2023

Belgrade Lakes Common Loon Monitoring Summary Report

SUBMITTED TO:

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Loon Conservation Associates is dedicated to the protection and welfare of loons through collaboration, education, and the implementation of successful conservation actions.

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1.0 EXECUTIVE SUMMARY

Supported by a fifth year of funding from the Belgrade Lakes Association (BLA), and a new collaboration with Colby College (CC), Loon Conservation Associates (LCA) and the BLA continued a study of common loons (Gavia Immer) on Great Pond and Long Pond. Loons are a key indicator of aquatic integrity for lakes, and this initiative provides an opportunity to confirm the current population status, identify major threats, and create long-term, sustainable conservation solutions designed to aid the current population.

Engaging and educating local volunteers to conduct surveys with professional guidance is a key component of the project. Formal training was conducted in May by LCA for BLA volunteers and CC student interns and staff. Results published in this report are taken from data gathered by LCA, BLA and CC.

In 2023, Great Pond and Long Pond were surveyed bi-weekly by LCA, and alternatively by BLA volunteers, and CC student interns and staff. Based on well-defined criteria for an established loon territory, a total of 23 territorial pairs were documented and 17 of these pairs nested. From nine successful nests 14 chicks hatched and six survived to > six weeks of age – an age defined as fledging for modeling purposes. Overall productivity on Great Pond and Long Pond in 2023 was 0.26 fledged young per territorial pair.

Historically, nesting loons have benefited from the use of artificial nesting islands (rafts). Pairs nesting on rafts have had better success than pairs nesting naturally. In 2023, the same number of rafts were deployed in the same territories and locations as 2022; three rafts on Long Pond (Beaver Cove, Lynch Cove and Tracy Cove) and three on Great Pond (Austin Bog, Horse Point and Robbins Mill). There was a downward trend in raft nesting. Two of the six rafts were used for nesting (33%), and one of the two nests was successful (50%). Comparatively, there were a total of 18 natural nest attempts on the two lakes, and nine nests were successful (50%), confirming equal success rates in 2023.

Banding (color-marking) loons is a key conservation measure for comprehensive population studies. Marked individuals can be tracked to gain further information on territory boundaries, between-year territory fidelity, mate switching, estimated minimum

and long-term survivorship, intra-seasonal movements, and recruitment. In 2023, the capture and banding program was continued with great success. A total of 17 loons were captured and banded; six adults on Great Pond, and 10 adults and one chick on Long Pond.

Significant findings/outcomes:

- Monitoring of a larger banded population allowed confirmation of individual survival, and mate and territory fidelity with high certainty. Observations from the 2023 field monitoring season included:
    - Sixteen of 20 adult loons banded since 2020 returned (80%).
    - Twelve of the 16 returning loons occupied the same territory (75%).
    - Four of eight banded pairs remained together (50%).
    - There were three cases where one loon of a banded pair was displaced by another loon
- Raft usage rates decreased in 2023, back to 2021 levels. Two of the six rafts deployed were used (33%). Constant disturbance from other loons in both Lynch Cove and Beaver Cove, Long Pond, is suspected as the most likely cause of neither of these pairs nesting on the rafts placed there.
- No mortalities were confirmed on the two lakes.
- A new territory was confirmed at Foster Point on Great Pond. Anecdotal evidence of past loon activity in this area makes it possible this has been a territory in previous years that could not be confirmed.
- Long Point, Crooked Island, and Finger Reef on Great Pond, and the W Boat Ramp territory on Long Pond were determined to be unoccupied in 2023. All other known, historical territories were occupied by a pair of loons.
- For the fifth year in a row a male loon who was banded in 2008 in the Snake Point Cove territory of Great Pond was observed in the Otter Island territory. He was mated with an unbanded female. Identification of this banded individual along with confirming an unbanded male and female at Chutes Island, continued to confirm two separate occupied territories.

2.0 INTRODUCTION

Loons were first banded in the Belgrade Lakes in 1997. The effort was funded as part of a Maine Department of Environmental Protection, Regional Monitoring and Assessment Program (ReMAP). Ongoing monitoring and banding efforts were continued, sporadically, over the following decades, but were limited by a lack of funding.

Data gathered from the prior banding effort and occasional surveys provides some insight into the population status. Personal monitoring efforts conducted over the last two decades confirmed Long Pond has upwards of 10± territorial pairs of loons, with knowledge of at least six territories known on Great Pond. Casual evidence suggests the population is relatively stable, with annual fluctuations in productivity, typical of the species throughout their range. However, recent declines in chick numbers observed by local residents and seasonal camp owners has generated concern about the health of the population.

