg addling program.

Table 6-4: Current (within last 5 years) Techniques Used by Various Municipalities in the Okanagan Valley. (Source: Personal Communications – Interviews.)

Municipality	Bylaws	Public Outreach	Addling	Damage Control	Relocation	Habitat Modification	Scare Techniques	Multiple Management Techniques
Armstrong (Armstrong Spallumcheen Parks & Recreation Commission)	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]
Kaleden	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Kelowna (City of)	Prohibit feeding waterfowl	Signage	Yes	Yes	No	Fence barriers	Canine control; pyrotechnics; decoys; laser; sprays	Yes
Lake Country (District of)	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]
Naramata	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Okanagan Falls (unincorporated)	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]
Oliver (Parks and Recreation Society)	No [3]	No	No [2]	No	No	No	No	No
Oliver (Town of)	No [3]	No	No [2]	No	No	No	No	No
Osoyoos (City of)	Permit hunting within City limits; permit dogs in parks	Media; council newsletters; pamphlets; complaint portal; encourage public participation	Yes	Yes	No	No	Canine Control; pyrotechnics; distress calls; decoys; balloons; sprays	Yes
Peachland (Corporation of the District of)	No	No	Yes	Yes	No	No	Canine control	No

Municipality	Bylaws	Public Outreach	Addling	Damage Control	Relocation	Habitat Modification	Hazing	Multiple Management Techniques
Penticton (City of)	Prohibit feeding waterfowl	Signage; media coverage	No	No	No	Fence barriers; selective planting	Pyrotechnics; laser	
Regional District of Central Okanagan (CORD)	Unknown	Unknown	No	No	Unknown	Unknown	Yes	Yes
Regional District of North Okanagan (NORD)	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]
Regional District of Okanagan Similkameen (RDOS)	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]	No [4]
Spallumcheen (District of)	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]	No [1]
Summerland (Corporation of the District of)	No	Signage	No	No	No	No	Canine control; pyrotechnics	No
Vernon (Greater Vernon Services)	No	Press releases	Yes	No	No	No	Canine control; laser; perhaps pyrotechnics	Yes

7.0 GOOSE MANAGEMENT STRATEGY IN THE OKANAGAN VALLEY

7.1 Rationale and Guiding Principles

As documented above, Canada geese populations in the Okanagan Valley have increased dramatically since the 1960s. These increases are not limited to the Okanagan Valley. Goose populations have increased elsewhere, and have been the target of efforts to bring numbers under control, and reduce their concentration where conflicts with public use take place. Canada goose numbers in the Valley average about 10,000 in winter, based on Christmas Bird Count data. The numbers in summer are less well known, there being no spring or summer equivalent of Christmas Bird Counts. Better knowledge of goose numbers is an objective of recommendations the study team makes in this report, but whatever the numbers, Canada geese are congregating at beaches where water quality samples in summer show contaminant levels reaching threshold levels. Whether or not geese are responsible, a further increment, and the Interior Health Authority may force some beaches to be closed. To an economy geared to tourism this is unacceptable scenario, and an obvious place to start is with goose management.

This situation has prompted goose management by individual municipalities, and the creation of the Okanagan Regional Goose Management Committee by these municipalities. The thrust of this project is to expand that effort, making it Valley-wide in an effort to achieve better results.

The following principles should be employed in all aspects of managing Canada goose populations in the Okanagan Valley:

- Canada geese, and other water associated birds, are an attractive feature of the lakes of the Okanagan Valley and the surrounding lowlands, and any management of their numbers and distribution must be directed solely to situations where damage may be occurring;
- Canada geese must be dispersed away from areas, particularly beaches in summer, where measurable water quality effects with potential consequences to the public and the local economy are taking place;
- A long term strategy is required to limit recruitment to the resident Canada goose population to reduce the likelihood and intensity of local measurable effects, such as contaminant levels at beaches;
- Canada geese are expected to remain in the Valley for the foreseeable future; thus, their management is viewed as a long term responsibility, whose expense to the public should stabilize and over time decline with the implementation of this program;
- Considering the long term nature of this program, the ORGMC is committed to informing the public on its progress, and encouraging it to participate in Canada goose management activities; and
- Data on goose numbers and management activities will be accurately maintained by the ORGMC, which will conduct an annual review and evaluation to ensure that the program is being run effectively, responsibly, and achieving its stated goals.
- Canada geese may be the most conspicuous problem species but they are not the only source of water contamination. A monitoring program that examines the impacts of other waterfowl and other contributory sources is required.

