

THE 2018 BREEDING STATUS OF COMMON LOONS IN VERMONT

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ABSTRACT: The Vermont Loon Conservation Project, a program of the Vermont Center for Ecostudies and the Vermont Fish and Wildlife Department, documented 91 nesting loon pairs and 123 territorial pairs statewide. Of the 91 pairs that attempted nesting, 66 successfully hatched 97 eggs, with 73 chicks surviving through August (chick survival rate 75%, 0.59 chicks surviving per territorial pair). Four new nesting pairs and 2 new potential territorial pair were identified. Twenty-six pairs that have nested in recent years did not nest in 2018. Of 28 pairs whose first nest attempts failed, 9 re-nested, and 3 were successful. Known causes of nest failure included depredation (6 nests), flooding (1 nest), and human disturbance (2 nests). The remaining failed nests were abandoned for unknown reasons with predators and disruption from intruder loons being the most likely causes. The causes of most chick mortality were unknown. At least 3 chicks disappeared after interactions with intruder loons, and 1 was depredated by a Bald Eagle and 2 from mink. During the summer months, 3 adult loon mortalities were documented, and one was unconfirmed. One loon died from infection caused by a fish hook (Nelson), and another died from aspergillois, a fungal infection (Mollys Falls). A third loon is awaiting a necropsy (Thurman Dix). An eagle reportedly was observed foraging on a loon on Lake Parker, but this was not confirmed. We monitored several other loons reported in distress, caught in fishing line, or observed in open water holes surrounded by ice. One loon was rescued after landing on a pond too small to fly from, and another was found near a private residence near a small pond. Several failed rescue attempts were made for a loon on Lake Raponda that had fishing line wrapped around its' bill and head. This bird likely migrated in mid-October. About 200 volunteers surveyed lakes throughout Vermont on 21 July as part of the Loonwatch program, an annual statewide loon count. Loons were observed on 132 of 174 surveyed lakes, where observers counted 356 adults, 65 chicks, and 3 subadult loons. The total number of adult loons increased substantially compared to the 2013-16 period when 297 to 308 loons were counted each year. To provide a historical perspective, volunteers counted 179 and 225 adult loons in 2003 and 2008, respectively. Twenty-five of the 91 breeding pairs nested on nesting rafts, 30 on islands, 27 in marshes, and 9 on shorelines. Forty-two nesting rafts were placed on known or potential nesting waterbodies. Warning sign buoys were placed around 56 of the 91 nests. Volunteers provided technical assistance through the placement and maintenance of nest warning signs and/or nesting rafts on 51 lakes as part of the adopt-a-lake program. Thirteen loon conservation programs were presented to over 350 people statewide. We continued to distribute 2 informational brochures on loon conservation and conservation of lakeshores. We revised the loon conservation brochure, and sent hundreds of brochures to 4 lake associations for further distribution. Loon conservation brochures were available in self-serve boxes at over 40 boat access areas.

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INTRODUCTION

In 1977, the Vermont Loon Conservation Project (VLCP) was initiated to assess the status of Common Loons (*Gavia immer*) in Vermont and found that the breeding population had significantly declined (Laughlin 1977). As a result, the VLCP began a loon monitoring and management program in 1978. Numbers of breeding pairs peaked at 19 in 1982, and then dropped sharply to 7 pairs in 1983 for unknown reasons. From 1983 to 1989, Vermont's breeding loon population gradually increased at an average rate of 1 pair per year, stabilized between 1989 and 1994 at 14-16 breeding pairs, and then experienced a marked increase since the mid-1990s to 91 nest attempts in 2018. The VLCP is a program of the Vermont Center for Ecotudies (VCE) and the Vermont Fish and Wildlife Department (VFWD).

In 2005, the Common Loon was removed from the Vermont Endangered and Threatened Species list. Conservation and educational efforts by many groups and individuals enabled the achievement of this milestone. Through the guidance of VCE and VFWD, monitoring and management programs were implemented throughout the 1980s and 1990s. In 1998, the Vermont Loon Recovery Plan (Borden and Rimmer 1998) was recommended for approval by the Vermont Scientific Advisory Group (SAG) on Birds and the Vermont Endangered Species Committee (ESC), and approved by the Vermont Agency of Natural Resources (ANR). The recovery plan recommended actions on management, monitoring, research, and education programs to promote the recovery of the species. The Common Loon was designated a state endangered species in 1987 following documentation of its population decline in the early 1980's. The target level to de-list as written in the Vermont Loon Recovery Plan was "40 nesting pairs averaged over 5 consecutive years", with a minimum of 5 nesting pairs in "2 geographically discrete areas." From 2000-2004, the average number of nesting loon pairs was 41, and 6 pairs nested in the southern half of Vermont. Today, the average number of nesting pairs from 2014-2018 was 90 with 28 territorial pairs in the southern half of the state in 2018.

Since the mid-1980's, the VLCP has been a joint program between VCE and VFWD. The Nongame Wildlife Fund has been the primary funding source for the VLCP (35-40% of budget) for many years, and VFWD has provided technical, law enforcement, and logistical support. Starting in 2013, the VFWD began utilizing the federal Pittman-Robertson Fund for the VLCP. VCE annually hires the VLCP biologist, provides staff support, and raises the remaining VLCP budget through donations and grants.

METHODS

Monitoring of lakes with breeding and territorial loons

The VLCP biologist, two VCE interns, and volunteers surveyed approximately 135 lakes with known histories of loon nesting, occupancy by territorial pairs, or high levels of loon activity on a regular basis (weekly to monthly). Over 180 adopt-a-lake volunteers provided technical assistance in this intensive monitoring effort.

Vermont Loonwatch day was initiated in 1983 to provide a mid-summer estimate of the statewide loon population. On the third Saturday in July each year, volunteers survey assigned lakes, ponds, and reservoirs from 8:00 to 9:00 a.m., recording the number of adult loons, subadult loons (1-2 year olds), and loon chicks on the water body, as well as relevant human and wildlife activity. The information has provided an annual statewide population estimate, an estimate of the number of non-breeding loons, and a check on lakes with previously undetected breeding pairs.

Management

Loon management practices included: 1) stabilization of water levels during the nesting period through cooperation with hydroelectric companies and others who control water levels; 2) placement of artificial nesting rafts in appropriate sites; 3) placement of warning sign buoys to discourage human intrusion at nest sites; 4) responding to all reports of distressed or dead loons, and 5) providing technical assistance to regulatory agencies. Volunteers provided important technical support for the first 4 of these practices.

The 8 hydroelectric companies and 3 agencies that regulate water levels on lakes where loons have historically nested were contacted in April by VFWD staff. Each company was requested to stabilize water levels during the nesting period so that nests would not be flooded by rising water levels or left stranded by water drawdowns.

Forty-two artificial nesting rafts were placed statewide. These rafts provided an alternative nest site to natural sites where predation from terrestrial mammals and/or fluctuating water levels had caused nests to fail in previous years. Rafts were

placed on some lakes with presumed territorial loon pairs, but where natural habitat is lacking (e.g., no suitable islands and/or marshes, highly developed shorelines). In cases where a potential pair is present and natural nest sites exist, rafts will not be considered unless the pair fails to nest after 4 or 5 consecutive years of occupancy. Rafts are considered on lakes where natural nests have failed 3 consecutive times, and the VLCP deems that rafts might prove beneficial. We also consider using rafts when natural nests are located in very close proximity to active cottages and other human activities to reduce potential disturbance. Adopt-a-lake volunteers maintained or helped with 21 rafts.

Warning sign buoys were placed around 56 of the 91 active nest sites to discourage human intrusion close to nests. These signs were also placed around 2 other nest sites where loons ultimately did not nest in 2018. Sign buoys were used in areas where repeated human disturbance was likely to occur. On Fairfield Pond, boaters continually ignored the nest warning signs to access an island, and the loon pair abandoned the nest. In most locations, people respect the presence of the signs.