Great Pond and Long Pond are vulnerable to multiple anthropogenic stressors, coupled with the potential impacts of climate change. More information is needed on the individual performance (i.e., reproductive success) and specific movements of individuals to better understand the status of the population.

3.0 OBJECTIVES

Collaborate with BLA and CC to:

1. Conduct bi-weekly, comprehensive productivity surveys to identify territorial pairs, nesting pairs, nest success/failure, number of chicks hatched, and number of chicks fledged;
2. Consult on deployment and placement of artificial nesting rafts, where appropriate, to increase nest success rates, and minimize nest loss due to flooding and predation;
3. Engage and instruct citizen volunteers and CC interns on the basics of conducting comprehensive loon breeding surveys, and
4. Continue an active capture and banding program to better understand the status of the current loon population, and

5. Share all data acquired at both regional and national conferences to aid our understanding of the species status and trends over a wide geographical area.

4.0 STUDY AREA

This study is limited to the entirety of Great Pond and Long Pond (including Ingham Stream and Ingham Pond), Kennebec County, Maine (Figure 1).

Figure 1. The Belgrade Lakes Study Area. Courtesy of Google Earth.

5.0 METHODS

5.1 GROUND SURVEYS

All known or potential loon territories and surrounding areas were surveyed by LCA, BLA volunteers, and CC student interns and staff using binoculars and/or a spotting scope, when needed. Surveys were conducted by boat, or alternatively from shore. Comprehensive surveys began in May and ended in August, although BLA volunteers and CC staff continued to conduct chick survival surveys well into the fall. Confirmed territories

occupied by loon pairs were prioritized and surveyed bi-weekly at a minimum. To minimize impacts on the loons, surveys were conducted from the greatest distance possible. If nesting evidence was obscured by vegetation, it necessitated searching for nest evidence by foot. All known nesting sites were checked regularly for nesting evidence.

Loon territories were delineated according to observed territorial behavior by a loon pair such as close physical association, and defensive posturing and calling along borders. Territories are used by pairs for feeding, resting, breeding, nesting and chick rearing, and are protected against incursion by other loons (and sometimes waterfowl) for a minimum of four weeks. Territories are used as a unit of reference in describing loon breeding activity and are recognized as being either *established* or *transitional*. Established territories have consistent occupancy for at least three seasons; transitional territories exhibit inconsistent occupation.

Nesting pairs were defined as those laying at least one egg; a nesting attempt was evidenced by a constructed nest dish or scrape with at least one egg present or fresh eggshell fragments. Successful nesting pairs hatched at least one chick. Causes of nest failure were attributed according to evidence observed.

Chicks hatched were recorded as those that hatched completely out of their eggs, not necessarily departing from the nest. For this report, we define the terms *chick* and *fledgling* as follows: *chicks* refer to loon young ≤ six weeks of age post-hatching and fledglings or "fledged young" refer to loon young > six weeks of age. Sub-adult loons in alternate plumage are recorded as immatures (ages 1-2). The number of loon chicks to survive past six weeks of age, were assumed to have fledged.

5.2 ARTIFICIAL NESTING ISLANDS

Rafts were floated in territories that met specific criteria for flotation; including knowledge of 1) a history of nest failures due to predation and/or flooding, 2) wind and wave action patterns relative to each territory, 3) loon territorial boundaries and proximity to neighboring territories, 4) previous traditional and non-traditional nest site locations, 5) boat traffic patterns relative to the specific territory, and 6) shoreline activities.

5.3 LOON CAPTURE AND SAMPLE COLLECTION

Loons were captured using well-established night lighting and playback techniques. Adult and juvenile birds were leg banded with USFWS aluminum bands and a unique combination of plastic-colored bands, enabling identification of individual birds to be made from a distance in future observations. Chicks were not banded if their legs were too small to hold adult-size bands. All sampling was accomplished using non-lethal methods.

5.4 DEFINING REPRODUCTIVE SUCCESS

Reproductive success was evaluated according to four parameters; 1) nesting frequency, 2) hatching success, 3) chick survivorship, and 4) overall productivity. Nesting frequency was defined as the number of nesting pairs per total territorial pairs. This measure indicates the percent of the total potential breeding population that attempts to reproduce each season. The rate of success by these pairs, or hatching success, was measured through the number of chicks hatched by these pairs. Chick survivorship was defined as the number of chicks surviving divided by the number of chicks hatched. Overall productivity is a combination of the prior three parameters and measured through fledged young per territorial pair (CS/TP).