7.2 Tolerable Population Levels

The study team and the ORGMC have deliberated at some length about the concept of tolerable population levels of Canada geese in the Okanagan Valley. The ORGMC and the study team have concluded that tolerance thresholds are exceeded only where Canada geese may be contributing significantly to public health and safety concerns, such as at bathing beaches whose water quality is monitored closely by health authorities. For this reason, the main focus of the management strategy is population control at key areas primarily in the summer months, supported by applying available technologies Valley-wide to limit the population.

For the above reasons, and the fact that baseline population levels are still not well known, this study has not set a specific numerical population target for Canada geese in the Valley. Such a target may be desirable in future when 1) goose monitoring results provide greater confidence in estimates of population levels at specific seasons, and 2) the success of proposed control measures at specific sites can be gauged after several years. Until then no tolerable population level should be proposed.

Recommendation: Instead of establishing a specific numerical target for Canada geese populations in the Okanagan Valley at this time, the study team recommends that the ORGMC review the findings of the first three years of monitoring (2007-2009) and revisit this topic.

7.3 Feasibility

The management of Canada Geese is a priority for local governments and some landowners. Significant effort has already been expended attempting to reduce the problems associated with high numbers of Canada geese. These efforts have been directed at 1) reducing goose numbers at beaches, parks, and other sites where their congregations can cause damage or lead to public expense, and 2) limiting recruitment to the adult goose population, largely through egg addling. The ORGMC and its local government members have shown this strategy combining short term and long term tactics is feasible. The strategy outlined here proposes to intensify that effort so that the risk of losing swimming beaches would be significantly diminished as would be the summer population of geese.

7.4 Management Strategy

The recommended Canada Goose Management Strategy comprises five basic elements, each with a number of broad tasks to achieve program objectives (Table 7-1). These elements are public awareness and involvement, reduced goose use in conflict/sensitive areas, population control, discouraging migrants from overwintering, and monitoring.

7.4.1 Public Awareness and Involvement

The public awareness and involvement component involves several key elements (Table 7-1). These are placing goose management signage at strategic locations, developing a program website, encouraging the participation of the public, and ensuring that ORGMC officials provide progress reports to the public on a periodic basis.

A proposed signage plan has been outlined in Appendix 6. While Okanagan residents are notified from time to time about goose management, visitors using high public use areas need to be informed of some of the basic features of local goose management. In particular, these involve avoiding the feeding of geese, and an awareness that goose deterrence activities may take place at any time.

An ORGMC website would be developed to inform the public of the program components, indicate the timetable for future goose management activities, and provide a contact site where the public could provide feedback on the program and volunteer themselves for appropriate future activities (Appendix 6).

Through the website, public notices, and direct contact with natural history, fish and game, and educational institutions the ORGMC would invite the participation of the public in program activities. While the planned activities most suitable would be the location of nesting areas and egg addling, on-going public reporting of goose concentrations would be highly informative. Local governments have been and will continue to be concentrating on scaring large goose flocks away from public beaches and parks. Such flocks will disperse or congregate at other locations. The ORGMC is aware that goose deterrence involves exporting the problem elsewhere. Goose flocks at other locations may be a benign occurrence, but there may be some instances when this is not the case. The public will be encouraged to report such occurrences.

At appropriate milestones, ORGMC officials would make themselves available to outline newsworthy activities, or report on progress of the program. Other activities may be added to this list.

Attention to public involvement should generate broad public support for the program, and reduce the risk of bad publicity arising from unanticipated events.