The VLCP biologist coordinated responses to loons in distress with volunteers, VFWD game wardens, wildlife rehab personnel, and veterinarians (e.g., caught in monofilament, injured, road crashes, landed on ponds too small to fly from, iced-in, other).

Education

Public education continued to be a vital part of loon management efforts. The VLCP biologist contacted landowners of new nesting sites as soon as nesting was suspected or observed. Thirteen slide lectures, discussions, and workshops on loon biology, conservation, and research were presented to audiences at lake associations, libraries, and other organizations (conservation groups, Road Scholar). Approximately 280 adults and 80 youth attended these programs. A sign informing boaters and anglers how to help nesting loons was placed at lake access areas. Another sign cautioning boaters to be alert for loon chicks and to watch loons from a distance was also placed at some access areas. Biologists, staff educators, and the project's volunteer network regularly informed camp owners and other lake users about loon conservation measures.

Two brochures directed at 1) boaters and 2) lakeshore owners were distributed at programs. "The Common Loon – a guide for boaters" containing information about loon conservation and natural history was available at over 40 boat access areas in self-serve boxes and at state parks with loon lakes. A second brochure "the Common Loon – a guide for lakeshore owners" contained information about the importance of riparian habitat for the health of a lake and was distributed to several lake associations. VCE mailed the *Loon Caller* newsletter to over 800 loon volunteers, donors, and other loon program contacts. The newsletter and brochures were distributed at all programs.

Contaminant sampling

Abandoned eggs were collected and delivered to Biodiversity Research Institute (276 Canco Rd., Portland, ME 04103) for methylmercury (MeHg) analysis (Evers et al. 1999). Eight eggs were collected in 2018. Results from 2017 indicated that the eggs collected Curtis Pond and Chandler Pond had high mercury levels. Both are shallow ponds with extensive muddy bottoms which might promote the methylation of inorganic mercury. Loon pairs on both ponds have successfully fledged numerous chicks. BRI has archived egg samples from most of the previous 10 years. Cooperators on this research include the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, BRI, the Vermont Department of Environmental Conservation, and several other state agencies, private organizations, and universities.

RESULTS AND DISCUSSION

Description of loon activity on individual lakes in 2017

Lake and loon activity descriptions are provided for nesting pairs, known and potential territorial pairs, and lakes with high levels of loon activity in Table 1. Nesting pairs nested this year, territorial pairs have nested in recent years, and potential territorial pairs have no recent history of nesting but 2 adult loons were observed throughout much of the summer.

Distribution of territorial and nesting pairs

There were 123 known and potential territorial loon pairs, 91 of which were confirmed to nest on 78 lakes (Fig. 1, Table 1). Four new nesting pairs were identified, including Lake Lakota (2 chicks), Mitchell Lake (failed), Old Marsh Pond (1

chick), and Lake Parker (failed). A new pair on Clyde Reservoir was observed nest building, but no eggs were laid. Two new potential loon pairs were identified on Glen Lake and Lake Rescue.

Population levels and breeding success

The number of nesting pairs declined from 97 in 2017 to 91 in 2018. The number of territorial pairs increased to 123 from 118 in 2017. Of the 91 pairs that attempted nesting, 66 successfully hatched 97 eggs, with 73 chicks surviving through August (Fig. 2, Table 2). There were 117 known territorial pairs on water bodies where nesting or nest building had occurred within the last 3 years, and 6 potential territorial pairs, each of which was observed consistently for 6 weeks or more. Twenty-six pairs that have nested in recent years did not nest in 2018, thus 77 percent of the known territorial pairs nested. The 5 year average nesting rate of known territorial pairs from 2013-17 was 85 percent. Of 28 pairs whose first nest attempts failed, 9 re-nested, and 3 were successful. Known causes of nest failure included depredation (6 nests), flooding (1 nests), human disturbance (2 nests). Rainfall amounts were low throughout the summer resulting in few flooded nests. The remaining failed nests were abandoned for unknown reasons with predators and disruption from intruder loons being the most likely causes. Details are provided in Table 1.

The chick survival rate through August was 75% with 0.59 chicks surviving per territorial pair in 2018. Since 1979, the average chick survival rate is 82% with 0.70 chicks per territorial pair. The causes of most chick mortality were unknown. At least 3 chicks disappeared after interactions with intruder loons, and 1 was depredated by a Bald Eagle and 2 from mink. Three adult loon mortalities were documented, and one was unconfirmed. One loon died from infection caused by a fish hook (Nelson), and another died from aspergillosis, a fungal infection (Mollys Falls). A third loon is awaiting a necropsy (Thurman Dix). An eagle reportedly was observed foraging on a loon on Lake Parker, but this was not confirmed.

Management Results: artificial nesting rafts and nest warning sign buoys

Of the 91 known nests, 25 were on artificial nesting rafts (92% successful), 30 on islands (63% successful), 27 in marshes (70% successful), and 9 on shorelines (56% successful). Nests with warning sign buoys had a 67% success rate compared to 81% for nests without signs. Signs are used more frequently for raft and island sites, which are often more exposed to boaters, but also tend to be more successful being away from shoreline predators. This is the first year that the nest success rate for signed sites was lower than unsigned locations. Ideally signs reduce or eliminate human disturbance as a cause of nest failure, thus other factors (e.g., predation) will be the primary cause of nest failure. Not all signs are respected as the Fairfield Pond pair abandoned their nest after people repeatedly ignored the nest warning signs to reach land on the island. Shoreline nests are more likely to be depredated causing nest success rates to be low.

Vermont Loonwatch Day

Vermont Loonwatch day was conducted on 21 July when over 200 volunteers counted 356 adult loons, 65 chicks, and 3 subadults (Table 2, Fig. 3). Loons were observed on 132 of the 174 lakes surveyed. The total number of adult loons increased dramatically compared to the 2013-2017 period when 297 to 308 adult loons were counted each year. Reasons for the large increase are numerous. Survey conditions were calm and clear this year. During the past few years, counts may have been suppressed because of higher winds and rainy conditions. Over 10 additional lakes were surveyed this year. And there were likely more loons.

Sixty-four of 356 adult loons counted were located in southern and central Vermont, an increase from 46 to 51 loons counted annually between 2015 and 2017. North central Vermont has observed the largest increase in loon numbers increasing from annual counts in the 130s in recent years to 162 in 2018. Volunteers counted the most loons on Green River Res. (14 adults), Caspian Lake (13 adults), and Peacham Pond (13 adults).

Loon Rescues

One loon was rescued after landing on a pond too small to fly from in East Hardwick; it was banded and released on Caspian Lake. Another loon was found near a private residence in Calais near Knob Hill Pond. The bird was brought to Vermont Institute of Natural Science Wildlife Services, evaluated, and then released back on Knob Hill Pond. Several failed rescue attempts were made for a loon on Lake Raponda that had fishing line wrapped around its' bill and head. This bird likely migrated in mid-October with fishing line still present. We monitored several other loons reported in distress. Chicks of the year became temporarily iced-in on Miles, Joe's, Green River, and Woodbury lakes. After a thaw

and rain event, all birds disappeared. It is likely they were able to become airborne, but also a chance they did not survive.

The VLCP biologist spent over 50 hours in 2018 conducting capture attempts and coordinating monitoring efforts with volunteers and game wardens. The biologist has spent 40-85 hours annually dealing with loons in distress in recent years. Volunteers were instrumental in the monitoring and capture attempts of all these birds.

Volunteer Effort

Volunteers provided important technical assistance for loon conservation efforts in Vermont. The efforts of adopt-a-lake volunteers, who helped monitor over 70 lakes statewide, varied from a few surveys over the summer to daily observations. Volunteers assisted with either loon nest warning signs and/or nesting rafts on 51 of the 69 lakes where these management tools were used. Volunteers were critical in helping to inform the VLCP biologist about lakes and ponds with increased loon activity, potential territorial pair development, and loons in distress. Volunteers or other citizens aware of the loon program helped determine the status of most of the potential territorial pairs through repeated surveys.

