Summary of 2020 Canada Goose Management Program: Egg Addling and Population Surveys

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 activities conducted by EBB Environmental Consulting Inc. (EBB) as part of the 2020 Okanagan Valley Goose Management Program. This year the program included egg-addling and post-addling gosling surveys. The egg-addling program consisted of pre-addling pairs surveys and nest surveys in March followed by an intensive addling period throughout April and the first half of May. Survey and access protocols were slightly modified to comply with restrictions related to the Covid-19 global pandemic.

This year, the City of Vernon implemented specific recommendations from past reports, including increased nest and population surveys during the nesting season. This resulted in an increased number of identified nests (and addled eggs). It also provided a better understanding of goose distribution in Vernon during the breeding season as well as potential sources of geese that may contribute to the Vernon goose population during the summer.

Overall, crews addled 1447 eggs from 374 nests. Of these, 31 nests were inaccessible due to safety concerns and five nest sites did not provide authorizations. Post-addling ground surveys indicated that an estimated 11% of the post-nesting population was comprised of young-of-the-year.

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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*) comprise 11 subspecies of geese (Banks *et al*. 2004) collectively referred to as Canada geese. Prior to the 1960's, Canada geese were migrants and summer visitants in British Columbia (Campbell *et al*. 1990). Some nesting was documented on Haida Gwaii and northern Vancouver Island (*B. c. fulva*) and in the northern interior (*B.c. moffittii)*, but most geese native to British Columbia, including the Okanagan Valley were migratory. Geese used the region as a temporary stopover during migration between northern nesting and southern wintering grounds.

By the 1970's, Canada goose numbers had increased through introduced transplants of flightless young (Campbell *et al*. 1990). Young of different taxonomic stocks of Canada geese from across Canada and the United States were introduced to British Columbia with the aim of providing a population that would allow harvest and wildlife viewing opportunities.

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. These geese and their progeny remained in areas to which they were relocated. The current non-migratory goose population in the Okanagan Valley is comprised of hybrid offspring from different stocks of geese that were introduced decades ago. As such, these geese do not fall into recognized subspecies defined by Banks *et al*. (2004).

At the time of translocations, the British Columbia landscape changed. Urban and rural areas increased, and many areas were closed to hunting. Increased suitable habitat with fewer population controls assisted Canada geese to become abundant in different areas throughout the province.

Today non-migratory, resident 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 and safety, 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). Non-migratory Canada geese can be found on land governed by various jurisdictions including federal, provincial, municipal, and private properties such as parks, golf courses, schools, and agricultural lands.

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

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. Communities and stakeholders of the Okanagan Valley formed an Okanagan Regional Goose Management Committee (ORGMC) to implement a unified and landscape-level approach to goose management throughout the region. In 2020, contributing partners included:

- District of Coldstream
- Greater Vernon Water
- City of Vernon
- District of Lake Country
- Central Okanagan Regional District
- City of Kelowna
- City of West Kelowna
- Westbank First Nation.
- District of Peachland
- District of Summerland
- City of Penticton
- Naramata
- Regional District of Okanagan-Similkameen
- Okanagan Falls
- Town of Oliver
- Town of Osoyoos.

1.3 Management

The Okanagan Regional Goose Management Strategy and Action Plan (Robertson Environmental and Ophiuchus Consulting 2006) drafted for ORGMC identified options to control the population of resident Canada geese. The plan was adopted by ORGMC and is being implemented by EBB Environmental Consulting Inc. (EBB) and other contractors (e.g., Wise Wildlife Control, LaHawk Enterprises). This addling summary describes the 14th season of the egg addling program, which was implemented in the spring of 2020.

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

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

In addition to 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. This protocol is available as an additional reference document.

1.5 Canada Goose Reproductive Ecology

A successful Canada goose egg addling program depends on a sound ecological approach. Factors influencing goose behaviour and reproductive output must be understood. Canada geese usually build nests within sight of water; however, geese will find alternative sites if necessary (Elphick *et al*. 2001, Environment Canada 2003). Preferred nesting locations are islands, including 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 is helpful for finding nests in successive years.

Nests are generally simple, constructed of weeds, twigs and other local vegetation. Females will use their bodies to make a depression in the vegetative mound and insulate it with down and feathers removed from their breasts, 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 constructed from scrapes in flower planters; depressions in sagging boat covers; conifer needle debris on roof-tops; osprey nesting platforms; ripped stuffing from patio/houseboat furniture; and other materials (e.g., Figure 1).

Females are responsible for building nests and incubating eggs. During this time, males 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.

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 incubation, which is approximately 25-27 days (Mowbray *et al*. 2002, Environment Canada 2003).

Figure 1. Canada goose nest made from twigs and leaf litter (Vaseux Lake, 2020)

2.0 Methodology

2.1 Administration

2.1.1 Permits

EBB obtained permits from Environment Canada for goose egg addling and addling in the Vaseux Lake Migratory Bird Sanctuary. In addition, EBB obtained a 10-year authorization for accessing and addling within BC Provincial Parks which included consultation with local First Nations. As part of the consultation process, Westbank First Nation provided an additional letter of authorization for access on traditional lands.

Shortly after the onset of the addling field work, BC Parks closed all access to provincial parks to the public and permit holders due to restrictions related to the Covid-19 global Pandemic. EBB applied for an exemption which was received on April 22.

Environment Canada required individual landowner authorization forms in addition to the overarching OVGMP permit for activities that occurred on private lands. Under this permitting structure, the federal 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). 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. Landowner authorizations are valid for up to three years, depending on the preference of the landowner. Copies of all authorizations are required to be submitted to CWS as part of mandatory reporting. Landowners who choose the multi-year option must be listed on the permit application of the following year.

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)
Canada Goose Egg Addling Permit, Vaseux Lake Migratory Bird Sanctuary	Environment Canada (Canadian Wildlife Service)
Research and Education Park Use Permit (10 year)	BC Parks/Ministry of Environment and Climate Change Strategy
Exemption of the Order of the Regional Director	BC Parks and Conservation Officer Service Division

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 for public to call with nest locations and other questions. These contacts remain active throughout the year. A public service Announcement (PSA) was drafted at the onset of the addling season to inform and encourage 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 were surveyed for behaviour to gauge timing of the nesting season. This allowed crews to become familiar with the landscape for efficient addling when egg laying occurred. 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. Any early nests were noted. Flocks of geese were also noted, but these groups were typically not nesting (e.g., had not reached maturity or 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. If nests contained full clutches of eggs, they 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 public or predators to the nest. In general, if nests are destroyed early in incubation, a goose pair will likely re-nest, defeating the purpose of addling.

The pairs survey also acted as an opportunity to engage with landowners regarding authorizations. Information requirements or authorizations sorted out prior to peak nesting saved time during the field-intensive addling season.

2.2.2 Egg Addling

Daily addling occurred between April 1 and May 16, 2020. Nests 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 following the ***United States Humane Society Canada Goose Egg-addling Protocol*** (HSUS 2009) and ***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, and boat-access only areas, working in threes and fours was more effective. The crew member working at the nest counted, addled and marked each egg; the other fended off the guard, if required, and recorded data.

Crews numbered the nests in the field to make rechecking easier and allow them to identify new nests quickly. Marking was such that all the eggs in Nest 1 were labelled “1”, all the eggs in Nest 2 were labelled “2” etc. (Figure 2). In addition, the crew member at the nest took GPS coordinates and field notes. Nests were rechecked once (occasionally twice), approximately 7-10 days following the first addling visit depending on incubation status of the nest.

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 age (Section 2.2.2.2). Float tests were routinely performed during the last part of the egg addling

season. If eggs were less than 14 days' incubation, the crew member working at the nest addled each egg, either by shaking or oiling.

Figure 2. Eggs numbered in a Canada goose nest (West Kelowna, 2020).

2.2.2.1 Oiling and Shaking Eggs

Oiling as a technique for sterilizing eggs was introduced during the 2011 addling program, as this was the first year CWS allowed it on the permit. To use oil, eggs were dipped and rolled in a container of 100% biodegradable, food-grade corn oil. 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 inner membranes are broken, and the egg contents "slosh", which can be heard and felt by the field technician (Figure 3).

Effectiveness and efficiency (i.e., timing and ease of use) of the two addling methods were compared in 2011. In general, 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 appears less aggressive in sensitive public locations. Eggs early in incubation (i.e. 1-2 days) are not easily addled with shaking; 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.

Figure 3. Field technician shaking goose eggs (Kelowna, 2020).

2.2.2.2 Float Tests

Float tests were used to determine the incubation stage of an egg. If the incubation stage 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 4; HSUS 2009).