7.4.2 Reduced Goose Occurrence in Conflict Areas

This part of the goose management strategy involves continuing the employment of a variety of techniques to remove Canada geese from public use areas. The goal with this part of the strategy is to respond to public complaints, make public use areas cleaner and freer from the residues of recent goose occurrences, and reduce the threats to acceptable water quality at recreational sites.

In particular, local government staff and their contractors should continue to apply appropriate scare techniques at public use areas where geese tend to congregate. At those areas most used by the public, specifically beaches in summer, the most disruptive techniques must be used early in the day to avoid disturbing beach and park users. The deterrence equipment technology has been evolving, but the current technique most favoured is laser lights. Other deterrence techniques have been used with varying success (Table 6-4). Not only should local governments continue to use these techniques, but they should continue to use them in combinations, and in a way that their application is, for better effect, unpredictable to the geese.

Geese prefer views that are unfettered by obstacles. The location of park lawns directly adjacent to sandy beaches and a lake foreshore is ideal for geese. In Kelowna and Penticton, barriers have been placed by park staff to reduce the attractiveness of goose habitat. Where opportunities to expand these activities exist, and the public is supportive, they should be taken advantage of.

Scare techniques may not always reduce goose concentrations to a satisfactory level. Satisfactory population levels will be defined by local parks departments triggered by water quality testing results from the Interior Health Authority indicating potential exceedence of threshold levels. In addition to the water quality levels, other factors to consider are public complaints, and increasing goose reluctance to leave in response to scare techniques and flocks reforming in target areas, such as public parks and beaches. Where such instances occur and the local municipality has successfully acquired a Damage Control Permit from the Canadian Wildlife Service and is in conformance with its own noise and firearm discharge by-laws, its staff or contractors can and should apply lethal control in limited instances. The application of such measures is intended for damage control and deterrence, and not population reduction.

These techniques reduce and will continue to reduce Canada goose use of public use areas, particularly beaches and parks. By doing so, water quality and other public health and safety parameters should improve at public use areas. Public use areas will have an improved appearance and complaints from the public will be reduced.

7.4.3 Population Control

The aim of population control is to disperse summer populations away from sensitive areas, and to discourage fall migrants from over-wintering. To reduce summer populations, egg addling would be expanded to cover the entire Valley. For a brief time in April it requires a very intensive effort. It has been practiced with varying levels of effort for several years, but it can reduce Canada goose numbers only when applied to all nesting efforts for an unbroken series of years.

Where the deterrence part of the Strategy would be implemented by local government staff and contractors, the Canada goose egg addling program would be best implemented by a contractor reporting to the ORGMC. This separate infrastructure is required because egg addling efforts have to take place from Osoyoos to Armstrong within a three week period and would require dedicated personnel for completion. More details of its implementation are outlined in the Action Plan (Section 8).

Population control would also involve recommendations to senior government agencies to increase the daily bag limit of Canada geese to 10 birds and possession limits to 20, and to encourage fish and game clubs to promote hunting of Canada geese. These techniques would be intended in part to reduce the population, but also to encourage non-resident birds to continue their southward migration. Also, through fish and game organizations it might be possible to encourage greater hunting on private lands.

The benefits of population control would initially comprise reduced recruitment of juvenile geese into the adult population, and as long as there was no significant net influx of immigrant birds over emigrant birds, a measurable decline in the summer Canada goose population should be recorded within three years. Increased hunting may have an effect on the summer Canada goose population, but its more important target would be to limit the overwintering population to approximately 10,000 and to encourage fall migrant geese to continue southwards.

7.4.4 Inventory and Monitoring

Information assembled for this report indicated notable gaps in our knowledge of Canada geese in the Okanagan Valley. In particular, recent Valley-wide survey information was largely non-existent for summer populations until the summer of 2005.

These gaps have not prevented the development of a comprehensive Canada Goose Management Strategy, but that strategy by necessity includes a significant inventory and monitoring component.

