

THE 2016 BREEDING STATUS OF COMMON LOONS IN VERMONT

Eric W. Hanson^{1,2} and John Buck³

ABSTRACT: The Vermont Loon Conservation Project, a program of the Vermont Center for Ecostudies and the Vermont Fish and Wildlife Department, documented 93 nesting loon pairs and 117 territorial pairs statewide. Of the 93 pairs that attempted nesting, 65 successfully hatched 102 eggs, with 80 chicks surviving through August (chick survival rate 78%, 0.68 chicks surviving per territorial pair). Seven new nesting pairs and 2 new potential territorial pair were identified. Eighteen pairs that have nested in recent years did not nest in 2016. Of 29 pairs whose first nest attempts failed, 6 re-nested, and 2 were successful. Known causes of nest failure included depredation (6 nests), flooding (2 nests), and human disturbance (1 nest). The remaining failed nests were abandoned for unknown reasons with predators and disruption from intruder loons being the most likely causes. The causes of mortality of most chicks were unknown. At least 2 chicks disappeared after interactions with intruder loons, 1 was depredated by a Bald Eagle, and 1 died from sibling rivalry. During the summer months, two adult loon mortalities were documented, and one was unconfirmed. One bird died from aspergillosis on Berlin Pond. Three additional adults and two subadults likely died after becoming iced-in during the winter. One adult loon was successfully rescued after beaching itself (Hardwick L.). A chick was rescued and treated for a broken wing after being attacked by an intruder loon (L. Groton). Another chick was rescued that landed on very small pond (Walden). One Common Loon and a Red-throated Loon were rescued after crash landing on roads in Rutland and Walden, respectively. Eight subadults were rescued after becoming iced-in on Lake Champlain in February. We monitored several other loons reported in distress or caught in fishing line. About 200 volunteers surveyed lakes throughout Vermont on 16 July as part of the LoonWatch program, an annual statewide loon count. Loons were observed on 112 of 153 surveyed lakes, where observers counted 301 adults, 74 chicks, and 2 subadult loons. The total number of adult loons was similar to 2013-15. To provide a historical perspective, volunteers counted 179 and 225 adult loons in 2003 and 2008, respectively. Twenty-eight of the 93 breeding pairs nested on nesting rafts, 27 on islands, 22 in marshes, and 16 on shorelines. Thirty-nine nesting rafts were placed on known or potential nesting waterbodies. Warning sign buoys were placed around 52 of the 93 nests. About 80 nest warning signs were replaced this year with easier-to-read lettering and updated information. Volunteers provided technical assistance through the placement and maintenance of nest warning signs and/or nesting rafts on 46 lakes as part of the adopt-a-lake program. A full page photographic story about the rescue of the eight loons iced-in on Lake Champlain was printed in the Burlington Free Press and an interview with the VLCP coordinator was aired on WCAX television. Ten loon conservation programs were presented to over 300 people statewide. We continued to distribute 2 informational brochures on loon conservation and conservation of lakeshores. Loon conservation brochures were available in self-serve boxes at over 40 boat access areas.

¹ Vermont Center for Ecostudies, P.O. Box 420, Norwich, VT 05055; 802-649-1431

² Vermont Loon Conservation Project Coordinator, P.O. Box 22, Craftsbury, VT 05826; 802-586-8064

³ Vermont Fish and Wildlife Department, McFarland State Office Building, 5 Perry St. Suite 40, Barre, VT 05641; 802-476-0196

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 over the subsequent 21 years to 93 in 2016. The VLCP is a program of the Vermont Center for Ecostudies (VCE) and the Vermont Fish and Wildlife Department (VFWD).

A major accomplishment was reached in 2005 with the removal of the Common Loon from the Vermont Endangered and Threatened Species list. Thirty-nine years of Common Loon conservation and education 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 2012-2016 was 83 with 20 territorial pairs in the southern half of the state in 2016.

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, a VCE intern and seasonal biologist, 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.

Thirty-nine artificial nesting rafts were placed on 32 lakes. 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. A new raft was placed on Fairfield Pond for 2016 after determining that even minor rain events can cause flooding of nests including the past 2 years; the loon pair used the raft but the nest failed. Another new raft was placed on Caspian Lake after the loons had a failed shoreline nest. The Caspian Lake shoreline is mostly developed. We placed the raft to encourage the loons to nest in a quieter location and to reduce future conflict with lakeshore use. Adopt-a-lake volunteers maintained or helped with 20 rafts.

Warning sign buoys were placed around 52 of the 93 active nest sites to discourage human intrusion close to nests. These signs were also placed around 4 other nest sites where loons ultimately did not nest in 2016. Sign buoys were used in areas where repeated human disturbance was likely to occur. In 2014, we received funding from the Vermont Watershed Grant Program and individual donors and lake associations to replace about 100 loon nest warning signs. For 2015-16, we received a grant from the Canaday Foundation to replace another 160 signs. The new signs contain updated loon information and are easier to read from a distance.

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. Ten slide lectures, discussions, and workshops on loon biology, conservation, and research were presented to audiences at lake associations, youth groups, and other organizations (conservation groups, Road Scholar). Approximately 300 people 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.

A full page photographic story about the rescue of the eight loons iced-in on Lake Champlain was printed in the Burlington Free Press and an interview with the VLCP coordinator was aired on WCAX television.

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). Nine eggs were collected in 2016. Currently BRI is archiving egg samples until funding is allocated for more mercury analysis. 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 2016

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 117 known and potential territorial loon pairs, 93 of which were confirmed to nest on 83 lakes (Fig. 1, Table 1). Seven new nesting pairs were identified, including Caspian Lake (2 chicks), Chittenden Res.- NE (2 chicks), Curtis Pond (failed), Lake Fairlee (2 chicks), Lake Iroquois (failed), Lake Raponda (1 chick), and Sugar Hill Res. (1 chick). Two new potential territorial pairs were identified on Gale Meadows Pond and Glen Lake, both located in the southern half of Vermont. Two pairs on Great Hosmer Pond – North and Parker Pond started building nest bowls but did not lay any eggs. Neither pair has nested in the past.