Threats to Vermont's loons

Vermont's loons continue to face many short- and long-term threats to their viability, including: (1) water level fluctuations on lakes where water levels are regulated; (2) shoreline development and human disturbance; (3) mortality through lead poisoning, entanglement with monofilament fishing line, and fishing gear ingestion; (4) environmental background of bio-accumulating mercury and methyl-mercury, (5) oil spills in wintering coastal areas, and (6) disease such as aspergillosis and botulism. Two natural sources of mortality include predation of eggs and chicks and intraspecific competition between breeding pairs and extraterritorial (rogue/intruder) loons. Background and historic information on these threats are provided in the Vermont Common Loon Recovery Plan (Borden and Rimmer 1998, pp. 5-10) and the VLCP 2000 and 2009 annual reports.

Table 1. Summary of Common Loon breeding activity in Vermont, 2018

Nesting pairs: 91 Known territorial pairs: 117 Potential territorial pairs: 6 Total territorials pairs: 123																
Chicks hatched out: 97 Chicks surviving through August: 73																
Lake list divided into sections: 1) nesting pairs and known and potential territorial pairs, and 2) loon active lakes.																
Loonwatch Count 21 July 2018: Adult loons - 356 New nesting pairs: 4 New territorial pairs: 2																
Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Baker P.	Barton	nesting	marsh	Successful		1 Ch	1 Ch							14	12	17
Bald Hill P.	Westmore	territory												16	10	12
Bean P.	Sutton	nesting	marsh	Successful		1 Ch	1 Ch							13	13	15
Beaver P.	Holland	territory												35	30	36
Beecher P.	Brighton	territory												4	3	3
Berlin P. - north	Berlin	nesting	marsh	Depredation - mammalian	signs									15	13	15
Bourn P.	Sunderland	nesting	island	Successful		2 Ch	1 Ch	Unknown						17	16	18
								Unknown - disappeared early								
Brownington P.	Brownington	nesting	marsh	Successful	signs	1 Ch	0 Ch							16	7	9
Bruce P. / Clark P.	Sheffield	territory												8	0	
Buck L.	Woodbury	nesting	marsh	Abandoned - no egg(s)									Depredation likely	11	6	6
													Landed on 40 m x 15 m pond 8/16/18. Several takeoff attempts but stopped short. Night capture successful 8/20. Banded LL: yellow/yellow stripe; RL - yellow/green (check exact order). Weight 3900 g tarsus 25.4			
Caspian L.	Greensboro	nesting	raft	Successful	signs	2 Ch	2 Ch		Rescue	8/20/2018	Adult	Small pond		4	3	5
Center P.	Newark	territory												3	0	
Chandler P.	Wheelock	nesting	raft	Successful		1 Ch	1 Ch							11	8	8
Chittendon Res. - East	Chittenden	nesting	raft	Successful	signs	1 Ch	1 Ch							14	11	13
Chittendon Res. - North	Chittenden	nesting	raft	Successful	signs	1 Ch	1 Ch							3	3	5
Clyde R.	Newport	territory														
Coles P.	Walden	nesting	marsh	Successful	signs	1 Ch	1 Ch							19	16	23
Curtis P.	Calais	nesting	marsh	Successful	signs	1 Ch	1 Ch							3	2	2
Daniels /Daniels West P.	Glover	nesting	marsh	Abandoned		1 Ch	0 Ch	Unknown					Newly hatched chick found dead in nest.	7	6	5
Derby P.	Derby	territory												9	5	5
Dog P.	Woodbury	nesting	marsh	Depredation - mammalian	signs								New nest location in Little Dog pond through the channel.	3	1	2
Dunmore L. / Mud P.	Leicester/ Salisbury	nesting	marsh	Successful	signs	1 Ch	1 Ch							12	9	10
East Long P.	Woodbury	nesting	island	Successful		2 Ch	2 Ch							37	29	35

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Echo L. (Charleston)	Charleston	nesting	raft	Successful	signs	2 Ch	0 Ch	Predation - mammalian					Mink observed harassing the loon family within 24 hours of hatch.	8	4	4
Eden L.	Eden	territory												14	12	16
Elligo L.	Greensboro	nesting	island	Successful	signs	1 Ch	1 Ch							17	14	17
Elmore L.	Elmore	nesting	marsh	Successful	signs	1 Ch	1 Ch							7	2	2
Ewell P.	Peacham	nesting	marsh	Successful		2 Ch	1 Ch	Unknown						10	10	11
Fairfield P.	Fairfield	nesting	raft	Human disturbance	signs								People on island despite being asked to leave. Loons off nest often as a result.	5	0	
Fairlee L.	Fairlee	nesting	raft	Successful	signs	2 Ch	2 Ch							3	3	4
Flagg P.	Wheelock	nesting	island	Abandoned - no egg(s)										6	4	6
Forest L.	Averill	nesting	raft	Successful		1 Ch	1 Ch							25	22	27
Fosters P.	Peacham	nesting	raft	Successful		2 Ch	2 Ch							16	16	25
Glen P.	Castleton	potential territory											Two adults observed several times - new potential territory			
Great Averill L. - North	Averill	nesting	raft	Successful		2 Ch	2 Ch							24	13	15
Great Averill L. - South	Averill	territory												8	6	6
Great Hosmer P. - North	Albany/ Craftsbury	nesting												1	0	
Great Hosmer P. - South	Albany/ Craftsbury	nesting	marsh	Abandoned - egg(s) abandoned - no egg(s)	signs									8	7	10
Green River Res. - Access Bay	Hyde Park	nesting	island	Successful	signs	2 Ch	2 Ch							11	10	13
Green River Res. - Merganser inlet	Hyde Park	nesting	island	Abandoned - no egg(s)	signs									4	1	1
Green River Res. - NW	Hyde Park	nesting	island	Abandoned - egg in water	signs								Possible water drawdown caused nest abandonment	40	30	42
Green River Res. - South	Hyde Park	nesting	island	Successful	signs	1 Ch	1 Ch							4	2	2
Greenwood L.	Woodbury	nesting	raft	Successful	signs	1 Ch	0 Ch	Unknown - disappeared early						8	7	5
Groton L. - North	Groton	territory												8	5	7
Groton L. - South	Groton	nesting	shoreline	Successful	signs	1 Ch	1 Ch							15	13	16
Halls L.	Newbury	potential territory														
Hardwick L.	Hardwick	nesting	raft	Successful		1 Ch	0 Ch	Unknown						15	14	19
Harveys L.	Barnet	nesting	marsh	Abandoned - no egg(s)	signs									10	7	6

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Holland P. - North	Holland	nesting	shoreline	Flooded										4	0	0
Holland P. - South	Holland	nesting		Successful	signs	1 Ch	0 Ch	Predation - avian					Bald eagle likely took the chick based on lake resident observation.	21	14	16
Iroquois L.	Hinesburg	nesting	island	Depredation - mammalian; Abandoned - egg(s) water										3	0	
Island P.	Brighton	nesting	island	Successful		2 Ch	1 Ch	Unknown - disappeared early					Two membranes in nest; 2nd chick never observed	18	15	17
Jobs P.	Westmore	nesting	shoreline	Successful		2 Ch	2 Ch							11	6	7
Joe's P - inlet	Cabot/ Danville	nesting	raft	Successful	signs	2 Ch	1 Ch	Unknown - disappeared early						19	19	25
Joe's P. - 1st Pond	Cabot/ Danville	nesting	shoreline	Successful		1 Ch	1 Ch							9	6	4
Keiser P.	Danville/ Peacham	nesting	shoreline	Abandoned - no egg(s)										14	10	9
Kent P.	Killington	nesting	island	Abandoned - no egg(s)	signs									9	6	8
Kettle P.	Groton/ Marshfield	territory												27	17	23
Knapp Brook P.	Reading	nesting	island	Successful		1 Ch	1 Ch							3	2	2
Lakota L.	Barnard	nesting		Successful		2 Ch	2 Ch						Private pond - no access	1	1	2
Little Averill L. - North	Averill	territory												6	4	1
Little Averill L. - West	Averill	territory												29	17	24
Little Hosmer P.	Craftsbury	nesting	island	Abandoned - egg(s)	signs									18	10	9
Long P. (Eden)	Eden	nesting	marsh	Successful		2 Ch	2 Ch							7	5	7
Long P. (Greensboro)	Greensboro	nesting		Successful		2 Ch	1 Ch	Unknown - disappeared early						2	1	1
Long P. (Westmore)	Westmore	nesting	island	Depredation - mammalian (both nests)	signs								Raccoon on the island depredated both nests	20	15	20
Lowell L.	Londonderry	territory														
Lower Symes P.	Ryegate	nesting	marsh	Successful		2 Ch	1 Ch	Trauma - attack by other loon					8/1 1ch dead - laceration on belly - attack by intruder likely	15	14	20
Lyford P.	Walden	nesting	marsh	Successful		1 Ch	1 Ch							9	7	7
Maidstone L. - North	Maidstone	nesting	marsh	Successful		1 Ch	1 Ch							8	6	4
Maidstone L. - SE	Maidstone	nesting	island	Successful	signs	1 Ch	1 Ch							8	4	6