With respect to summer goose concentrations at specific public use areas, it will be important for program managers to review recent (e.g. 2003 – 2005) survey information at those sites, particularly those with threshold contaminant levels. The purpose of this will be to set target goose concentration levels and to use monitoring results to identify beaches where more intensive deterrence efforts should be directed. For example, if the average goose numbers at a specific beach in recent years have been 250, particularly at a beach with marginal water quality, it would be important to set a reduced target of acceptable goose numbers beyond which more intense deterrence may have to be practiced.

Recommendation: At beaches where water quality has approached or is approaching threshold levels, target numbers of acceptable goose populations should be set significantly below recent mean levels, and intensified deterrence should be implemented if these targets are exceeded.

Annual aerial surveys in summer should be repeated for at least the first three years of the program to provide survey continuity, identify year to year variation in numbers, and ideally record by year three the success of population control efforts.

Much of the potential reproduction of Canada geese in the Valley should be curbed by egg addling, but some geese will successfully nest and hatch goslings. These should be monitored particularly with respect to numbers and location. Results might indicate where nesting areas have been previously missed. This activity should provide an opportunity for post-secondary students either independently or through their institutions to get involved with this program.

Although water quality is a shared responsibility, it is important that the appropriate health and environmental agencies establish a water quality sampling and interpretation program for recreational use sites in the Valley. Water quality provides a considerable proportion of the momentum of this program, along with the assumption that Canada geese are significant contributors to elevated coliform and E. coli levels.

Despite the conspicuous nature of Canada geese and their fecal contamination there are other sources that may impair water quality. More information is required regarding the risk to public health as water quality declines.

Recommendation: A microbial source monitoring program should be employed to determine the nature of the contamination, particularly related to other water associated birds, especially gulls, and possible runoff and groundwater sources. This information will be very significant, particularly as development increases in the Valley.

Documentation of public complaints about Canada geese, and costs by local governments and their contractors to control geese concentrations require continued documentation. Optimistically, these numbers should stabilize and possibly decline.

Monitoring results will help gauge the success of the program in achieving its targets. In a similar vein, it will help direct control activities over the short and long term.

7.4.5 Program Administration

At the present time the ORGMC is not a well known entity, and a number of recommended initiatives of this report may require an authorizing entity, other than the local governments which comprise that body.

Recommendation: The study team recommends that the ORGMC use opportunities to raise its public profile, creating an ORGMC logo, website, and signage as outlined in the Information Plan (Appendix 6).

Recommendation: As part of its responsibility to administer this program the ORGMC should convene a program review meeting annually, as well as additional meetings on an as-required basis. The output of the annual meeting should be an annual program report detailing Valley-wide field results covering the program elements outlined above, with recommendations on the thrust of the program for the coming year.

The annual meeting, preferably taking place in October of each year, would:

- Review goose control activities in that year;
- Propose activities for the coming year, and outline the checklist of activities necessary for successful implementation;
- Those activities would include the permits required for the coming year, and a timetable for the transmittal of the permit applications to CWS and other agencies;
- A checklist of required activities to ensure that the egg addling component covers the entire Valley; and
- The identity of officers on the ORGMC and member municipalities responsible for the permits, the implementation of different elements of the program, and their documentation at the conclusion of their respective activities for presentation at the annual meeting.

The annual report and any surrounding publicity should provide the ORGMC with an appropriate vehicle for communication with the public, and in so doing increase public awareness, and improve the prospects of positive involvement of the public.

7.5 Management Focus and Containment of Anticipated Effects

The Strategy outlined in this report is directed solely at Canada geese. No direct effects are anticipated on non-target species by recommended management activities. Of greatest concern are the impacts from discouraging geese that might also impact migrant shorebirds that use Okanagan beaches as staging grounds. Further, goose management activities should consider the relationship of Canada geese with other problem contamination sources in the Valley.

Table 7-1: Approaches, Process, and Anticipated Effects for Individual Management Objectives.