Population levels and breeding success

The number of nesting pairs and territorial pairs increased from 2015. Of the 93 pairs that attempted nesting, 65 successfully hatched 102 eggs, with 80 chicks surviving through August (Fig. 2, Table 2). There were 111 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. Eighteen pairs that have nested in recent years did not nest in 2016, thus 84 percent of the known territorial pairs nested. This represents a high rate of pairs nesting compared to recent years. Of 29 pairs whose first nest attempts failed, 6 re-nested, and 2 were successful. Known causes of nest failure included depredation (6 nests), flooding (2 nests), and human disturbance (1 nest). A record number of loon pairs nested on shorelines, where depredation occurs more frequently. The remaining failed nests were abandoned for unknown reasons, with depredation and disruption from intruder loons being the most likely causes.

The chick survival rate through August was 78% with 0.68 chicks surviving per territorial pair in 2016. Since 1979, the average chick survival rate is 81% with 0.70 chicks per territorial pair. The causes of mortality of most chicks were unknown. At least 2 chicks disappeared after interactions with intruder loons, 1 was depredated by a Bald Eagle, and 1 died from sibling rivalry. During the summer months, two adult loon mortalities were documented, and a third one was unconfirmed (May P.). One bird died from aspergillosis on Berlin Pond. A dead loon from Ricker Pond was sent to Tufts University for a necropsy. Three additional adults and two subadults likely died after becoming iced-in during the winter. A Bald Eagle was harassing two iced-in loons on Lake Morey. One adult dove under the ice and was not observed again; a second adult disappeared during a several hour period from the same open-water hole and presumably drowned. A Bald Eagle depredated an iced-in adult loon on Lake Seymour. A rescue attempt was considered for both of these cases, but the ice was determined to be unsafe. Two subadults drowned after becoming iced-in on Lake Champlain, but eight subadults were rescued from the same situation (see Rescues below).

In 2014 and 2015, we observed higher nest failure and chick mortality rates compared to recent years. In 2016, a large number of depredated shoreline nests contributed to the high nest failure rate, however the 78 percent chick survivorship was near the 39 year average. With chick survivorship leveling off from 2009 to 2015, we recently speculated that the Vermont loon population may be reaching a certain level of carrying capacity. However, seven new loon pairs were detected in 2016 indicating loons are finding new habitat in which to expand. Five of the nesting pairs were located on highly developed lakes (Caspian, Curtis, Fairlee, Iroquois, Raponda), where education and management efforts will be necessary for the pairs to be successful. One pair was located on a small reservoir (Sugar Hill). Although the availability of quality habitat may be becoming limited and competition for available habitat may be increasing, we will likely observe new loon pairs attempting to nest on water bodies considered to be marginal habitat (e.g., highly developed shorelines, small size).

Management Results: artificial nesting rafts and nest warning sign buoys

Of the 93 known nests, 28 were on artificial nesting rafts (82% successful), 27 on islands (74% successful), 22 in marshes (68% successful), and 16 on shorelines (44% successful). Nests with warning sign buoys had a 79% success rate compared to 59% for nests without signs. Signs are used more frequently for raft and island sites, which are often more exposed to boaters. Shoreline nests are more likely to be depredated causing nest success rates to be low.

Vermont LoonWatch Day

Vermont LoonWatch day was conducted on 16 July when over 200 volunteers counted 301 adult loons, 74 chicks, and 2 subadults (Table 2, Fig. 3). Loons were observed on 112 of the 153 lakes surveyed. The total number of adult loons was similar to 2013-2015. Forty-six of 301 adult loons counted were located in southern and central Vermont, an increase from 39 in both 2013 and 2014, but lower than the 51 adults observed in 2015. Volunteers counted the most loons on Joe's Pond (14 adults) and Lake Memphremagog (10 adults) followed by Green River Reservoir, Little Averill Lake, Norton Pond, Seymour Lake, and Lake Willoughby, all with 9 adults.

Loon Rescues

One adult loon was successfully rescued after beaching itself near Hardwick Lake. A chick from Lake Groton was rescued and treated for a broken wing by Avian Haven in Freedom, Maine after being attacked by an intruder loon. Lake residents, VLCP volunteer Darlene Sprague, VFWD game warden Mark Shichtle, the Vermont Institute of Natural Science Wildlife Services, and water bird rehabilitator Kappy Sprenger all assisted. Another chick was rescued from a small pond in Walden, VT where it could not take off. It is likely the chick was from Coles Pond. In November, one Common Loon and a Red-throated Loon were rescued after crash landing on roads in Rutland and Walden, respectively.

Eight subadults were rescued over a week period after becoming iced-in on Lake Champlain in February with the assistance of Bob Dill, Phyll Newbeck, and several other long-distance ice-skaters, who found the birds and were knowledgeable in ice-safety. We monitored several other loons reported in distress or caught in fishing line. These included 1 chick (Spectacle P.) and 3 adults (L. Morey, Seymour L.) that became iced-in and likely died before we could rescue them (see Population and Breeding Success above).