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Maidstone L. -SW	Maidstone	nesting	island	Successful	signs	2 Ch	2 Ch							36	33	38
Martins P.	Peacham	nesting	raft	Successful	signs	1 Ch	1 Ch							22	22	32
May P.	Barton	nesting	marsh	Successful		1 Ch	1 Ch							22	19	27
Metcalf P.	Fletcher	nesting	island	Abandoned - no egg(s)	signs								Depredation likely	6	2	4
Miles P.	Concord	nesting	island	Successful	signs	1 Ch	1 Ch							23	17	23
Miller P.	Strafford	territory												5	5	7
Mitchell L.	Sharon	nesting		Abandoned									Private pond - no access. New nest: reported that pair also had flooded nest in 2017	2	0	0
Molly's Falls Res. - Island	Cabot	nesting	raft	Successful		2 Ch	2 Ch		Mortality	6/1/2018	Adult	Aspergillosis	Found dead on island. Pair in water nearby interested in island for nesting. Nested 6/8 on nearby raft on west shore.	6	5	9
Molly's Falls Res. - North	Cabot	nesting	raft	Successful	signs	1 Ch	1 Ch							24	22	30
Mollys P.	Cabot	potential territory														
Neal P.	Lunenburg	territory												2	0	
Newark P.	Newark	territory												28	21	29
Nichols P.	Woodbury	territory												18	16	17
Ninevah L.	Mount Holly	nesting	island	Successful	signs	1 Ch	1 Ch							24	22	30
No. 10 P. (Mirror L.)	Calais	nesting	raft	Abandoned - no egg(s)	signs									11	10	13
Norford L.	Thetford	territory											Private pond - no access	1	1	1
Norton P. - Island	Norton	nesting	raft	Successful	signs	1 Ch	1 Ch							39	32	41
Norton P. - North	Norton	nesting	raft	Successful	signs	1 Ch	1 Ch							10	4	7
Norton P. - South	Norton	nesting	raft	Successful		1 Ch	0 Ch	Unknown						18	16	18
Old Marsh P.	Fair Haven	nesting	island	Successful		2 Ch	1 Ch	Unknown - disappeared early						1	1	1
Osmore P.	Peacham	nesting	island	Successful		2 Ch	2 Ch							10	6	7
Parker L.	Glover	nesting		Abandoned - no egg(s)					Mortality	9/27/2018	Adult	Depredation - avian	Lake residents reported a bald eagle eating a loon on a dock 9/28/18	1	0	0
Peacham P. - North	Peacham	nesting	island	Successful	signs	2 Ch	0 Ch	Unknown					Intruder loons frequent	40	33	37
Peacham P. - SE	Peacham	potential territory												6	2	3
Peacham P. - SW	Peacham	territory												27	19	23
Pensioner P.	Charleston	nesting	raft	Successful	signs	1 Ch	0 Ch	Unknown - disappeared early					Unknown - disappeared early	11	10	12
Pigeon P.	Groton	nesting	raft	Successful		2 Ch	2 Ch							4	2	4

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Raponda L.	Wilmington	nesting	marsh	Human disturbance	signs				Rescue	6/2/2018	Adult	Fishing gear - monofilament	Fishing line wrapped around bill. Rescued attempts 6/5 night - easily avoided capture. Nest abandoned. 2nd and 3rd capture attempts failed (7/21 day 8/1 day and night). Preening, eating, diving. Appears to be sleeping more in August and kayakers paddling within 15 feet.	3	2	2
Rescue L.	Ludlow	potential territory											New potential territory. 1 adults observed several times.			
Ricker P.	Groton	nesting	raft	Successful	signs	2 Ch	0 Ch	Trauma - attack by other loon					Both chicks disappeared after major chases observed.	16	13	11
Seymour L. - Winape	Morgan	territory												20	15	20
Shadow L. - (Concord)	Concord	territory												11	5	6
Silver L. (Leicester)	Leicester	territory												4	4	6
Somerset Res. - Dandeneau Cove	Somerset	nesting	island	Abandoned - no egg(s)	signs									37	26	33
Somerset Res. - Narrows	Somerset	nesting	island	Successful	signs	2 Ch	1 Ch	Unknown					unknown - found dead in nest	6	2	2
Somerset Res. - North Islands	Somerset	nesting	island	Depredation - mammalian	signs									11	8	11
South P. (Eden)	Eden	nesting	island	Successful	signs	2 Ch	2 Ch							20	16	22
South P. (Marlboro)	Marlboro	nesting	marsh	Successful	signs	2 Ch	2 Ch							4	4	7
Spectacle P.	Brighton	nesting	raft	Successful	signs	2 Ch	2 Ch							24	22	25
Spring L.	Shrewsbury	nesting	raft	Successful		1 Ch	1 Ch							16	11	15
Stiles Res.	Waterford	nesting	marsh	Abandoned										15	9	13
Sugar Hill Res.	Goshen	nesting	raft	Successful	signs	2 Ch	2 Ch							3	3	4
Sunset L. (Marlboro)	Marlboro	territory												9	7	6
Thurman Dix Res.	Orange	nesting	island	Successful		2 Ch	1 Ch	Unknown - disappeared early	Mortality	8/26/2018	Adult	Unknown - pre-necropsy	Mid August adult loon observed crawling onto land two times and sitting for 30 minutes plus. A few days later both adults and chick behaving normal. 1-2 weeks later, one of pair found dead on shore. Intruder loons frequent.	38	31	36

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warming Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Ticklenaked	Ryegate	nesting	marsh	Abandoned - no egg(s)										4	2	1
Wallingford P.	Wallingford	territory												18	13	21
Wantastiquet P.	Weston	nesting	island	Abandoned - no egg(s)									Private pond. No access.	10	8	12
Warden P.	Barnet	potential territory														
West Mountain P.	Maidstone	territory												17	11	7
								Unknown - disappeared early; unknown								
Wolcott P.	Wolcott	nesting	marsh	Successful		2 Ch	0 Ch						2nd chick found dead in early Oct; thin, disposed	26	22	25
Woodbury L. (Sabin)	Woodbury	nesting	raft	Successful	signs	2 Ch	2 Ch							12	12	14
Woodward Res.	Plymouth	nesting	shoreline	Successful	signs	1 Ch	1 Ch							12	9	11
Zack Woods P.	Hyde Park	nesting	island	Successful	signs	1 Ch	1 Ch							22	20	31
Amherst L.	Plymouth	loon active														
Berlin P. -South	Berlin	loon active														
Branch P.	Sunderland	loon active												1	1	1
Carmi L.	Franklin	loon active														
Champlain L.	various	loon active												2	0	0
Clark P./ Bruce multi-lake	Glover	loon active												1	0	
Coits P.	Cabot	loon active												3	3	2
Crystal L.	Barton	loon active														
	Leicester/ Salisbury	loon active														
Dunmore L.- North	Salisbury	loon active														
Gale Meadows Res.	Winhall	loon active												2	0	0
Hardwood P.	Elmore	loon active												10	9	11
Harriman Res.	Wilmington	loon active														
Hortonia L.	Hubbardton	loon active														
Inman P.	Fair Haven	loon active														
Lewis P.	Lewis	loon active														
Marshfield P.	Marshfield	loon active												0		
McConnell P.	Brighton	loon active												15	11	15
Memphramagog L. - Holbrook Bay	Newport	loon active														
Memphremagog L. - John's River	Derby	loon active												4	2	1
Moore Res. - Roaring Brook	Concord	loon active												4	3	0