Broad Approach	Specific Steps	Anticipated Effect
1. Public Awareness and Involvement	1. Place goose management signage at strategic locations. 2. Develop an ORGMC website to apprise the public of program tasks and milestones, and seek comment on program elements. 3. Encourage participation from the public, students, and stakeholders with specific program activities, such as nest reporting. 4. Make ORGMC officials available to the media to answer questions on the program.	• Broad support from the public for the effective management of Canada geese. • Improved management of geese on public and private lands. • Provides an opportunity for the public to make comments.
2. Reduced Goose Use in Conflict Areas	1. Apply the most effective scare techniques to remove geese from sensitive public use areas, particularly beaches. 2. Modify existing parks and public areas so that they do not provide the security features that geese require. 3. As a last resort, implement damage (lethal) control techniques where scare techniques are insufficient.	• Improved water quality and other health and safety issues at conflict areas. • Improved aesthetics on public and private lands. • Reduced complaints from the public and landowners.
3. Population Control	1. Establish a Valley-wide egg addling program, comprising the search and recording of nesting areas, followed by egg addling. 2. Promote fall hunting of geese where permitted. 3. Encourage the increase in bag limits. 4. Apply scare techniques to discourage migrants from public areas. 5. Encourage hunting on private lands.	• Documentation of primary nesting sites. • Reduced recruitment of juvenile birds. • Significant reductions in adult populations. • Reduced numbers of migrant geese that overwinter. • Maintenance of the migrant behaviour of non-resident geese.
4. Monitoring	1. Closely monitor goose numbers at key public use areas where Canada geese concentrate. 2. Monitor juvenile recruitment. 3. Conduct aerial surveys annually to determine summer population levels. 4. Monitor water quality to determine what level of impact geese have on water quality.	• A means to gauge the effectiveness of management efforts from addling, lethal control, hazing, and other deterrents. • An opportunity to review the results of management activities in order to improve the strategies.
5. Program Administration	1. Establish unique identity and logo for ORGMC. 2. ORGMC should convene annual meeting and other meetings as required, analyze results of monitoring and other data collection, adjust program targets as appropriate, and issue an annual report.	• Public acceptance of goose management program. • Establishment of appropriate vehicle for communication with the public.

8.0 ACTION PLAN

8.1 General Layout

The Action Plan expands concepts and recommendations in Section 7 (Goose Control Strategy) and earlier and are summarized under Public Awareness and Involvement (Tables 8-1), Reduced Use in Conflict Areas (Table 8-2), Population Control (Table 8-3), Monitoring (Table 8-4), and Program Administration (Table 8-5). The narrative of this chapter highlights certain elements where greater detail is appropriate.

8.2 Public Awareness and Involvement

The public awareness and involvement section summarises much of the elements of the Information Plan (Appendix 6). It includes a modest signage program, the development of a website, continuity of existing information services, proposes to extend greater links to stakeholders, including First Nations, fish and game clubs, and post-secondary education institutions, whose students particularly those in environmental programs may wish to become involved in aspects of the program (Table 8-1).

Certain municipalities have bylaws against the feeding of wild animals on municipal property. Such bylaws should exist in all Valley municipalities with goose concentrations, and enforcement should be increased.

Most of the costs of this part of the Strategy are staff time, but there are costs associated with placing signs and developing a website. The preparation of a modest number of signs (50±) is anticipated to cost approximately $7,500. The website can be prepared for less than $2,000. A link to the website can then be made from the websites of the various ORGMC members.

8.3 Reduced Goose Use in Conflict Areas

This program component deals with dispersing geese away from areas of high public use, many of which are used as recreational beaches, where geese and other sources affect water quality (Table 8-2). It also deals with the techniques of dispersal. Population reduction is a separate challenge.

Dispersal and deterrence techniques have been described in Section 6, and most are well-known to goose control staff and contractors in the Valley. Moreover, they are successfully mobilized every season to conduct this part of the goose control program. This strategy recommends that the goose counts at specific problem beaches and fields be analysed, and from this analysis targets be set for acceptable numbers per site. If these numbers are being exceeded, particularly when combined with poor water quality, deterrence should be intensified including possible relocation and application of lethal control methods.

