Summary of 2013 Canada Goose Management Program: Egg Addling, Population Surveys, and Relocations

Okanagan Valley Goose Management Program

MAINTAINING THE BALANCE
BETWEEN PEOPLE AND GEESE

Prepared by:
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Executive Summary

This document provides a summary of the activities conducted by EBB Environmental Consulting Inc. (EBB) for the 2013 Okanagan Valley Goose Management Program. This year the program included egg-addling, population surveys, temporary relocation of moulting geese, and marking birds with coloured leg bands. Dennis Ingram of LaHawk Enterprises and Pete Wise of Wise Wildlife Control also contributed greatly to the program.

The egg-addling program consisted of pre-addling nest surveys in March followed by an intensive addling period throughout April and May. Follow-up ground surveys for population composition (e.g. % young) were conducted in June. Overall, EBB addled 968 eggs from 195 nests in the southern and central regions of the Okanagan Valley. Wise Wildlife Control addled 226 eggs from 40 nests in the Vernon region for a grand total of 1194 eggs from 235 nests. Post-addling ground surveys indicated that an estimated 14% of the post-nesting population was comprised of young-of-the-year.

This year, Canada geese were relocated from three beach areas in the Okanagan during moult and marked with coloured-leg band (yellow with black alpha-numeric codes). In total 127 geese were relocated from Vernon, 17 from Kelowna and 38 from Penticton. Geese captured in Kelowna were temporarily relocated from Waterfront Park to Bredin Ponds, geese from Penticton were temporarily relocated from Marine Way Beach to Ellis Creek and Penticton Diversion #2, and geese from Vernon were relocated from Kin Beach to MacKay Reservoir.

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1.0 Introduction

1.1 Background

The global population of Canada geese (*Branta canadensis*) and the smaller, closely related cackling geese (*Branta hutchinsii*) together comprise 12 subspecies of geese (Banks *et al*. 2004) hereafter collectively referred to as Canada geese. Prior to the 1960's, Canada geese were considered migrants and summer visitants in British Columbia (Campbell *et al*. 1990). Some nesting was documented on Haida Gwaii and northern Vancouver Island (*B. c. vancouverensis*) and in the northern interior (*B.c. moffittii)*, but the majority of geese native to British Columbia, including the Okanagan Valley were migratory, and used the region as a stopover during flights between northern nesting and southern wintering grounds.

By the 1970's, however, Canada goose numbers had increased through introduced transplants of flightless young. Young from different taxonomic stocks of Canada geese from across Canada and the United States were introduced to British Columbia with the aim of providing a sustainable population that would allow harvest and wildlife viewing opportunities.

The translocated young of the 1960's and 70's did not have the opportunity to imprint on mature geese (i.e. parents) and did not learn migratory patterns. Therefore, these geese and their progeny remained in areas to which they were relocated. Geese in the Okanagan Valley are offspring, likely hybrids, of the different stocks of geese that were transplanted decades ago. As such, these geese do no fall into one of the recognized subspecies defined by Banks *et al*. (2004).

At the time of the relocations, the British Columbia landscape also changed. Urban and rural areas increased and many areas were closed to hunting. Consequently, increased habitat with fewer population controls assisted Canada geese to become over-abundant in many areas throughout the province.

Today, urban populations of Canada geese are largely perceived as problem wildlife, due to their abundance, territorial behaviour during breeding season, crop damage, potential risks to human health, fouling of grassy areas with droppings, fecal coliform contamination of public swimming areas, damage to lawns and green spaces, as well as other economic losses (Smith *et al*. 2005). Urban Canada geese can be found on land governed by various jurisdictions including federal, provincial, municipal, and private properties such as golf courses, schools, and agricultural lands.

Canada geese, like all waterfowl in Canada, are specifically protected under the federal *Migratory Birds Convention Act* and pursuant *Migratory Bird Regulations*. Thus, any attempts to

manage geese must abide by the federal Act as well as any provincial and municipal regulations that apply in their respective regions.

1.2 Regional Background

The Okanagan Valley in the interior of British Columbia is coping with a serious goose management issue. Canada geese are fouling green spaces and contaminating lake waters to such an extent that they pose a risk to human health and the associated economic losses from tourism and recreation. To this end, communities and stakeholders of the Okanagan Valley have formed an Okanagan Regional Goose Management Committee (ORGMC) to implement a unified and landscape-level approach to goose management throughout the region. In 2013, contributing partners included:

- City of Vernon
- District of Lake Country
- Central Okanagan Regional District
- City of Kelowna
- Glenmore-Ellison Improvement District
- District of West Kelowna
- District of Peachland
- District of Summerland
- City of Penticton
- Regional District of Okanagan-Similkameen
- Okanagan Falls
- Town of Oliver
- Town of Osoyoos
- Westbank First Nation
- Western Canada Turfgrass Association
- British Columbia Golf Superintendents—Interior Region.

1.3 Management

The Okanagan Regional Goose Management Strategy and Action Plan (Robertson Environmental and Ophiuchus Consulting 2006) drafted for the ORGMC identified several management options to control and reduce the population of urban Canada geese in the region. These options were adopted by the ORGMC and are being implemented by EBB Environmental Consulting Inc. (EBB) and other contractors (e.g. Wise Wildlife Control, LaHawk Enterprises). This specific document describes the protocol and results of the seventh season

of the egg addling program, which was implemented in the spring of 2013, and the relocation and leg-banding program which is in its second year.

1.4 Coordination and Implementation of a Valley-Wide Egg Addling Program

Egg addling is a relatively simple, cost-effective and humane tool for controlling the reproductive output of Canada geese. To be effective, crews must be trained to access nesting areas and addle eggs in such a way that geese will not attempt to immediately re-nest. In addition, crews must be thorough, ensuring all nests in a targeted area are included. Many of the target egg addling areas are within public viewing, thus crew members must be able to sensitively address questions and refer the public to the program coordinator and other educational resources for additional information.

In addition to the actual addling, the early years of the program included development of an egg addling protocol manual, including mapping nest locations using GPS technology, and maintaining records of nest sites and addling activities.

1.5 Canada Goose Reproductive Ecology

A successful Canada goose egg addling program depends on a sound ecological approach, thus factors influencing their behaviour and reproductive output must be understood. Canada geese usually build nests within sight of water; however, will find alternative sites if necessary (Elphick *et al*. 2001, Environment Canada 2003). Their preferred nesting locations are islands, including the tops of beaver lodges and floating mats of vegetation. First-time breeders exhibit high natal fidelity, and will attempt to nest in the same area they were fledged (Mowbray *et al*. 2002). Geese will return to old nest sites, or nearby locations year after year. This knowledge can be helpful for finding nests in successive years of addling.

Nests are generally simple, constructed out of weeds, twigs and other local vegetation (Figure 1). Females will use their bodies to make a depression in the vegetative mound, and insulate it with down and feathers removed from her breast, resulting in a noticeable area of fewer feathers (brood patch). In the Okanagan, EBB has observed geese that have adapted their nest construction to urban environments. Nests have been created from scrapes in flower planters; depressions in sagging boat covers; conifer needle debris on roof-tops, and ripped stuffing from patio/house boat furniture.

Females are responsible for building nests and incubating eggs. During this time, the male will diligently “mate guard” ensuring other geese and predators do not disturb the female. A good indicator of a nearby nest is a lone male, particularly if he is in an alert posture with his head

and neck held high, or as he is approached, he lowers his head and neck in a threatening stance and hisses. Our experience suggests that a male may be >100 m away from his mate and nest (i.e., across a wetland), but provided he maintains her within his sight line, he will remain in a vigilant stance. This knowledge is helpful when using a male to locate a potential nest site.

During mild climatic conditions, Canada geese may begin nesting as early as February. Egg-laying is initiated in March and can continue into late May. Females typically lay 4-7 creamy white eggs (average is 5; total can be greater than 12) on consecutive days. They may also lay replacement eggs if originals are preyed upon, or the nest is destroyed early in the incubation period, which is approximately 25-27 days (Mowbray *et al*. 2002, Environment Canada 2003).

Figure 1. Canada goose nest in shed

2.0 Methodology

2.1 Administration

2.1.1 Permits

In 2013, EBB obtained permits from Environment Canada for goose egg addling, relocation, scientific salvage, and addling in the Vaseux Lake Migratory Bird Sanctuary. Kate Hagmeier of

EBB holds a master bird banding permit from the Canadian Bird Banding Office for marking Canada geese. In addition, EBB renewed its five year permit from BC Parks for accessing and addling within Vaseux Lake, Fintry, Sun-Oka Beach, Kalamalka Lake, Christie Memorial, and Okanagan Mountain Provincial Parks (Table 1).

