THE 2014 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 84 nesting loon pairs and 110 territorial pairs statewide. Of the 84 pairs that attempted nesting, 57 successfully hatched 93 eggs, with 62 chicks surviving through August (chick survival rate 67%, 0.56 chicks surviving per territorial pair). Five new nesting pairs and 4 new potential territorial pair were identified. Sixteen pairs that have nested in recent years did not nest in 2014. Of 28 pairs whose first nest attempts failed, 4 re-nested, and 1 was successful. Causes of nest failure included flooding (3 nests), stranding (1 nest), loon disturbance (3 nest), adult killed by fishing gear (1 nest), 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 1 chick disappeared after interactions with intruder loons, and 1 was depredated by a Bald Eagle. Eagles were present near the time of 6 other chicks disappearing, and intruder loons were frequently observed where 8 other chicks disappeared. Five adult loon mortalities were documented. All 5 loons died from fishing gear of which 3 loons have been confirmed to have lead in them. Two adult loons were successfully rescued after crashing on land (Walden, Marshfield), and 1 chick was rescued after becoming entangled in fishing line and a hook (Island). Another adult loon was not rescued from fishing line entanglement after 4 attempts (Caspian). Four adults loons were monitored after being observed with fishing line, but the line came free on all of them. About 200 volunteers surveyed lakes throughout Vermont on 19 July as part of the LoonWatch program, an annual statewide loon count. Loons were observed on 103 of 161 surveyed lakes, where observers counted 301 adults, 66 chicks, and 6 subadult loons. The total number of adult loons increased slightly from 2013. To provide a historical perspective, volunteers counted 179 and 225 adult loons in 2003 and 2008, respectively. Twenty-three of the 84 breeding pairs nested on nesting rafts, 28 on islands, 24 in marshes, and 9 on shorelines. Thirty-five nesting rafts were placed on known or potential nesting waterbodies. Several rafts were removed this year to encourage natural nesting. Warning sign buoys were placed around 48 of the 84 nests. About 100 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 45 lakes as part of the adopt-a-lake program. Interviews with the VLCP coordinator were aired on Vermont Public Radio, WCAX news, and Channel 17 Burlington Public Access television. Six loon conservation programs were presented to over 270 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.

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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 over the subsequent 19 years to 84 in 2014. 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-six 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 2010-2014 was 75 with 15 territorial pairs in the southern half of the state.

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. In 2014, the name of the program was changed from the Vermont Loon Recovery Project to the Vermont Loon Conservation Project.

METHODS

Monitoring of lakes with breeding and territorial loons

The VLCP biologist, a VLCP 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 190 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-five artificial nesting rafts were placed on 29 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. Adopt-a-lake volunteers maintained or helped with 20 rafts. Several rafts were removed this past year to promote natural nesting or because the rafts were not being used.

Warning sign buoys were placed around 48 of the 84 active nest sites to discourage human intrusion close to nests. These signs were also placed around 3 other nest sites where loons ultimately did not nest in 2014. Sign buoys were used in areas where repeated human disturbance was likely to occur. We received funding from the Vermont Watershed Grant Program and individual donors and lake associations to replace about 100 loon nest warning signs in 2014. For 2015-16, we recently 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, caught in ice, 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. Six 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 278 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.

C*ontaminant sampling*

Abandoned eggs were collected and delivered to BioDiversity Research Institute (BRI,19 Flaggy Meadow Road, Gorham, ME 04038-1203) for methylmercury (MeHg) analysis (Evers et al. 1999). Fourteen eggs were collected in 2014. We are waiting for results of mercury sampling on eggs collected over the past several 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 2014

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 through much of the summer.

Distribution of territorial and nesting pairs

There were 110 known and potential territorial loon pairs, 84 of which were confirmed to nest on 72 lakes (Fig. 1, Table 1). Five new nesting pairs were identified, including Beecher P. (abandoned), Fairfield P. (flooded), Green River Res. –

Southwest (1 chick), Silver L.-Leicester (1 chick), and South P.-Marlboro (2 chicks). Four new potential territorial pairs were identified on Halls P., L. Raponda, Sugar Hill Res., and Waterbury Res.