6.0 RESULTS

6.1 OVERALL STUDY AREA PRODUCTIVITY

During the 2023 field season, Great Pond and Long Pond were surveyed six times by LCA. Twenty-three territorial pairs were identified. Of the 23 pairs, 17 nested, and 10 successful nests hatched 14 chicks; six survived to fledge. This yielded a nesting frequency of 0.74, a hatching success of 0.82, and chick survival of 0.43. Overall productivity was 0.26 fledged young per territorial pair (Table 1).

Table 1. Common Loon Population and Productivity, Great Pond and Long Pond, 2023.

Population		*Reproductive Success*	
Territorial Pairs	23	Nesting Frequency	0.74
Nesting Pairs	17	Hatching Success	0.82
Chicks Hatched	14	Chick Survivorship	0.43
Chicks Surviving	6	Overall Productivity	0.26

6.1.1 GREAT POND PRODUCTIVITY

Thirteen territorial pairs were identified on Great Pond. Of the 13 pairs, 10 pairs nested, and four successful nests hatched six chicks. Two chicks survived to fledge. This yielded a nesting frequency of 0.77, a hatching success of 0.60, and chick survival of 0.33. The overall productivity was 0.15 fledged young per territorial pair (Table 2, Figure 2).

Table 2. Common Loon Population and Productivity, Great Pond, 2023.

Population		*Reproductive Success*	
Territorial Pairs	13	Nesting Frequency	0.77
Nesting Pairs	10	Hatching Success	0.60
Chicks Hatched	6	Chick Survivorship	0.33
Chicks Surviving	2	Overall Productivity	0.15

Figure 2. Nesting Loons, Great Pond, Austin Bog, 2023.

6.1.2 LONG POND PRODUCTIVITY

Ten territorial pairs were identified on Long Pond. Of the 10 pairs, seven nested, and six successful nests hatched eight chicks; four survived to fledge. This yielded a nesting frequency of 0.70, a hatching success of 1.14, and chick survival of 0.50. Overall productivity was 0.40 fledged young per territorial pair (Table 3, Figure 3).

Table 3. Common Loon Population and Productivity, Long Pond, 2023.

Population		*Reproductive Success*	
Territorial Pairs	10	Nesting Frequency	0.70
Nesting Pairs	7	Hatching Success	1.14
Chicks Hatched	8	Chick Survivorship	0.50
Chicks Surviving	4	Overall Productivity	0.40

Figure 3. Adult and chick, Great Pond, 2023.

6.2 PRODUCTIVITY AND NEST FAILURE RESULTS BY LAKE/TERRITORY, 2023.

Productivity results were analyzed and documented by lake/territory, including nest failures. A total of 10 nest failures were recorded. There were six cases where the cause of

failure was unknown, three cases of abandonment/predation, and one confirmed case of mammalian predation. A total of three eggs were collected (Table 4).

Table 4. Productivity and Nest Failure Results by Lake/Territory, 2023.

Lake/Territory	TP*	NP*	CH*	CS*	NF*	CAUSE OF NEST FAILURE
GREAT POND:						
Marina	Y	Y	1	1	0	
Finger Reef	?	N	0	0	0	
Blueberry Island	Y	Y	0	0	1	unknown, eggs ended up in water (collected)
Robbins Mill Stream	Y	Y	0	0	1	unknown, nest empty
Crooked Island	N	N	0	0	0	
Ram Island	Y	N	0	0	0	
Otter Island	Y	N	0	0	0	
Chutes Island	Y	Y(2)	0	0	2	abandonment/predation
Bear Springs	Y	Y	0	0	1	unknown, nest empty
Snake Point Cove	Y	N	0	0	0	
Horse Point	Y	Y	0	0	1	predation
Pine Island	Y	Y	0	0	1	abandonment/predation, 1 egg collected
Austin Bog	Y	Y(2)	2	0	1	unknown, nest empty
Oak Island	Y	Y	2	0	0	
Long Pt/Abena Shores	?	N	0	0	0	
Foster Point	Y	Y	1	1	0	
LONG POND:						
Beaver Cove	Y	N	0	0	0	
Tracy Cove	Y	Y	2	2	0	
Lynch Cove	Y	N	0	0	0	
Blueberry Island	Y	Y	1	1	0	
Castle Island	Y	N	0	0	0	
W Boat Ramp	N	N	0	0	0	
Lost River	Y	Y(2)	0	0	2	unknown, eggs missing
Graveyard	Y	Y	2	0	0	
SW Cove	Y	Y	1	0	0	1 egg abandoned, collected
Ingham Stream	Y	Y	1	1	0	
Ingham Pond	Y	Y	1	0	0	
TOTALS:	**23**	**17**	**14**	**6**	**10**	

*TP = territorial pair, NP = nesting pair, CH = chick(s) hatched, CS = chick(s) surviving, NF = nest failure.