8.4 Population Control

Since the most acute problem facing the goose control program is poor water quality the management focus is on summer Canada goose populations. The initial target reduction is one third, compared to the baseline counts of 2005. Egg addling is most effective means to achieve that end (Table 8-3).

Egg addling has been practiced in the Valley for many years. This Strategy proposes to make egg addling a Valley-wide project and directed from one central location. There is a very short window of opportunity for egg addling to occur each year. Canada geese usually lay their eggs starting in mid March, with eggs hatching from mid April onward. Egg addling must be done in the early stages of incubation and the nest sites re-checked a week later.

The most practical way to achieve complete coverage of the entire Okanagan Valley would be to employ an independent contractor, who is already familiar with the goose control program, its personnel, and the egg addling component. This individual would assemble staff, technicians and volunteers, some of whom would already be familiar with egg addling. In order for the egg addling to be completed in the appropriate timeframe (which usually lasts 2 -3 weeks in April), some thought would have to be given to two or more crews to conduct the work. If two, one crew would work in advance to identify nesting areas, and the second would conduct the addling. The specific decision would be best left to the egg addling contract manager whose tasks collectively would include:

- Identify sectors for work and personnel required (based on budget)
- Arrange for all necessary permits for egg addling on public lands.
- Assemble team of staff, contractors, and volunteers (with good animal handling skills)
- Provide a training session to ensure all team members are familiar with the proposed program and expectations of them
- Review information on nesting areas from previous years, assemble required equipment, identify private landowners who need to be approached for access
- Liaise with municipal staff and wildlife officials to arrange publicity for the project
- Work with municipal staff to assist with searching in the field for new or previously unrecorded nesting areas
- Conduct egg addling, geo reference all nesting areas, record all data and maintain them as required by the permit for verification and for later program evaluation
- Maintain communications with contract staff and direct their actions
- Prepare annual report with recommendations for ensuing year.

The estimated cost assumes at least two crews spending approximately 15 working days, after advance planning work has been conducted at the office.

8.5 Monitoring

During the peak season of goose control – summer – monitoring is as important as goose control itself. Each morning (and occasionally later) prior to dispersing geese (should that be required) goose control personnel should record goose numbers. Those numbers provide a gauge not only on how many geese are present but how successful was the previous days' deterrence. The immediate goal of deterrence is temporary relocation of geese, but if the deterrence is sufficiently uncomfortable to the geese less geese will congregate at that site the following overnight period, meaning less geese recorded the following morning. Regular monitoring is a gauge on the success of deterrence, everything else being equal. This is one of several types of monitoring required (Table 8-4).

Monitoring is also required: 1) after egg addling to measure the success of that operation, and the number of nests missed, 2) to assess the numbers of geese in summer, and 3) measure water quality levels in areas frequented by geese.

8.6 Program Administration

The program administration component involves raising the profile of the ORGMC through signage, website, other public information releases when appropriate, expanded membership, a program review function, and greater emphasis on record keeping and documentation (Table 8-5). Most of these elements have been repeated elsewhere in this report more than once, but the emphasis has tended to be on public lands, as is the membership of the ORGMC. Goose management is rightfully regarded as a public responsibility, and it may be on public land that most damage is recorded. Elements of goose control have and may continue to transfer the problem onto private lands, and this should be reflected in an expanded membership of ORGMC to include more non-public stakeholders.

Table 8-1. Strategy: Public Awareness and Involvement

Action: Launch a campaign to educate the public about the biology and management issues of Canada Geese in the Valley.