Population levels and breeding success
The number of nesting pairs and territorial pairs increased from 2013. Of the 84 pairs that attempted nesting, 57 successfully hatched 93 eggs, with 62 chicks surviving through August (Fig. 2, Table 2). There were 9 fewer chicks fledged in 2014 compared to 2013. There were 100 known territorial pairs on water bodies where nesting had occurred within the last 3 years, and 10 potential territorial pairs, each of which was observed consistently for 6 weeks or more. Sixteen pairs that have nested in recent years did not nest in 2014. Some pairs likely did not nest because of intruder loon activity or lack of suitable nest sites. Of 28 pairs whose first nest attempts failed, 4 re-nested, and 1 was successful. Causes of nest failure included flooding (3 nests), disruption by other loons (3 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 chick survival rate through August was 67% with 0.56 chicks surviving per territorial pair in 2014. Since 1979, the average chick survival rate is 82% with 0.70 chicks per territorial pair. The causes of mortality of most chicks were unknown. At least 1 chick disappeared after interactions with intruder loons, and 8 others disappeared from territories where intruder loons were frequently observed around the time the chick disappeared. One chick was depredated by a Bald Eagle, and 6 others disappeared on ponds where eagles were observed within a day of the chick disappearing. Five adult loon mortalities were documented. Five adult loons died from fishing gear of which 3 have been confirmed to have lead in them.

In 2014, we observed higher nest failure and chick mortality rates compared to recent years potentially indicating that some of the breeding range may be reaching a certain level of carrying capacity. Availability of quality habitat may be becoming limited, as well as competition for available habitat may be increasing. Loon pairs nesting in marginal habitat tend to nest less often and are less successful (e.g., small ponds, shoreline nests).

Management Results: artificial nesting rafts and nest warning sign buoys
Of the 84 known nests, 23 were on artificial nesting rafts (74% successful), 28 on islands (79% successful), 24 in marshes (63% successful), and 9 were on shorelines (33% successful). Nests with warning sign buoys had a 67% success rate compared to 69% for nests without signs.

Vermont LoonWatch Day
Vermont LoonWatch day was conducted on 19 July when over 200 volunteers counted 301 adult loons, 66 chicks, and 6 subadults (Table 2, Fig. 3) Loons were observed on 103 of the 161 lakes surveyed. The total number of adult loons was similar to 2013. Thirty nine of 301 adult loons counted were located in southern and central Vermont, the same as in 2013. High counts of adult loons in 2013 were obtained on Peacham Pond (13 adults), Green River Reservoir and Lake Memphremagog (10 adults), and Caspian Lake (9 adults).

Loon Rescues
Two adult loons were successfully rescued after crashing on land (Walden, Marshfield), and 1 chick was rescued after becoming entangled in fishing line and a hook (Island). Another adult loon was not rescued from fishing line entanglement after 4 attempts (Caspian). After one month of observation, the line appeared less constrictive and the loon was behaving more normally (long dives, more active). This loon is being monitored into the fall. Four adults loons were monitored after being observed with fishing line, but the line came free on all of them (Coits, Coles, Kent, South-Eden). However, the Coles Pond pair abandoned their nest during this time. The VLCP biologist spent over 83 hours in 2012, 65 hours in 2013, and 52 hours in 2014 conducting capture attempts and coordinating monitoring efforts with volunteers and game wardens. Volunteers were instrumental in the monitoring and capture attempts of all these birds.

Table 1. Summary of Common Loon breeding activity in Vermont, 2014

Nesting pairs: 84 Known territorial pairs: 100 Potential territorial pairs: 10 **Total territorials pairs: 110**

Chicks hatched: 93 Chicks surviving through August: 62

Lake list divided into sections: 1) nesting pairs, 2) known and potential territorial pairs, and 3) loon active lakes.

Loonwatch Count 19 July 2014: Adult loons - 301 New nesting pairs: 5 New territorial pairs: 3