This year (2013) was the second year that Environment Canada required individual landowner authorization forms in addition to the overarching OVGMP permit for any addling activities that occurred on private lands. Under this permitting structure, the egg addling permit EBB received for the OVGMP was sufficient for activities conducted on public lands owned or managed by members of the ORGMC (e.g. municipal parks). Any additional lands (e.g. private residences, institutions, docks/groins above the high water mark) required the signature of a landowner or designated manager attesting EBB was addling on their behalf.

Table 1. Permit Summary

Permit	Issuer
Canada Goose Egg Addling Permit for OVGMP	Environment Canada (Canadian Wildlife Service)
Landowner attestations as required to augment the OVGMP addling permit	Environment Canada (Canadian Wildlife Service)
Relocation Permits (site-specific)	Environment Canada (Canadian Wildlife Service)
Scientific Salvage	Environment Canada (Canadian Wildlife Service)
Canada Goose Egg Addling Permit, Vaseux Lake Migratory Bird Sanctuary	Environment Canada (Canadian Wildlife Service)
Scientific Permit to Capture and Band Migratory Birds	Environment Canada (Bird Banding Office)
Research and Education Park Use Permit	BC Parks/Ministry of Environment

2.1.2 Media and Public Involvement

A toll number (1-877-943-3209) and e-mail address (coordinator@okanagangooseplan.com) were established in 2007 to enable the public to inform EBB of nest locations. These contacts remain active throughout the year so the public can call with general questions. As well, media statements were released throughout the addling season to inform and encourage the public to report nests or observations of leg-banded birds.

2.2 Field Program

2.2.1 Pairs Surveys

Prior to the addling season, pairs of geese and early nests were located and identified. This allowed crews to become familiar with the landscape for efficient addling when egg laying occurred. Nest surveys were conducted in the last week of March. Field crew surveyed lands (e.g. parks, playing fields, beach accesses) that EBB had permission to access. Pairs and lone Canada geese were identified and nest searches were conducted in these locations. Flocks of geese were noted, but these groups were typically not nesting (e.g., have not reached maturity or have lost their mates). Where nests were located, crew members recorded UTM coordinates as well as a general description of the area to facilitate relocation and reporting. Nests containing eggs were addled, marked and noted following the appropriate egg addling protocol (Section 2.2.2). Crews did not use nest-marking techniques (e.g. flagging tape), as this can attract the general public or predators to the nest. In general, if nests are destroyed, the pair will likely re-nest, thus defeating the purpose of addling.

The pair survey also acted as a time to engage with landowners regarding authorizations. Any information requirements or authorizations sorted out prior to the peak of nesting saved time during the field-intensive addling season.

2.2.2 Egg Addling

Daily addling occurred between April 2 and May 12. Spot checks and responses to nest reports from the public were conducted until the end of May. Nests that were located during the pre-addling nest surveys were visited first. Nest searching continued with the expectation that most newly located nests would contain eggs, and this was generally the case. Crews worked in pairs and followed the United States Humane Society Canada Goose Egg-addling Protocol (HSUS 2009) and the recently published ***Best Practices for Destroying Eggs or Preventing Hatching: Canada Goose Management*** (Environment Canada 2011). During addling, one crew member moved the female or pair away from the nest while the other worked at the nest. In high density nest areas (e.g. Vaseux Lake), where there were many agitated geese, working in threes and fours was more effective. The crew member working at the nest counted, addled and marked each egg with an “X”. In high density areas crews numbered the nests in the field to make rechecking easier and allow them to identify new nests quickly. In this case, marking was such that all the eggs in Nest 1 were labelled “1”, all the eggs in Nest 2 were labelled “2” etc. In addition, the crew member at the nest took GPS coordinates (NAD 83) and any additional field notes. Nests were rechecked once (occasionally twice) about one week following the first addling visit.

Canada goose eggs are humanely addled until about 14 days of incubation (HSUS 2009). If there was concern that eggs were older than 14 days, crews performed a float test to estimate their age (Section 2.2.2.2). Float tests were also routinely performed during the last part of the egg addling season. If eggs were less than 14 days old, the crew member working at the nest addled each egg, either by shaking or oiling.

2.2.2.1 Oiling and Shaking Eggs

Oiling was introduced into the 2011 addling program, but was restricted from federal lands (e.g. Vaseux Lake). To sterilize eggs with oil, eggs were either dipped in a container of food-grade corn oil and removed with a slotted spoon, or misted with oil from a spray bottle. Only a light coating of oil is necessary to stop gas exchange and interrupt egg development (HSUS 2009).

When addling by shaking, the egg is vigorously shaken for about one minute. In doing so, the yolk is broken, and the egg contents "slosh", which can be heard and felt by the field technician.

The effectiveness and efficiency (i.e. timing and ease of use) of the two addling methods were compared in 2011. In general, during the 2013 program, the crew found the logistics of shaking simpler (i.e. no need for extra equipment and the oil can be messy), but oiling is physically easier and a less aggressive appearing in areas where the public may be sensitive to the addling program. In addition, eggs early in incubation (i.e. 1-2 days) are not easily shaken and oiling is more effective on these nests. It continues to be up to the discretion of the crew which technique should be applied at each location.

2.2.2.2 Float Tests

Float tests were used to determine the incubation stage of an egg. If the incubation stage of the eggs was unknown, the addling crew used a bucket of water to perform a float test. Eggs that did not float were less than two weeks old and were humanely addled. Eggs that rose near the surface were older than two weeks and were not addled (Figure 2; HSUS 2009).

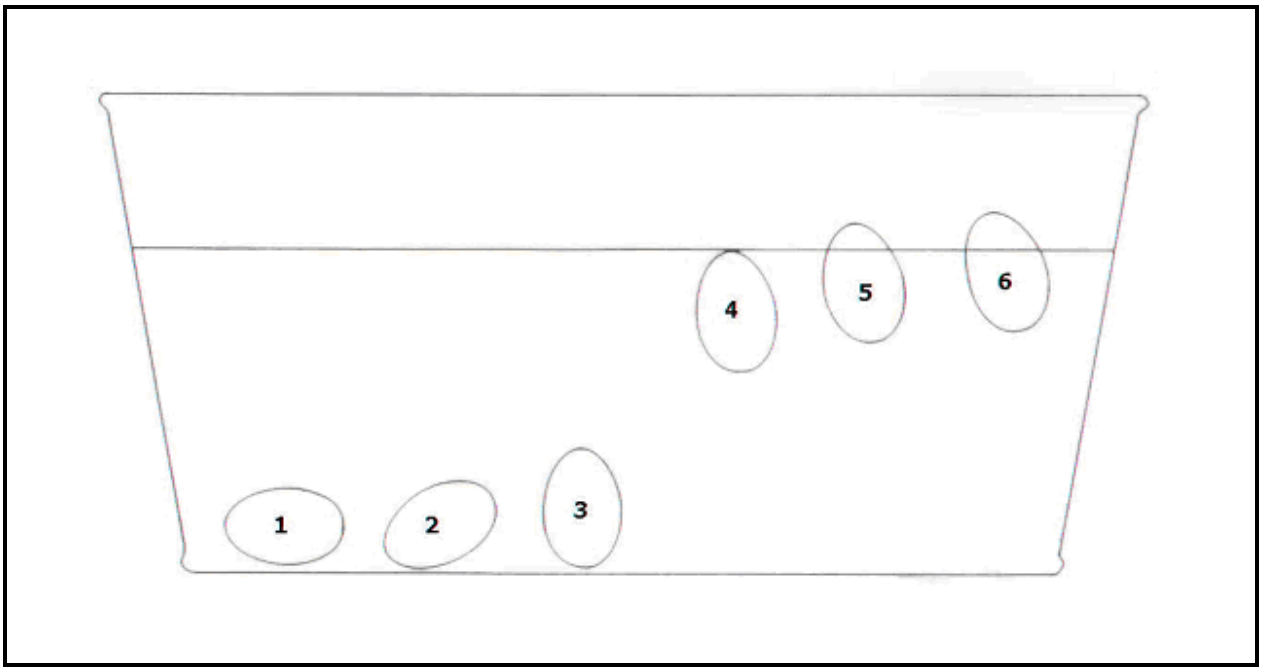

Figure 2. Cross-Section of a Float Test: Stages 1-3 represent eggs incubated for less than 2 weeks; Stages 4-6 represent eggs incubated for 14-27 days (Diagram from HSUS Canada Goose Egg Addling Protocol)

2.2.3 Follow-Up Surveys

Follow-up surveys for goslings were conducted in June (following addling) to help identify areas where nests were missed and estimate the number of young in the population. The entire valley was surveyed, so the estimate contained data from jurisdictions that did not participate in the egg addling program.