Population and productivity were mapped for each lake for location reference, confirmed occupation and reproductive success (Figures 4, 5).

Figure 4. Common Loon Population and Productivity, Great Pond, 2023. Courtesy of Google Earth.

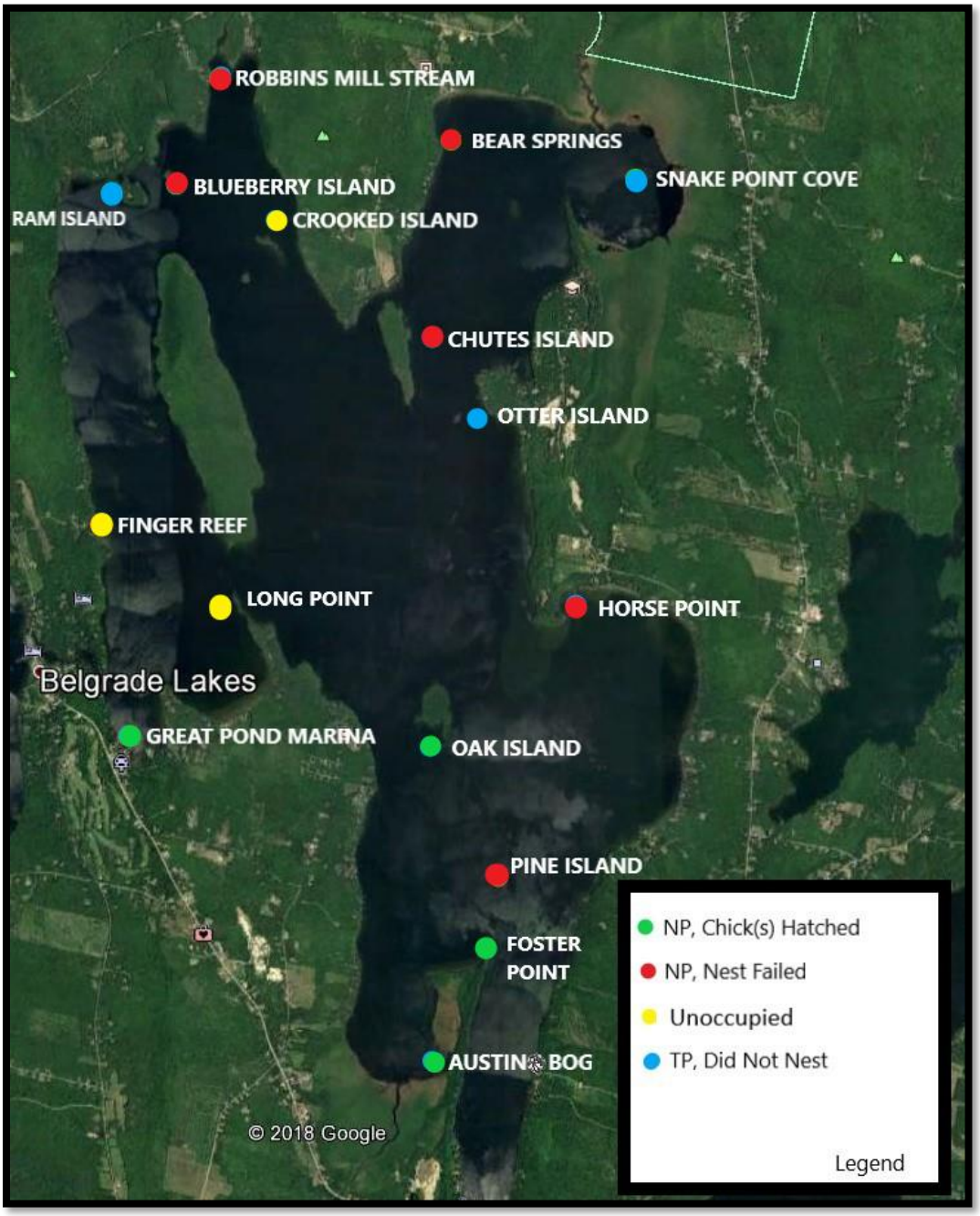
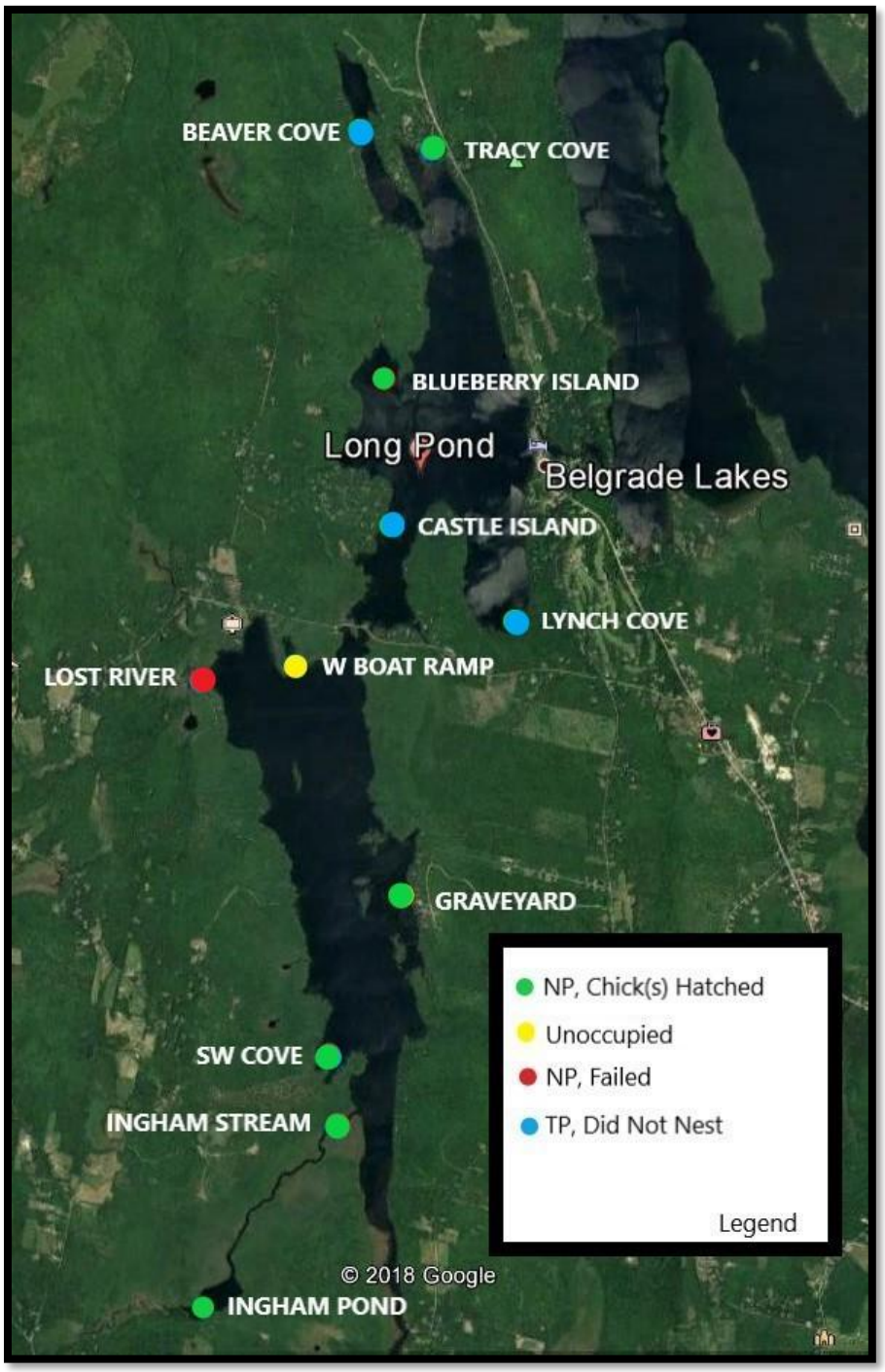