Lake Name	Town	Status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Adult Mortality and Rescue	Comments	# years nested	# years nest success	total # surviving chicks
Baker P.	Barton	nesting	marsh	Abandoned - egg(s)							10	8	13
Bean P.	Sutton	nesting	island	Successful		1 ch	0 ch	Intruder loon	Fishing gear - lead	7/ 8/ 14 Jighead likely in gizzard. Weakened adult might have been killed by intruder loon. Chick disappeard during chases and fighting.	10	10	13
Beaver P.	Holland	nesting	island	Successful		2 ch	1 ch	Unknown			32	27	34
Beecher P.	Brighton	nesting	marsh	Abandoned - egg(s)						1st nest attempt ever recorded.	1	0	
Berlin P.	Berlin	nesting	marsh	Successful	signs	1 ch	1 ch				11	10	13
Bourn P.	Sunderland	nesting	island	Successful		1 ch	1 ch				13	12	13
Brownington P.	Brownington	nesting	raft	Successful	signs	1 ch	1 ch				13	6	9
Buck L.	Woodbury	nesting	marsh	Egg(s) in water						Last nested in 2011.	7	3	4
Chandler P.	Wheelock	nesting	marsh	Successful		2 ch	1 ch	Unknown			7	4	4
Chittendon Res. - East	Chittenden	nesting	raft	Abandoned - egg(s)	signs					Some 2nd pair-like activity in June to the north. Pair off nest often.	10	7	9
Clark P.	Glover	nesting	shoreline	Egg(s) in water						Pair is likely same pair that has attempted to nest on Bruce P. for past 6 years	1	0	
Coits P.	Cabot	nesting	marsh	Successful	signs	2 ch	1 ch	Unknown - disappeared early	Monitor - fishing line	8/ 9/ 14 Report of loon with fishing line around head; 8/ 11/ 14 line fell off	2	2	1
Coles P.	Walden	nesting	marsh	Loon disturbance					Monitor - fishing line	6/ 10/ 14 Breeding adult had fishing line around head. Off nest often as well as intruder loon present. Abandoned nest. Monoflilament fell off within 2 weeks.	15	13	19
Daniels / Daniels W.	Glover	nesting	marsh	Successful		2 ch	1 ch	Other- chick disappeared during 600m overland journey			5	4	4
Dunmore L. / Mud P.	Leicester/ Salisbury	nesting	island	Successful	signs	1 ch	1 ch				8	7	8
East Long P.	Woodbury	nesting	island	Successful		1 ch	1 ch				34	26	30
Eden L.	Eden	nesting	raft	Successful	signs	2 ch	2 ch				11	9	12
Elligo L.	Greensboro	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early			13	11	13
Elmore L.	Elmore	nesting	marsh	Abandoned - no eggs	signs					Intruder loons frequent.	3	1	1
Ewell P.	Peacham	nesting	marsh	Successful		1 ch	0 ch	Unknown - disappeared early			6	6	5
Fairfield	Fairfield	nesting	island	Flooded						1st nest attempt ever recorded.	1	0	
Flagg P.	Wheelock	nesting	island	Successful		1 ch	1 ch				4	3	5
Forest L.	Averill	nesting	raft	Successful		2 ch	1 ch	Unknown - disappeared early			21	18	24
Fosters P.	Peacham	nesting	raft	Successful		2 ch	2 ch				12	12	17
Great Averill L. - North	Averill	nesting	raft	Successful		2 ch	1 ch	Unknown		Intruder loons frequent.	20	12	13
Great Averill L. - South	Averill	nesting	raft	Successful		1 ch	1 ch				5	4	5
Green River Res. - Access Bay	Hyde Park	nesting	island	Successful	signs	2 ch	1 ch	Unknown		Intruder loons frequent.	7	6	6