2.2.4 Banding and Temporary Relocation

This was the second year that geese were marked with leg-bands. Bird-banding is the practice of applying unique markers (bands) to legs of birds. In doing so, if a marked bird is observed by a birdwatcher or recovered by a hunter, the information can be reported and data on age, survival, habitat use, and migratory patterns can be discerned. Canada geese were captured during moult at three locations representing the three general regions in the Okanagan Valley:

1. Marina Way Beach, Penticton (South Okanagan)
2. Waterfront Park, Kelowna (Central Okanagan
3. Kin Beach, Vernon (North Okanagan).

At each location, a temporary corral was set-up along the shoreline that guided geese into a large trailer modified to hold and transport geese (Figures 3-4). Early each morning as the

geese approached the shore to graze and loaf, the team calmly directed the geese into the corral from the water using canoes and kayaks. Team members positioned on the shore closed the corral after the geese were inside and herded them into the trailer. All captures and relocations were done according to ***Best Practices for Capturing, Transporting and Caring for Relocated Canada Geese*** (Environment Canada 2011).

EBB acquired permits from Environment Canada on the behalf of the Cities of Penticton and Vermom to relocate geese that were captured from Marina Way Beach (Penticton) and Kin Beach (Vernon). LaHawk acquired a permit to relocate geese captured at Waterfront Park, Kelowna. Geese were banded at the relocation sites then released. Two leg bands were applied to each goose: a standard US Fish and Wildlife Service-Environment Canada metal leg-band was applied to the right leg and a colour-coded plastic leg band was applied to the left. The metal band is engraved with a unique numeric code. Plastic leg bands were yellow with black, individual, three character, alpha-numeric codes that can be read at a distance with binoculars or a spotting scope (up to 300 m).

Figure 3. Snowfence corral leading to modified trailer at Kin Beach, Vernon (geese in the corral are plastic decoys)

Figure 4. Banding team directing geese into the corral at Marina Way Beach, Penticton.

3.0 Results

3.1 Egg Addling

The mean clutch size was 5-6 eggs, which is consistent with most years of the program and common for geese. In total 195 nests, containing 968 eggs were addled by EBB. Wise Wildlife Control addled an additional 226 eggs from 40 nests in the Vernon region, and 1 nest in Kelowna. Table 2 provides a summary of all egg addling data. An overview is provided in Figure 5. Regional data are detailed in Appendix A. In addition, crews identified 17 nests that were not addled/inaccessible (e.g., landowner was unavailable for consent; landowner did not want the nest addled; nest identified after humane addling window; nest in unsafe working conditions).

Table 2. Okanagan Valley Egg Addling Data Summary

Nest Element	Value
Minimum Clutch Size	1
Maximum Clutch Size	15
Mean Clutch Size	5.1 (5)
Total Number of Nests	235
Total Number of Eggs	1194
Number of Geese Prevented from Entering Population (approximately 75% of addled eggs)	896

Similar to previous years, EBB found that the highest density and number of nests were in the Vaseux Lake Migratory Bird Sanctuary. This year, crews identified 77 nests (425 eggs) in the sanctuary. The number continues on a downward trend (93 nests in 2012, 123 nests in 2010 and 2011). However, this still accounts approximately 36% of the overall total eggs addled this year.

3.1.1 Banding and Temporary Relocation

Geese captured in the City of Penticton were relocated to two sites—Penticton Reservoir Diversion (23 geese released) and Ellis Creek Dam #4 (15 geese). Of the 38 geese captured in Penticton, 23 were banded in 2012, 14 were newly banded this year and one was released unbanded (downy gosling). Geese captured from Waterfront Park in Kelowna were relocated to Bredin Pond. Here, 13 geese were newly banded. Three hatch year birds were released without banding. One-hundred and twenty-seven geese were captured in Vernon. All hatch year birds were released as soon as we arrived at the release site in addition to some after-hatch year birds as we wanted to hold birds for as short a time as possible. Forty-one birds were banded with new bands and eight birds had bands from 2012.

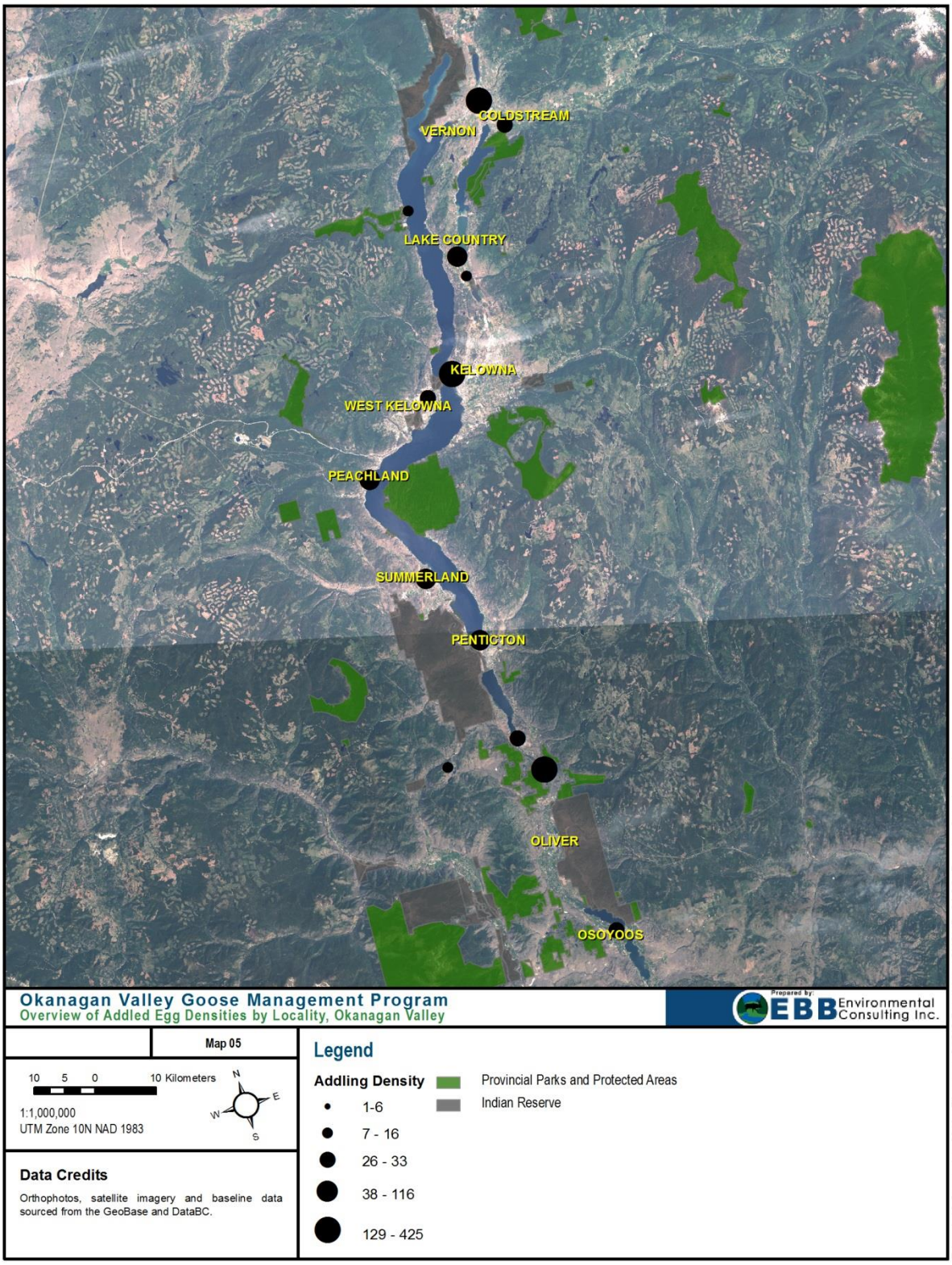

Figure 5. Egg Addling Density for the 2013 Field Season (Valley Overview)

3.2 Media and Public Involvement

EBB kept a record of all calls and emails received at the office. Records include:

- 27 phone calls on the toll-free reporting nest locations;
- 26 email reporting nest locations;
- 4 emails after the addling program was completed, requesting additional information on goose management (particularly during the moulting season);
- 5 media interviews (2 live radio interviews, 3 over-the phone conversations for print).