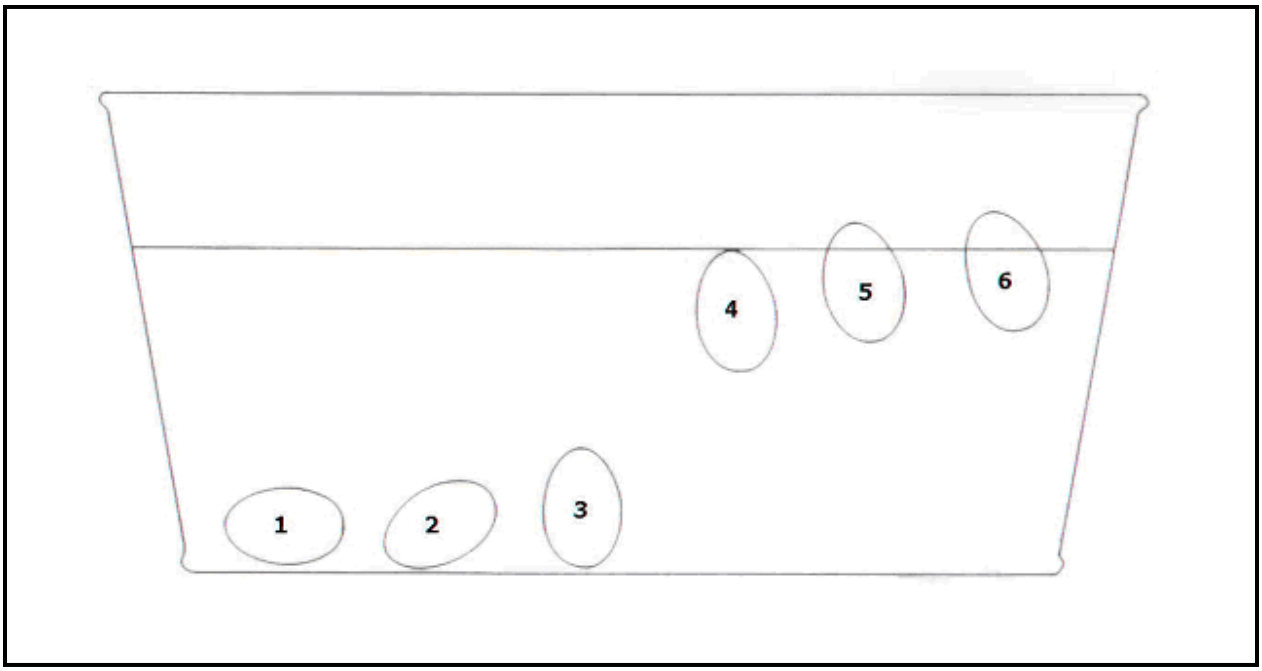

Figure 4. Cross-Section of a Float Test: Stages 1-3 represent eggs incubated for less than 2 weeks; Stages 4-6 represent eggs incubated for 14-27 days (Diagram from HSUS Canada Goose Egg Addling Protocol).

2.2.2.3 Covid-19 Related Restrictions

This year some survey and addling protocols had to be modified to accommodate safety considerations related to the global Covid-19 pandemic. At the direction of provincial health authorities, physical distancing measures were required that ensured the addling crew (which isolated in place as a team) did not come within 2m of the public or other workers (e.g. municipal, parks, etc.). In some instances, this prevented addling nests that had to be accessed through apartments/residential units or with municipal crews (e.g. use of picker trucks). Nest locations were noted for future years.

2.2.3 Additional Surveys

2.2.3.1 Vernon Surveys

To understand likely sources of nests and geese that moult in Vernon, crews documented geese throughout Vernon and the north arm of Okanagan Lake during the addling season. Locations with the number of geese were noted and mapped.

2.2.3.2 Gosling Surveys

Follow-up ground surveys for goslings were conducted in June 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 properties that did not participate in the egg addling program.

2.3 Leg Band Data

EBB crews observed geese for leg-bands (Figure 5). 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) and directly through the OVGMP website from general public. Maps are regularly updated to provide an overview of distribution of banded birds. No new bands were applied to geese in 2020.

Figure 5. Yellow plastic leg band with black alpha-numeric code.

3.0 Results

3.1 Egg Addling

EBB crews addled 1447 eggs from 338 nests. An additional 108 eggs were identified that had been predated and did not require addling. Crews identified 31 additional nests that were inaccessible due to safety concerns (e.g., unsafe location such as a cliff or access violated the Covid-19 physical distancing restrictions such as an apartment patio). Five nests were not addled due to lack of authorizations to access the nests (e.g., landowner was unavailable for consent; landowner did not want the nest addled) or the nest was found after the humane addling window; Figure 8).Table 2 provides a summary of egg addling data. An overview of nest distribution is provided in Figures 6 and 7. Regional data are detailed in Appendix A. The mean clutch size was 4.3 (4 to 5) eggs, which is consistent with other years of the program.

Table 2. Okanagan Valley Egg Addling Data Summary

Nest Element	Value
Minimum Clutch Size	0
Maximum Clutch Size	12
Mean Clutch Size	4.3
Number of Accessible Nests	338
Number of Inaccessible Nests	36
Total Number of Addled Eggs	1447
Number of Geese Prevented from Entering Population (approximately 75% of addled eggs)	1085

Nests were built on a variety of substrates including, but not limited to:

- Rooftops (cottage, home and industrial),
- Planters,
- Boat Covers, boats and barges,
- Groins/breakwaters,
- Trees/stumps,
- Docks/wharves,
- Osprey nesting platforms,
- Barges,
- Cliffs,
- Beaver lodges,
- Islands and peninsulas, and
- Debris piles.

3.2 Media and Public Involvement

A press release was provided to the City of Kelowna communications department for distribution at the onset of the addling program (March 16). This coincided with the onset of Covid-19 restrictions and work-from-home recommendations and may not have been correctly released. Therefore, it was updated and directly re-released to ORGMC members for distribution (April 14).

This year we received 65 emails and 10 calls from the public, and 3 requests for interviews from media. Additional calls and emails are ongoing and include topics such as:

- Hunting and hunting seasons,
- Flocks of migrating geese,
- Using dogs for hazing,
- Geese at beaches,

- Feeding of geese,
- Building nests for eggs that appear stranded,
- Injured geese (and other wildlife),
- Leg-bands on geese
- Goose control in other parts of the country, and
- Soliciting goose management techniques.

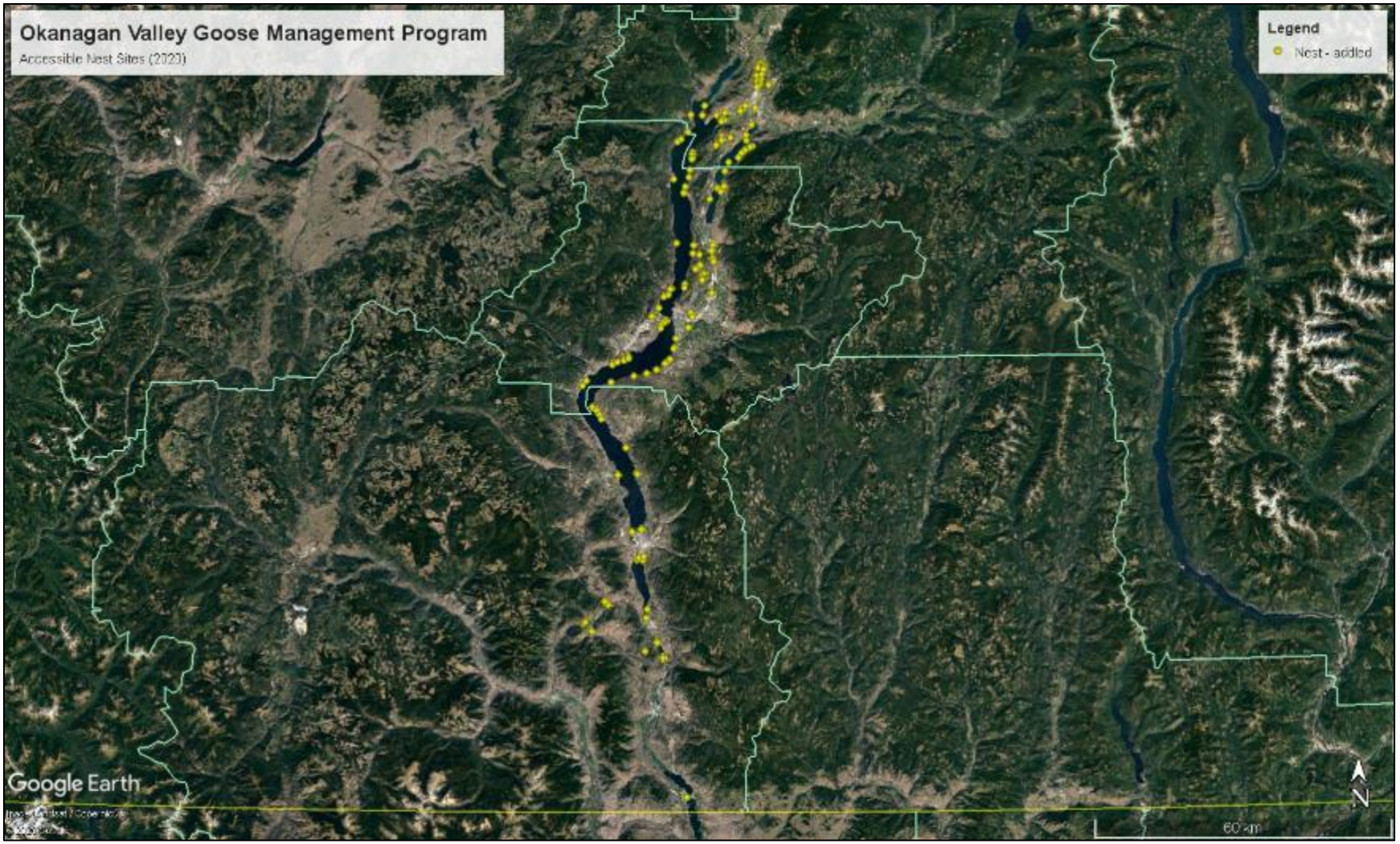

Figure 6. Accessible nest sites (addled) during the 2020 field season (valley overview)