Table 1 Continued. Summary of Common Loon breeding activity 2014

Lake Name	Town	Status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Adult Mortality and Rescue	Comments	# years nested	# years nest success	total # surviving chicks
Green River Res. - NW	Hyde Park	nesting	island	Successful	signs	2 ch	0 ch	Unknown	Fishing gear - lead	Intruder loons frequent. 8/4/14 Adult - lead in body fluids (object passed through or dissolved). Possibly attacked by other loon.	36	27	39
Green River Res. - SW	Hyde Park	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Intruder loons frequent. 1st nest attempt ever recorded.	1	1	1
Greenwood L.	Woodbury	nesting	raft	Successful	signs	2 ch	1 ch	Unknown - disappeared early			4	3	2
Groton L. - North	Groton	nesting	raft	Abandoned - eggs	signs					Possible hatch but not confirmed. Intruder loons frequent.	5	2	3
Harveys L.	Barnet	nesting	marsh	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Eagle sighted frequently.	6	4	4
Holland P. - South	Holland	nesting	raft	Successful	signs	1 ch	0 ch	Unknown - eagle present		Eagle present at south end most days.	19	12	15
Island P.	Brighton	nesting	island	Successful		1 ch	1 ch		Rescue - see comments	8/28/14 Chick had fishing line around body and hook in wing. Rescued and released.	14	12	14
Jobs P.	Westmore	nesting	shoreline	Abandoned - egg(s)						Last nested in 2011.	7	4	3
Joe's P - inlet	Cabot/ Danville	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early			15	15	20
Joe's P. - 1st Pond	Cabot/ Danville	nesting	island	Successful		1 ch	1 ch				5	4	3
Keiser P.	Danville/ Peacham	nesting	marsh	Successful		1 ch	0 ch	Unknown		Intruder loons frequent.	10	9	9
Kent P.	Killington	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early	Monitor - fishing line	Eagle present around time chick disappeared. 8/15/14 Report of loon in fishing line; all loons fine 8/16	5	3	3
Kettle P.	Groton/ Marshfield	nesting	shoreline	Abandoned - no eggs	signs						25	16	21
Little Averill L. - North	Averill	nesting	raft	Successful		2 ch	0 ch	Unknown		Intruder loons frequent.	5	3	1
Little Averill L. - West	Averill	nesting	raft	Abandoned	signs						28	17	24
Long P. (Eden)	Eden	nesting	marsh	Flooded							3	1	2
Long P. (Westmore)	Westmore	nesting	island	Abandoned - no eggs	signs						16	13	18
Lower Symes P.	Ryegate	nesting	marsh	Successful		1 ch	1 ch				11	10	14
Lyford P.	Walden	nesting	marsh	Successful		2 ch	1 ch	Unknown - disappeared early			5	4	4
Maidstone L. - North	Maidstone	nesting	shoreline	Successful		1 ch	1 ch			Last nested in 2010.	6	5	3
Maidstone L. - SE	Maidstone	nesting	island	Human disturbance						Will likley place nesting raft offshore from island in 2015.	4	2	3
Maidstone L. - SW	Maidstone	nesting	island	Successful	signs	1 ch	1 ch				32	29	34
Martins P.	Peacham	nesting	raft	Successful	signs	2 ch	2 ch				18	18	27
Metcalf P.	Fletcher	nesting	island	Successful	signs	2 ch	2 ch			Nest back on north island.	3	2	4
Miles P.	Concord	nesting	island	Successful	signs	2 ch	2 ch				21	16	22
Miller P.	Strafford	nesting	marsh	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Eagle present on the day chick disappeared.	2	2	3
Molly's Falls Res. - Island	Cabot	nesting	island	Flooded	signs						3	2	3
Molly's Falls Res. - North	Cabot	nesting	raft	Successful	signs	2 ch	1 ch	Unknown - disappeared early	Rescue - see comments	Intruder loons frequent. 8/25/14 Adult loon crash landed at Twinfield High School; released at Mollys Falls Reservoir.	20	19	27
Neal P.	Lunenberg	nesting	marsh	Abandoned - no eggs	signs						2	0	