The number of calls and reports has increased since the beginning of the program (2007) in particular the use of the "report-a-nest" tab on the webpage. A press release in April generated newspaper articles in different publications along the valley, which were generally supportive of the program and its humane approach.

3.3 Follow-Up Surveys

During the ground surveys in June, EBB recorded 979 geese. We accessed more areas than we had in past surveys (including north Okanagan Lake near Vernon, Twin Lakes Ranch, and smaller lakes west of the core project area). The population composition was 837 adults and 142 juveniles (14.5%; Table 3). The distribution of juveniles varied greatly across the landscape. In areas where addling was widespread, juveniles did not occur (e.g. Vasuex Lake), but juvenile numbers were high in specific pockets where addling was not widespread (e.g., north Okanagan Lake).

The the geographic areas surveyed in 2007-2011 had a population composition of 11.2% young (for comparison across years).

3.4 Leg Band Data

During all field activities EBB crew observed geese for leg-bands. Ten nest locations were from banded birds. In addition, leg-band data returns were provided from the National Bird Banding Office (i.e. observations that were reported to that office were forwarded to EBB; Table 4). Regional summaries of nest locations are provided in the appendices, including nests of marked birds.

Table 3. Summary Data for 2013 Follow-up Surveys

Easting	Northing	Region	Site	Adults	Juveniles	Total
319912	5533797	West Kelowna	Bear Creek, Log Booms	68	4	72
312155	5498273	Naramata	Mill Rd	20	11	31
312971	5486912	Penticton	Yacht and Tennis Club	10	0	10
311114	5486483	Penticton	SS Sicamous	29	7	36
302704	5516654	Peachland	Peachland	8	0	8
311344	5521354	West Kelowna	Gellatly field	4	0	4
311816	5522294	West Kelowna	Rotary Beach	18	35	53
312235	5522422	West Kelowna	West Kelowna	6	0	6
313274	5522037	West Kelowna	West Kelowna	42	0	42
314398	5522518	West Kelowna	Pritchard Park	26	0	26
318683	5528096	West Kelowna	Shelter Bay Marina	29	0	29
320521	5529840	Kelowna	Rotary Marsh	4	3	7
320548	5529764	Kelowna	Rotary Marsh	2	11	13
312061	5525788	West Kelowna	Shannon Lake	8	2	10
311101	5480945	Penticton	Skaha Lake	38	0	38
312748	5467556	OK Falls	OK Falls	19	10	29
312326	5462884	Okanagan Similkameen	Mahoney Lake	4	4	8
315996	5462769	Vaseux Lake	Vaseux Lake	224	0	224
315996	5462769	Okanagan Similkameen	Twin Lake Ranch	12	26	38
300548	5465481	Okanagan Similkameen	Twin Lake	36	8	44
299447	5468374	Okanagan Similkameen	Yellow Lake	6	2	8
330652	5554290	Oyama	Kaloya Park	112	0	112
330724	55333470	Oyama	Traditional School	2	2	4
332174	5568984	Vernon	Kin Beach	110	17	127
		Total		**837**	**142**	**979**

Table 4. Leg-band data returns from national bird banding office:

Band Number	Band Colour	Date	Location	Original Banding Site
1048-81504	Red	08/27/12	Summerland	Penticton
1048-81564	White	08/03/12	Vernon	Vernon
1048-81569	White	01/27/13	Oroville, USA	Vernon
1048-81574	White	02/23/13	Vernon	Vernon
n/a	Red	12/03/12	Penticton	Penticton

4.0 Discussion

EBB considers the 2013 addling season successful. Close to 1200 eggs were addled in the Okanagan Valley. Taking natural mortality into account, addling prevented an estimated 896 new geese from entering the population. This number may be higher, as the survival rate of urban geese is substantially higher than non-urban populations due to reduced pressure from predators, hunting, physical stresses of long-distance migration, and stochastic variation in resource availability (Smith *et al*. 2005).

The program also continued to be successful in terms of its reception by the general public. The public used the toll line and email to help crews locate nest sites and were generally supportive of the goal to humanely reduce the Canada goose population through addling. The program continued to be well-supported by the media. Discussion of the issue and well-informed explanations of the program will serve to maintain or increase the program profile, public buy-in and participation.

In 2013, new partners contributed to the ORGMP. These included Westbank First Nation and Okanagan Falls. The addition of new partners provides an opportunity to access new areas for nest surveys and potential addling. In addition, this year EBB met with Elder Richard Armstrong of the Penticton Indian Band. Mr. Armstrong is a Traditional Ecological Knowledge Keeper with a deep respect and knowledge of Okanagan ecological communities. He supported our goal to control non-native species where they impact natural ecosystems and has provided permission to access Locatee Lands adjacent to the Channel. These lands will be surveyed in 2014. Increasing program awareness over the coming years will that ensure new partners and the entire valley benefit from a thorough regional approach.

As in previous years, some located nests were impossible for field crew to access, either due to safety issues (e.g. cliff or pole-nesting birds), or nests located on private property where access was denied. As well, non-participating jurisdictions were not surveyed for nests and likely produce a number of eggs that continue to contribute to the Okanagan Valley goose population.

Our follow-up surveys suggested that an estimated 14.5% of the valley-wide population was comprised of juveniles. Although well below natural (unmanaged) population production levels which can be greater than 50%, this percentage is higher than we have seen in recent years. Looking at Table 3 the results show that in jurisdictions where addling occurred, population growth was well controlled. However, where addling was not widespread or did not occur, juvenile numbers were high. Specific high numbers of juveniles were observed at Twin Lake Ranch, District of West Kelowna (Rotary Beach) and Vernon (Kin Beach area).

In addition we witnessed young (1-2 day old goslings) entering the study area via creek systems that drained into Okanagan Lake. Geese traversed to bigger (safer) water after their young had hatched along these linear creek systems. Creeks have the potential to collect several birds and deliver them into the study area (i.e., creeks such as Mission Creek source east of the study area). This has likely always accounted for some young in the Okanagan goose population; however, this year our crews observed more of these occurrences than in past field seasons. We speculate that some adult pairs that have failed over successive years (due to the addling program) within the study area may have relocated. Some pairs may have also moved into less visible locations after owners "goose-proofed" their properties.

Using these data, we identified areas where efforts should be increased to engage the public and increase awareness about goose management. In doing so more nest reports and access to lands will increase the ability of crews to successfully find and addle nests, particularly outside the urban core areas.

Increased band data will also assist with understanding goose patterns in the valley. As the band observation database grows, our understanding on movements, nesting, longevity and population mixing will improve.

As in the past, large numbers of flocking geese were observed in the District of West Kelowna (e.g. Powers Creek). In addition, the district hosted moulting geese during summer months. In general, moulting geese travel to habitat with open water, cover, and forage to reduce predation risk during their flightless period. The Powers Creek area offers perfect habitat for moulting geese and is centrally located along the valley so that geese from throughout the valley may locally migrate to the District of Westside for their moult.

Geese are long lived (up to 20 years) and with addling as the only population control tool, we have not yet seen enough natural attrition to confidently confirm that the existing adult population has decreased. However, informal discussions with landowners and managers on lands we accessed, praise program results. We received many comments about the decrease in goose conflicts and the reduced efforts required by landowners to discourage geese from nesting on their lands.

However, as long as some geese are still breeding, the population may be stable for some years. Initial population modeling (see 2007 and 2011 reports) predicts the population increases slightly before it decreases in approximately 2015 or 2016. According to the modeling and the field data results, what is not happening is an exponential increase in the population that would have started by year 2013 without addling as a form of population control. Aerial population surveys are planned for 2014. These data will help track the population growth.

In addition to Vaseux Lake, other areas likely exist that act as large source populations in the Valley. The aerial surveys (2007, 2011) indicated large numbers of geese along the northern shoreline of the lake. We do not know if these are birds breeding outside the region and coming back to the lake to moult or if they are locally nesting. These areas are less populated by people and therefore, less conflict and less investigation into goose presence has occurred here. However, the number of recorded nests in Vernon did increase in 2013. In particular, a concentration of 13 nests occurred at Mackay Reservoir. This site will need consistent addling pressure in the coming years to control its growth.