The VLCP biologist spent over 85 hours in 2016 conducting capture attempts and coordinating monitoring efforts with volunteers and game wardens. The biologist has spent 52-85 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 46 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 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, 2016

Nesting pairs: 93 Known territorial pairs: 111 Potential territorial pairs: 6 Total territorials pairs: 117																
Chicks hatched: 103 Chicks surviving through August: 70																
Lake list divided into sections: 1) nesting pairs, 2) known and potential territorial pairs, and 3) loon active lakes.																
Loonwatch Count 16 July 2016: Adult loons - 301 New nesting pairs: 6 New territorial pairs: 2																
Lake Name	Town	2016 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		2 ch	2 ch							12	10	15
Bald Hill P.	Westmore	nesting	shoreline	successful		2 ch	2 ch							15	9	10
Bean P.	Sutton	nesting	island	successful		1 ch	0 ch	Unknown						12	12	14
Beaver P.	Holland	nesting	island	successful		1 ch	1 ch							34	29	35
Beecher P.	Brighton	nesting	marsh	successful		2 ch	1 ch	Unknown - disappeared early						3	2	2
Berlin P. - north	Berlin	nesting	marsh	successful	signs	2 ch	1 ch	Unknown	Mortality	7/17/2016	Adult	Aspergillois	Found dead along shore. Sent to UNH. Severe case of aspergillois.	13	12	15
Bourn P.	Sunderland	nesting	island	successful		1 ch	1 ch							15	14	15
Brownington P.	Brownington	nesting	marsh	Abandoned - no eggs	signs									15	6	9
Bruce P.	Sheffield	nesting	marsh	Over-incubation										7	0	
Buck L.	Woodbury	nesting	marsh	successful		1 ch	0 ch	Unknown						9	5	5
Caspian L.	Greensboro	nesting	raft	successful	signs	2 ch	2 ch							2	1	2
Center P.	Newark	nesting	shoreline	Abandoned - no eggs	signs									3	0	
Chandler P.	Wheelock	nesting	marsh	successful		1 ch	1 ch							9	6	6
Chittendon Res. - East	Chittenden	nesting	raft	successful	signs	1 ch	1 ch							12	9	11
Chittendon Res. - NE	Chittenden	nesting	island	successful		2 ch	2 ch						New nest within 400 m of East pair; chicks reared west side of reservoir	1	1	2
Coles P.	Walden	nesting	marsh	successful	signs	2 ch	2 ch		Rescue	10/24/2016	Chick	Small pond	Chick on small pond in Walden; Coles P. located nearby. Released on Caspian L.	17	14	21
Curtis P.	Calais	nesting	marsh	Over-incubation										1		
Daniels /Daniels West P.	Glover	nesting	marsh	successful		2 ch	1 ch	Other					Disappeared during journey from West Daniels to Daniels; one chick survived	6	5	5
Derby P.	Derby	nesting	marsh	Avian depredation										8	5	5
Dunmore L. / Mud P.	Leicester/ Salisbury	nesting	island	Abandoned - no eggs	signs									10	8	9
East Long P.	Woodbury	nesting	island	successful		2 ch	2 ch							36	28	33
Echo L. (Charleston)	Charleston	nesting	shoreline	Flooded	signs									6	2	2
Eden L.	Eden	nesting	raft	successful	signs	2 ch	2 ch							13	11	15
Elligo L.	Greensboro	nesting	island	Abandoned - egg(s); re-nest abandoned - no eggs	signs									15	12	14
Elmore L.	Elmore	nesting	marsh	Abandoned - no eggs	signs									5	1	1
Ewell P.	Peacham	nesting	marsh	successful	signs	2 ch	2 ch							8	8	8
Fairfield	Fairfield	nesting	island	Abandoned - no eggs	signs									3	0	
Fairlee L.	Fairlee	nesting	shoreline	successful		1 ch	1 ch							1	1	1

Table 1 - continued. Summary of Common Loon breeding activity in Vermont, 2016

Lake Name	Town	2016 Status	Nest Type	Nest Outcome	Nest Warning Sign Buoy	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
Forest L.	Averill	nesting	raft	successful		1 ch	0 ch	Unknown - disappeared early						23	20	25
Fosters P.	Peacham	nesting	raft	successful		2 ch	2 ch							14	14	21
Great Averill L. - North	Averill	nesting	raft	Abandoned - no eggs										22	12	13
Great Averill L. - South	Averill	nesting	raft	successful		1 ch	1 ch							7	6	6
Great Hosmer P. - South	Albany/ Craftsbury	nesting	marsh	successful	signs	1 ch	1 ch							6	6	9
Green River Res. - Access Bay	Hyde Park	nesting	island	successful	signs	2 ch	2 ch							9	8	9
Green River Res. - Big Island	Hyde Park	nesting	island	Mammalian depredation										2	0	
Green River Res. - NW	Hyde Park	nesting	raft	successful	signs	1 ch	0 ch	Unknown - disappeared early					Intruder loons common	38	29	40
Greenwood L.	Woodbury	nesting	raft	successful	signs	2 ch	1 ch	Unknown - disappeared early						6	5	5
Groton L. - North	Groton	nesting	raft	successful	signs	1 ch	1 ch		Rescue	8/19/2016	Chick	Trauma - attack by intruder loon	Chick attacked by intruder loon while parents off defending. Minor head wounds and broken wing. Brought to VINS and then Kappy Sprenger/Avian Haven.	7	4	5
Hardwick L.	Hardwick	nesting	raft	successful		1 ch	1 ch		Rescue	7/24/2016	Adult	Beached	Left Hardwick Lake and found nearby near road. A little thin but feisty. Banded and released on Elligo.	13	12	18
Harveys L.	Barnet	nesting	marsh	successful	signs	1 ch	0 ch	Trauma - attack by another loon					Intruder loons common	8	6	5
Iroquois L.	Hinesburg	nesting	island	Human disturbance										1		
Island P.	Brighton	nesting	island	Abandoned										16	13	15
Jobs P.	Westmore	nesting	shoreline	Abandoned - no eggs										9	5	5
Joe's P. - inlet	Cabot/ Danville	nesting	raft	successful	signs	2 ch	1 ch	Unknown - disappeared early						17	17	23
Joe's P. - 1st Pond	Cabot/ Danville	nesting	shoreline	Abandoned - no eggs										7	4	3
Keiser P.	Danville/ Peacham	nesting	marsh	Abandoned - no eggs										12	9	9
Kent P.	Killington	nesting	island	successful	signs	2 ch	2 ch							7	5	7
Kettle P.	Groton/ Marshfield	nesting	raft	Abandoned - no eggs	signs									26	16	21
Little Averill L. - West	Averill	nesting	raft	Abandoned - no eggs	signs									29	17	24
Little Hosmer P.	Craftsbury	nesting	island	successful	signs	2 ch	1 ch	Unknown - disappeared early						16	9	8
Long P. (Eden)	Eden	nesting	marsh	successful		2 ch	2 ch							5	3	4
Long P. (Westmore)	Westmore	nesting	island	Abandoned (eggs disappeared); same for re-nest	signs									18	14	18
Lower Symes P.	Rye Gate	nesting	marsh	successful		2 ch	2 ch							13	12	18
Lyford P.	Walden	nesting	marsh	Chicks lost right away 1st nest; re-nest abandoned (eggs disappeared)										7	5	5