Table 1 continued. Summary of Common Loon breeding activity in Vermont, 2018

Lake Name	Town	2018 status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Rescues/ Mortality/ Monitor	Date	Age	Mortality and Rescue Cause	Comments	# years nested	# years nest success	total # surviving chicks
Memphremagog L. - John's River	Derby	loon active												4	2	1
Moore Res. - Roaring Brook	Concord	loon active												4	3	0
Morey L.	Fairlee	loon active												0		
Nelson P.	Woodbury	loon active							Mortality	7/17/2018	Adult	Fishing gear - fishhook	7/16 raspy breathing; 7/17 beached and placed in box. X-ray revealed one lung full of fluids (aspergillosis likely caused by 2" fishhook. Possibly boat hit after the infection. Euthanized. St. Johnsbury Vet Clinic and Dr. Mark Pokras involved.	1	0	
Noyes P.	Groton	loon active												1	0	0
Nulhegan	Brighton	loon active														
Seymour L. - West	Morgan	loon active												1	1	2
Shadow L. (Glover)	Glover	loon active														
Silver L. (Barnard)	Barnard	loon active														
Silver L. (Georgia)	Georgia	loon active														
South Bay	Newport	loon active														
Sunset L. (Benson)	Benson	loon active														
Wallace P.	Canaan	loon active												0		
Wapanacki P.	Wolcott	loon active														
Waterbury Res.	Waterbury	loon active												3	1	1
West Hill P.	Cabot	loon active														
Willoughby L.	Westmore	loon active														

Figure 1a. Common Loon Nesting and Territorial Pairs in Vermont – Northern Area

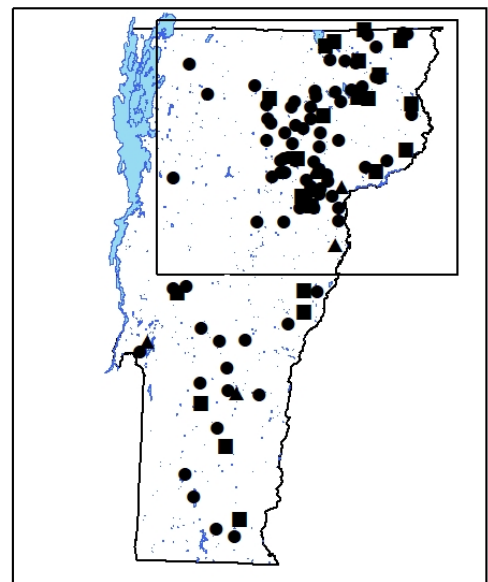
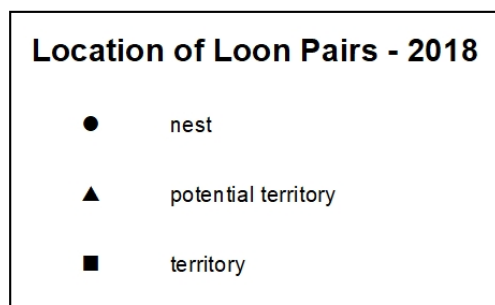
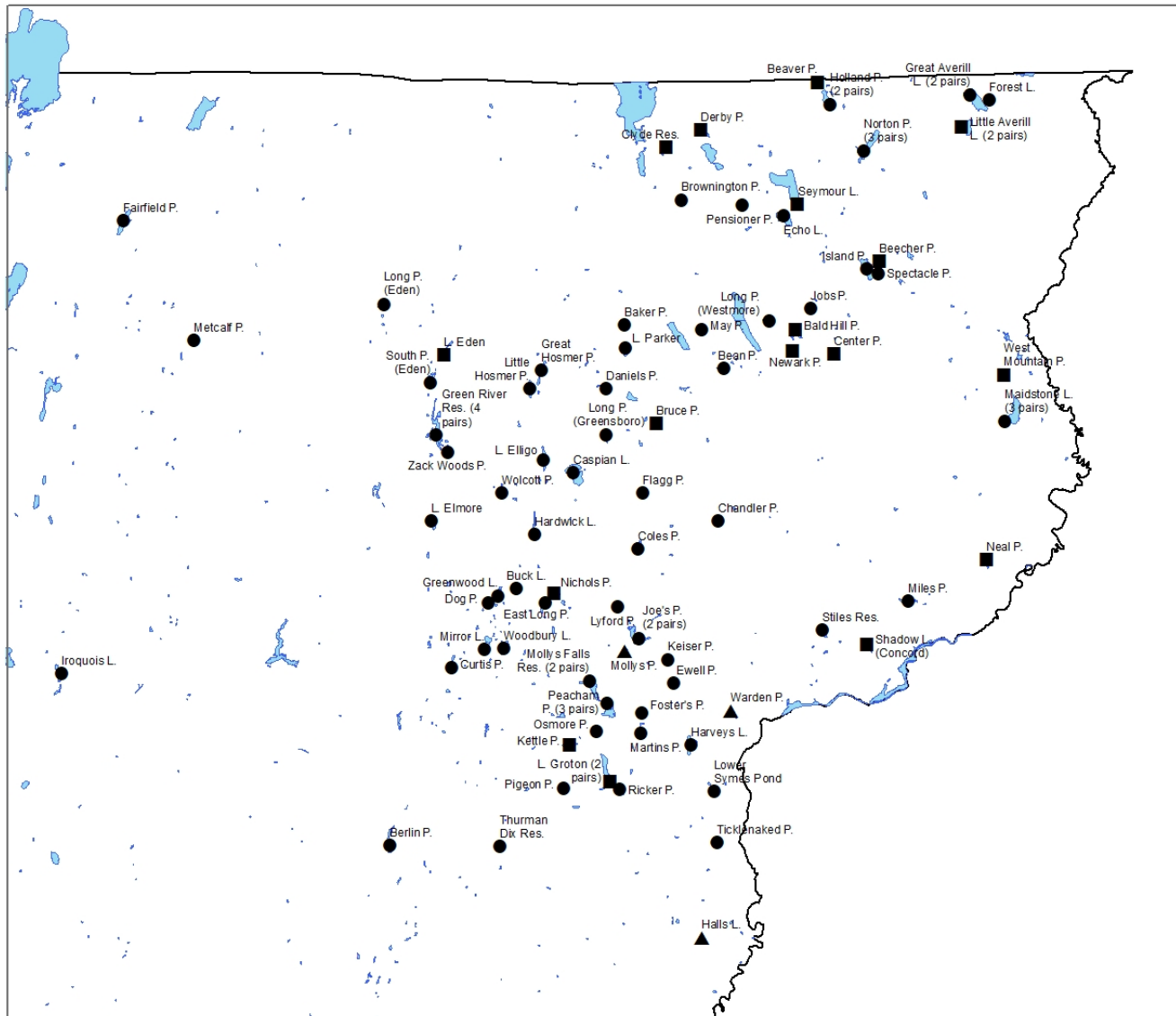