Other factors that contribute to changes in population levels include:

1. The Okanagan Valley Canada Goose Population may experience natural fluctuations that contribute to varying annual reproductive rates;
2. Some geese, after experiencing breeding failure or changes to nesting locations such as covering of planters or boat covers, may have found more reclusive nesting locations and/or, may have moved outside the geographic area targeted by the addling program, to breed, but returned to the program area after hatching their clutch;
3. Geese that would otherwise have hatched from addled eggs in the previous years of the program are not entering the breeding population.

5.0 Recommendations

On review of this year's season, the following recommendations have been provided to ensure continued success. These recommendations include items that are on-going or newly identified. Action items from previous years that were addressed have been removed. Recommendations are as follows:

- Achieve greater buy-in from new partners, stakeholders and the general public

  Action: Draft an article for local distribution outlining the origins of geese in the region and rationale for management.

  Action: Promote program activities at conferences or other forums (e.g. environmental fairs, Western Canada Turfgrass Association conference);

  Action: Have committee members discuss the issue with their counterparts in other jurisdictions, engage councils where appropriate; discuss the issue with potential partners such as golf course superintendents, hunting/fishing clubs, naturalist groups.

- Develop Best Management Practices (BMPs) that are available at municipal halls and online. These could be developed for landscaping, development (i.e. creating goose unfriendly landscapes when planning neighbourhoods, buildings and parks), and water management (e.g., retention pond or aesthetic water feature designs that do not encourage geese).

- Improve leg-band reporting from jurisdictional staff and general public

  Action: Advise committee members on the value of incidental leg band sighting data. Have committee members discuss the issue with their staff and provide a reporting mechanism.

  Action: Improve web-based reporting mechanism (consider adding mapping as a visual tool).

- Limit nest destruction on private property or boat covers. Destruction of nests within a breeding season can result in geese re-nesting in new locations, and addling crews missing the new nest;

  Action: Encourage residents to prevent nesting (e.g. by eliminating sag in boat covers) by providing information in media releases following breeding season, or early in spring; have bylaw officers notify residents of laws regarding protection of breeding birds and their nests.

- Continue to build public awareness, so the program's email and toll number are utilized more by the public

  Action: Continue website and distribute OVGMP pamphlets; have bylaw officers draw attention to the signs, have parks staff discuss the issue with park users;

  Action: Continue to provide an information package with a copy of the information pamphlet, landowner attestation form (required by Environment Canada),

  Action: Promote program activities at conferences or other forums (e.g. environmental fairs, Western Canada Turfgrass Association conference);

- Expand educational materials to assist partners and the general public in identifying goose breeding behaviour

Action: Where public interest is identified, provide training sessions or informational materials to resident volunteers, and/or partners such as golf course superintendents and maintenance staff, on observing and identifying goose breeding behaviour to assist in identifying nest locations

- Increase ethical population control

  Action: Examine feasibility of promoting hunting in nearby farmland and other areas open to hunting (see provincial regulations), particularly on opening weekend when geese are most susceptible.

  Action: Increase reach of program to include new potential source locations; nest surveys along the northern shoreline of the lake.

- West Kelowna: District of West Kelowna and Westbank First Nation—specific actions to control the population on the west side of the lake

  Action: increase public awareness of participation in the program so that email and phone number are utilized for goose nest locations (i.e., link to website, community notice in local newspaper and community services guides);

  Action: standard goose management signage with toll-number so people can report nests and identify the goose management as an ongoing issue in the area.

  Action: intensive and consistent hazing in problem areas (e.g. Powers Creek) in the spring and early summer to prevent flocks from congregating.

  Action: temporary relocation away from conflict areas during moult. Assist with identifying a relocation site that satisfies Environment Canada conditions. Note: banding birds could be an option to help identify where they source from.

  Action: Modify landscape (e.g. keep grasses mowed long, install barriers and points of access between lake and shoreline).

  Action: Where (if) feasible assist landowners in applying for damage permit to lethally remove geese on farmed lands.

- North Okanagan/Greater Vernon Area—specific actions

  Action: Continued addling pressure at Mackay Reservoir to prevent nesting colony expansion.

Action: Where (if) feasible assist landowners in applying for damage permit to lethally remove geese on farmed lands.

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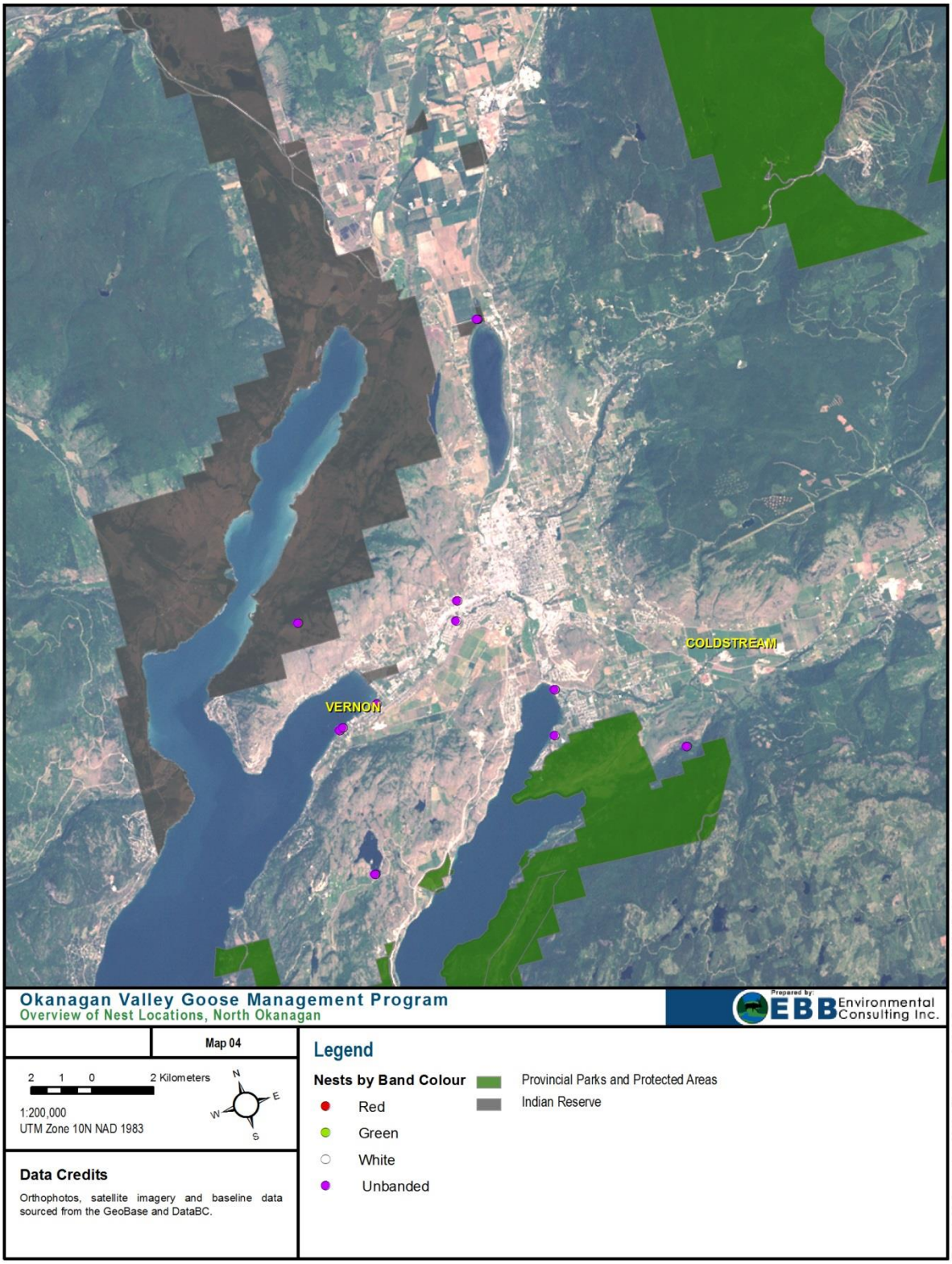
APPENDIX A