Table 1 Continued. Summary of Common Loon breeding activity 2014

Lake Name	Town	Status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Adult Mortality and Rescue	Comments	# years nested	# years nest success	total # surviving chicks
Newark P.	Newark	nesting	island	Successful	signs	2 ch	1 ch	Unknown		Intruder loons frequent.	25	18	26
Nichols P.	Woodbury	nesting	raft	Successful	signs	1 ch	0 ch	Depredation - eagle		Resident observed eagle take chick.	15	13	13
Ninevah L.	Mount Holly	nesting	island	Successful	signs	2 ch	2 ch				20	18	24
No. 10 P. (Mirror L.)	Calais	nesting	raft	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Eagle present around time chick disappeared.	8	8	9
Norton P. - Island	Norton	nesting	raft	Successful	signs	2 ch	2 ch				35	28	38
Norton P. - North	Norton	nesting	raft	Loon disturbance	signs					Intruder loons frequent.	7	2	4
Norton P. - South	Norton	nesting	marsh	Abandoned - no eggs						Geese on raft in May; loons nested in marsh.	14	12	14
Osmore P.	Peacham	nesting	island	Abandoned - no eggs	signs						6	4	4
Peacham P. - North	Peacham	nesting	island	Successful	signs	1 ch	1 ch				37	30	37
Peacham P. - SE	Peacham	nesting	shoreline	Abandoned - no eggs	signs						6	2	3
Ricker P.	Groton	nesting	raft	Abandoned - egg(s)	signs					Intruder loons frequent. Geese on raft in May; loons used raft later.	12	10	11
Seymour L. - Winape	Morgan	nesting	raft	Loon disturbance	signs					Intruder loons frequent. Pair off nest often.	17	14	19
Shadow L. - (Concord)	Concord	nesting	shoreline	Successful		2 ch	2 ch				8	4	5
Silver L. (Leicester)	Leicester	nesting	shoreline	Successful		1 ch	1 ch			1st nest attempt ever recorded.	1	1	1
Somerset Res. - Dandeneau Cove	Somerset	nesting	island	Abandoned - no eggs both 1st nest and re-nest	signs						33	24	30
Somerset Res. - Narrows	Somerset	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Eagle present around time chick disappeared.	4	1	1
South P. (Eden)	Eden	nesting	island	Successful	signs	2 ch	2 ch		Monitor - fishing line	8/ 21/ 14 Report of loon with fishing line around head; 8/ 25 line fell off.	16	13	16
South P. (Marlboro)	Marlboro	nesting	marsh	Successful	signs	2 ch	2 ch			1st nest attempt ever recorded.	1	1	2
Spectacle P.	Brighton	nesting	raft	Successful	signs	2 ch	1 ch	Unknown - disappeared early		Eagle present around time chick disappeared.	20	18	22
Sunset L.	Marlboro	nesting	island	1st nest abandoned ; re-nest adult died from fishing gear	signs				Fishing gear	7/ 4/ 14 Hook and swivel present in gizzard; awaiting full necropsy. Intruder loon might have killed the weakened adult.	6	4	4
Thurman Dix Res.	Orange	nesting	raft	Stranded						Late nest. Normal water drawdown likely caused nest failure.	34	28	33
Wallingford P.	Wallingford	nesting	marsh	Successful		2 ch	2 ch				15	11	18
Wantastiquet P.	Weston	nesting	island	1st nest abandoned ; re-nest successful		2 ch	2 ch				6	5	7
West Mountain P.	Maidstone	nesting	shoreline	Successful		1 ch	0 ch	Unknown			15	9	6
Wolcott P.	Wolcott	nesting	marsh	Abandoned - no eggs	signs						23	19	25
Woodbury L. (Sabin)	Woodbury	nesting	raft	Successful	signs	2 ch	2 ch				8	8	8
Woodward Res.	Plymouth	nesting	island	Successful	signs	1 ch	1 ch				8	5	6
Zack Woods P.	Hyde Park	nesting	island	Successful	signs	2 ch	1 ch	Unknown - disappeared early			18	16	26