Figure 5. Common Loon Population and Productivity, Long Pond, 2023. Courtesy of Google Earth.



6.3 USE OF ARTIFICIAL NESTING ISLANDS (RAFTS)

Six artificial nests rafts were floated in 2023, and two were used (33%). One of the two pairs nesting on rafts successfully hatched chicks (50%). In comparison, there were 18 natural nest attempts and nine were successful (50%), (Table 5, Figure 6).

Table 5. Comparative Loon Nesting Summary: Raft vs. Natural Nests, Great Pond and Long Pond, 2023.

***Raft* Nests**	***2023***	***Natural* Nests**	***2023***
Number of Nest Attempts	2	Number of Nest Attempts	18
Number of Successful Nest Attempts	1	Number of Successful Nest Attempts	9
Success Rate	***50%***	***Success Rate***	***50%***
Chicks Hatched from Rafts	2	Chicks Hatched from Natural Sites	12
Total Chicks Hatched	14	Total Chicks Hatched	14
Contribution to Productivity	***14%***	***Contribution to Productivity***	***86%***
Total Chicks Fledged	2	Total Chicks Fledged	4
Final Productivity*	***33.3%***	***Final Productivity****	***66.6%***

* Percentage of total chicks fledged.

Figure 6. Nest raft being checked by Lee Attix and Colby Intern, Brynne Robbins, 2023.

6.4 CAPTURE AND BANDING

In 2023, 17 loons were captured and banded; 16 adults and one chick (Table 6, Figure 7).

Table 6. Captured and Banded Loons, 2023.

Lake/Territory	Band #	Year	Sex	Age*	Left Leg Top	Left Leg Bottom	Right Leg Top	Right Leg Bottom
Great Pond:								
Great Pond Marina	1238-25647	2023	F	ATY	Orange Dot	Orange	Orange Dot	Silver
Great Pond Marina	1238-25642	2023	M	ATY	Red	White Stripe	Orange Dot	Silver
Foster Point	0687-15945	2023	F	ATY	Red	Yellow Stripe	Green Dot	Silver
Foster Point	1238-24449	2023	M	ATY	White	Yellow Stripe	Green Dot	Silver
Austin Bog	1238-25641	2023	F	ATY	White Dot	Green Dot	Yellow Dot	Silver
Austin Bog	1238-25646	2023	M	ATY	Blue Dot	Green Dot	Orange Dot	Silver
Long Pond:								
Ingham Stream	1238-24407	2023	F	ATY	Red Stripe	Green	Silver	Orange Dot
Ingham Stream	1238-25632	2023	M	ATY	White Dot	Blue	Silver	Yellow Dot
Tracy Cove	1238-25635	2023	F	ATY	Green Dot	Orange	Yellow Dot	Silver
Tracy Cove	1238-25638	2023	M	ATY	Red	Green Dot	Silver	Orange Dot
SW Cove	0689-15976	2023	F	ATY	Red	Orange	Silver	Yellow Dot
Ingham Pond	1238-25651	2023	M	ATY	Blue Stripe	Yellow	White	Silver
Ingham Pond	0689-15914	2023	UNK	HY	White Dot	Silver	Green	Yellow
Blueberry Island	1238-25653	2023	F	ATY	Blue	Red Stripe	Silver	White
Blueberry Island	1238-25652	2023	M	ATY	Orange	Yellow Stripe	White Dot	Silver
Graveyard	0689-15911	2023	M	ATY	Orange Stripe	Blue	White Dot	Silver
Graveyard	1238-08886	2023	F	ATY	Green Stripe	Yellow	Silver	White

* ATY = adult, HY = chick.

Figure 7. Colby interns, Kate Jaffee and Brynne Robbins holding chicks to safeguard them during banding, 2023.

6.5 BANDED LOON RE-OBSERVATIONS AND RECOVERIES

Loons were first banded on Great Pond and Long Pond in 1997. Between 1997 and 2022, 40 loons were banded (33 adults and seven juveniles). In 2023, 17 banded adults were confirmed on Long Pond and Great Pond (Table 7). All breeding loons were confirmed as either banded, with a positive confirmation or as unbanded (100% confirmation).

Table 7. Banded Loon Re-observations and Recoveries, 2023.