Egg Addling Data: Regional Summaries

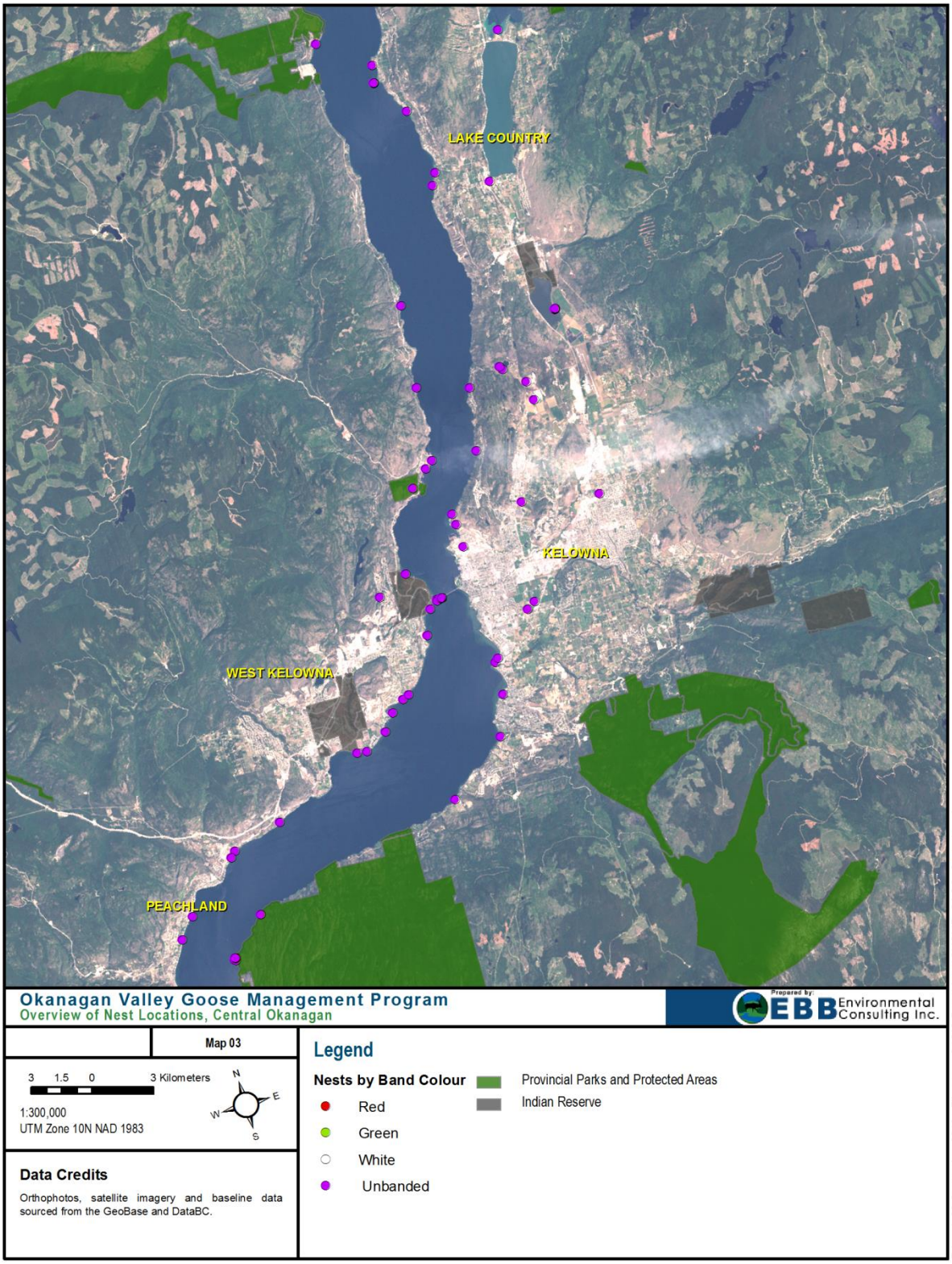
North Okanagan



Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
North Okanagan	Mackay Reservoir #1	11	331117	5562449	**4**
North Okanagan	Mackay Reservoir #10	11	331117	5562449	**4**
North Okanagan	Mackay Reservoir #11	11	331117	5562449	**7**
North Okanagan	Mackay Reservoir #12	11	331117	5562449	**6**
North Okanagan	Mackay Reservoir #13	11	331117	5562449	**5**
North Okanagan	Mackay Reservoir #2	11	331117	5562449	**7**
North Okanagan	Mackay Reservoir #3	11	331117	5562449	**7**
North Okanagan	Mackay Reservoir #4	11	331117	5562449	**5**
North Okanagan	Mackay Reservoir #5	11	331117	5562449	**4**
North Okanagan	Mackay Reservoir #6	11	331117	5562449	**4**
North Okanagan	Mackay Reservoir #7	11	331117	5562449	**7**
North Okanagan	Mackay Reservoir #8	11	331117	5562449	**5**
North Okanagan	Mackay Reservoir #9	11	331117	5562449	**6**
North Okanagan	Deep Lake	11	342126	5563444	**5**
North Okanagan	Deep Lake	11	342126	5563444	**5**
North Okanagan	Private Rd off Kidston	11	338092	5565067	**6**
North Okanagan	Kal Lake Lagoon #1	11	338538	5566502	**5**
North Okanagan	Kal Lake Lagoon #2	11	338538	5566502	**6**
North Okanagan	Kal Lake Lagoon #3	11	338538	5566502	**4**
North Okanagan	Yacht Club	11	331392	5567310	**6**
North Okanagan	Yacht Club	11	331392	5567310	**6**
North Okanagan	Yacht Club	11	331392	5567310	**4**
North Okanagan	Yacht Club	11	331392	5567310	**4**
North Okanagan	Paddlewheel Fishing Boat #1	11	331518	5567359	**15**
North Okanagan	Paddlewheel Fishing Boat #2	11	331518	5567359	**5**
North Okanagan	Paddlewheel Log Boom #1	11	331518	5567359	**6**
North Okanagan	Paddlewheel Log Boom #2	11	331518	5567359	**6**
North Okanagan	Paddlewheel Log Boom #3	11	331518	5567359	**4**
North Okanagan	Paddlewheel Log Boom #4	11	331518	5567359	**7**
North Okanagan	The Strand Okanagan Ave	11	332811	5567779	**6**
North Okanagan	Water Reclamation	11	336113	5569612	**5**
North Okanagan	Cross Rock #1	11	336332	5570226	**7**
North Okanagan	Cross Rock #2	11	336332	5570226	**7**
North Okanagan	Cross Rock #3	11	336332	5570226	**5**
North Okanagan	39 Ave Reservoir # 2	11	331117	5571082	**4**
North Okanagan	39 Ave Reservoir #1	11	331117	5571082	**4**
North Okanagan	North End	11	339694	5578868	**7**
North Okanagan	North End	11	339694	5578868	**5**

Nest Element	Value
Minimum Clutch Size	4
Maximum Clutch Size	15
Mean Clutch Size	5.65 (6)
Total Number of Nests	40
Total Number of Eggs	226