Steps to Achievement	Detail	Anticipated Effects	Annual Costs	Timeframe
Adopt a public information plan on management and control of Canada geese. Ensure that the messages being distributed are rational, scientifically defensible, reflective of humane values and are respectful of different positions regarding the management of Canada Goose populations. Public liaison	1.Develop generic information program 2. Place signage initially in high priority areas, expanding it as required. Select strategic placement locations for maximum coverage. 3. Create printed brochures covering rationale and elements of the program. Dispense through public outlets etc. 4. Develop a website that identifies the ORGMC, reports on key program milestones, and provides an opportunity for public input. 5. Use city/municipal outlets for program information incl. tax notices, on refuse collection calendar, community centre flyers etc. 6. Provide consistent information and notification of actions through newspaper outlets, web sites for all municipalities, regional districts etc. Link with other levels of government. 7. Provide advice to the public as required. 8. Consider contributing to a documentary or related media coverage about goose management in the Valley 9. Establish links with and recruit volunteers from naturalist groups, First Nations, fish and game clubs, and post-secondary institutions 10. Enact consistent and enforceable bylaws prohibiting the feeding of problem wildlife in regional districts, municipalities. 11. Ensure that positive values associated with resident Canada geese are maximized.	Support from the public for the effective management of Canada Geese. To develop a better understanding of the project Unity of purpose by all parties. Confirms the approach for some people. Developing stakeholder interest and support Improved management of geese on private lands. Maintain a style that reduces confrontation and open dialogue with public	1. Staff time 2. >$10K for min 50 signs and placement 3. Staff time 4. <$2K 5. No cost 6. No cost 7. Staff time 8. Staff time 9. Staff time; volunteers 10. Staff time 11. No cost	2007 -

Table 8-2. Strategy: Reduced Goose Use in Conflict Areas

Action: Maintain a toolbox of control procedures and practices that discourage geese from public areas where conflict with human activities occurs. Document operational systems that will describe effective application of these techniques.

Steps to Achievement	Detail	Anticipated Effects	Annual Costs	Timeframe
Continue the coordinated application of deterrence and scare techniques to remove geese from sensitive public areas. Promote the modification of existing parks and public areas so that they do not provide the security features that geese require. Relocate geese away from sensitive areas by relocating them to approved areas. As a last resort, implement damage (lethal) control techniques where non-lethal techniques are insufficient.	1. Reassemble goose control teams within local government jurisdictions and other authorities, composed of municipal staff and contractors. 2. Review and/or establish criteria for acceptable goose numbers at specific sites. 3. Monitor and record goose concentrations. 4. Where threshold numbers are exceeded disperse geese using applicable scare and deterrence techniques, and monitor direction of departure. Repeat daily as required, particularly during summer. 5. Where geese concentrations persist, particularly in areas where recreational water quality levels are approaching regulatory thresholds, attempt to relocate or apply damage (lethal) control. 6. For damage control, ensure bylaw amendments are in place to discharge firearms, and apply lethal techniques. Continue to monitor site. 7. Obtain appropriate permits, identifying sites of origin and relocation (for relocation only). 8. For relocation, assemble teams, and capture and relocate geese. 9. Continue to monitor sites, in part to record return of relocated geese. 10. Through environmental design, create habitats in urban areas that are less desirable for geese. Include pathways, different plantings, shoreline obstructions, reduce nesting opportunities.	Reduced geese at beaches, parks, and other areas Improved water quality at conflict areas. Improved aesthetics of public and private lands. Reduced complaints by the public and landowners Possible relocation of goose problem to other land owners.	1-6. Deterrence: staff & contractor costs: ~$50,000 7-9. Relocation (if attempted): staff and contractor costs per relocation: ~$2000 10. Environmental redesign can be costly. Employ with new projects. Retrofit basic changes that will reduce conflicts.	2007 - 2007 -

Table 8-3. Strategy: Population Reduction

Action: Implement goose population control measures by employing sound biological principles for reducing of resident goose populations in localized areas of the Okanagan Valley, through egg addling and relocation.

