COMMON LOON MONITORING SUMMARY REPORT

2020

Kezar Lake Watershed

KEZAR LAKE WATERSHED

Common Loon Monitoring Summary Report

SUBMITTED TO:
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Loon Conservation Associates (LCA) 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 INTRODUCTION

Anecdotal evidence from casual surveys performed by KLWA members and volunteers over the past decade indicate the productivity of loons in the Kezar Lake watershed may be well below the 0.48 threshold needed to sustain a healthy loon population. Poor reproductive success is likely attributed to one or more causes, including; predation, human disturbance, water level fluctuation impacts, as well as contaminants, including lead (Pb) and mercury (Hg), and wintering hazards such as commercial fishing nets and oil spills.

In response to these observations and related concerns about the local loon population LCA and KLWA began a multi-year study in 2018. 2020 efforts continued this critical work for the third consecutive year.

This report is condensed and focuses on conveying key results only. Results are presented by year for the past three years to allow for easy comparison and evaluation of important trends through time. For more background and information on study design and methods you may reference the full 2018 and 2019 reports.

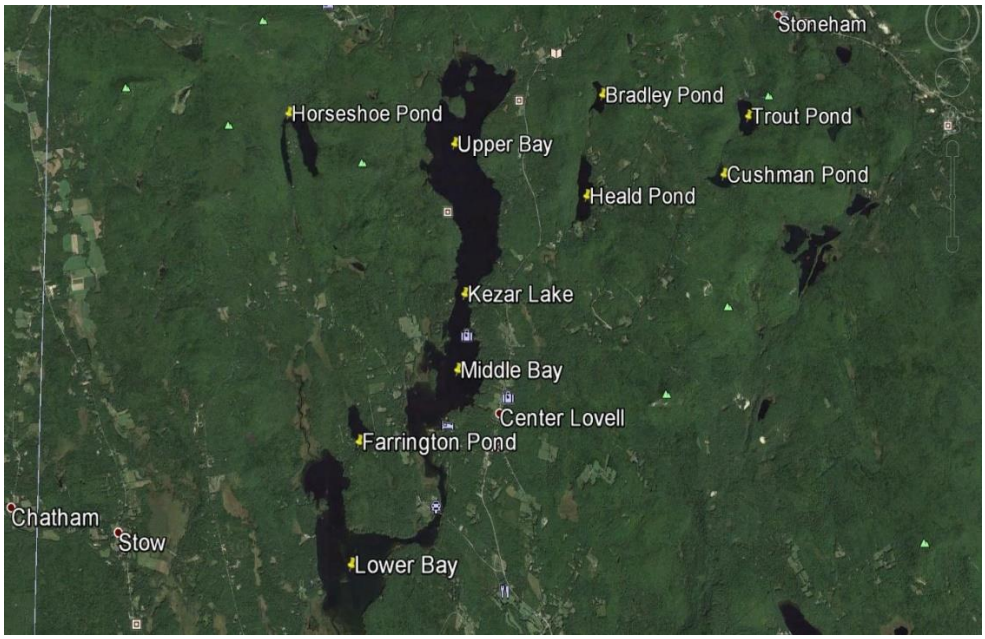
2.0 PRODUCTIVITY SUMMARY

In 2020, seven lakes were surveyed in the watershed. Based on well-defined criteria for an established loon territory a total of 16 territorial pairs were documented, and 10 of these pairs nested. From four successful nests, seven chicks hatched and four (57%) survived to > six weeks of age – an age defined as fledging for modeling purposes. Overall productivity in the Kezar Lake watershed in 2020 was 0.25 fledged young per territorial pair. This is the lowest productivity recorded in the first three years of the study.

3.0 STUDY AREA

This study is limited to lakes of appropriate size, and with suitable habitat in the Kezar Lake watershed in Oxford County, Maine (Figure 1). The specific lakes are: Kezar Lake, Horseshoe Pond, Farrington Pond, Cushman Pond, Heald Pond, Bradley Pond, and Trout Pond.

Figure 1. The Kezar Lake watershed study area. Courtesy of Google Earth Pro.