Band #	Lake	Year	Sex	Age*	Original Territory	2022 Territory	2022	Notes
0848-04699	Long Pond	1997	M	ATY	W Boat Ramp	NA	N	
0898-05397	Long Pond	1997	U	HY	W Boat Ramp	NA	N	
0898-05395	Long Pond	1997	F	ATY	Twin Islands	NA	N	
0559-61756	Great Pond	1997	M	ATY	Pine Island	NA	N	
0848-04785	Great Pond	1997	F	ATY	Pine Island	NA	N	
0559-61896	Long Pond	1999	F	ATY	SW Cove	NA	N	
0559-61871	Long Pond	1999	M	ATY	Twin Islands	NA	N	
0938-03338	Long Pond	1999	U	HY	Twin Islands	NA	N	
0898-09873	Long Pond	2000	F	ATY	Beaver Cove	NA	N	
0938-30822	Long Pond	2003	M	ATY	Beaver Cove	NA	N	deceased 2005
0938-30886	Long Pond	2003	M	ATY	Lynch Cove	NA	N	deceased 2006
0938-03384	Long Pond	2003	F	ATY	Lynch Cove	NA	N	
0938-66608	Long Pond	2008	M	ATY	W Boat Ramp	NA	N	
0938-66613	Long Pond	2008	F	ATY	W Boat Ramp	Lost River	N	deceased 2022
0938-66612	Long Pond	2008	U	HY	W Boat Ramp	NA	N	deceased 2018
0938-66607	Great Pond	2008	M	ATY	Snake Pt Cove	Otter Island	Y	w/unbanded female
0938-66603	Great Pond	2008	U	HY	Snake Pt Cove	NA	N	
0689-09482	Long Pond	2020	F	ATY	Beaver Cove	Beaver Cove	Y	w/unbanded male
0689-09476	Long Pond	2020	M	ATY	Beaver Cove	NA	N	
0689-09484	Long Pond	2020	F	ATY	Ingham Pond	Ingham Pond	Y	w/unbanded male
0689-09487	Long Pond	2020	M	ATY	Ingham Pond	NA	N	
1238-04764	Long Pond	2020	F	ATY	Lynch Cove	none	Y	open lake, group
1238-04763	Great Pond	2020	M	ATY	Ram Island	NA	N	
0968-87783	Great Pond	2020	U	HY	Ram Island	NA	N	
0689-15630	Long Pond	2021	F	ATY	Castle Island	none	Y	unpaired in area
0689-15644	Long Pond	2021	M	ATY	Castle Island	Castle Island	Y	w/unbanded female
0689-15634	Long Pond	2021	U	HY	Castle Island	NA	N	
0689-15638	Long Pond	2021	F	ATY	Lynch Cove	Lynch Cove	Y	
0689-15626	Long Pond	2021	M	ATY	Lynch Cove	Lynch Cove	Y	
0689-09437	Great Pond	2021	M	ATY	Pine Island	NA	N	
0689-09439	Great Pond	2021	M	ATY	Robbins Mill	none	Y	unpaired in area
0689-09436	Great Pond	2021	M	ATY	Blueberry Island	Blueberry Island	Y	
0689-09428	Great Pond	2021	F	ATY	Blueberry Island	Blueberry Island	Y	
0689-09426	Great Pond	2021	F	ATY	Snake Point Cove	Snake Point Cove	Y	w/unbanded male
0689-09422	Great Pond	2021	M	ATY	Snake Point Cove	none	Y	displaced
1238-25626	Great Pond	2022	M	ATY	Oak Island	Oak Island	Y	
1238-24446	Great Pond	2022	F	ATY	Oak Island	Oak Island	Y	
1238-24445	Great Pond	2022	UNK	HY	Blueberry Island	NA	N	deceased 2022
1238-25630	Great Pond	2022	M	ATY	Ram Island	Ram Island	Y	
1238-24447	Great Pond	2022	F	ATY	Ram Island	Ram Island	Y	

*ATY = adult, HY = chick.

6.6 CONTAMINANT ANALYSIS

Lab analysis for contaminant levels in loons is not being conducted in 2023. Lab results for both mercury (Hg) and lead (Pb) contaminants have been analyzed since loons were first banded in 1997. The results over the past 24 years, including recent samples from as recent as 2020, show only low and moderate levels of these contaminants in both blood and feathers. These results do not indicate any levels of concern at this time.

6.7 MORTALITIES:

There were no confirmed mortalities in 2023.

7.0 DISCUSSION

In 2023, 23 of 27 known territories (85%) were occupied by loon pairs. This continued high occupancy rate demonstrates a strong breeding base in numbers, with potential to sustain a healthy breeding population. Most of the high-quality nesting habitat is occupied on both lakes, but some suitable habitat remains where new territories could possibly emerge in the future.

Nesting conditions were relatively favorable in 2023. Water levels were managed well during extended rainy periods, and no nests were lost due to flooding, which is often a cause of loon nest failures. Six of seven nesting pairs on Long Pond were successful (86%), and four of 10 pairs on Great Pond were successful (40%). Four of eight chicks on Long Pond fledged (50%), and two of six chicks on Great Pond fledged (33%). Very low nest success rates on Great Pond, coupled with low chick survival were the primary factors in low overall productivity in the study area.

Identifying the cause of nest failures with some certainty is important in understanding population trends over time, as researchers weigh all the factors contributing to low productivity. In 2023 there were six cases where the cause of failure was unknown. In five of these cases the eggs went missing, and in one case the eggs ended up in the water. While predators are most likely to blame, collecting photo evidence to confirm what actually happened would be valuable in the future.