Table 1 Continued. Summary of Common Loon breeding activity 2014

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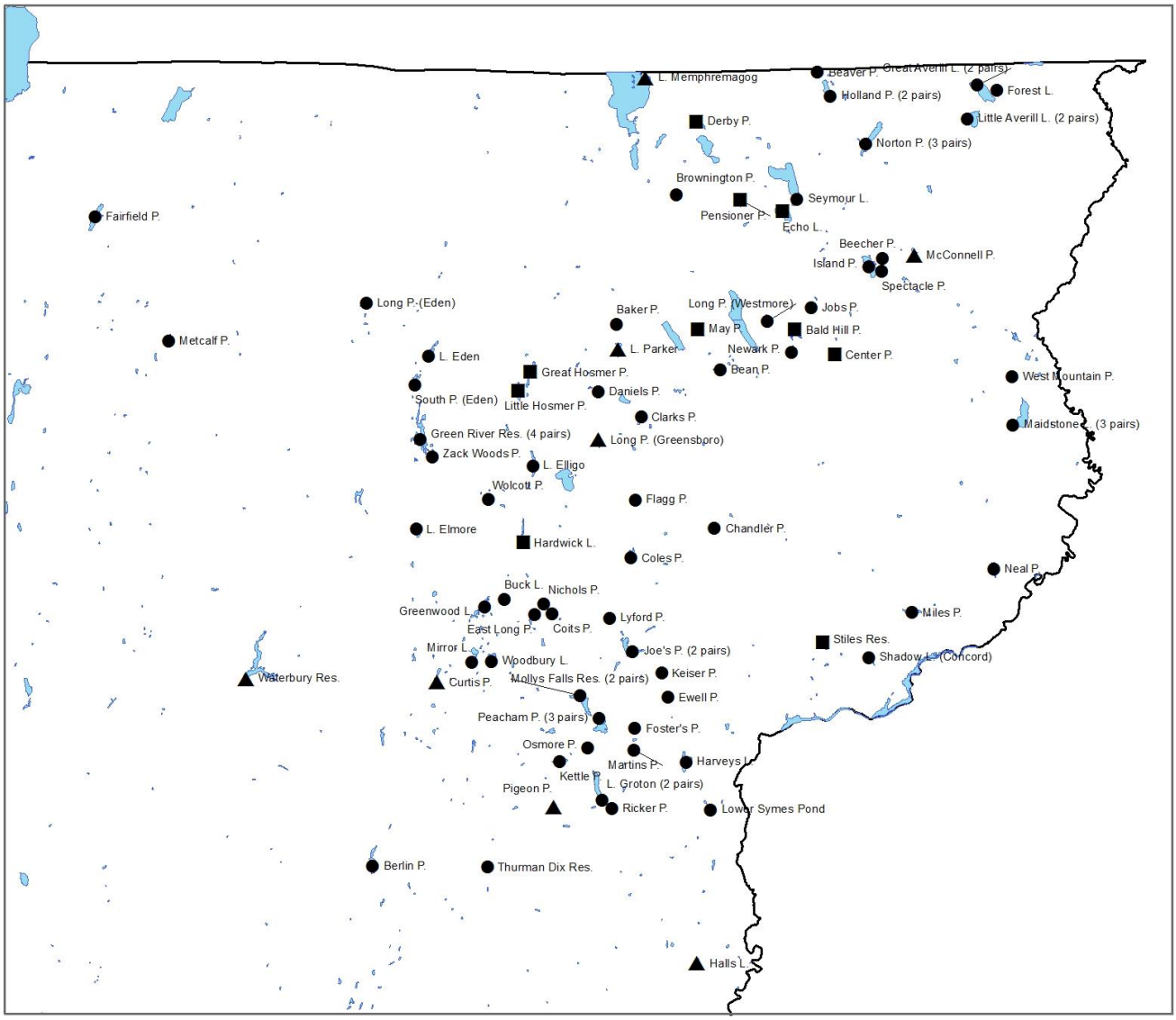
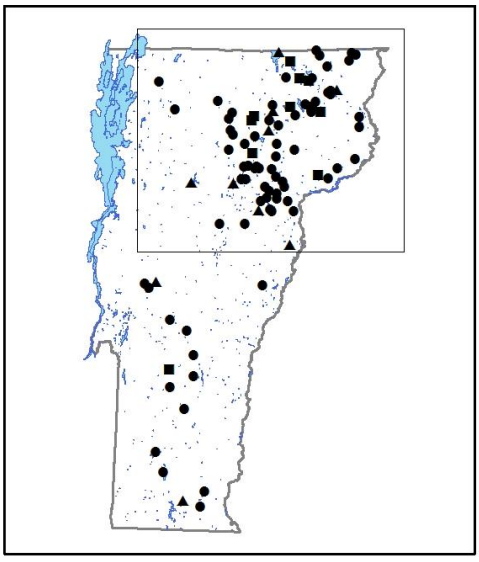
Bald Hill P.	Westmore	territory		last nested 2013						No nest likely influenced by lack of good nest site.	13	8	8
Center P.	Newark	territory		last nested 2013	signs					No nest likely influenced by lack of good nest site.	1	0	
Derby P.	Derby	territory		last nested 2013							6	4	4
Echo L. - North	Charleston	territory		last nested 2013	signs					No nest likely influenced by lack of good nest site.	5	2	2
Great Hosmer P.	Albany/ Craftsbury	territory		last nested 2013						Intruder loons frequent.	4	4	6
Green River - Big Island	Hyde Park	territory		last nested 2013						Intruder loons frequent.	1	0	
Groton L. - South	Groton	territory		last nested 2012						Intruder loons frequent.	13	11	14
Hardwick L.	Hardwick	territory		last nested 2013						No nest likely influenced by lack of good nest site.	11	11	17
Holland P. - North	Holland	territory		last nested 2009						No nest likely influenced by lack of good nest site.	2	0	0
Little Hosmer P.	Craftsbury	territory		last nested 2012						Intruder loons frequent.	14	7	6
May P.	Barton	territory		last nested 2009						Intruder loons frequent.	19	17	24
Peacham P. - SW	Peacham	territory		last nested 2013						Intruder loons frequent.	26	19	23
Pensioner P.	Charleston	territory		last nested 2013	signs						7	6	8
Somerset Res. - North Islands	Somerset	territory		last nested 2008							7	5	6
Spring L.	Shrewsbury	territory		last nested 2013							12	8	11
Stiles Res.	Waterford	territory		last nested 2013							11	8	11
Curtis P.	Calais	potential territory											
Halls	Newbury	potential territory											
Long P. (Greensboro)	Greensboro	potential territory											
McConnell P.	Brighton	potential territory		last nested 2007							15	11	15
Memphremagog L. - John's River	Derby	potential territory		last nested 2009						No nest likely influenced by lack of good nest site.	4	2	1
Parker L.	Glover	potential territory											
Pigeon P.	Groton	potential territory		last nested 2004							1	0	0
Raponda L.	Wilmington	potential territory											
Sugar Hill Res.	Goshen	potential territory											
Waterbury Res.	Waterbury	potential territory		last nested 1992							3	1	1
Branch P.	Sunderland	loon active		Last nested 1980.							1	1	1
Bruce P.	Sheffield	loon active								Pair likely moved to Clarks P. a mile away.	6	0	
Carmi L.	Franklin	loon active											
Caspian L.	Greensboro	loon active							Rescue - see comments	6/ 5/ 14 Adult found along road in Walden, VT. Too small for banding. Released on Caspian. 8/ 8/ 14 Adult with lure and fishing line around head. 4 rescue attempts made. Appeared stronger 9/ 5/ 14.	1	0	0
Champlain L.	various	loon active							Fishing gear - lead	8/ 2/ 14 Lead jig likely in gizzard; awaiting full necropsy.	2	0	0
Chittendon Res. - North	Chittenden	loon active											
Crystal L.	Barton	loon active											
Dunmore L.- North	Leicester/ Salisbury	loon active											