Table 1 - continued. Summary of Common Loon breeding activity in Vermont, 2016

Lake Name	Town	2016 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. - North	Maidstone	nesting	shoreline	Abandoned - no eggs										7	5	3
Maidstone L. - SE	Maidstone	nesting	island	successful		2 ch	2 ch							6	3	5
Maidstone L. -SW	Maidstone	nesting	island	successful	signs	1 ch	0 ch	Other					Neglected by parents for several days who were dealing with intruder loon; possible attack but not observed.	34	31	36
Martins P.	Peacham	nesting	raft	successful	signs	2 ch	2 ch							20	20	29
Metcalf P.	Fletcher	nesting	shoreline	Mammalian depredation; same for re-nest	signs									4	2	4
Miller P.	Strafford	nesting	marsh	successful	signs	1 ch	1 ch		Monitor	6/19/2016	Adult	Fishing gear - monofilament	One of pair had fishing line for about a week before line no longer observed.	4	4	6
Molly's Falls Res. - North	Cabot	nesting	raft	successful	signs	1 ch	1 ch							22	21	29
Newark P.	Newark	nesting	island	successful	signs	1 ch	0 ch	Trauma - attack by another loon						27	20	28
Nichols P.	Woodbury	nesting	raft	successful	signs	1 ch	1 ch							17	15	15
Ninevah L.	Mount Holly	nesting	island	successful	signs	2 ch	2 ch							22	20	28
Norton P. - Island	Norton	nesting	raft	successful	signs	2 ch	1 ch	Unknown - disappeared early						37	30	39
Norton P. - North	Norton	nesting	raft	successful	signs	2 ch	2 ch							8	3	6
Norton P. - South	Norton	nesting	raft	successful		2 ch	2 ch							16	14	17
Osmore P.	Peacham	nesting	shoreline	successful		1 ch	1 ch							8	5	5
Peacham P. - North	Peacham	nesting	island	successful	signs	2 ch	0 ch	Unknown					Intruder loons common	39	32	37
Pensioner P.	Charleston	nesting	raft	successful	signs	1 ch	1 ch							9	8	10
Pigeon P.	Groton	nesting	raft	Abandoned - no eggs										2	0	0
Raponda L.	Wilmington	nesting	island	successful	signs	1 ch	1 ch							1	1	1
Ricker P.	Groton	nesting	shoreline	Flooded	signs				Mortality	8/26/2016	Adult	Unknown	Found dead along shore; sent to Tufts.	14	11	11
Seymour L. - Winape	Morgan	nesting	raft	successful	signs	1 ch	1 ch							19	15	20
Shadow L. - (Concord)	Concord	nesting	shoreline	successful		1 ch	1 ch							10	5	6
Silver L. (Leicester)	Leicester	nesting	shoreline	successful		2 ch	2 ch							3	3	4
Somerset Res. - Dandeneau Cove	Somerset	nesting	island	successful	signs	2 ch	2 ch							35	25	32
Somerset Res. - North Islands	Somerset	nesting	island	successful		1 ch	1 ch							9	7	9
South P. (Eden)	Eden	nesting	island	successful	signs	2 ch	2 ch							18	14	18
South P. (Marlboro)	Marlboro	nesting	marsh	successful	signs	2 ch	1 ch	Unknown - disappeared early						2	2	3
Spectacle P.	Brighton	nesting	raft	successful	signs	2 ch	1 ch	Sibling rivalry					Chick ignored by family; likely sibling dominance	22	20	23
Spring L.	Shrewsbury	nesting	shoreline	successful	signs	2 ch	2 ch							14	10	14
Stiles Res.	Waterford	nesting	marsh	Abandoned										13	9	13
Sugar Hill Res.		nesting	raft	successful	signs	1 ch	1 ch							1	1	1
Sunset L. (Marlboro)	Marlboro	nesting	island	successful	signs	2 ch	1 ch	Unknown						8	6	6