Figure 1b. Common Loon Nesting and Territorial Pairs in Vermont – Southern Area

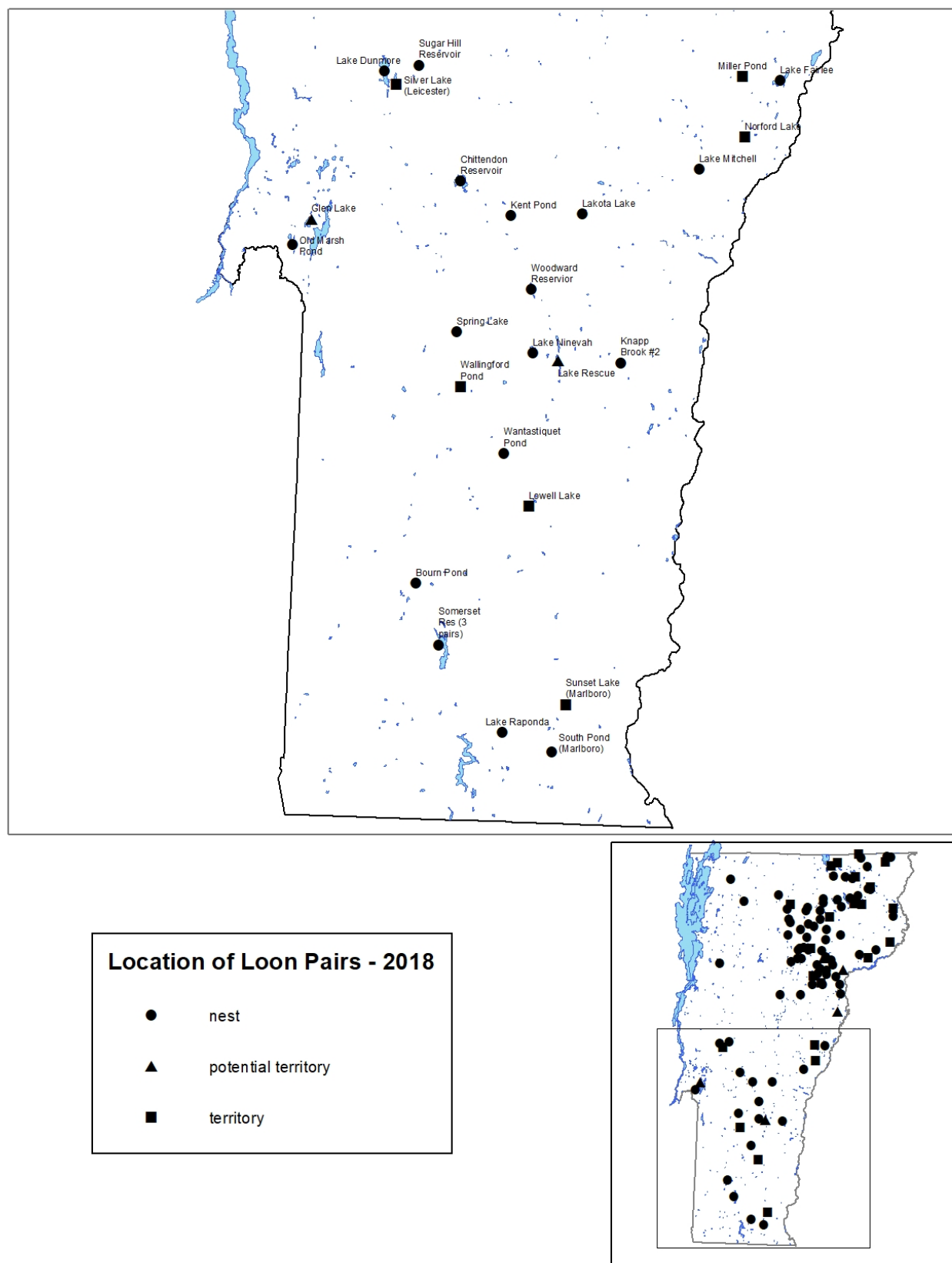


Figure 2. Summary of Common Loon breeding activity in Vermont, 1978-2018

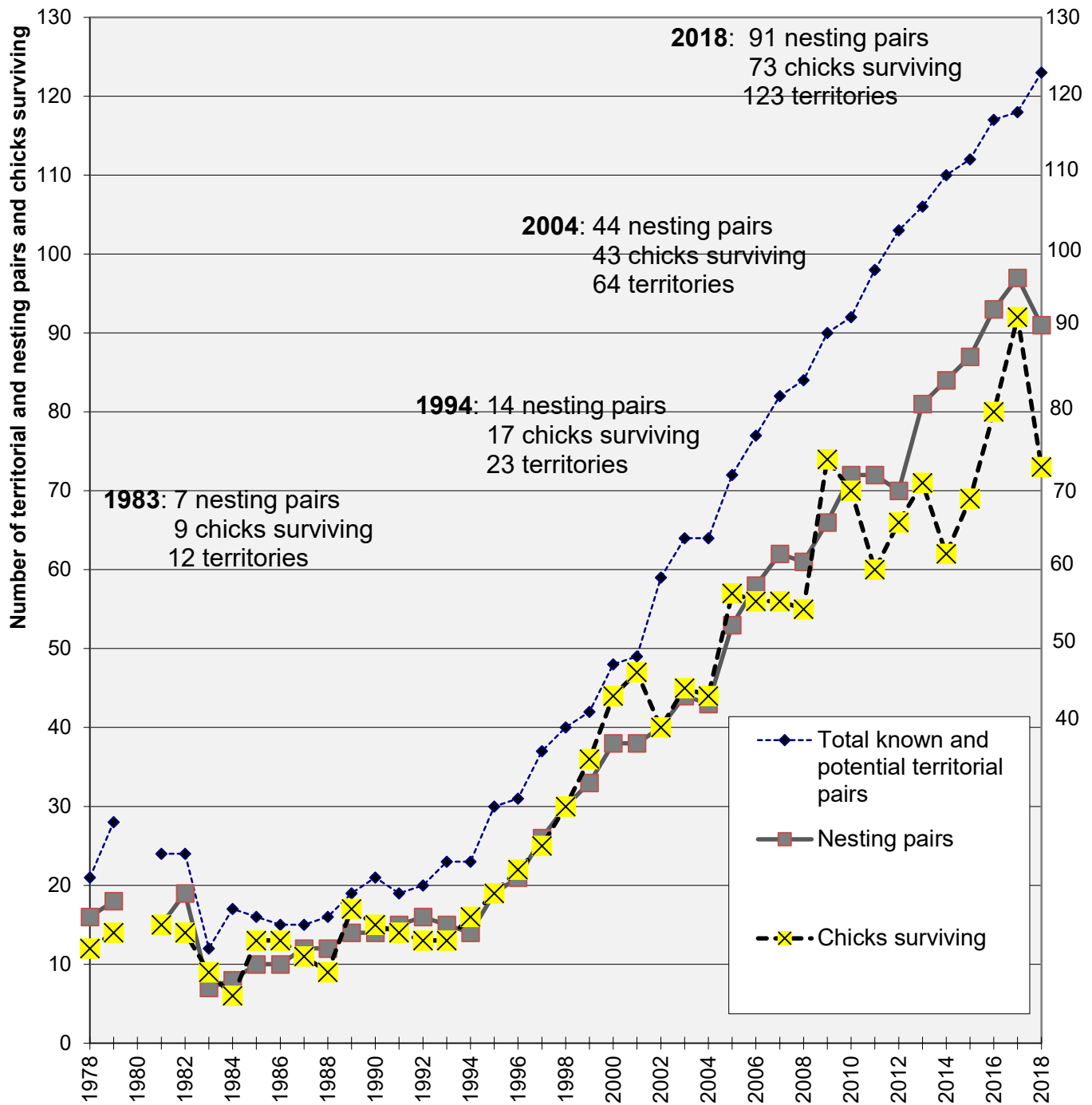


Table 2. Summary of population changes and reproductive success of Common Loons in Vermont, 1979-2018