Table 1 Continued. Summary of Common Loon breeding activity 2014

Lake Name	Town	Status	Nest Type	Nest Outcome	Nest Warning Sign Buoys	Chicks hatched out	Chicks through August	Chick Mortality Cause	Adult Mortality and Rescue	Comments	# years nested	# years nest success	total # surviving chicks
Fairlee L.	Fairlee	loon active											
Hardwood P.	Elmore	loon active		last nested 2002							10	9	11
Lewis P.	Lewis	loon active											
Lowell L.	Londonderry	loon active											
Marshfield P.	Marshfield	loon active											
Memphramagog L. - Holbrook Bay	Newport	loon active											
Mollys P.	Cabot	loon active											
Moore Res. - Roaring Brook	Concord	loon active		last nested 2003							4	3	0
Morey L.	Fairlee	loon active								Some possible pair activity observed.			
Nelson P.	Woodbury	loon active		last nested 2012							1	0	
Notch P.	Ferdinand	loon active											
Noyes P.	Groton	loon active									1	0	0
Rescue L.	Ludlow	loon active											
Salem L.	Derby	loon active											
Seymour L. - West	Morgan	loon active									1	1	2
Shadow L. (Glover)	Glover	loon active											
Somerset Res. - South	Somerset	loon active											
Stratton P.	Stratton	loon active											
Ticklenaked		loon active											
Wallace P.	Canaan	loon active											
Wapanacki P.	Wolcott	loon active											
Warden P.	Barnet	loon active											
West Hill	Cabot	loon active							Fishing gear	7/25 caught adult that had ingested fishing line and hook; cut leader from end of line; released. Found dying on Nichols P. 8/24; euthanized. Some pair-like activity prior to this.			
Willoughby L.	Westmore	loon active								Loon rescued in 2011 from fishing gear re-observed.			