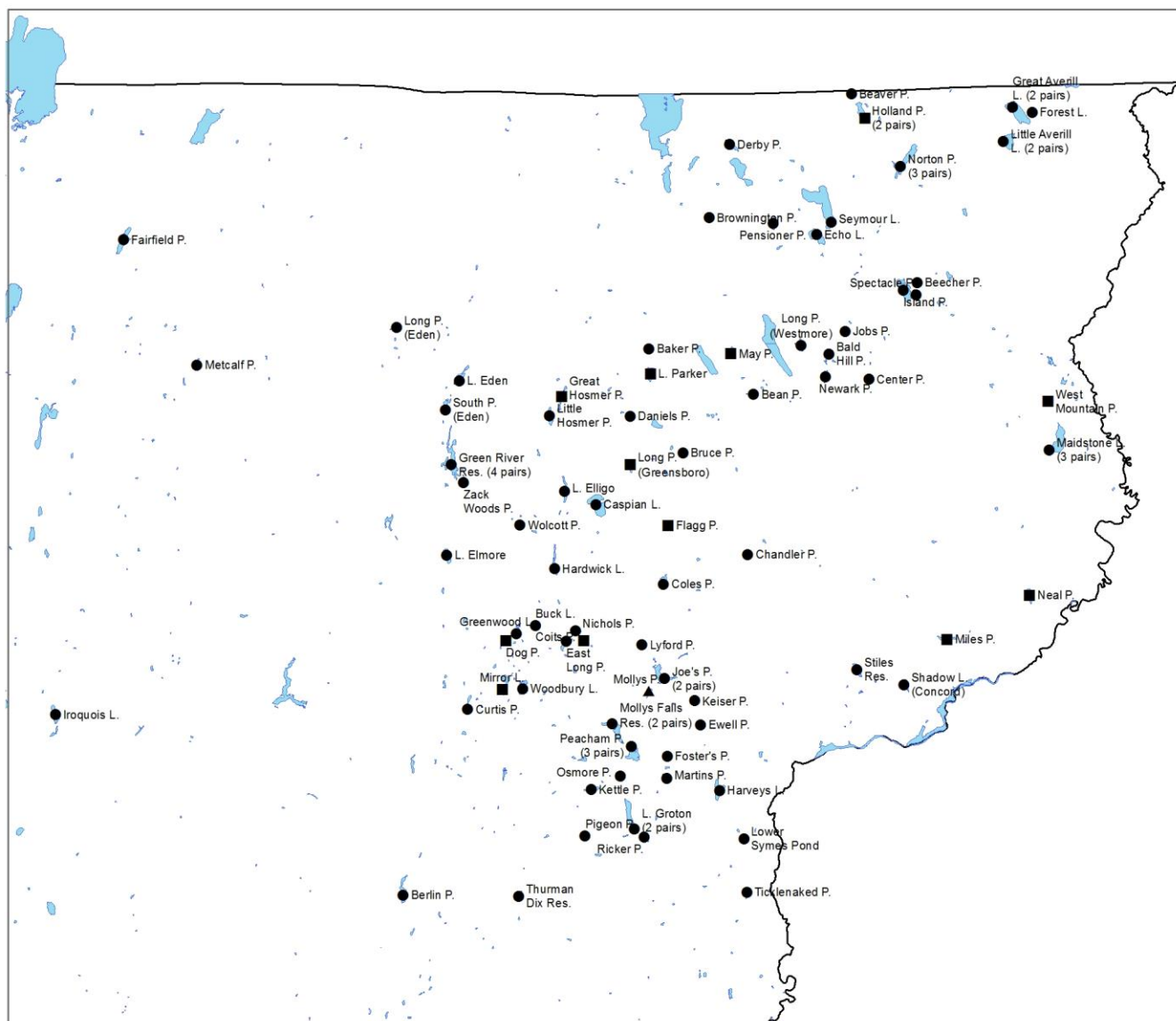
Table 1 - continued. Summary of Common Loon breeding activity in Vermont, 2016

Lake Name	Town	2016 Status	Nest Type	Nest Outcome	Nest Warning Sign Buoy	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
Thurman Dix Res.	Orange	nesting	island	Abandoned										36	29	34
Ticklenaked		nesting	shoreline	successful	signs	2 ch	1 ch	Unknown - disappeared early						2	1	1
Wallingford P.	Wallingford	nesting	marsh	Abandoned - eggs										17	12	19
Wantastiquet P.	Weston	nesting	island	successful		2 ch	2 ch							8	7	10
Wolcott P.	Wolcott	nesting	marsh	successful	signs	2 ch	1 ch	Unknown - disappeared early						24	20	26
Woodbury L. (Sabin)	Woodbury	nesting	raft	successful	signs	2 ch	1 ch	Predation - avian					Bald Eagle observed attacking family; chick not observed after this incident.	10	10	10
Woodward Res.	Plymouth	nesting	island	successful	signs	1 ch	1 ch							10	7	8
Zack Woods P.	Hyde Park	nesting	island	successful	signs	1 ch	1 ch							20	18	29
Coits P.	Cabot	territory		last nested 2015	signs									3	3	2
Dog Pond	Woodbury	territory		last nested 2015										1	0	
Flagg P.	Wheelock	territory		last nested 2014										4	3	5
Great Hosmer P. - North	Albany/ Craftsbury	territory											Nest building far NW shore			
Green River Res. - SW	Hyde Park	territory		last nested 2015									Nest building SE island	2	1	1
Groton L. - South	Groton	territory		last nested 2015										14	12	15
Holland P. - South	Holland	territory		last nested 2015	signs									20	13	16
Little Averill L. - North	Averill	territory		last nested 2015										6	4	1
Long P. (Greensboro)	Greensboro	territory		last nested 2015										1	0	
May P.	Barton	territory		last nested 2015	signs				Mortality	7/25/2016	Adult	Unknown	Report of dead loon floating near shore; not found. Many territorial chases observed all summer.	20	17	24
Miles P.	Concord	territory		last nested 2015										22	16	22
Molly's Falls Res. - Island	Cabot	territory		last nested 2015										4	3	5
Neal P.	Lunenburg	territory		last nested 2015					Rescue	10/5/2016	Adult	Fishing gear - monofilament	VFW game warden attempted unsuccessful capture; outcome unknown	2	0	
No. 10 P. (Mirror L.)	Calais	territory		last nested 2015	signs									9	9	11
Parker L.	Glover	territory											Nest building observed SW inlet	0		
Peacham P. - SW	Peacham	territory		last nested 2015										27	19	23
Somerset Res. - Narrows	Somerset	territory		last nested 2014										4	1	1
West Mountain P.	Maidstone	territory		last nested 2015										16	10	6
Gale Meadows Res.	Winhall	potential territory												2	0	0
Glen P.	Castleton	potential territory														
Holland P. - North	Holland	potential territory		last nested 2009										2	0	0
Mollys P.	Cabot	potential territory														