Year	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18
TOTAL territorial pairs	28	0	24	24	12	17	16	15	15	16	19	21	19	20	23	23	30	31	37	40	42	48	49	59	64	64	72	77	82	86	90	92	98	103	106	110	112	117	118	123
Known terr. prs.	21	--	18	19	9	12	11	11	12	13	16	17	16	18	17	21	22	24	29	34	39	44	44	49	53	57	60	65	71	75	80	85	88	92	93	100	102	111	113	117
Potential terr. prs.	7	--	6	5	3	5	5	4	3	3	3	4	3	2	6	2	8	7	8	6	3	4	5	10	11	7	12	12	11	11	10	7	10	11	13	10	10	6	5	6
Nesting pairs	18	--	15	19	7	8	10	10	12	12	14	14	15	16	15	14	19	21	26	30	33	38	38	40	44	43	53	58	62	61	66	72	72	70	81	84	87	93	97	91
Successful pairs	12	--	11	12	5	6	8	9	9	7	10	9	10	10	11	13	15	14	21	23	25	36	34	34	38	34	47	44	47	49	53	57	52	50	62	57	65	65	74	66
Chicks hatched	--	--	--	--	10	7	--	16	12	11	19	18	16	15	18	20	21	25	32	37	41	56	56	52	62	54	68	66	71	75	83	85	76	87	97	93	103	102	117	97
Chicks surviving through August	14	--	15	14	9	6	13	13	11	9	17	15	14	13	13	17	19	22	25	30	36	44	47	40	45	44	57	56	56	55	74	70	60	66	71	62	69	80	92	73
Chicks surviving per nesting pair	0.78	--	1.00	0.74	1.29	0.75	1.30	1.30	0.92	0.75	1.21	1.07	0.93	0.81	0.87	1.21	1.00	1.05	0.96	1.00	1.09	1.16	1.24	1.00	1.02	1.02	1.08	0.97	0.90	0.90	1.12	0.97	0.83	0.94	0.88	0.74	0.79	0.86	0.95	0.80
Chicks surviving per total territorial pair	0.50	--	0.63	0.58	0.75	0.35	0.81	0.87	0.73	0.56	0.89	0.71	0.74	0.65	0.57	0.74	0.63	0.71	0.68	0.75	0.86	0.92	0.96	0.68	0.70	0.69	0.79	0.73	0.68	0.64	0.82	0.76	0.61	0.64	0.67	0.56	0.62	0.68	0.78	0.59
% chick survival	--	--	--	--	90%	86%	--	81%	92%	82%	89%	83%	88%	87%	72%	85%	90%	88%	78%	81%	88%	79%	84%	77%	73%	81%	84%	85%	79%	73%	89%	82%	79%	76%	73%	67%	67%	78%	79%	75%
Lakes with nesting pairs	17	--	14	19	7	8	10	10	11	11	13	13	14	15	14	14	18	21	25	29	32	36	36	38	41	39	49	52	57	54	61	63	63	63	72	72	76	83	84	78
Loonwatch results ^{a,b} (statewide annual survey)																																								
Number of adults	--	--	--	--	29	30	37	50	45	41	47	79	74	86	71	83	97	79	99	106	127	126	135	166	179	184	191	201	218	223	228	201 ^c	271	280	297	301	298	301	308	356
Number of chicks	--	--	--	--	9	16	13	17	9	9	16	15	15	15	14	11	17	21	21	26	36	45	45	39	44	40	45	53	54	42	65	53	52	63	69	66	63	74	85	65
Number of subadults	8	--	11	6	7	1	0	5	15	9	9	33	18	23	11	14	10	9	2	6	6	10	2	5	0	3	5	2	9	8	6	0	7	9	3	6	9	2	0	3
Number of lakes surveyed																					150	107	131	133	123	98	122	133	148	148	129	129	162	150	162	161	162	153	161	174
Number of lakes occupied																										68	69	84	86	84	89	76	102	98	106	103	116	112	111	132

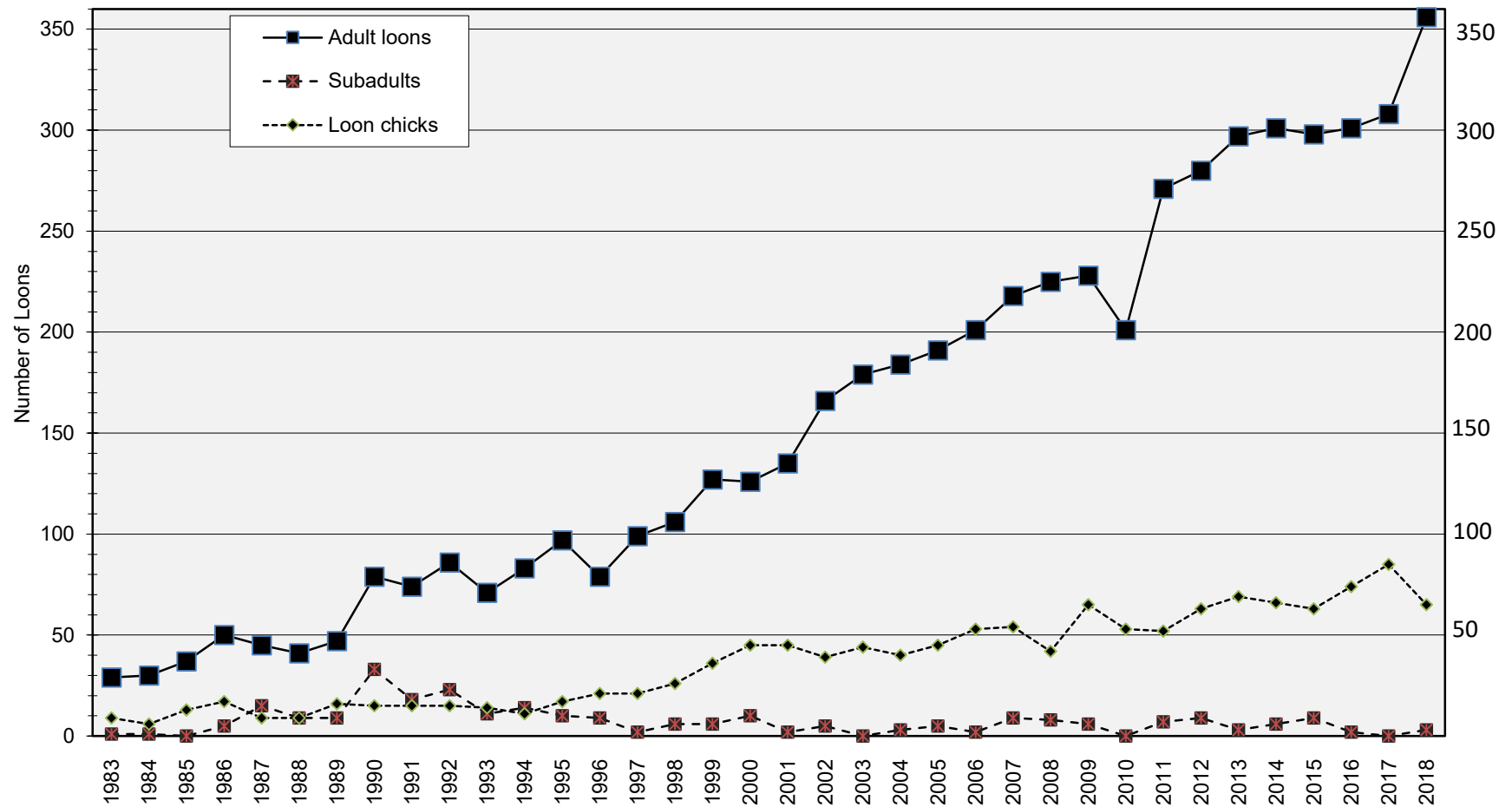
^a The number of lakes surveyed for Loonwatch increased in 1999. It is possible survey adult loon counts during the mid-1990s were slightly lower.

^b Data since 2002 do not include Lake Champlain survey results, because of the large-scale survey effort conducted in that year.

On July 19 and 20 in 2002, 28 adult and 18 subadult loons were counted in non-overlap regions on Lake Champlain.

^c Over 10 known lakes with loon activity were missed in 2010.