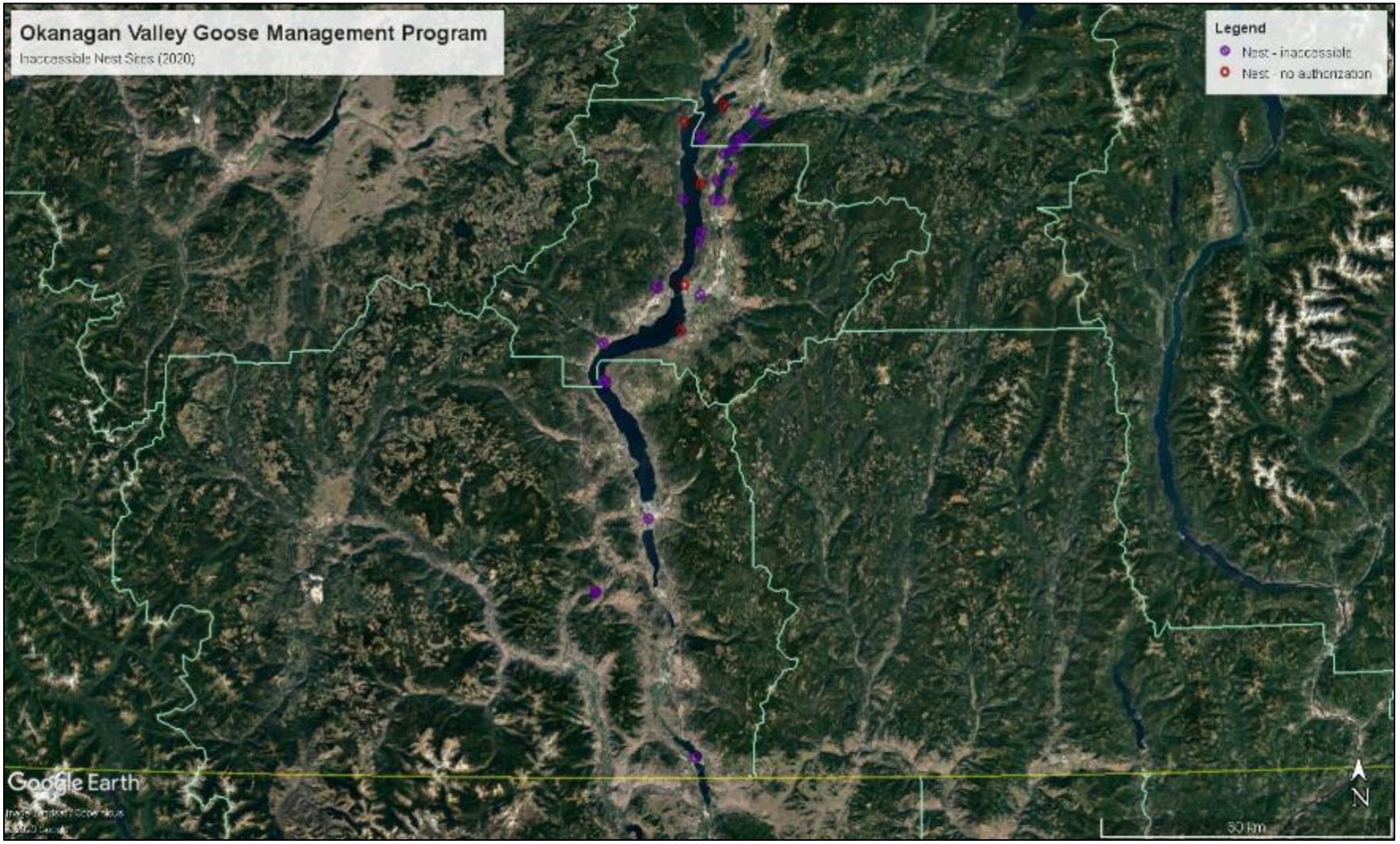

Figure 7. Inaccessible nests (not addled) during 2020 field season

3.3 Vernon Surveys

Data indicated that many nests probably occur in the north arm of Okanagan Lake outside of program reach. Many single geese (likely guards) and pairs of geese (likely breeding pairs) were observed (Figure 8). Flocks of geese were also observed which did not likely contain breeding geese.

3.4 Gosling Surveys

During ground surveys, population composition was 704 adults and 87 goslings (11% young overall; Table 3).

Table 3. Summary Data for 2020 Post-addling Population Ground Surveys

Location	Site	Adults	Juveniles	Total	% Young	Estimated Clutches
Vernon	Kin Beach	26	0	26	0.0	0
Vernon	Paddlewheel Hall Park	28	0	28	0.0	0
Vernon	Swan Lake	93	4	97	4.1	1
Coldstream	Kalamalka Lake	8	0	8	0.0	0
Lake Country	Kaloya Regional Park	4	6	10	60.0	1
Lake Country	Young Wetland	82	0	82	0.0	0
Lake Country	Wood Lake -	27	37	64	57.8	7
Kelowna	Duck Lake/Ellison Lake	20	0	20	0.0	0
Kelowna	Waterfront Park	23	23	46	50.0	4
West Kelowna	Westbank FN Beach	18	9	27	33.3	2
West Kelowna	Gellatly Bay	2	0	2	0.0	0
Peachland	Beach Avenue	15	5	20	25.0	1
Peachland	Boat Launch Park	41	0	41	0.0	0
Summerland	Lakeshore Dr Beach Access	2	0	2	0.0	0
Penticton	Red Wing Beach	14	0	14	0.0	0
Penticton	Penticton Marina	2	0	2	0.0	0
Penticton	Skaha - Sudbury Beach	6	0	6	0.0	0
Okanagan Falls	Christie Beach	16	3	19	15.8	1
Okanagan Falls	AG fields	163	0	163	0.0	0
Okanagan Falls	Vaseux North	91	0	91	0.0	0
Osoyoos	Osoyoos Lake	23	0	23	0.0	0
Total		**704**	**87**	**791**	**11.0**	**17**

3.5 Leg Band Data

EBB banded 281 geese in Vernon, Kelowna, West Kelowna and Penticton between 2012-2018. The band observation database contains 205 entries and continues to increase slightly each year despite most observations being from hunters who have shot geese. Figure 9 shows the overall

distribution of band returns relative to their origin for the last five years. Figure 10 provides a valley-wide aspect of local data. Largely, geese banded in central and south Okanagan do not migrate outside the valley. Geese banded in north Okanagan (Vernon) are not so clearly defined. Banding results there indicate resident and migratory geese mixed at the banding site.