4.0 RESULTS

4.1 OVERALL PRODUCTIVITY BY YEAR (Table 1, Figure 2).

Table 1a. Common Loon population and productivity, Kezar Lake watershed, **2020**.

Population		Reproductive Success	
Territorial Pairs	16	Nesting Frequency	0.63
Nesting Pairs	10	Hatching Success	0.70
Chicks Hatched	7	Chick Survivorship	0.57
Chicks Surviving	4	Overall Productivity	0.25

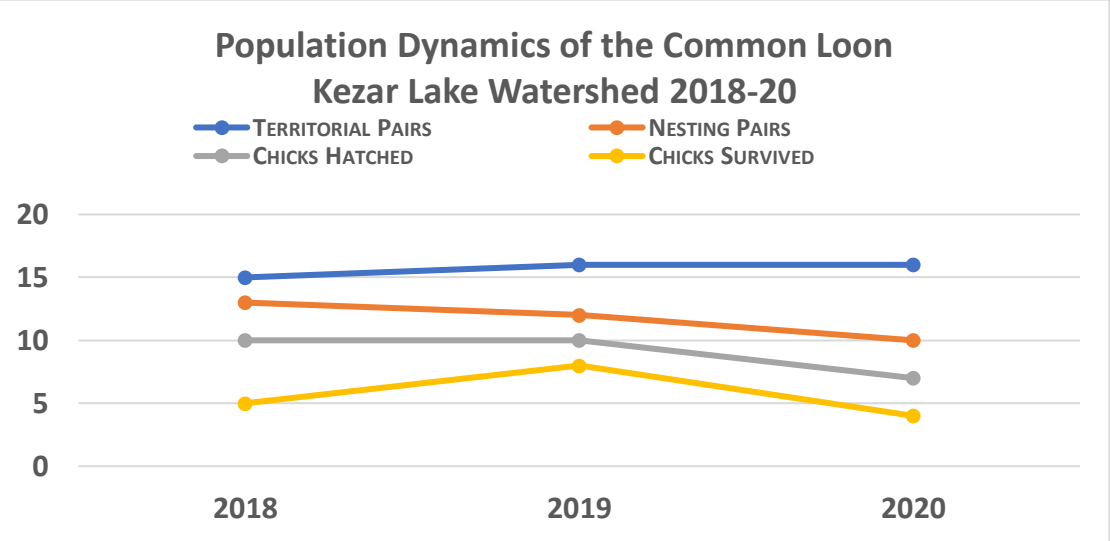
Table 1b. Common Loon population and productivity, Kezar Lake watershed, **2019**.

Population		Reproductive Success	
Territorial Pairs	16	Nesting Frequency	0.75
Nesting Pairs	12	Hatching Success	0.83
Chicks Hatched	10	Chick Survivorship	0.80
Chicks Surviving	8	Overall Productivity	0.50

Table 1c. Common Loon population and productivity, Kezar Lake watershed, **2018**.

Population		Reproductive Success	
Territorial Pairs	15	Nesting Frequency	0.87
Nesting Pairs	13	Hatching Success	0.77
Chicks Hatched	10	Chick Survivorship	0.50
Chicks Surviving	5	Overall Productivity	0.33

Figure 2.



4.2 PRODUCTIVITY AND NEST FAILURE BY LAKE/TERRITORY BY YEAR (Table 2).

Table 2a. Productivity and nest failure by lake/territory, **2020**.