Central Okanagan

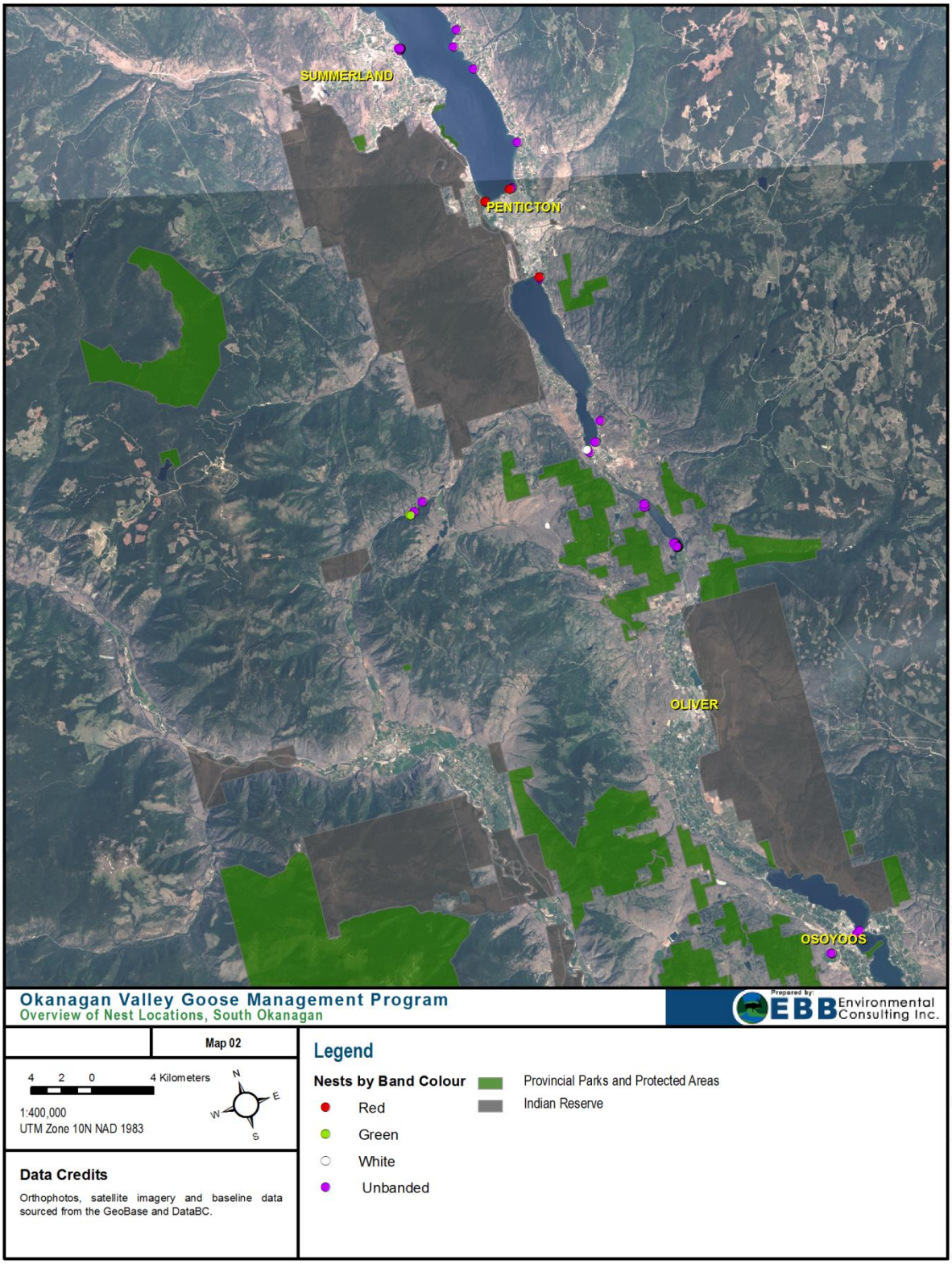


Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
Naramata	4395 Mill Lane	11	312416	5497971	**6**
Peachland	Okanagan Lake	11	305559	5509088	**1**
Peachland	Rattlesnake Island	11	304266	5514073	**3**
Peachland	Rattlesnake Island	11	304201	5514121	**2**
Peachland	Rattlesnake Island	11	304301	5514173	**4**
Peachland	Rattlesnake Island	11	304275	5514178	**2**
Peachland	Rattlesnake Island	11	304252	5514190	**1**
Peachland	Peachland Shed	11	302044	5515810	**7**
Peachland	Okanagan Lake	11	306102	5515855	**1**
Peachland	Okanagan Lake	11	306106	5515871	**1**
Peachland	Pentownia Marina	11	302860	5516768	**7**
Peachland	Okanagan Lake	11	316921	5518471	**7**
Peachland	Davis Cove	11	305527	5518957	**3**
Peachland	Okanagan Lake	11	305805	5519223	**2**
Peachland	Okanagan Lake	11	308340	5519919	**7**
Peachland	Okanagan Lake	11	319965	5520751	**8**
Peachland	Okanagan Lake	11	313462	5522007	**7**
Peachland	Okanagan Lake	11	312985	5522070	**5**
Peachland	Okanagan Lake	11	314620	5522654	**7**
Peachland	Okanagan Lake	11	320688	5522709	**6**
Peachland	Okanagan Lake	11	315229	5523445	**6**
Peachland	Okanagan Lake	11	315912	5523915	**1**
Peachland	Okanagan Lake	11	316247	5524061	**6**
Peachland	Okanagan Lake	11	320788	5524341	**7**
Kelowna	Okanagan Lake	11	320978	5524503	**1**
Peachland	Okanagan Lake	11	320977	5524505	**6**
Kelowna	Munson Lake	11	323105	5526374	**7**
Peachland	Okanagan Lake	11	317968	5526576	**3**
Kelowna	Munson Pond	11	323531	5526636	**2**
West Kelowna	Shelter Bay Marina	11	318515	5527762	**6**
Kelowna	Kelowna Bridge	11	318952	5528073	**6**
Kelowna	Kelowna Bridge	11	319116	5528126	**5**
Kelowna	Kelowna Bridge	11	319117	5528128	**7**
Peachland	Okanagan Lake	11	318971	5528134	**6**
Kelowna	Kelowna Bridge	11	319237	5528137	**7**
Kelowna	Kelowna Bridge	11	319188	5528138	**11**
Kelowna	Kelowna Bridge	11	319165	5528140	**6**
Kelowna	Kelowna Bridge	11	319202	5528146	**4**
West Kelowna	Rose Valley Elementary	11	316305	5529077	**7**
West Kelowna	Okanagan Lake	11	317853	5529794	**5**
Kelowna	Industrial Park	11	320980	5530241	**8**

Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
Kelowna	Chichester Wetlands	11	328146	5530760	**8**
Kelowna	Okanagan Lake	11	320944	5531397	**6**
Kelowna	Glenn Valley Wetlands	11	324370	5531491	**7**
Kelowna	Okanagan Lake	11	320914	5531926	**4**
West Kelowna	Bear Creek Park	11	319438	5533722	**2**
West Kelowna	Okanagan Lake	11	320333	5534433	**1**
Kelowna	Okanagan Lake	11	322965	5534551	**5**
West Kelowna	Okanagan Lake	11	320725	5534746	**4**
Kelowna	Kelowna Landfill	11	326419	5536141	**5**
Kelowna	Kelowna Landfill	11	326320	5537088	**1**
Kelowna	Okanagan Lake	11	323567	5537629	**3**
Kelowna	McKinley Reservoir	11	325374	5538023	**7**
Kelowna	McKinley Reservoir	11	325286	5538185	**6**
West Kelowna	Okanagan Lake	11	321056	5538388	**3**
Kelowna	Duck Lake Island	11	328706	5540085	**3**
Kelowna	Duck Lake Island	11	328712	5540095	**5**
Kelowna	Duck Lake Island	11	328719	5540102	**1**
Kelowna	Duck Lake Island	11	328727	5540109	**1**
Kelowna	Duck Lake Island	11	328732	5540113	**3**
West Kelowna	Okanagan Lake	11	321509	5542473	**5**
Winfield	Woodlake Campground	11	327494	5547042	**5**
Lake Country	Okanagan Lake	11	324738	5547680	**5**
Lake Country	Okanagan Lake	11	325042	5548240	**4**
Winfield	Okanagan Lake	11	324607	5551547	**7**
Lake Country	James Grant Island	11	323455	5553343	**4**
Lake Country	James Grant Island	11	323461	5553347	**6**
Lake Country	James Grant Island	11	323470	5553355	**5**
Lake Country	James Grant Island	11	323467	5553366	**5**
Lake Country	James Grant Island	11	323463	5553367	**1**
Lake Country	James Grant Island	11	323474	5553368	**4**
Lake Country	James Grant Island	11	323460	5553371	**2**
Lake Country	Oyama Camp Hatikvah	11	330074	5554065	**4**
Lake Country	Okanagan Lake	11	323637	5554200	**6**
Fintry	Okanagan Lake	11	321310	5556019	**7**

Nest Element	Value
Minimum Clutch Size	1
Maximum Clutch Size	11
Mean Clutch Size	4.6 (5)
Total Number of Nests	75
Total Number of Eggs	349