Steps to Achievement	Detail	Anticipated Effects	Annual Costs	Timeframe
Continue existing and local egg addling programs by expanding them to cover all Canada goose breeding locations in the Okanagan Valley. The target is to reduce the summer Canada goose population by one third.	1. Create an ORGMC operations manual for valley-wide egg-addling, covering the following steps: 2. Identify and map Canada goose breeding areas valley-wide. 3. Hire egg-addling program project manager and contractors, as required. 4. Obtain appropriate permits. 5. Using contractors and/or volunteers, organize egg addling team(s) valley wide. 6. Set project timing through data from previous years or surveys of nesting areas to confirm status of egg laying for that year. 7. Encourage the reporting by stakeholders of all nesting sites (incl. on First Nations lands). 8. Conduct egg addling at all nest sites, and document locations and nests covered.	Documentation and monitoring of primary nesting sites. Reduced recruitment of juvenile birds. Significant reductions in adult populations, with a target reduction of one third.	1-8. Staff and contractor costs: ~$25K / yr	2007 -

Table 8-4. Strategy: Monitoring

Action: Continue the monitoring program expanded in 2005 to address data gaps, and thus better influence future goose management.

Steps to Achievement	Detail	Anticipated Effects	Annual Costs	Timeframe
Continue to monitor goose numbers at key public use areas where Canada geese concentrate. Monitor juvenile recruitment (brood counts). Continue annual surveys (June to September) to determine summer population levels. Monitor water quality to determine what level of impact geese have on water quality.	1. At key public use sites, continue goose counts at comparable times during the day, at regular (e.g. daily) intervals, and record results. 2. Ensure observations record no geese as 0, not just a blank. 3. Subsequent to the nest search and egg addling phases (March & April), involve volunteers in surveys of the distribution and extent of successful nesting, i.e. goose nests missed during the egg addling phase. 4. Analyze brood counts to identify program deficiencies, and possible areas where nesting areas were missed. 5. Continue summer aerial surveys of geese. 6. Develop common GIS database system to track Canada goose populations. 7. Support the continued water quality testing by appropriate agencies and expand where necessary.	Improved data base of geese numbers at specific sites to use as a basis for establishing threshold and related control targets, and as a basis for measuring program success. Involvement of volunteers (naturalist groups, post-secondary students in environmental studies, private citizens) in the program. Landowner involvement and possible untapped revenue source Improved water quality control program, and better data on the potential role of Canada geese as contributors in this problem.	1-2. Regular monitoring: staff and contractor costs: ~ $35,000 3-4. Brood counts: <$5,000 5. Aerial surveys: ~$7,000 6. Staff time 7. Water quality: other agencies	2007 -

Table 8-5. Strategy: Program Administration

Action: ORGMC to continue to involve Valley municipalities and regional districts in goose control, and find appropriate ways to involve private citizens to reflect the challenge of goose control on private lands.

Steps to Achievement	Detail	Anticipated Effects	Costs	Timeframe
Raise profile of ORGMC through signage, website, and other public information releases. Expand ORGMC membership to include First Nations and private citizens. ORGMC should regularly review results of different program elements, convene an annual program review meeting and other meetings as required, and release information through its website and other means at regular milestones. Keep accurate records on staff and contractor time spent on goose control.	1. Implement appropriate components of the recommended Information Plan. 2. Recruit into the ORGMC other stakeholders, including First Nations and private citizens. These should have connections to local government and be aware of its workings and responsibilities to reflect the fact that Valley-wide goose control extends beyond public lands. 3. Each of the main elements in this strategy requires regular documentation, which must be summarized in reports to the ORGMC on an annual or more frequent basis. 4. The ORGMC should assemble and review findings, establish appropriate targets, and prepare an annual report for public consumption. 5. Among the findings assembled each year should be a tabulation on goose control costs, by local government, and private agency.	Public acceptance of the goose management program. Accurate records frequently forwarded to department heads and through them to the ORGMC will allow goose management staff and the ORGMC to monitor progress, assess successes and set future direction. A solid information base will allow for response to questions or concerns about the program. Improved budget accuracy and forecasting.	1. See 8.1 2. Staff & committee members time 3. Staff & contractor time: ~ $5,000 4. Staff & contractor time: ~ $8,000	2007 -

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