Lake Name	Territory	TP*	NP*	CH*	CF*	NF*	Cause of Nest Failure
Kezar Lake	LB - NW Cove	Y	N	0	0	0	
Kezar Lake	LB – Rock Island	Y	Y	2	1	0	
Kezar Lake	LB – Outlet River Marsh	Y	N	0	0	0	
Kezar Lake	LB – SW Island	Y	N	0	0	0	
Kezar Lake	MB - Narrows	Y	Y	0	0	2	Unknown & Flooding (inviable)?
Kezar Lake	MB – Blueberry Island	N	N	0	0	0	
Kezar Lake	MB – Mud Cove	Y	N	0	0	0	
Kezar Lake	MB – Fox Cove	Y	Y	0	0	2	Mammalian Predation/Abandonment
Kezar Lake	MB – Severance West	Y	Y	0	0	1	Mammalian Predation
Kezar Lake	MB – Vinton's Cove	Y	Y	0	0	2	Unknown & Abandonment (inviable)?
Kezar Lake	UB – Alaska Bay	Y	Y	0	0	1	Mammalian Predation
Kezar Lake	UB – Great Brook	Y	Y	2	1	1	Abandoned – Black Flies/Wakes? **
Farrington Pond	Farrington	Y	N	0	0	1	
Horseshoe Pond	Horseshoe	Y	Y	1	1	0	
Cushman Pond	Cushman	Y	Y	0	0	1	Unknown – egg found in water
Bradley Pond	Bradley	N	N	0	0	0	
Heald Pond	Heald	Y	Y	2	1	0	
Trout Pond	Trout	Y	N	0	0	0	

* TP = territorial pair, NP = nesting pair, CH = chick(s) hatched, CF = chicks fledged, NF = nest failure

**One intact egg was found in the water, underneath the raft at UB, Great Brook. A nest monitoring camera captured images of huge wakes from boats washing over the raft during incubation, illustrating the possibility that the wakes could have caused the nest failure.

Table 2b. Productivity and nest failure by lake/territory, **2019**.

Lake Name	Territory	TP*	NP*	CH*	CF*	NF*	Cause of Nest Failure
Kezar Lake	LB - NW Cove	Y	Y	2	2	0	
Kezar Lake	LB – Rock Island	Y	Y	1	1	1	Abandoned - Black Flies
Kezar Lake	LB – Outlet River Marsh	Y	Y	0	0	1	Abandoned
Kezar Lake	LB – SW Island	Y	N	0	0	0	
Kezar Lake	MB - Narrows	Y	N	0	0	0	
Kezar Lake	MB – Blueberry Island	N	N	0	0	0	
Kezar Lake	MB – Mud Cove	Y	N	0	0	0	
Kezar Lake	MB – Fox Cove	Y	Y	0	0	1	Mammalian Predation
Kezar Lake	MB – Severance West	Y	Y	0	0	1	Mammalian Predation - Raccoon
Kezar Lake	MB – Vinton's Cove	Y	Y	0	0	1	Unknown Predation
Kezar Lake	UB – Alaska Bay	Y	Y	2	2	0	
Kezar Lake	UB – Great Brook	Y	Y	1	0	1	Abandoned – Black Flies
Farrington Pond	Farrington	Y	Y	0	0	1	Unknown
Horseshoe Pond	Horseshoe	Y	Y	1	1	0	
Cushman Pond	Cushman	Y	N	0	0	0	
Bradley Pond	Bradley	N	N	0	0	0	
Heald Pond	Heald	Y	Y	1	0	0	
Trout Pond	Trout	Y	Y	2	2	0	

*TP = territorial pair, NP = nesting pair, CH = chick(s) hatched, CF = chicks fledged, NF = nest failure

Table 2c. Productivity and nest failure by lake/territory, **2018**.

Lake Name	Territory	TP*	NP*	CH*	CF*	NF*	Cause of Nest Failure
Kezar Lake	LB - NW Cove	Y	Y	1	1	0	
Kezar Lake	LB – Rock Island	Y	Y	1	1	0	
Kezar Lake	LB – Outlet River Marsh	Y	Y	2	0	0	
Kezar Lake	LB – SW Island	Y	N	0	0	1	Abandoned
Kezar Lake	MB - Narrows	Y	N	0	0	2	Mammalian Predation
Kezar Lake	MB – Blueberry Island	N	N	0	0	0	
Kezar Lake	MB – Mud Cove	Y	Y	0	0	1	Mammalian Predation
Kezar Lake	MB – Fox Cove	Y	Y	1	0	0	
Kezar Lake	MB – Severance West	Y	N	0	0	0	
Kezar Lake	UB – Alaska Bay	Y	Y	0	0	1	Mammalian Predation
Kezar Lake	UB – Great Brook	Y	Y	2	1	0	
Farrington Pond	Farrington	Y	N	0	0	0	
Horseshoe Pond	Horseshoe	Y	Y	2	2	0	
Cushman Pond	Cushman	Y	N	0	0	2	Unknown
Bradley Pond	Bradley	N	N	0	0	0	
Heald Pond	Heald	Y	Y	1	0	0	
Trout Pond	Trout	Y	Y	0	0	1	Mammalian Predation