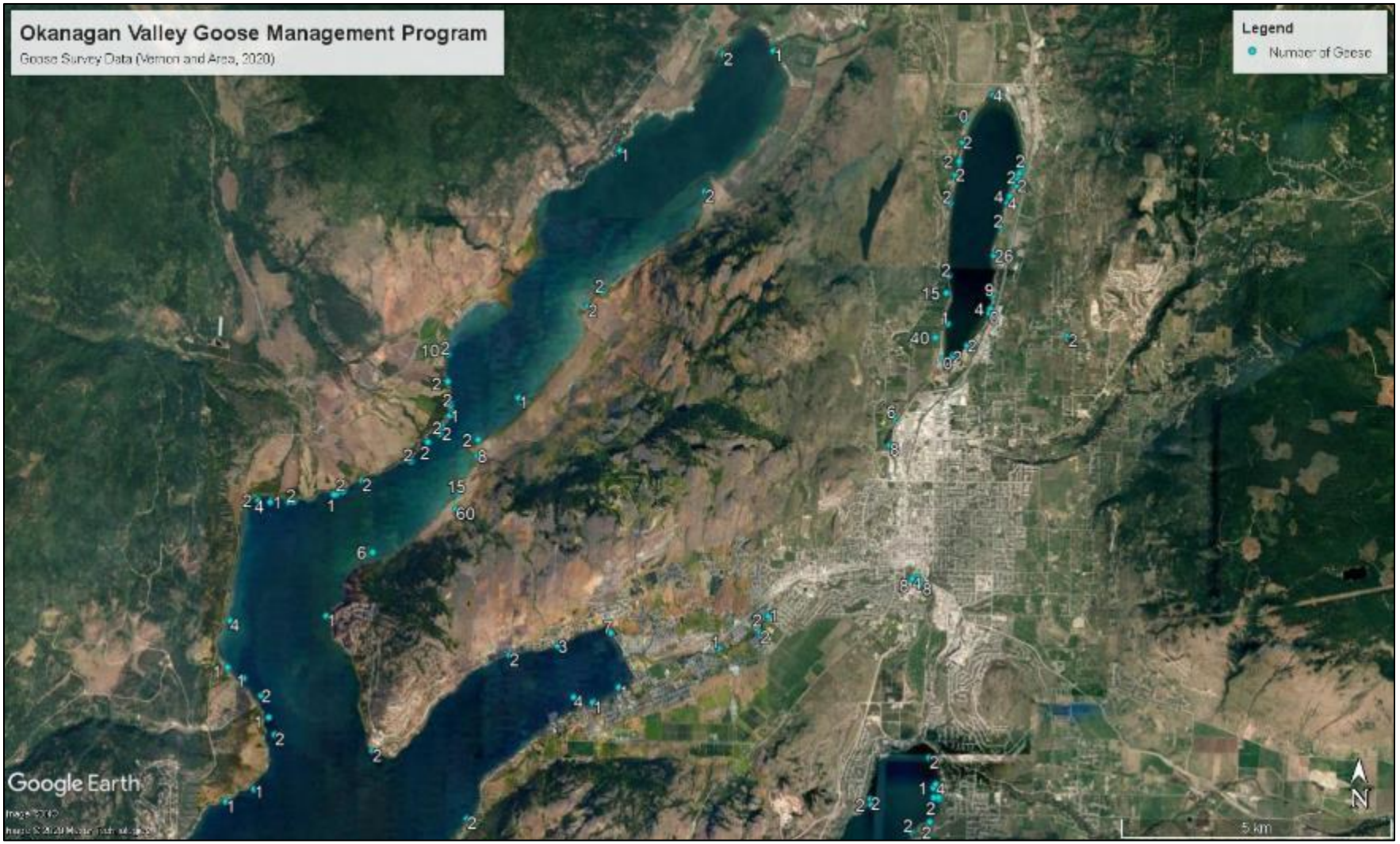

Figure 8. Goose observations in Vernon and North Arm of Okanagan Lake

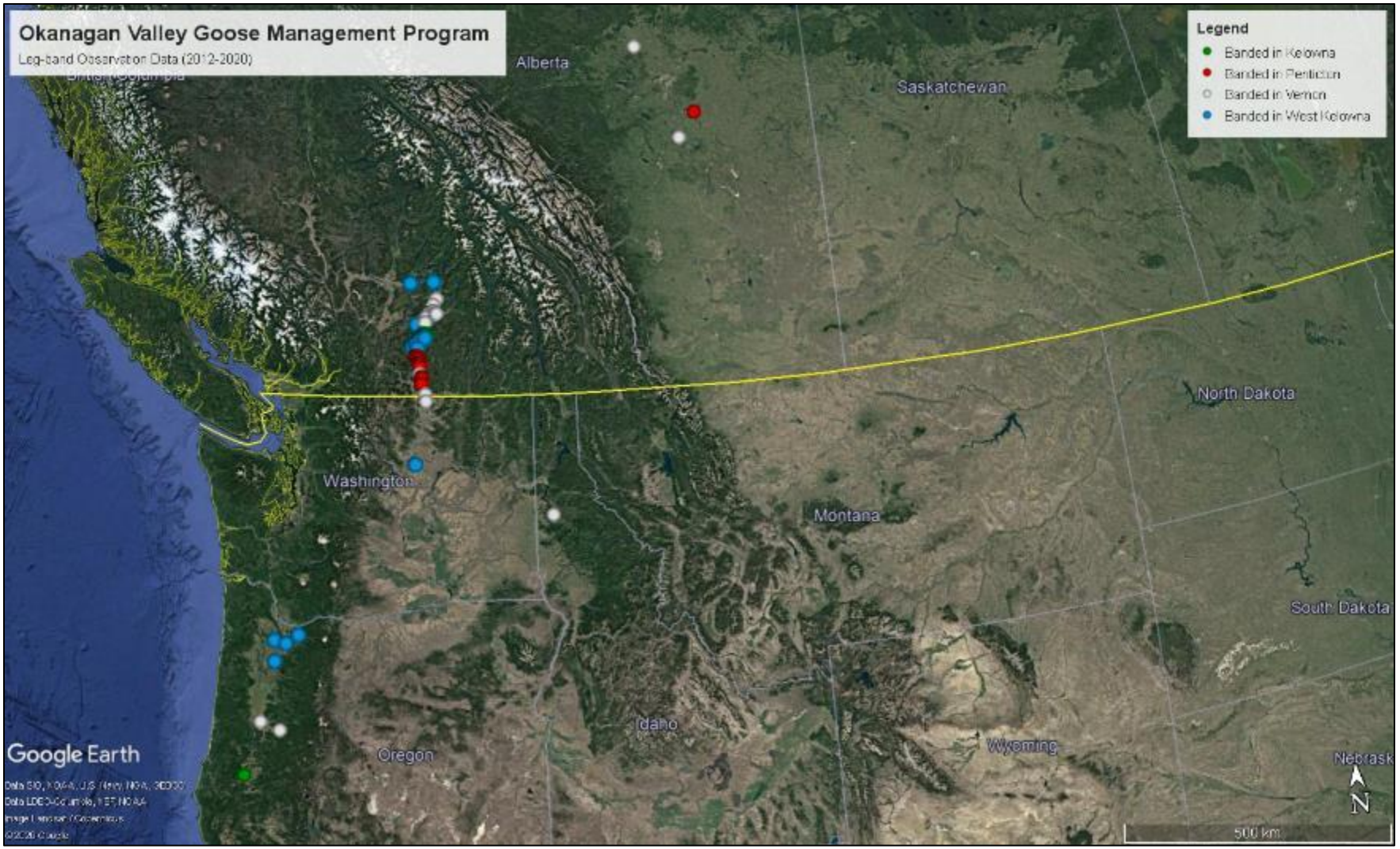

Figure 9. Band observations coloured by banding origin

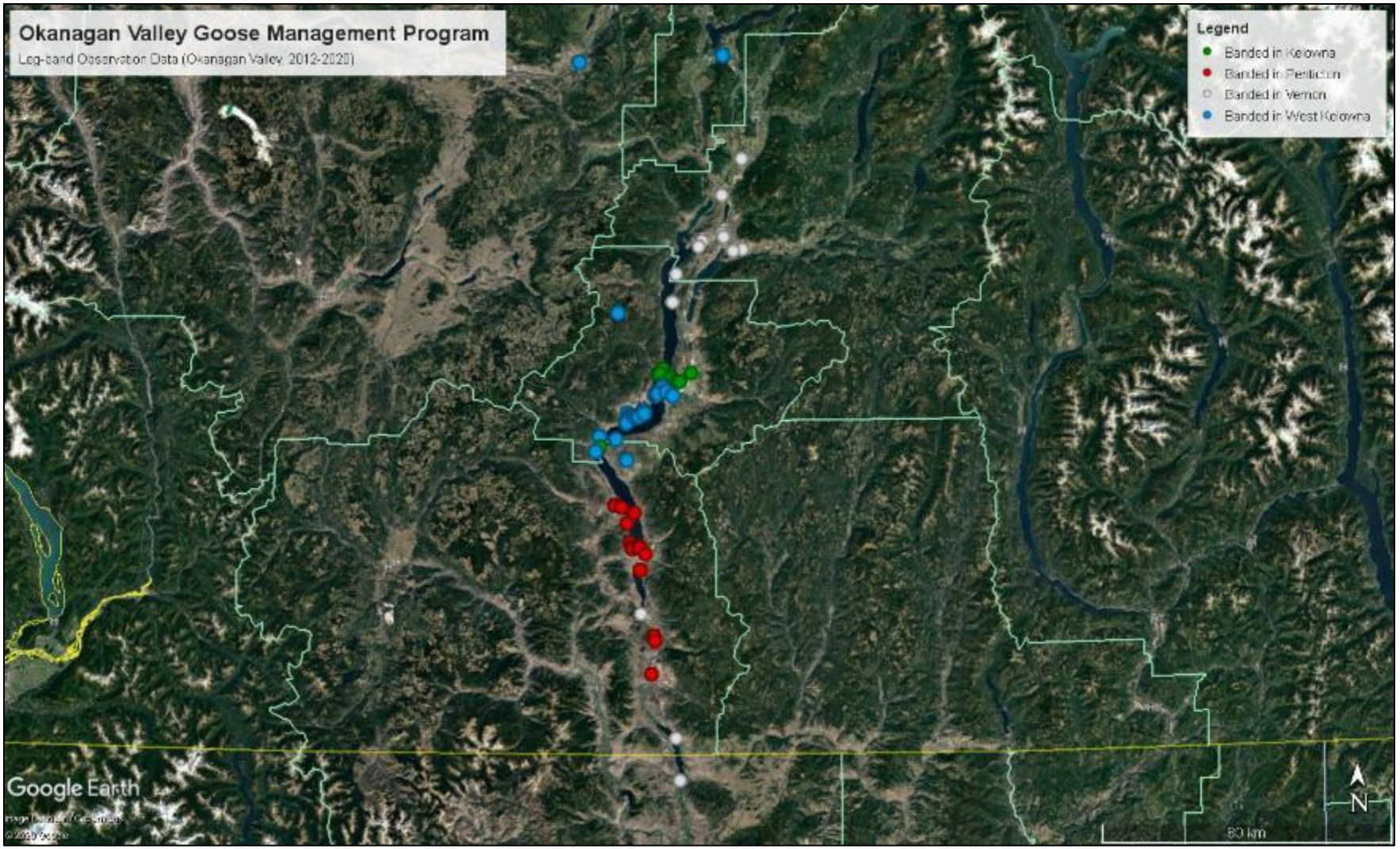

Figure 10. Band observations within the valley

4.0 Summary and Discussion

This year 1447 eggs were addled in the Okanagan Valley. Taking natural mortality into account, addling prevented over 1000 new geese from entering the population. Cumulatively, over the 14-year span of the addling program, approximately 14,100 geese have been directly prevented from entering the population. Recognizing each female goose can hatch up to 240 goslings in her lifetime, many additional generations of geese have also been prevented from hatch.

Although geese are traditional in their nesting patters, it is likely that the addling program has influenced nest distribution since the onset of the program. We observed 108 eggs that had been predated prior to us finding them. This is an increase over past years and may be an indication of increased predation pressure on nests situated in less optimal locations.

As in previous years, EBB found that the highest density and number of nests were in the Vaseux Lake Migratory Bird Sanctuary (103 nests; 514 eggs; Table 4). Vaseux Lake accounts for approximately one third of the eggs addled each year.