Table 1 - continued. Summary of Common Loon breeding activity in Vermont, 2016

Lake Name	Town	2016 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
Morey L.	Fairlee	potential territory							Mortality	12/15/2015	Adult	Iced-in	One disappeared under ice and did not surface; 2nd adult disappeared. Chance it flew off or dove under ice. Eagle presence causing loons to dive.	0		
Peacham P. - SE	Peacham	potential territory		last nested 2014	signs									6	2	3
Amherst L.	Plymouth	loon active														
Berlin P. -South	Berlin	loon active														
Branch P.	Sunderland	loon active												1	1	1
Carmi L.	Franklin	loon active														
Clark P.	Glover	loon active											Multi-lake territory with Bruce P.	1	0	
Clyde R.	Newport	loon active														
Crystal L.	Barton	loon active														
Dunmore L.- North	Leicester/ Salisbury	loon active														
Halls L.	Newbury	loon active												0		
Hardwood P.	Elmore	loon active												10	9	11
Harriman Res.	Wilmington	loon active														
Hortonia L.	Hubbardton	loon active														
Knapp Brook P.	Reading	loon active												1	1	1
Lowell L.	Londonderry	loon active														
Marshfield P.	Marshfield	loon active												0		
McConnell P.	Brighton	loon active		last nested 2007										15	11	15
Memphramagog L. - Holbrook Bay	Newport	loon active														
Memphremagog L. - John's River	Derby	loon active		last nested 2009										4	2	1
Moore Res. - Roaring Brook	Concord	loon active												4	3	0
Nelson P.	Woodbury	loon active		last nested 2011										1	0	
Noyes P.	Groton	loon active							Monitor	6/15/2016	Adult	Fishing gear - monofilament	Loon observed with fishing line around the head. Eventually fell off on it's own. Loon taking fish from anglers' lines.	1	0	0
Nulhegan	Brighton	loon active														
Rescue L.	Ludlow	loon active														
Seymour L. - West	Morgan	loon active							Mortality	1/20/2016	Adult	Depredation - avian	Iced-in; depredated by bald eagle	1	1	2
Shadow L. (Glover)	Glover	loon active														
South Bay	Newport	loon active														
Sunset L. (Benson)	Benson	loon active														
Wallace P.	Canaan	loon active												0		
Wapanacki P.	Wolcott	loon active														
Warden P.	Barnet	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



Location of Loon Pairs - 2016

- nest
- ▲ potential territory
- territory

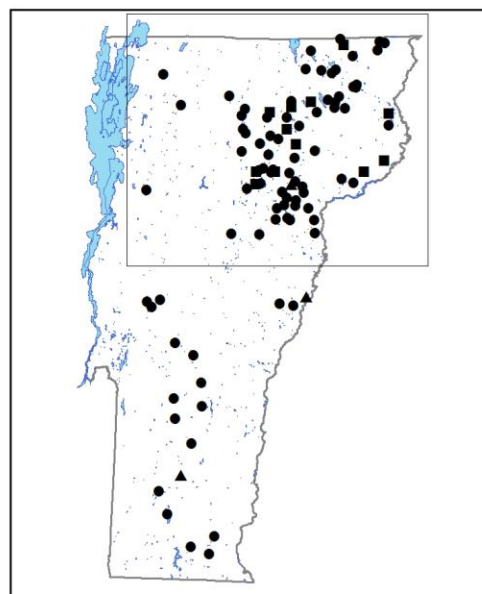


Figure 1b. Common Loon Nesting and Territorial Pairs in Vermont – Southern Area

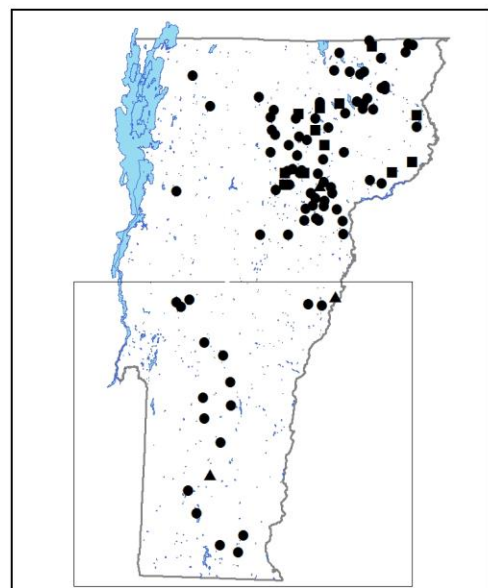
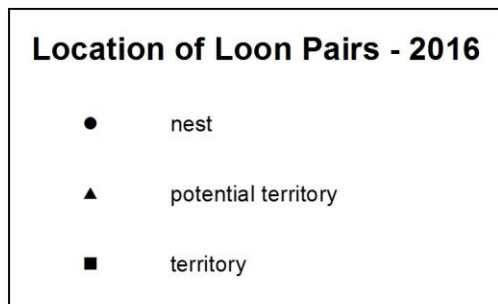
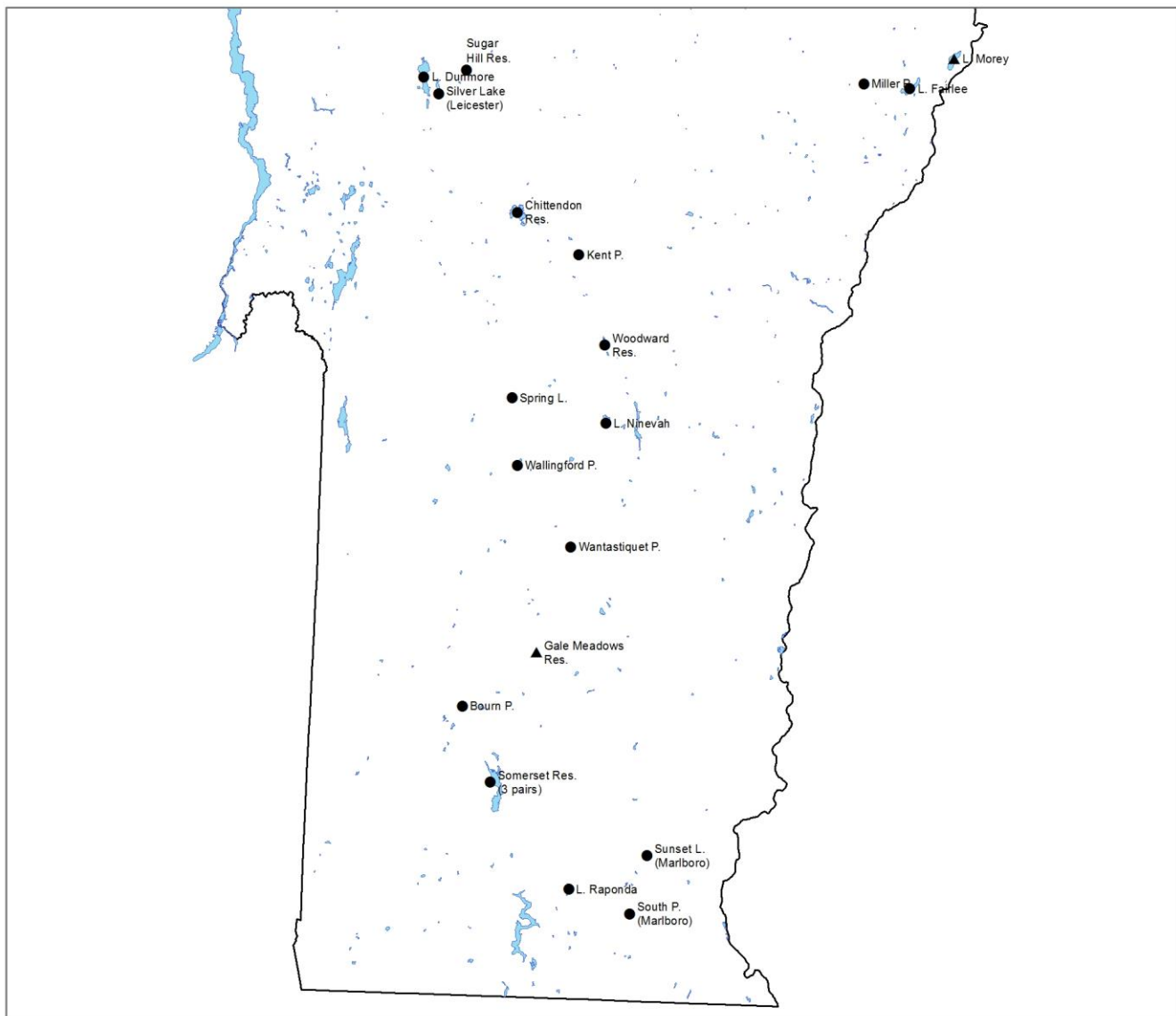