*TP = territorial pair, NP = nesting pair, CH = chick(s) hatched, CF = chicks fledged, NF = nest failure

4.3 USE OF ARTIFICIAL NESTING ISLANDS (RAFTS) BY YEAR (Table 3).

Table 3a. Comparative loon nesting summary: raft vs. natural nests, **2020**.

Raft Nests	**2020**	**Natural Nests**	**2020**
Number of Nest Attempts	6	Number of Nest Attempts	7
Number of Successful Nest Attempts	2	Number of Successful Nest Attempts	1
Success Rate	**33%**	**Success Rate**	**14%**
Chicks Hatched from Rafts	3	Chicks Hatched from Natural Sites	2
Total Chicks Fledged	3	Total Chicks Fledged	1
Contribution to Productivity*	**75%**	**Contribution to Productivity***	**25%**

** Percentage of total chicks fledged.*

Table 3b. Comparative loon nesting summary: raft vs. natural nests, **2019**.

Raft Nests	**2019**	**Natural Nests**	**2019**
Number of Nest Attempts	4	Number of Nest Attempts	10
Number of Successful Nest Attempts	3	Number of Successful Nest Attempts	6
Success Rate	**75%**	**Success Rate**	**60%**
Chicks Hatched from Rafts	3	Chicks Hatched from Natural Sites	7
Total Chicks Fledged	2	Total Chicks Fledged	6
Contribution to Productivity*	**25%**	**Contribution to Productivity***	**75%**

** Percentage of total chicks fledged.*

Table 3c. Comparative loon nesting summary: raft vs. natural nests, **2018**.

Raft Nests	**2018**	**Natural Nests**	**2018**
Number of Nest Attempts	3	Number of Nest Attempts	12
Number of Successful Nest Attempts	3	Number of Successful Nest Attempts	3
Success Rate	**100%**	**Success Rate**	**25%**
Chicks Hatched from Rafts	5	Chicks Hatched from Natural Sites	5
Total Chicks Fledged	4	Total Chicks Fledged	1
Contribution to Productivity*	**80%**	**Contribution to Productivity***	**20%**

** Percentage of total chicks fledged.*

4.4 CAPTURE AND BANDING BY YEAR (Table 4).

Table 4a. Common loons captured and banded, Kezar Lake watershed, **2020**.

Lake Name	Territory	Band #	Year	Sex	Age*	Left Leg Top	Left Leg Bottom	Right Leg Top	Right Leg Bottom
Kezar	G. Brook	0689-09499	2020	F	HY	Silver	Orange	Yellow	Green
Kezar	Rock Isl.	0649-09454	2020	F	HY	Orange	Silver	Green	Orange

* HY = hatch year, ATY = adult

Table 4b. Common loons captured and banded, Kezar Lake watershed, **2019**.

Lake Name	Territory	Band #	Year	Sex	Age*	Left Leg Top	Left Leg Bottom	Right Leg Top	Right Leg Bottom
Kezar	NW Cove	0938-78850	2019	UNK	HY	Yellow Stripe	Green	Green Dot	Silver
Kezar	NW Cove	0649-08855	2019	UNK	HY	Red Stripe	White	Green Dot	Silver
Kezar	Alaska Bay	0649-08853	2019	UNK	HY	Green	Red	Silver	Green Dot
Kezar	Alaska Bay	0938-78831	2019	M	ATY	Yellow Stripe	White	Green Dot	Silver
Kezar	Alaska Bay	1118-15849	2019	F**	ATY	Yellow Dot	Red	Green Dot	Silver
Kezar	Rock Isl.	1118-15844	2019	UNK	HY	Red Stripe	White	Red	Silver
Trout Pond	Trout	1118-15842	2019	M	ATY	Orange Stripe	Green	Red	Silver
Trout Pond	Trout	0938-78836	2019	F	ATY	Yellow Stripe	Green	Silver	Red

* HY = hatch year, ATY = adult

** The Alaska Bay banded female has lost the Green Dot band on her right leg.

Table 4c. Common loons captured and banded, Kezar Lake watershed, **2018**.