Table 4. Summary of addling results at Vaseux Lake

Year	Nests	Addled Eggs
2007	113	618
2008	124	658
2009	128	674
2010	123	634
2011	123	679
2012	93	536
2013	77	425
2014	72	412
2015	87	446
2016	92	489
2017	79	428
2018	91	479
2019	92	450
2020	103	514

Gosling survey results help us identify areas where efforts should be increased to engage the public and increase awareness about goose management as well as look for nests. In doing so, more nest reports and access to lands will increase the ability of crews to successfully find and addle nests. Gosling data also provide us with an indicator of overall program success and where we should be directing our field survey/nest-finding efforts. This year we estimated 11% young for the valley-wide population. This is a substantial improvement over the 2019 results, which

showed 18% young. The largest improvement was in Vernon where one clutch was identified at Swan Lake and no clutches were observed at Kin Beach or Paddlewheeler Park. Wood Lake remains a high source of goslings. Crews identified 4 inaccessible nests at this site, but three additional clutches were observed. Increased survey effort needs to continue at this lake to identify sources of additional clutches.

As the leg-band observation database grows, our understanding of movements, nesting, longevity and population mixing continues to improve. The maps provided in this report continue to indicate that most geese do not travel along or outside of the valley, although some movement does occur. In terms of population management, this supports the conclusion that population control of these birds does not impact natural migratory populations and will likely have long-term benefits towards mitigation and prevention of damage caused by geese in the Okanagan Valley.

5.0 Recommendations

The following recommendations have been provided to ensure continued program success. 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:

- Continue increased nest survey/addling effort in Vernon

  Action: ORGMC to continue to work with Vernon to identify resources specifically available for nest survey and addling.

  Action: coordinator to work with Vernon to engage northern partners for increased data collection and addling effort in North Arm

  Action: Coordinator to continue to implement Vernon-specific nest survey and addling protocols for the most efficient use of those resources.

  Action: Coordinator to ensure that PSA/media releases go out in Vernon—confirm contact of Vernon communications staff.

  Action: Continued addling pressure at known/developing colony sites (e.g., Mackay Reservoir) to prevent nesting colony expansion and hatch success.

- Increase nest survey/addling effort at Wood Lake

  Action: Coordinator to ensure time is allocated to Wood Lake for hard-to-find nest surveys

- Continue to achieve buy-in from new partners, stakeholders and the general public

  Action: Continue to promote program activities through networks and other conferences/venues (respecting Covid-19 restrictions)

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.

- Continue to develop Best Management Practices (BMPs) brochures for Canada goose mitigation to be available at municipal halls and online.

  Action: Distribute the updated educational materials to assist partners and the public with program objectives.

  Action: Work with jurisdictions on habitat management options to reduce attractiveness of conflict areas to geese.

  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 (this can be delivered via video-conference)

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

  Action: Prior to addling, draft a media release with recent results for the public (e.g., population growth statistics such as flattened population growth, and % young).

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

  Action: Continue to have committee members discuss the issue with their staff and provide a reporting mechanism.

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

  Action: Encourage residents to prevent nesting 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.

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APPENDIX A

Egg Addling Data: Regional Summaries

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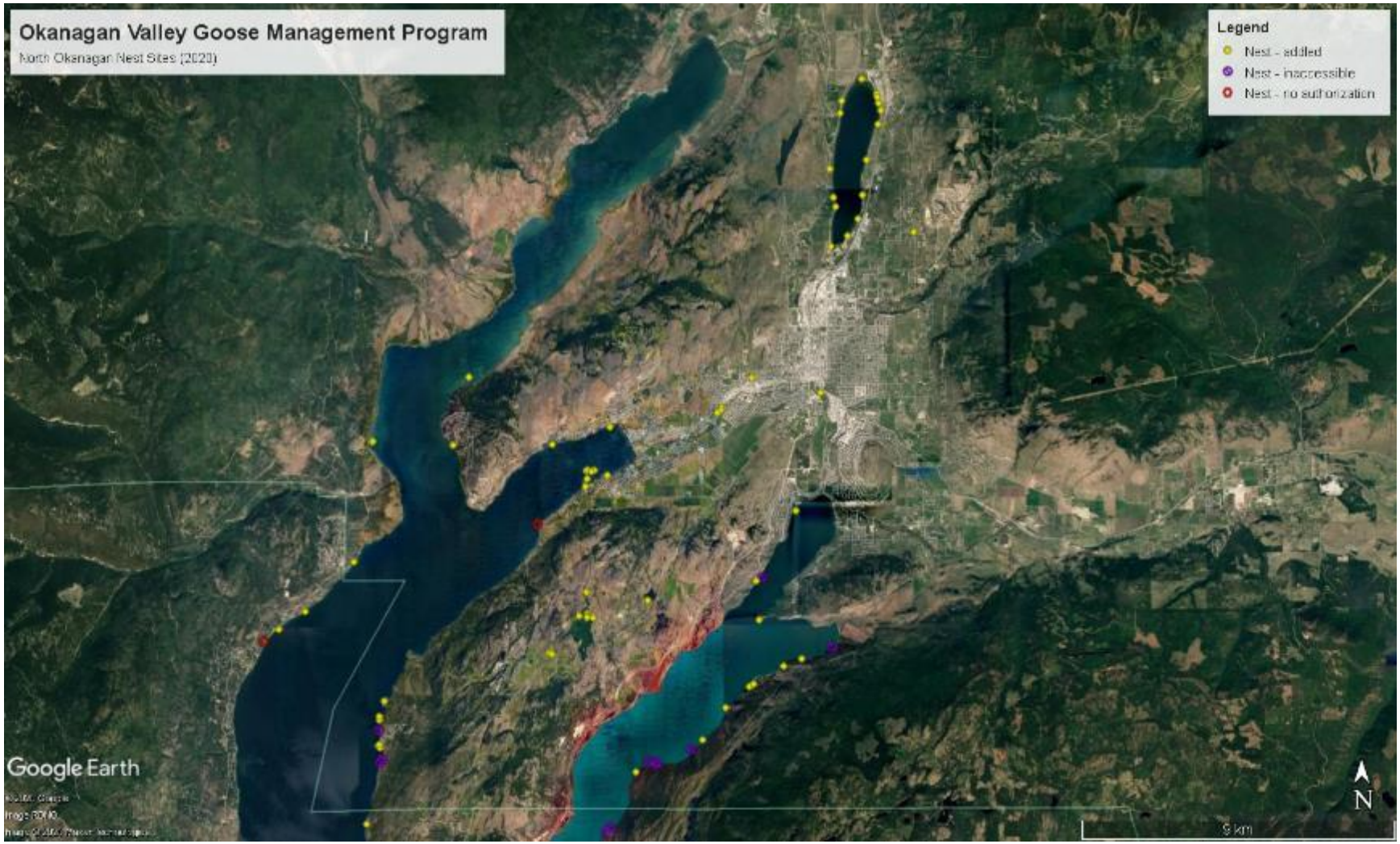
North Okanagan



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Lake Country	Inaccessible	50.146430	-119.35382	0
Lake Country	Accessible	50.147442	-119.45152	4
Lake Country	Accessible	50.160713	-119.34355	5
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Lake Country	Inaccessible	50.162990	-119.33505	0
Lake Country	Inaccessible	50.163161	-119.44610	0
Lake Country	Inaccessible	50.163244	-119.33860	0
Lake Country	Inaccessible	50.164179	-119.44521	0
Lake Country	Inaccessible	50.166490	-119.32146	0
Lake Country	Accessible	50.167006	-119.44613	0
Lake Country	Accessible	50.167474	-119.44688	3
Lake Country	Accessible	50.167810	-119.44637	4
Lake Country	Accessible	50.168932	-119.31680	4
Lake Country	Inaccessible	50.171464	-119.44649	0
Lake Country	Accessible	50.174135	-119.44634	5
Lake Country	Accessible	50.175040	-119.44634	4
Lake Country	Accessible	50.177163	-119.30759	4
Vernon	Accessible	50.178982	-119.44440	3
Lake Country	Accessible	50.182521	-119.29805	4
Lake Country	Accessible	50.183217	-119.29632	2
Lake Country	Accessible	50.187747	-119.28426	5
Lake Country	Accessible	50.189641	-119.27702	4
Vernon	Accessible	50.190991	-119.37713	0
Vernon	Accessible	50.191267	-119.37829	0
Lake Country	Inaccessible	50.192600	-119.26473	0
Vernon	Unauthorized	50.194227	-119.49267	0
Vernon	Accessible	50.197354	-119.48660	6
Lake Country	Accessible	50.199591	-119.29404	0
Vernon	Accessible	50.200244	-119.36060	5
Vernon	Accessible	50.200375	-119.36308	9
Vernon	Accessible	50.200476	-119.36301	5
Vernon	Accessible	50.200501	-119.36302	6
Vernon	Accessible	50.200502	-119.36304	2
Vernon	Accessible	50.200556	-119.36299	6
Vernon	Accessible	50.200566	-119.36313	3
Vernon	Accessible	50.200569	-119.36312	8
Vernon	Accessible	50.200582	-119.36307	4
Vernon	Accessible	50.200591	-119.36308	4
Vernon	Accessible	50.200601	-119.36310	5