Figure 2. Summary of Common Loon breeding activity in Vermont, 1978-2016

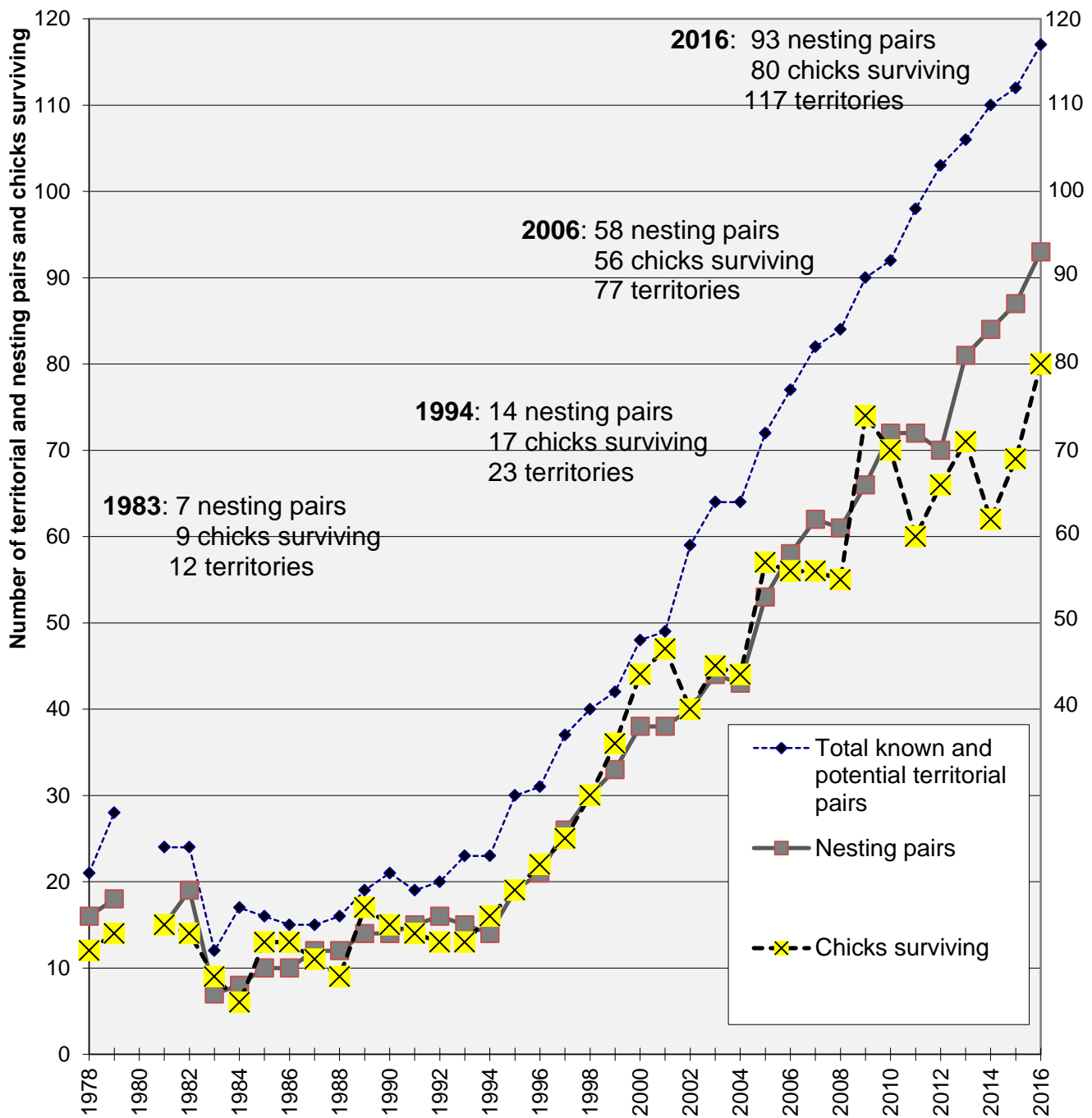


Table 2. Summary of population changes and reproductive success of Common Loons in Vermont, 1979-2016.