Lake Name	Territory	Band #	Year	Sex	Age*	Left Leg Top	Left Leg Bottom	Right Leg Top	Right Leg Bottom
Kezar	NW Cove	0938-78850	2018	F	ATY	Yellow Stripe	Green	Green Dot	Silver
Kezar	NW Cove	0649-08855	2018	M	ATY	Red Stripe	White	Green Dot	Silver
Kezar	Fox Cove	0649-08853	2018	F	ATY	Green	Red	Silver	Green Dot
Kezar	Fox Cove	0938-78831	2018	M**	ATY	Yellow Stripe	White	Green Dot	Silver
Kezar	Rock Island	1118-15849	2018	F	ATY	Yellow Dot	Red	Green Dot	Silver
Kezar	Rock Island	1118-15844	2018	M	ATY	Red Stripe	White	Red	Silver
Horseshoe	Horseshoe	1118-15842	2018	M	ATY	Orange Stripe	Green	Red	Silver
Horseshoe	Horseshoe	0938-78836	2018	F	ATY	Yellow Stripe	Green	Silver	Red

* HY = hatch year, ATY = adult

** The Fox Cove banded male has lost the White band on his left leg.

4.5 CONTAMINANT ANALYSIS BY YEAR (Tables 5 - 8)

All blood and feather samples, and whole eggs collected were processed and analyzed at Biodiversity Research Institute's (BRI) laboratory in Portland, Maine.

To assess the potential impacts of mercury (Hg) on loons, known baseline effects levels can be separated into risk categories based on studies from BRI and their collaborators.

Low risk indicates background Hg concentrations that have no known impact on wildlife. Loons that fall within the moderate risk category have elevated Hg concentrations but their impact levels on individuals remain undetermined. Loons that are in the high-risk category are exposed to toxic levels of environmental Hg that statistically show physiological, behavioral, and reproductive impacts. The extremely high Hg category is based on in-field observable impacts on loons and other birds (Evers et al. 2008). The high and extremely high categories therefore have Hg at levels of concern (Table 5).

Table 5. Risk categories for assessing Hg and Pb impacts, reported as parts per million (ppm) in wet weight (ww) for blood and egg, and fresh weight (fw) for feathers, for the common loon.

Contaminant and Matrix	Low	Moderate	High	X High	Endpoint	Reference
Mercury (Hg)						
Adult (blood)	0-1.0	1.0 to 3.0	3.0-4.0	>4.0	40% fewer fledged young	Burgess and Meyer 2008; Evers et al. 2008
Adult (feather)	0- 9.0	9.0-20.0	20.0-35.0	>35.0	Significant asymmetry	Evers et al. 2008
Juvenile (blood)	0-0.1	0.1-0.3	0.3-0.4	>0.4	Lower survival	Evers et al. 2010; unpubl. data
Egg	0-0.5	0.5-1.3	1.3-2.0	>2.0	Significantly smaller egg and reduced hatchability	Evers et al. 2003
Lead (Pb)						
Blood	0-0.12	0.12-0.24	> 0.24		Probable death	Franson et al. 2003; BRI unpubl. data

4.5.1 BLOOD

Blood Hg results are reported in parts per million (ppm) wet weight (ww). The mercury level in the blood of the Kezar Lake, Great Brook male was 4.071 ppm (ww), which puts him in the extremely high risk category for possible adverse effects. This is significantly higher than his Hg blood level of 2.962 reported in 2017. The mercury level in the blood of the two chicks sampled varied from 0.160 – 0.200. These both fall within the moderate risk range for adverse effects (Table 6).