Location	Access	Latitude	Longitude	Total Addled
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Vernon	Accessible	50.200760	-119.36615	7
Vernon	Accessible	50.200762	-119.36629	0
Vernon	Accessible	50.200896	-119.36206	6
Vernon	Accessible	50.200897	-119.36207	2
Vernon	Accessible	50.200903	-119.36218	9
Vernon	Accessible	50.200928	-119.36219	3
Vernon	Accessible	50.200936	-119.36207	3
Vernon	Accessible	50.200947	-119.36211	5
Vernon	Accessible	50.201030	-119.36219	0
Vernon	Accessible	50.201288	-119.36296	7
Vernon	Accessible	50.201333	-119.36288	2
Vernon	Accessible	50.201338	-119.36288	2
Vernon	Accessible	50.201929	-119.47606	7
Vernon	Accessible	50.204718	-119.33865	5
Vernon	Accessible	50.206789	-119.36326	5
Lake Country	Accessible	50.209606	-119.29519	6
Lake Country	Inaccessible	50.210497	-119.29269	0
Vernon	Accessible	50.214640	-119.45653	3
Vernon	Unauthorized	50.224260	-119.38262	0
Lake Country	Accessible	50.227568	-119.27917	4
Vernon	Accessible	50.233880	-119.36363	3
Vernon	Accessible	50.235889	-119.36283	6
Vernon	Accessible	50.236754	-119.35481	5
Vernon	Accessible	50.237723	-119.36117	5
Vernon	Accessible	50.237887	-119.36327	0
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Vernon	Accessible	50.238149	-119.36274	0
Vernon	Accessible	50.244520	-119.41666	7
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Vernon	Accessible	50.245357	-119.44925	0
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Vernon	Accessible	50.245549	-119.44897	5
Vernon	Accessible	50.249112	-119.35366	4
Vernon	Accessible	50.252700	-119.31064	5
Vernon	Accessible	50.253386	-119.30916	0
Vernon	Accessible	50.254084	-119.30890	6
Vernon	Accessible	50.257757	-119.26917	1
Vernon	Accessible	50.261637	-119.29677	4
Vernon	Accessible	50.261944	-119.41028	6
Vernon	Accessible	50.261944	-119.41028	8

Location	Access	Latitude	Longitude	Total Addled
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Vernon	Accessible	50.298868	-119.23154	0
Vernon	Accessible	50.302254	-119.25382	0
Vernon	Accessible	50.305389	-119.26281	3
Vernon	Accessible	50.307764	-119.26371	2
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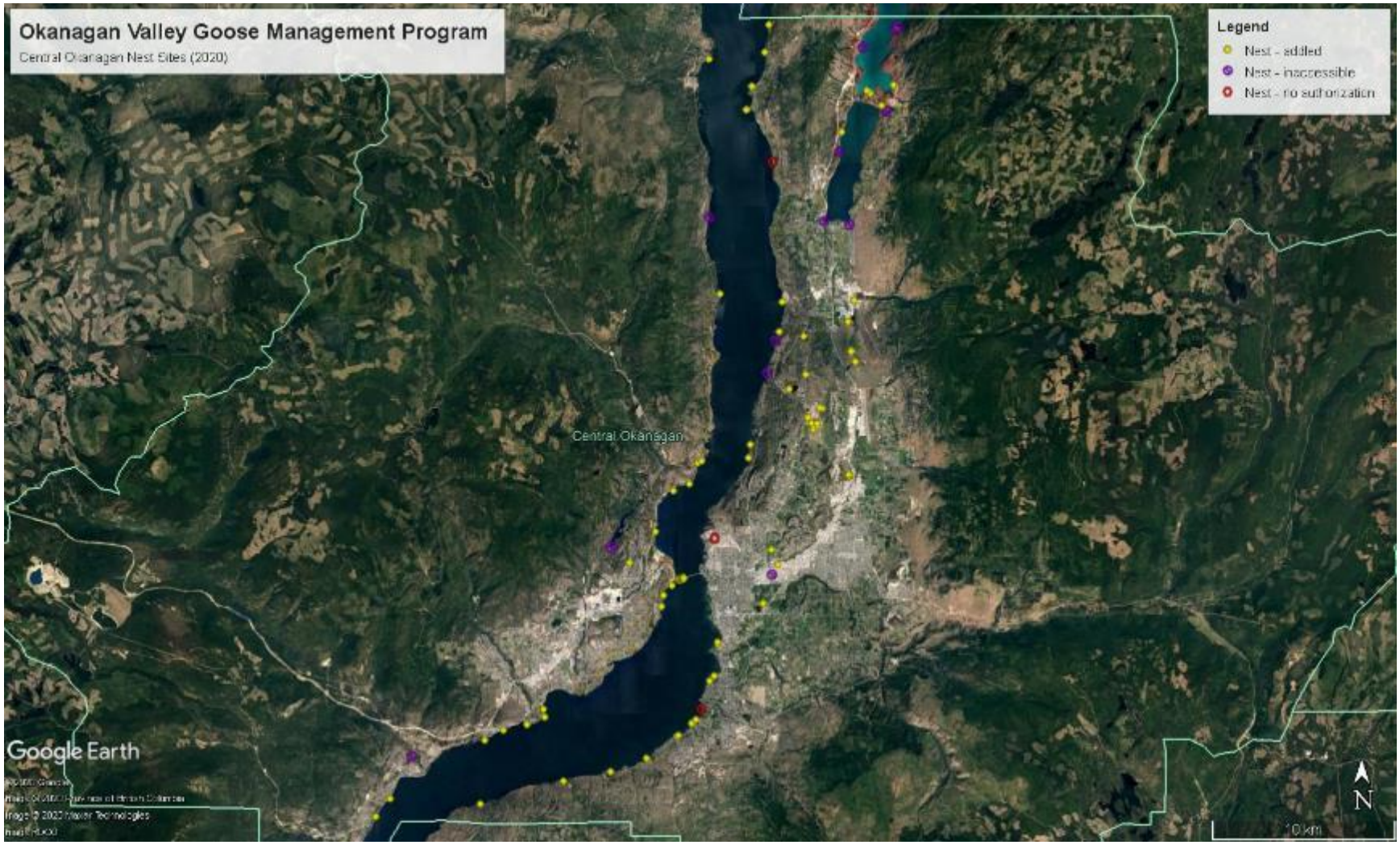
Vernon	Accessible	50.315059	-119.26511	6
Vernon	Accessible	50.317360	-119.25037	7
Vernon	Accessible	50.326496	-119.24569	4
Vernon	Accessible	50.329362	-119.26086	6
Vernon	Accessible	50.330039	-119.24450	7
Vernon	Accessible	50.331915	-119.24544	5
Vernon	Accessible	50.332531	-119.26027	5
Vernon	Accessible	50.333446	-119.24597	8
Vernon	Accessible	50.334276	-119.24624	7
Vernon	Accessible	50.338120	-119.25220	4

Nest Summary	Value
Minimum Clutch Size	0
Maximum Clutch Size	10
Mean Clutch Size	4
Total Number of Nests	101
Total Number of Eggs	369

Central Okanagan



Location	Access	Latitude	Longitude	Total Addled
Peachland	Accessible	49.762212	-119.74874	8
Okanagan Mountain Provincial Park	Accessible	49.768561	-119.66982	4
Peachland	Accessible	49.770955	-119.73794	3
Kelowna	Accessible	49.779789	-119.60699	3
Kelowna	Accessible	49.784406	-119.57149	7
Kelowna	Accessible	49.790957	-119.54436	6
Peachland	Inaccessible	49.791558	-119.72184	0
West Kelowna	Accessible	49.799560	-119.66649	1
Kelowna	Accessible	49.801643	-119.52146	4
Kelowna	Accessible	49.802068	-119.52019	0
West Kelowna	Accessible	49.804443	-119.65239	2
West Kelowna	Accessible	49.807260	-119.63463	5
Kelowna	Accessible	49.807935	-119.51030	4
Kelowna	Accessible	49.809733	-119.50696	6
West Kelowna	Accessible	49.810869	-119.62121	6
Kelowna	Unauthorized	49.814621	-119.50264	0
West Kelowna	Accessible	49.814709	-119.62222	4
Kelowna	Accessible	49.828571	-119.49670	7
Kelowna	Accessible	49.831001	-119.49313	3
Kelowna	Accessible	49.846480	-119.49053	0
Kelowna	Accessible	49.847433	-119.49058	7
West Kelowna	Accessible	49.864760	-119.53298	6
Kelowna	Accessible	49.866237	-119.45610	0
West Kelowna	Accessible	49.870160	-119.53154	5
West Kelowna	Accessible	49.874888	-119.52511	7
Kelowna	Accessible	49.877620	-119.52026	7
Kelowna	Accessible	49.877726	-119.51918	7
Kelowna	Accessible	49.877987	-119.51818	6
Kelowna	Accessible	49.878092	-119.51762	6
Kelowna	Accessible	49.878153	-119.51762	5
Kelowna	Accessible	49.878226	-119.51739	5
Kelowna	Accessible	49.878255	-119.51720	2
Kelowna	Accessible	49.878287	-119.51690	6
Kelowna	Accessible	49.878288	-119.51700	2
Kelowna	Accessible	49.878313	-119.51666	2
Kelowna	Accessible	49.878318	-119.51715	5
Kelowna	Accessible	49.878324	-119.51914	8
Kelowna	Accessible	49.878377	-119.51598	4
Kelowna	Accessible	49.878383	-119.51617	4
Kelowna	Accessible	49.878384	-119.51638	6
Kelowna	Accessible	49.878388	-119.51623	7
Kelowna	Accessible	49.878408	-119.51655	6