Figure 3. Vermont Loonwatch Results, 1983-2018
(an annual statewide loon census on the third Saturday of July)



RECOMMENDATIONS

The total adult loon population and numbers of nesting pairs have steadily increased since the mid-1990s. These results suggest that conservation efforts have aided the loon recovery in Vermont, in spite of persistent threats identified above. Increasing numbers of territorial pairs and ponds with more consistent loon activity indicate a potential for further growth in the breeding population. The invaluable assistance of volunteer observers, cottage owners, VFWD biologists and game wardens, and Vermont State Park and Green Mountain National Forest staff have greatly enhanced the effectiveness of statewide loon conservation efforts. Monitoring and management efforts, participation of volunteers, education of lake-users, and water level management should continue to be the primary tools for ensuring success of Vermont's breeding loons.

Implementation of the comprehensive Vermont Loon Recovery Plan (Borden and Rimmer 1998) has been ongoing and has helped the VLCP realize its population recovery goals. The majority of the short-term, high priority goals have been implemented since the mid-1990s. The post-delisting monitoring and management plan addresses continued threats to loons in Vermont and the species' dependence on the VLCP's management and educational efforts. It should be emphasized that over 50% of the breeding loons in Vermont have directly benefited from VLCP management programs, and that many of these pairs would likely fail without such assistance. The Vermont Loon Recovery Plan will continue to guide loon conservation efforts in the future.

With most short-term goals of the Recovery Plan having been achieved, the VLCP must now address the Plan's long-term, medium priority actions while monitoring potential changes due to delisting and the lead sinker ban. Many of the actions and recommendations below have been in place for several years, but resources have limited their implementation. These include:

1. Development of a comprehensive database would allow us to better assess and summarize Vermont's loon population trends, share and compare data with New Hampshire, Maine, and New York, develop a detailed population viability assessment for Vermont, and more efficiently coordinate volunteers.
2. We would like to provide more detailed training packets for adopt-a-lake volunteers.
3. Other future initiatives to consider should focus on improving the awareness of lake users on busy lakes. Actions could include (a) developing an information sheet and set of management protocols for loon breeding lakes, especially those requiring intensive management and education, and (b) developing permanent displays at State Parks and at kiosks on busy lakes.
4. Capture methods have improved over the past decade. It would be helpful to upgrade equipment for both summer and winter rescues. Loons caught in open water openings surrounded by ice continue occur, and the public expects rescues to occur. If the situation is safe, we will potentially attempt to conduct ice rescues. We need to invest in ice-rescue equipment to make these situations even more safe.
5. Further work should assess other means to protect nesting sites, including conservation easements. The Trust for Public Land has indicated an interest in prioritizing critical shorelines for protecting nesting areas.
6. Future research needs should be assessed and prioritized including the effects of climate change.

The VLCP will continue its involvement with the Northeast Loon Study Working Group (NELSWG), a coalition of state and federal agency representatives, universities, non-profit organizations, and other interested parties addressing the conservation problems of loons in eastern North America. This is a valuable partnership and forum for information exchange.

Acknowledgments

Major contributors: We sincerely thank the VFWD for ongoing, core financial support through the federal State Wildlife Grant program and the Nongame Wildlife Fund. We are also sincerely grateful for Great River Hydro's continued generous support of our efforts to monitor and manage nesting loons on Somerset Reservoir. Many individual donors have provided critical support to maintain VLCP programs. Without them, VCE's statewide loon conservation work would not be possible.

Professional assistance: Alex Kuligan and Tara Rodkey provided support as VCE interns. VFWD biologist John Buck provided general support for the VLCP. We greatly appreciate ongoing support from VFWD game wardens who assisted with the project. We thank the hydroelectric companies and other groups that regulate water levels for their continuing stabilization efforts. We are especially grateful to Mathew Cole from Great River Hydro, Sylvain Breault from Coaticook River Water Power Company, John Sutter from Green Mountain Power, Hardwick Electric Department, Craig Myotte and John Pilton of Morrisville Water and Light, Bill Rogers from Great Bay Hydro, and Reg Abare from the Barre Public Works Department for their efforts to ensure stable water levels during the nesting season. Vermont Parks and Recreation staff at Brighton, Maidstone, New Discovery, Ricker, and Stillwater state parks helped with outreach efforts. Craig Newman at Outreach for Earth Stewardship, veterinarians Dan Hament in Richmond, VT and Robert Hoppe in St. Johnsbury, VT, the Vermont Institute of Natural Science (VINS), Kappy Sprenger, and Avian Haven have assisted loons in distress over the past several years. Thanks also go to Dr. Mark Pokras of Tufts University Wildlife Medicine Program, John Cooley and Harry Vogel of the LPC, and Alex Daulton of BRI. The Nature Conservancy's efforts to protect loon habitat continue to promote the success of this project, and we appreciate all the staff and members who contribute to those efforts. Chris Rimmer, Susan Hindinger, Steve Faccio, Mistie Boule, and Sarah Carline of VCE assisted in VLCP fundraising and administration.

Volunteer assistance: We extend special thanks to the more than 280 Loonwatch and adopt-a-lake volunteers who care so deeply about Vermont's loons. We received assistance from dozens of lakeshore owners in reporting loon sightings and allowing access to lakes. Numerous volunteers helped distribute loon conservation brochures and promote awareness about loon conservation. Volunteers and staff spent hundreds of hours monitoring and attempting to catch loons in distress over the past several years.

Vermont Wildlife Action Plan: The efforts of VFWD staff and many contributing partners resulted in the formal acceptance of the congressionally mandated Vermont Wildlife Action Plan in November 2005. The plan draws attention to the 323 Species of Greatest Conservation Need in Vermont, including the Common Loon. Now that the Common Loon has been removed from the Vermont Endangered and Threatened Species list due to many years of dedicated monitoring and management of this species, the Vermont Wildlife Action Plan provides for continued attention to our natural heritage. For more information, visit http://www.vtfishandwildlife.com/SWG_home.cfm.

LITERATURE CITED AND BACKGROUND LITERATURE

Borden, S.E. and C.C. Rimmer. 1998. Vermont Loon Recovery Plan. Unpubl. report. Vermont Institute of Natural Science, Woodstock, VT and Vermont Fish and Wildlife Department, Waterbury, VT.

Desorbo, C.R., K.M. Taylor, D.E. Kramar, J. Fair, J.H. Cooley, Jr., D.C. Evers, W. Hanson, H.S. Vogel, J.L. Atwood. 2007. Reproductive advantages for Common Loons using rafts. *J. of Wildl. Mgmt.* 71(4):1206-1213.

Evers, D.C., O.P. Lane, C. DeSorbo, and L. Savoy. 2002. Assessing the impacts of methylmercury on piscivorous wildlife using a wildlife criterion value based on the Common Loon, 1998-2001. Unpubl. report, submitted to Maine Dept. of Environmental Protection by Biodiversity Research Institute, Freeport, Maine.

- Evers, D.C. 2006. Status assessment and conservation plan for the common Loon (*Gavia immer*) in North America. U.S. Fish Wildl. Serv., Hadley, Massachusetts.
- Hanson, E.W. 1996. Monitoring the Common Loon population in Minnesota: assessment of the 1994 and 1995 survey results, the accuracy of volunteers and aerial surveys, and the power of detecting trends. M.S. thesis. Univ. of Minnesota. 206 pp.
- Hanson, E.W. and J. Buck. 2009. The 2009 breeding status of Common Loons in Vermont. Unpubl. report. Vermont Center for Ecostudies, Norwich, VT and Vermont Fish and Wildlife Department, Waterbury, VT.
- Hanson, E.W., C.C. Rimmer, and J. Gobeille. 2000. The 2000 breeding status of Common Loons in Vermont. Unpubl. report. Vermont Institute of Natural Science, Woodstock, VT and Vermont Fish and Wildlife Department, Waterbury, VT.
- Laughlin, S.B. 1977. Status of the Common Loon in Vermont: August 1977. Unpubl. report, Vermont Institute of Natural Science, Woodstock, VT.
- McIntyre, J.W. 1988. The Common Loon: Spirit of Northern Lakes. Univ. Minnesota Press, Minneapolis, MN. 228 pp.
- McIntyre, J.W. and J.F. Barr. 1997. Common Loon (*Gavia immer*). In The Birds of North America, No. 313 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.