Table 6a. Results of Hg in blood (ppm, ww), **2020**.

Date Collected	Lake	Territory	Sex	Age*	Blood Hg (ppm, ww)
8/19/2020	Kezar	Great Brook	M	ATY	4.071 X high
8/19/2020	Kezar	Great Brook	F	HY	0.200
8/19/2020	Kezar	Rock Island	F	HY	0.160

* HY = hatch year, ATY = adult

Table 6b. Results of Hg in blood (ppm, ww), **2019**.

Date Collected	Lake	Territory	Sex	Age*	Blood Hg (ppm, ww)
8/1/2019	Kezar	Alaska Bay	M	ATY	3.947 high
8/1/2019	Kezar	Alaska Bay	F	ATY	1.828
8/1/2019	Trout	Trout	M	ATY	2.183
8/1/2019	Trout	Trout	F	ATY	1.633
8/29/2019	Kezar	NW Cove	U	HY	0.287
7/8/2018	Kezar	Alaska Bay	U	HY	0.404 X high**
7/24/2018	Kezar	Rock Island	U	HY	0.146

* HY = hatch year, ATY = adult

** Changed from reported high in 2019 to X high, due to revisions to Table 5 in the interim, adding the extremely high classification.

Table 6c. Results of Hg in blood (ppm, ww), **2017 & 2018**.

Date Collected	Lake	Territory	Sex	Age*	Blood Hg (ppm, ww)
7/19/2017	Kezar	Great Brook	M	ATY	2.962
9/12/2017	Kezar	Alaska Bay	UNK	HY	0.169
7/8/2018	Kezar	NW Cove	M	ATY	2.283
7/8/2018	Kezar	NW Cove	F	ATY	0.822
7/8/2018	Kezar	Fox Cove	M	ATY	2.584
7/8/2018	Kezar	Fox Cove	F	ATY	1.620
7/24/2018	Kezar	Rock Island	M	ATY	1.379
7/24/2018	Kezar	Rock Island	F	ATY	0.846
7/24/2018	Horseshoe	Horseshoe	M	ATY	1.385
7/24/2018	Horseshoe	Horseshoe	F	ATY	1.178

* HY = hatch year, ATY = adult

4.5.2 FEATHER

Feather Hg results are reported in parts per million (ppm), fresh weight (fw). The mercury level in the feathers of the Kezar Lake, Great Brook male was 18.716 (ppm, fw) in 2020. This is slightly lower than his feather mercury level of 19.110 in 2017. This falls within the moderate risk range for adverse effects (Table 7).

Table 7a. Results of Hg in feathers (ppm, fw), **2020**.

Date Collected	Lake	Territory	Sex	Age*	Feather Hg (ppm, fw)
8/19/2020	Kezar	Great Brook	M	ATY	18.716

* ATY = adult

Table 7b. Results of Hg in feathers (ppm, fw), **2019**.

Date Collected	Lake	Territory	Sex	Age*	Feather Hg (ppm, fw)
8/1/2019	Kezar	Alaska Bay	M	ATY	16.930
8/1/2019	Kezar	Alaska Bay	F	ATY	11.672
8/1/2019	Trout	Trout	M	ATY	16.080
8/1/2019	Trout	Trout	F	ATY	18.845

* ATY = adult

Table 7c. Results of Hg in feathers (ppm, fw), **2017 & 2018**.

Date Collected	Lake	Territory	Sex	Age*	Feather Hg (ppm, fw)
7/19/2017	Kezar	Great Brook	M	ATY	19.110
7/8/2018	Kezar	NW Cove	M	ATY	15.171
7/8/2018	Kezar	NW Cove	F	ATY	11.040
7/8/2018	Kezar	Fox Cove	M	ATY	17.176
7/8/2018	Kezar	Fox Cove	F	ATY	11.354
7/24/2018	Kezar	Rock Island	M	ATY	15.772
7/24/2018	Kezar	Rock Island	F	ATY	9.382
7/24/2018	Horseshoe	Horseshoe	M	ATY	9.626
7/24/2018	Horseshoe	Horseshoe	F	ATY	9.452

* ATY = adult

4.6 BANDED LOON REOBSERVATIONS AND RECOVERIES BY YEAR.

In 2020, all adult loons previously banded returned and occupied the same territory, except the Trout Pond male (didn't return), and the LB, NW Cove male (returned but lost territory). No banded juveniles were observed (Table 9a).