Location	Access	Latitude	Longitude	Total Addled
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Kelowna	Accessible	49.878461	-119.51736	4
Kelowna	Accessible	49.878560	-119.51606	4
Kelowna	Inaccessible	49.879805	-119.44975	0
Kelowna	Inaccessible	49.879805	-119.44975	0
Kelowna	Accessible	49.885134	-119.44484	4
West Kelowna	Accessible	49.886033	-119.55725	7
Kelowna	Accessible	49.892297	-119.44989	6
West Kelowna	Inaccessible	49.893261	-119.57110	0
Kelowna	Unauthorized	49.897746	-119.49284	0
West Kelowna	Accessible	49.901088	-119.53763	5
West Kelowna	Accessible	49.920910	-119.52404	0
West Kelowna	Accessible	49.924309	-119.51188	1
Kelowna	Accessible	49.927567	-119.39147	6
Kelowna	Accessible	49.927927	-119.39160	8
Kelowna	Accessible	49.927966	-119.39181	6
Kelowna	Accessible	49.928118	-119.39046	5
Kelowna	Accessible	49.928287	-119.39077	6
Kelowna	Accessible	49.928420	-119.39021	4
Kelowna	Accessible	49.928524	-119.39060	0
Kelowna	Accessible	49.928552	-119.39105	5
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West Kelowna	Accessible	49.934433	-119.50566	4
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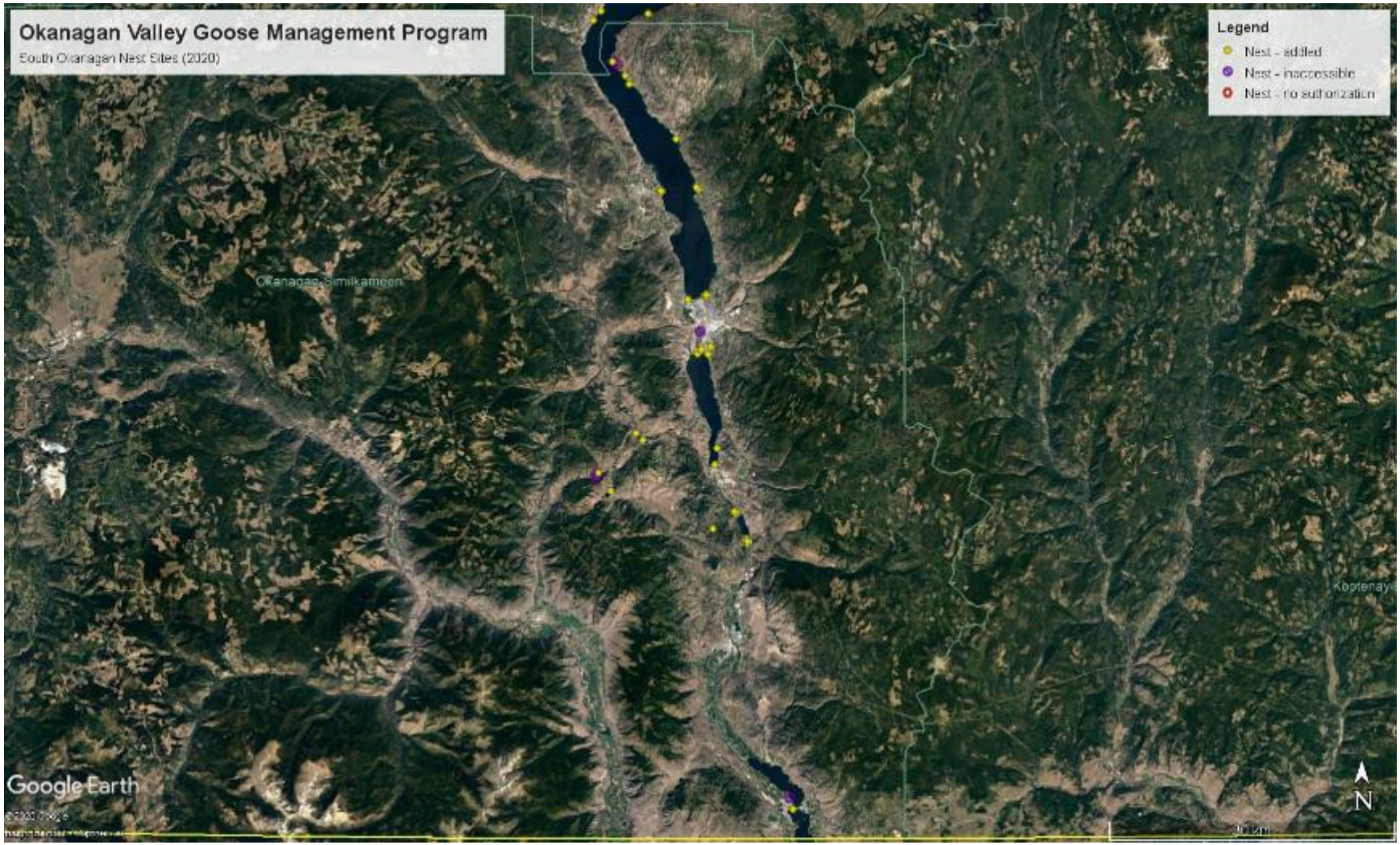
Kelowna	Accessible	49.936932	-119.46718	4
Kelowna	Accessible	49.943397	-119.46579	0
Kelowna	Accessible	49.950800	-119.41809	0
Kelowna	Accessible	49.952328	-119.41502	0
Kelowna	Accessible	49.952868	-119.41784	0
Kelowna	Accessible	49.953666	-119.41508	6
Kelowna	Accessible	49.953780	-119.41931	0
Kelowna	Accessible	49.956571	-119.42222	4
Kelowna	Accessible	49.960943	-119.41104	0
Kelowna	Accessible	49.961264	-119.41291	0
Kelowna	Accessible	49.970288	-119.43627	3
Kelowna	Accessible	49.977448	-119.42372	4
Kelowna	Inaccessible	49.978014	-119.45329	0
Kelowna	Accessible	49.983618	-119.38612	8
Kelowna	Accessible	49.988437	-119.38962	1
Kelowna	Accessible	49.988582	-119.38948	5
Kelowna	Accessible	49.988587	-119.38935	5
Kelowna	Accessible	49.988612	-119.38940	3

Location	Access	Latitude	Longitude	Total Addled
Kelowna	Accessible	49.988751	-119.38948	2
Kelowna	Accessible	49.988785	-119.38924	7
Kelowna	Inaccessible	49.993970	-119.44709	0
Kelowna	Accessible	49.995996	-119.42515	6
Kelowna	Accessible	49.998244	-119.44378	6
Kelowna	Accessible	50.002925	-119.39126	7
Kelowna	Accessible	50.002959	-119.39138	3
Kelowna	Accessible	50.002985	-119.39183	7
Kelowna	Accessible	50.003001	-119.39150	7
Kelowna	Accessible	50.003001	-119.39150	8
Kelowna	Accessible	50.003043	-119.39166	1
Kelowna	Accessible	50.003043	-119.39180	7
Kelowna	Accessible	50.003064	-119.39194	5
Kelowna	Accessible	50.012687	-119.44162	7
Kelowna	Accessible	50.013492	-119.38706	5
West Kelowna	Accessible	50.016592	-119.48868	5
Lake Country	Inaccessible	50.050041	-119.39048	0
Lake Country	Inaccessible	50.051848	-119.40977	0
West Kelowna	Inaccessible	50.053700	-119.49674	0
Lake Country	Unauthorized	50.080563	-119.44868	0
Lake Country	Inaccessible	50.085572	-119.39830	0
Lake Country	Accessible	50.095229	-119.39624	6
Lake Country	Inaccessible	50.105467	-119.36250	0
Lake Country	Accessible	50.105965	-119.46871	2
Lake Country	Accessible	50.106156	-119.46861	2
Lake Country	Accessible	50.108140	-119.36582	0
Lake Country	Accessible	50.113987	-119.37443	2
Lake Country	Accessible	50.115429	-119.37706	0
Lake Country	Accessible	50.115429	-119.37706	0
Lake Country	Accessible	50.117371	-119.46441	4
Lake Country	Accessible	50.117514	-119.46438	6
Lake Country	Accessible	50.118092	-119.35669	8
Fintry Provincial Park	Accessible	50.130703	-119.49698	5
Lake Country	Accessible	50.134034	-119.45460	2

Nest Summary	Value
Minimum Clutch Size	0
Maximum Clutch Size	8
Mean Clutch Size	4
Total Number of Nests	118
Total Number of Eggs	442


Okanagan Valley Goose Management Program
South Okanagan Nest Sites (2020)
Legend
Nest - addled
Nest - inaccessible
Nest - no authorization
Okanagan-Similkameen
Kootenay
Google Earth
N

Location	Access	Latitude	Longitude	Total Addled
Osoyoos	Accessible	49.027941	-119.46109	6
Osoyoos	Accessible	49.027980	-119.46096	6
Vaseaux Lake	Accessible	49.275906	-119.52546	1
Vaseaux Lake	Accessible	49.275908	-119.52539	7
Vaseaux Lake	Accessible	49.275953	-119.52563	6
Vaseaux Lake	Accessible	49.275974	-119.52562	3
Vaseaux Lake	Accessible	49.275984	-119.52564	3
Vaseaux Lake	Accessible	49.275985	-119.52562	5
Vaseaux Lake	Accessible	49.276003	-119.52552	5
Vaseaux Lake	Accessible	49.276091	-119.52568	1
Vaseaux Lake	Accessible	49.276091	-119.52568	10
Vaseaux Lake	Accessible	49.276114	-119.52555	6
Vaseaux Lake	Accessible	49.276187	-119.52557	4
Vaseaux Lake	Accessible	49.276222	-119.52547	4
Vaseaux Lake	Accessible	49.276229	-119.52537	6
Vaseaux Lake	Accessible	49.276247	-119.52568	2
Vaseaux Lake	Accessible	49.276266	-119.52566	6
Vaseaux Lake	Accessible	49.276269	-119.52566	6
Vaseaux Lake	Accessible	49.276272	-119.52564	5
Vaseaux Lake	Accessible	49.276278	-119.52564	6
Vaseaux Lake	Accessible	49.276313	-119.52577	6
Vaseaux Lake	Accessible	49.276348	-119.52554	5
Vaseaux Lake	Accessible	49.276410	-119.52573	5
Vaseaux Lake	Accessible	49.276421	-119.52557	8
Vaseaux Lake	Accessible	49.276446	-119.52589	5
Vaseaux Lake	Accessible	49.276464	-119.52562	5
Vaseaux Lake	Accessible	49.276548	-119.52590	3
Vaseaux Lake	Accessible	49.276549	-119.52584	7
Vaseaux Lake	Accessible	49.276595	-119.52581	1
Vaseaux Lake	Accessible	49.276643	-119.52570	3
Vaseaux Lake	Accessible	49.276650	-119.52615	5
Vaseaux Lake	Accessible	49.276741	-119.52585	3
Vaseaux Lake	Accessible	49.276780	-119.52581	5
Vaseaux Lake	Accessible	49.276807	-119.52582	5
Vaseaux Lake	Accessible	49.276818	-119.52581	4
Vaseaux Lake	Accessible	49.276838	-119.52603	7
Vaseaux Lake	Accessible	49.276848	-119.52605	5
Vaseaux Lake	Accessible	49.276885	-119.52610	0
Vaseaux Lake	Accessible	49.276890	-119.52610	6
Vaseaux Lake	Accessible	49.276893	-119.52599	12
Vaseaux Lake	Accessible	49.276904	-119.52583	1
Vaseaux Lake	Accessible	49.276906	-119.52595	2