The 2023 overall productivity of 0.26 CS/TP remains very low when compared to the established sustainable population threshold of 0.48 CS/TP. Looking at 2019 (0.35), 2020 (0.17), 2021 (0.35), 2022 (0.30) productivity, no single year approaches 0.48 CS/TP. These consistently low productivity numbers over a five-year period are concerning. Further study and evaluation of population trends is warranted to help better understand the low productivity, and determine if there are additional conservation measures which could be implemented to enhance productivity.

Determining the occupancy status of territories, and accurately identifying all territories on both lakes is of critical importance when calculating productivity. This is extremely challenging on large lakes, especially Great Pond, and errors are likely. Errors that might incorrectly add or subtract one or two territories, or err in determining occupancy status can dramatically alter the findings of this study. It should be noted that in 2023 there was some uncertainty about the occupancy status of a number of territories.

Similarly, confirming chick survival to six weeks of age is of critical importance. In 2023 logistics and weather issues caused a lapse of survey coverage during late summer, which introduced the possibility of errors in accurately gathering this information.

Despite a downward trend in nest raft usage and productivity in 2023, artificial nest rafts have been highly effective when looked at over the five-year period of the study. Overall contributions to increased productivity are currently limited by a small percentage of known territories having rafts, and current usage rates.

Human disturbance of both nesting loons and loons on the lakes has been observed and documented. Maps contained in this report help to inform the public about occupied loon territories. With more knowledge and education, it is hoped the public will avoid disturbing nesting loons and exercise caution when boating in these areas of the lakes.

When used appropriately, signs can be used as a valuable education and conservation tool. Well-thought out and strategic usage of signage can help to reduce disturbance issues. Signs have been utilized broadly, often as part of well-developed conservation programs throughout common loon breeding ranges.

Tracking movements, territory and mate fidelity, and long-term survival of banded loons is key to understanding the dynamics of the local population. For populations to thrive, long-term survival and mate fidelity are critical factors. The successful re-introduction of an active capture and banding program since 2020 has allowed project staff to closely monitor these factors over time. Three years of data collection is a beginning. It's important to continue the in depth monitoring, as well as continued banding of new individuals in future years.

In the first five years, this project demonstrated the effectiveness of collaboration between trained professional researchers and volunteer citizen scientists. Progress recruiting new citizen volunteers in the community has been slow, however. The new collaboration with CC offers the possibility of always having dedicated seasonal staff through the paid internships, which could assure the long-term sustainability of the project. This unique partnership allows for the development of sustainable conservation efforts, which in turn provides valuable information to local communities and scientists concerned about the health of loon populations.

8.0 RECOMMENDATIONS

Common loons have responded well to dedicated human conservation measures designed to either stabilize a population or help a population rebound. However, these actions were implemented after years of research needed to accurately verify the status of the population, and identify past and present stressors, which may have led to population declines.

LCA recommends the following actions for 2024:

- With professional guidance, continue to use standardized survey methods to collect data on the number of territorial pairs, nesting pairs, location of nests, chicks hatched, and those surviving >six weeks of age.
- Review current utilization of nest rafts for possible changes to enhance the usage Continue the strategic use of artificial nest rafts to aid productivity. When circumstances are appropriate, look to introduce new rafts into territories where nesting pairs are struggling to nest successfully.
- Procure and utilize nest monitoring cameras (trail cameras), as circumstances allow to better understand the causes of nest disturbance and failure.

- Continue the new collaboration with CC using student interns to conduct dedicated surveys, with an emphasis on training and oversight designed to support the students as self-guided, independent researchers.

- Re-emphasize the focus on accurate data collection, more comprehensive survey time, especially in territories where the occupancy and breeding status is less certain (more time), and close monitoring of chick survival to six weeks of age.

- Repeat capture and banding of loons through traditional night capture of adults with chicks, allowing individual identification and tracking of movements and survival over time.

- Continue to engage and inform the local community about loons on Great Pond and Long Pond through all available media.

- Increase outreach and education efforts to communicate and reduce threats from human nest disturbance, fishing line entanglement, boat wakes, etc. Specific steps could include signage at any nests where disturbance has been documented with any frequency, general education signage at boat launches, and installment of containers for disposing of fishing line.

9.0 ACKNOWLEDGMENTS

LCA wishes to acknowledge the Belgrade Lakes Association and its' members, especially Dick Greenan, and the volunteers who participated in field surveys, Colby College and professor Cathy Bevier, and student interns Brynne Robbins and Kate Jaffe.