Table 9a. Banded loon reobservations and recoveries, Kezar Lake watershed, **2020**.

Lake Name	Band #	Year	Sex	Age*	2020 Return	Original Territory	2020 Territory
Kezar	0938-03351	2017	M	ATY	Y	Great Brook	Great Brook
Kezar	0938-61715	2017	U	HY	N	Alaska Bay	NA
Kezar	0649-08855	2018	M	ATY	Y	NW Cove	None – lost territory to new male
Kezar	0938-78850	2018	F	ATY	Y	NW Cove	NW Cove
Kezar	1118-15844	2018	M	ATY	Y	Rock Island	Rock Island
Kezar	1118-15849	2018	F	ATY	Y	Rock Island	Rock Island
Kezar	0938-78831	2018	M	ATY	Y	Fox Cove	Fox Cove
Kezar	1118-15849	2018	F	ATY	Y	Fox Cove	Fox Cove
Horseshoe	1118-15842	2018	M	ATY	Y	Horseshoe	Horseshoe
Horseshoe	0938-78836	2018	F	ATY	Y	Horseshoe	Horseshoe
Kezar	0938-78831	2019	M	ATY	Y	Alaska Bay	Alaska Bay
Kezar	1118-15849	2019	F	ATY	Y	Alaska Bay	Alaska Bay
Kezar	0649-08853	2019	U	HY	N	Alaska Bay	NA
Kezar	0649-08855	2019	U	HY	N	NW Cove	NA
Kezar	0938-78850	2019	U	HY	N	NW Cove	NA
Trout	1118-15842	2019	M	ATY	N	Trout	NA – new unbanded male
Trout	0938-78836	2019	F	ATY	Y	Trout	Trout

* HY = hatch year, ATY = adult

In 2019, all adult loons previously banded returned and occupied the same territory. No banded juveniles were observed (Table 9b).

Table 9b. Banded loon reobservations and recoveries, Kezar Lake watershed, **2019**.

Lake Name	Band #	Year	Sex	Age*	2019 Return	Original Territory	2019 Territory
Kezar	0938-03351	2017	M	ATY	Y	Great Brook	Great Brook
Kezar	0938-61715	2017	U	HY	N	Alaska Bay	NA
Kezar	0649-08855	2018	M	ATY	Y	NW Cove	NW Cove
Kezar	0938-78850	2018	F	ATY	Y	NW Cove	NW Cove
Kezar	1118-15844	2018	M	ATY	Y	Rock Island	Rock Island
Kezar	1118-15849	2018	F	ATY	Y	Rock Island	Rock Island
Kezar	0938-78831	2018	M	ATY	Y	Fox Cove	Fox Cove
Kezar	1118-15849	2018	F	ATY	Y	Fox Cove	Fox Cove
Horseshoe	1118-15842	2018	M	ATY	Y	Horseshoe	Horseshoe
Horseshoe	0938-78836	2018	F	ATY	Y	Horseshoe	Horseshoe

* HY = hatch year, ATY = adult

In 2018, the UB, Great Brook male returned and occupied the same territory. The UB, Alaska Bay chick was not observed (Table 9c).

Table 9c. Banded loon reobservations and recoveries, Kezar Lake watershed, **2018**.

Lake Name	Band #	Year	Sex	Age*	2018 Return	Original Territory	2018 Territory
Kezar	0938-03351	2017	M	ATY	Y	Great Brook	Great Brook
Kezar	0938-61715	2017	U	HY	N	Alaska Bay	NA

* HY = hatch year, ATY = adult

7.0 DISCUSSION

In 2020, six of seven lakes (86%) with suitable nesting habitat in the Kezar Lake watershed were occupied by loon pairs. This high occupancy rate demonstrates a strong breeding base in numbers, with potential to sustain a healthy breeding population. Bradley Pond in Lovell was the only lake unoccupied by a pair of loons, although it has an adequate fish population and good nesting habitat. Future occupancy by a pair, and breeding is possible.