Location	Access	Latitude	Longitude	Total Addled
Vaseaux Lake	Accessible	49.276944	-119.52589	3
Vaseaux Lake	Accessible	49.276954	-119.52615	5
Vaseaux Lake	Accessible	49.277015	-119.52610	7
Vaseaux Lake	Accessible	49.277046	-119.52580	6
Vaseaux Lake	Accessible	49.277047	-119.52594	6
Vaseaux Lake	Accessible	49.277059	-119.52591	5
Vaseaux Lake	Accessible	49.277129	-119.52586	7
Vaseaux Lake	Accessible	49.277154	-119.52611	5
Vaseaux Lake	Accessible	49.277230	-119.52620	6
Vaseaux Lake	Accessible	49.277310	-119.52601	4
Vaseaux Lake	Accessible	49.277311	-119.52613	7
Vaseaux Lake	Accessible	49.277329	-119.52609	8
Vaseaux Lake	Accessible	49.277359	-119.52622	7
Vaseaux Lake	Accessible	49.277374	-119.52606	1
Vaseaux Lake	Accessible	49.277375	-119.52622	6
Vaseaux Lake	Accessible	49.277392	-119.52623	5
Vaseaux Lake	Accessible	49.277420	-119.52633	6
Vaseaux Lake	Accessible	49.277513	-119.52606	6
Vaseaux Lake	Accessible	49.277513	-119.52620	4
Vaseaux Lake	Accessible	49.277753	-119.52640	7
Vaseaux Lake	Accessible	49.277974	-119.52646	6
Vaseaux Lake	Accessible	49.278000	-119.52651	6
Vaseaux Lake	Accessible	49.278076	-119.52676	5
Vaseaux Lake	Accessible	49.278179	-119.52661	5
Vaseaux Lake	Accessible	49.278219	-119.52658	6
Vaseaux Lake	Accessible	49.278295	-119.52662	6
Vaseaux Lake	Accessible	49.278303	-119.52652	7
Vaseaux Lake	Accessible	49.278343	-119.52677	6
Vaseaux Lake	Accessible	49.278411	-119.52654	6
Vaseaux Lake	Accessible	49.278432	-119.52695	7
Vaseaux Lake	Accessible	49.278444	-119.52704	1
Vaseaux Lake	Accessible	49.278471	-119.52661	6
Vaseaux Lake	Accessible	49.278485	-119.52723	8
Vaseaux Lake	Accessible	49.278488	-119.52715	4
Vaseaux Lake	Accessible	49.278499	-119.52676	5
Vaseaux Lake	Accessible	49.278500	-119.52686	5
Vaseaux Lake	Accessible	49.278512	-119.52665	6
Vaseaux Lake	Accessible	49.278518	-119.52714	4
Vaseaux Lake	Accessible	49.278520	-119.52712	1
Vaseaux Lake	Accessible	49.278537	-119.52717	1
Vaseaux Lake	Accessible	49.278556	-119.52734	5
Vaseaux Lake	Accessible	49.278557	-119.52715	7

Location	Access	Latitude	Longitude	Total Addled
Vaseaux Lake	Accessible	49.278575	-119.52668	6
Vaseaux Lake	Accessible	49.278577	-119.52689	4
Vaseaux Lake	Accessible	49.278599	-119.52689	6
Vaseaux Lake	Accessible	49.278617	-119.52729	4
Vaseaux Lake	Accessible	49.278645	-119.52739	8
Vaseaux Lake	Accessible	49.278663	-119.52669	5
Vaseaux Lake	Accessible	49.278671	-119.52718	7
Vaseaux Lake	Accessible	49.278688	-119.52717	7
Vaseaux Lake	Accessible	49.278695	-119.52750	7
Vaseaux Lake	Accessible	49.278703	-119.52695	7
Vaseaux Lake	Accessible	49.278806	-119.52717	6
Vaseaux Lake	Accessible	49.278810	-119.52703	5
Vaseaux Lake	Accessible	49.278847	-119.52691	6
Vaseaux Lake	Accessible	49.278857	-119.52726	3
Vaseaux Lake	Accessible	49.278866	-119.52743	1
Vaseaux Lake	Accessible	49.278982	-119.52745	7
Twin Lakes	Accessible	49.288994	-119.57514	0
Vaseaux Lake	Accessible	49.302889	-119.54167	5
Vaseaux Lake	Accessible	49.304477	-119.54388	0
Vaseaux Lake	Accessible	49.304485	-119.54385	7
Vaseaux Lake	Accessible	49.304613	-119.54211	0
Vaseaux Lake	Accessible	49.305010	-119.54474	0
Twin Lakes	Accessible	49.324113	-119.72153	5
Twin Lakes	Accessible	49.337317	-119.74634	6
Twin Lakes	Accessible	49.338555	-119.74267	0
Twin Lakes	Accessible	49.340970	-119.73920	0
Okanagan Falls	Accessible	49.348674	-119.57263	6
Okanagan Falls	Accessible	49.348685	-119.57267	0
Okanagan Falls	Accessible	49.348726	-119.57269	0
Penticton	Accessible	49.363966	-119.56960	0
Twin Lakes	Accessible	49.371470	-119.67591	5
Twin Lakes	Accessible	49.377899	-119.68564	5
Penticton	Accessible	49.451431	-119.58263	0
Penticton	Accessible	49.451443	-119.58220	0
Penticton	Accessible	49.451787	-119.59760	0
Penticton	Accessible	49.454794	-119.59255	6
Penticton	Accessible	49.455953	-119.59237	0
Penticton	Accessible	49.458356	-119.57872	6
Penticton	Accessible	49.502477	-119.61158	0
Penticton	Accessible	49.506019	-119.58785	3
Penticton	Accessible	49.506035	-119.58728	3
Penticton	Accessible	49.506290	-119.58595	0

Location	Access	Latitude	Longitude	Total Addled
Penticton	Accessible	49.506559	-119.58573	0
Penticton	Accessible	49.506570	-119.58529	4
Penticton	Accessible	49.506629	-119.58430	0
Penticton	Accessible	49.506719	-119.58496	0
Summerland	Accessible	49.601836	-119.65101	0
Summerland	Accessible	49.602478	-119.65019	0
Summerland	Accessible	49.602491	-119.65022	6
Summerland	Accessible	49.602798	-119.65026	0
Summerland	Accessible	49.602939	-119.65025	1
Summerland	Accessible	49.603364	-119.65003	6
Summerland	Accessible	49.603382	-119.65035	2
Summerland	Accessible	49.603447	-119.65068	6
Naramata	Accessible	49.604807	-119.59690	0
Naramata	Accessible	49.606911	-119.59989	6
Naramata	Accessible	49.651769	-119.62887	6
Okanagan Mountain Provincial Park	Accessible	49.702791	-119.69665	6
Okanagan Mountain Provincial Park	Accessible	49.710676	-119.70261	2
Okanagan Mountain Provincial Park	Accessible	49.717947	-119.71004	4
Okanagan Mountain Provincial Park	Accessible	49.723782	-119.72102	6
Okanagan Mountain Provincial Park	Accessible	49.723808	-119.72100	4
Okanagan Mountain Provincial Park	Accessible	49.724275	-119.72256	6
Osoyoos	Inaccessible	49.038275	-119.46506	0
Twin Lakes	Inaccessible	49.337356	-119.74315	0
Twin Lakes	Inaccessible	49.338312	-119.74155	0
Twin Lakes	Inaccessible	49.340440	-119.74135	0
Penticton	Inaccessible	49.472525	-119.59414	0
Okanagan Mountain Provincial Park	Inaccessible	49.720400	-119.71351	0
Okanagan Mountain Provincial Park	Inaccessible	49.723295	-119.72031	0
Okanagan Mountain Provincial Park	Inaccessible	49.723295	-119.72031	0

Nest Summary	Value
Minimum Clutch Size	0
Maximum Clutch Size	12
Mean Clutch Size	4
Total Number of Nests	155
Total Number of Eggs	636

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APPENDIX B

Select Project Photographs

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Boat Nest (Vernon)

Polson Park (Vernon)

Okanagan Lake (Across from Fintry Provincial Park)

Okanagan Lake

Boat Cover (Kelowna)

Peachland

Vaseux Lake