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		
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		
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		
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		
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		
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		
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		
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		
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		
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		
% 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%		
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		
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	225	228	201 ^c	271	280	297	301	298	301		
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		
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		
Number of lakes surveyed																					150	107	131	133	123	98	122	133	148	148	129	129	162	150	162	161	162	153		
Number of lakes occupied																										68	69	84	86	84	89	76	102	98	106	103	116	112		

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	225	228	201 ^c	271	280	297	301	298	301
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
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
Number of lakes surveyed																					150	107	131	133	123	98	122	133	148	148	129	129	162	150	162	161	162	153
Number of lakes occupied																										68	69	84	86	84	89	76	102	98	106	103	116	112

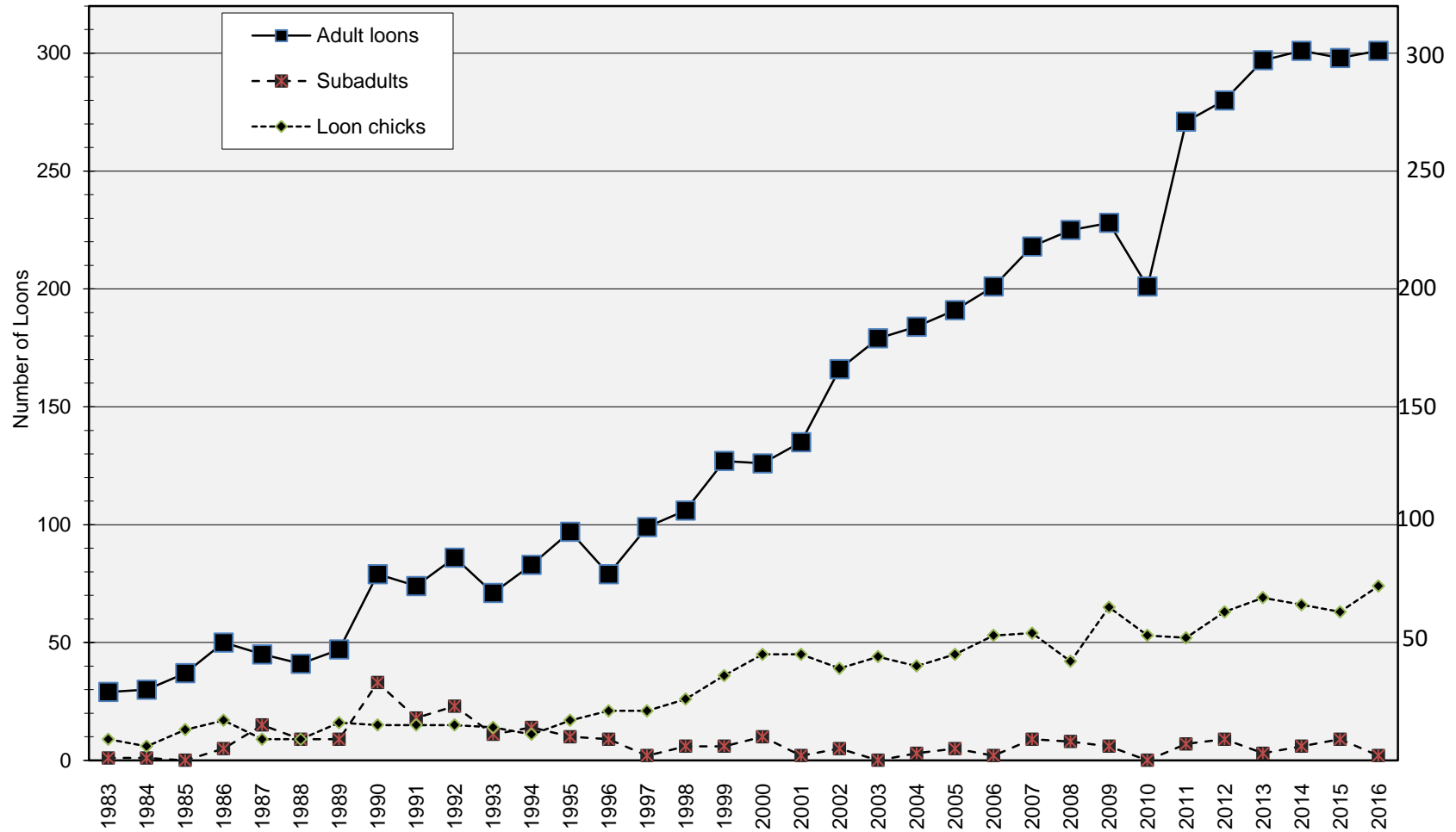
^a The number of lakes surveyed for Loonwatch increased in 1999. It is possible survey adult loon counts during the mid-1990s were slightly lower.

^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, 1983-2016
 (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 in conjunction with the LPC in New Hampshire and BRI in Maine and New York 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.
5. In 2017, the VLCP might assist the Biodiversity Research Institute capture several loons in Vermont as part of a North America Common Loon health assessment.
6. 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.
7. 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

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Professional assistance: Amber Wolf provided support as a VCE intern, and Grace Mitchum was the VCE seasonal biologist. 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 Trans Canada Hydro, Simon Morin 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. 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 Jim Paruk 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, and Melissa MacKenzie 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.

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