Nesting conditions were variable in 2020. Rising water levels caused by significant rainfall events during the nesting period threatened to flood multiple nests. This likely lead to the failure of at least one nest (Blueberry Island). Efforts by volunteers to aid nesting loons in building up their nests didn't prevent nest failure. These efforts did extend incubation periods, but without any way to confirm if the eggs remained viable.

Ten of the 16 pairs (63%) in the watershed nested, but only four nests were successful (40%). There were 11 documented nest failures. Predation along the western shore of the Middle Bay and Alaska Bay remains the leading cause of nest failure. Low productivity in 2020 is directly linked to reduced nesting frequency and nest failure.

The 2020 productivity of .025CH/TP is well below the established sustainable population threshold of 0.48 CH/TP. However, loon productivity is subject to significant year-to-year fluctuations, and one year is not indicative of longer-term trends. Multi-year studies, typically no less than five years in duration are required to adequately begin to assess the population status.

Entanglement in fishing line is a documented threat to the health and safety of common loons. In 2020, one adult in Vinton's Cove and the banded female in UB, Alaska Bay were observed to have fishing line entanglement on feet and/or legs. Pictures were taken for permanent record, and both loons were closely monitored. The entanglements did not appear to impair either bird significantly.

Ten artificial nest platforms (rafts) were initially introduced in the watershed in 2014, with the hope of increasing nest productivity. In 2014 – 2017, none of the rafts were used. In 2018, three of the ten rafts were used, and all three pairs were successful. Rafts usage increased in 2020. Five rafts were used, increasing utilization to 50%. Three pairs who used rafts were successful. Rafts eliminate the threat of nest failure due to fluctuating water levels and reduce the threat from mainland predators. These results clearly demonstrate the value of rafts in boosting the productivity of nesting loons.

Inexpensive trail cameras have proven to be a valuable tool to document the events and behaviors during the incubation period of nesting loons. Depending on individual circumstances, they are usually installed after incubation has begun, and they are tolerated without any negative impacts or recorded cases of abandonment. In 2020, cameras were used to monitor six different nests with varying degrees of success. One of the cameras did capture images of large boat wakes washing over a nest raft during incubation, possibly leading to failure of the nest. Continued use of nest cameras going forward will aid in determining causes of nest failure, possibly leading to future conservation actions designed to reduce the number of nest failures.

Samples analyzed for mercury (Hg) contamination showed extremely high levels of mercury in the UB, Great Brook male. Prior research has shown possible negative impacts on reproduction at these levels. Short-term results from this study do not demonstrate any apparent negative impacts on reproductive success. The UB, Great Brook male has the highest reproductive success since 2017 of any loon on Kezar Lake.

In its third year, this project demonstrated the effectiveness of collaboration between trained professional researchers and volunteer citizen scientists. With training and guidance of dedicated volunteers, following successful models in other regions, 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 2020:

- 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.
- Focus on band return identification to verify color-marked individuals have returned, the status of territory fidelity, and individual productivity.
- Expand the use of nest monitoring cameras, as circumstances allow.
- Further develop the engagement and skills of citizen science volunteers and seek to expand the volunteer base.
- Continue to capture and band loons through traditional night capture of pairs with chicks.
- Maintain ongoing monitoring of contaminants (Hg & Pb) and expand research into Hg levels in fish and potentially other food sources.

- Increase outreach and education efforts to communicate and reduce threats from fishing line entanglement, boat wakes, etc. Steps could include signage at boat launches and installment of containers for disposing of fishing line.
- Continue to engage and inform the local community about loons in the watershed through all available media.
- Continue strategic use and monitoring of artificial nesting platforms (rafts). Focus on locations where territorial pairs have been confirmed for multiple years, where a raft has a likelihood of enticing successful nesting. Review nesting platform locations, annually, and make strategic relocations as circumstances dictate.

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10.0 LITERATURE CITED

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