South Okanagan



Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
Osoyoos	Sewage Lagoons	11	318129	5432744	**7**
Osoyoos	Sewage Lagoons	11	318122	5432754	**6**
Osoyoos	Osoyoos Lake Island	11	320105	5433488	**13**
Osoyoos	Osoyoos Peninsula	11	320326	5433636	**5**
Vaseaux Lake	Hatfield Island	11	316300	5461202	**4**
Vaseaux Lake	Hatfield Island	11	316315	5461202	**5**
Vaseaux Lake	Hatfield Island	11	316311	5461205	**6**
Vaseaux Lake	Hatfield Island	11	316301	5461210	**6**
Vaseaux Lake	Hatfield Island	11	316296	5461214	**5**
Vaseaux Lake	Hatfield Island	11	316296	5461214	**1**
Vaseaux Lake	Hatfield Island	11	316312	5461218	**6**
Vaseaux Lake	Hatfield Island	11	316312	5461218	**11**
Vaseaux Lake	Hatfield Island	11	316303	5461219	**7**
Vaseaux Lake	Hatfield Island	11	316293	5461225	**7**
Vaseaux Lake	Hatfield Island	11	316288	5461228	**7**
Vaseaux Lake	Hatfield Island	11	316285	5461234	**8**
Vaseaux Lake	Hatfield Island	11	316310	5461236	**9**
Vaseaux Lake	Hatfield Island	11	316303	5461239	**8**
Vaseaux Lake	Hatfield Island	11	316287	5461242	**6**
Vaseaux Lake	Hatfield Island	11	316300	5461245	**7**
Vaseaux Lake	Hatfield Island	11	316308	5461247	**5**
Vaseaux Lake	Hatfield Island	11	316296	5461248	**6**
Vaseaux Lake	Hatfield Island	11	316299	5461253	**1**
Vaseaux Lake	Hatfield Island	11	316282	5461259	**7**
Vaseaux Lake	Hatfield Island	11	316299	5461260	**6**
Vaseaux Lake	Hatfield Island	11	316286	5461260	**3**
Vaseaux Lake	Hatfield Island	11	316289	5461275	**7**
Vaseaux Lake	Hatfield Island	11	316288	5461279	**2**
Vaseaux Lake	Hatfield Island	11	316286	5461281	**6**
Vaseaux Lake	Hatfield Island	11	316283	5461282	**2**
Vaseaux Lake	Hatfield Island	11	316266	5461294	**8**
Vaseaux Lake	Hatfield Island	11	316278	5461306	**5**
Vaseaux Lake	Hatfield Island	11	316289	5461307	**5**
Vaseaux Lake	Hatfield Island	11	316269	5461311	**6**
Vaseaux Lake	Hatfield Island	11	316275	5461317	**6**
Vaseaux Lake	Hatfield Island	11	316253	5461317	**5**
Vaseaux Lake	Hatfield Island	11	316279	5461325	**1**
Vaseaux Lake	Hatfield Island	11	316265	5461327	**2**
Vaseaux Lake	Hatfield Island	11	316283	5461332	**5**
Vaseaux Lake	Hatfield Island	11	316252	5461335	**7**
Vaseaux Lake	Hatfield Island	11	316266	5461340	**6**

Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
Vaseaux Lake	Hatfield Island	11	316276	5461347	**6**
Vaseaux Lake	Hatfield Island	11	316241	5461354	**6**
Vaseaux Lake	Hatfield Island	11	316256	5461364	**6**
Vaseaux Lake	Hatfield Island	11	316269	5461365	**5**
Vaseaux Lake	Hatfield Island	11	316263	5461379	**5**
Vaseaux Lake	Hatfield Island	11	316262	5461382	**4**
Vaseaux Lake	Hatfield Island	11	316254	5461388	**7**
Vaseaux Lake	Hatfield Island	11	316233	5461394	**7**
Vaseaux Lake	Hatfield Island	11	316251	5461397	**6**
Vaseaux Lake	Hatfield Island	11	316228	5461408	**6**
Vaseaux Lake	Hatfield Island	11	316251	5461422	**7**
Vaseaux Lake	Hatfield Island	11	316245	5461433	**7**
Vaseaux Lake	Hatfield Island	11	316209	5461443	**7**
Vaseaux Lake	Hatfield Island	11	316240	5461447	**6**
Vaseaux Lake	Hatfield Island	11	316243	5461480	**7**
Vaseaux Lake	Hatfield Island	11	316204	5461483	**10**
Vaseaux Lake	Hatfield Island	11	316213	5461488	**6**
Vaseaux Lake	Hatfield Island	11	316221	5461488	**6**
Vaseaux Lake	Hatfield Island	11	316224	5461489	**6**
Vaseaux Lake	Hatfield Island	11	316239	5461490	**6**
Vaseaux Lake	Hatfield Island	11	316215	5461492	**6**
Vaseaux Lake	Hatfield Island	11	316183	5461495	**5**
Vaseaux Lake	Hatfield Island	11	316206	5461497	**5**
Vaseaux Lake	Hatfield Island	11	316229	5461503	**6**
Vaseaux Lake	Hatfield Island	11	316221	5461517	**4**
Vaseaux Lake	Hatfield Island	11	316176	5461517	**2**
Vaseaux Lake	Hatfield Island	11	316220	5461518	**4**
Vaseaux Lake	Hatfield Island	11	316207	5461519	**6**
Vaseaux Lake	Hatfield Island	11	316170	5461520	**4**
Vaseaux Lake	Hatfield Island	11	316180	5461528	**8**
Vaseaux Lake	Hatfield Island	11	316168	5461535	**5**
Vaseaux Lake	Hatfield Island	11	316195	5461535	**6**
Vaseaux Lake	Hatfield Island	11	316211	5461537	**5**
Vaseaux Lake	Hatfield Island	11	316194	5461537	**5**
Vaseaux Lake	Hatfield Island	11	316184	5461537	**6**
Vaseaux Lake	Hatfield Island	11	316172	5461538	**5**
Vaseaux Lake	Hatfield Island	11	316177	5461551	**8**
Vaseaux Lake	North Vaseaux Lake	11	314998	5464394	**2**
Vaseaux Lake	North Vaseaux Lake	11	315077	5464402	**1**
Vaseaux Lake	North Vaseaux Lake	11	315045	5464590	**2**
Twin Lakes	Yellow Lake	11	300148	5468368	**5**

Region	Name	UTM			Total Eggs
		Zone	*Easting*	*Northing*	
Twin Lakes	Yellow Lake	11	300447	5468532	**4**
Okanagan Falls	Okanagan River Island	11	312593	5468878	**6**
Twin Lakes	Toy Lake	11	301167	5469010	**3**
Okanagan Falls	Okanagan River Cliffs	11	312503	5469074	**1**
Okanagan Falls	Christie Island	11	313154	5469399	**7**
Okanagan Falls	Christie Island	11	313168	5469405	**4**
Okanagan Falls	Christie Island	11	313168	5469416	**5**
Okanagan Falls	Christie Island	11	313174	5469418	**3**
Skaha Lake	Eastside Road	11	313896	5470621	**5**
Penticton	Skaha Marina	11	312845	5480714	**4**
Skaha Lake	Skaha Marina	11	312841	5480819	**1**
Skaha Lake	Skaha Marina	11	312842	5480840	**4**
Penticton	CN Tug	11	310903	5486583	**5**
Penticton	CN Tug	11	310913	5486599	**4**
Penticton	Penticton Marina	11	312664	5486935	**3**
Penticton	Penticton Marina	11	312757	5486949	**6**
Penticton	Penticton Marina	11	312834	5486966	**5**
Penticton	Okanagan Lake	11	314064	5489723	**1**
Naramata	Naramata Irrigation Building	11	312740	5495170	**6**
Naramata	Okanagan Lake	11	311883	5496956	**4**
Summerland	Summerland Yacht Club	11	308470	5497757	**6**
Summerland	Summerland Yacht Club	11	308515	5497791	**7**
Summerland	Summerland Yacht Club	11	308513	5497844	**3**
Summerland	Summerland Yacht Club	11	308516	5497844	**1**
Summerland	Summerland Yacht Club	11	308517	5497849	**2**
Summerland	Summerland Yacht Club	11	308516	5497866	**3**
Summerland	Summerland Yacht Club	11	308511	5497886	**6**
Summerland	Summerland Yacht Club	11	308525	5497886	**7**
Summerland	Summerland Yacht Club	11	308522	5497887	**5**
Summerland	Summerland Yacht Club	11	308521	5497888	**3**
Summerland	Summerland Yacht Club	11	308471	5497892	**5**
Summerland	Summerland Yacht Club	11	308447	5497894	**5**
Summerland	Summerland Yacht Club	11	308500	5497894	**6**
Summerland	Summerland Yacht Club	11	308441	5497894	**5**
Summerland	Summerland Yacht Club	11	308506	5497894	**3**
Summerland	Summerland Yacht Club	11	308515	5497896	**3**
Summerland	Summerland Yacht Club	11	308431	5497898	**6**
Summerland	Summerland Yacht Club	11	308491	5497898	**1**

Nest Element	Value
Minimum Clutch Size	1
Maximum Clutch Size	13
Mean Clutch Size	5.2 (5)
Total Number of Nests	120
Total Number of Eggs	619

APPENDIX B

Project Photographs: Examples of nesting sites and leg-banding

Nest scraped from goose feces, Osoyoos

White-banded goose in Okanagan Falls

Banded pair at Skaha Marina

Nest at Industrial Site in Kelowna

Relocation team easing geese to corral in Kelowna