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

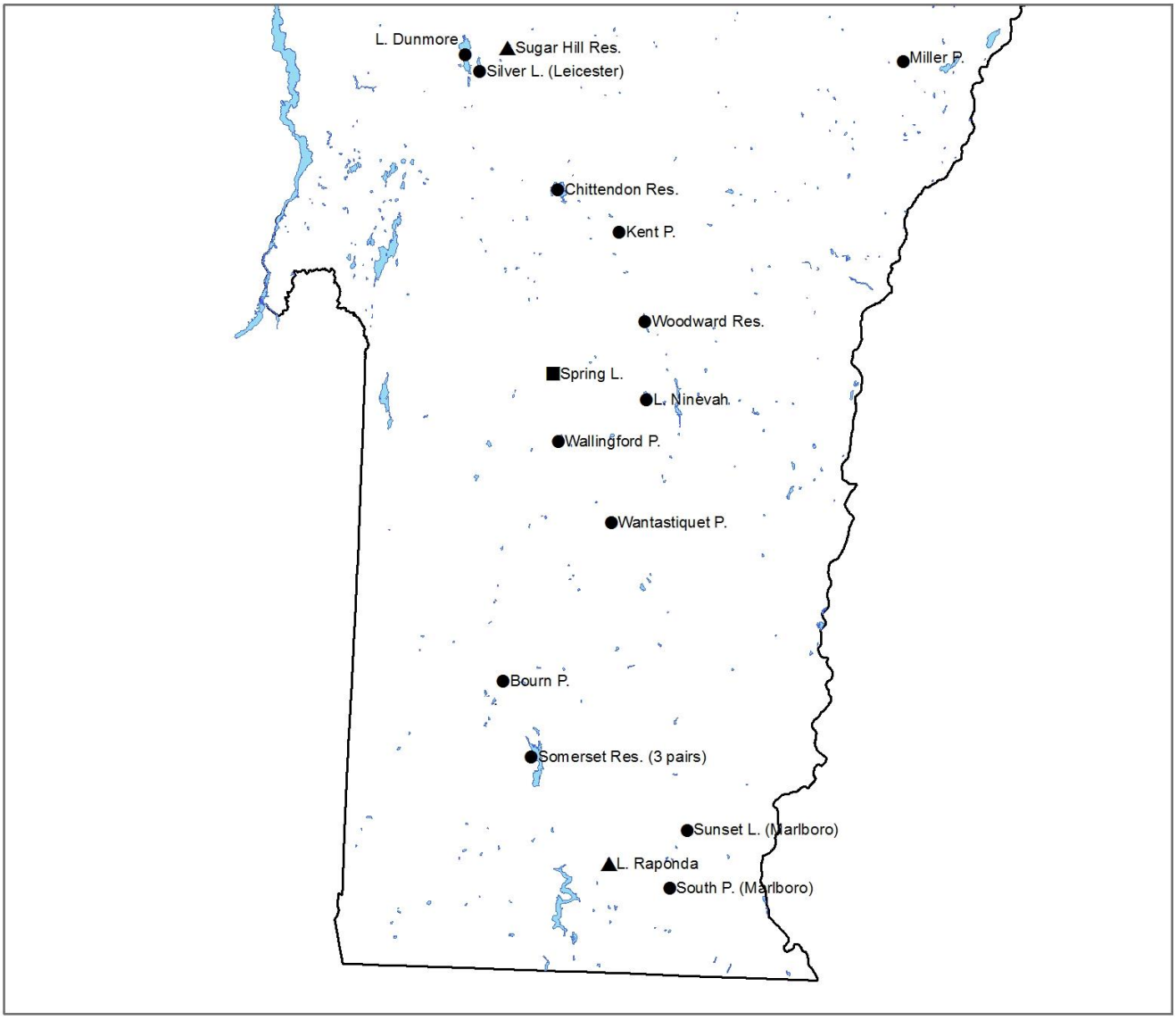




Location of Loon Pairs - 2014

- ● nest
- ▲ potential territory
- ■ territory

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



Location of Loon Pairs - 2014

- ● nest
- ▲ potential territory
- ■ territory

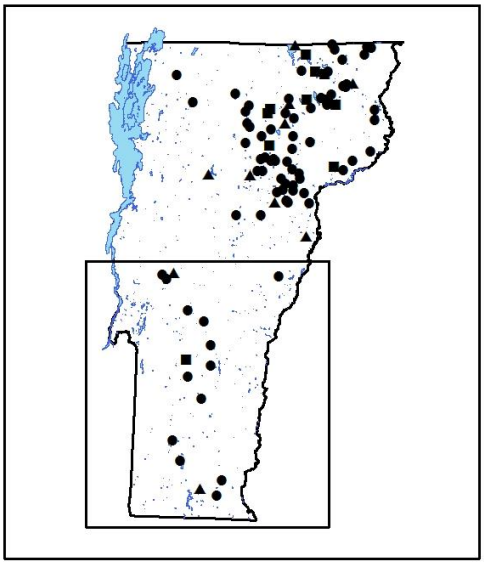


Figure 2. Summary of Common Loon breeding activity in Vermont, 1978-2014

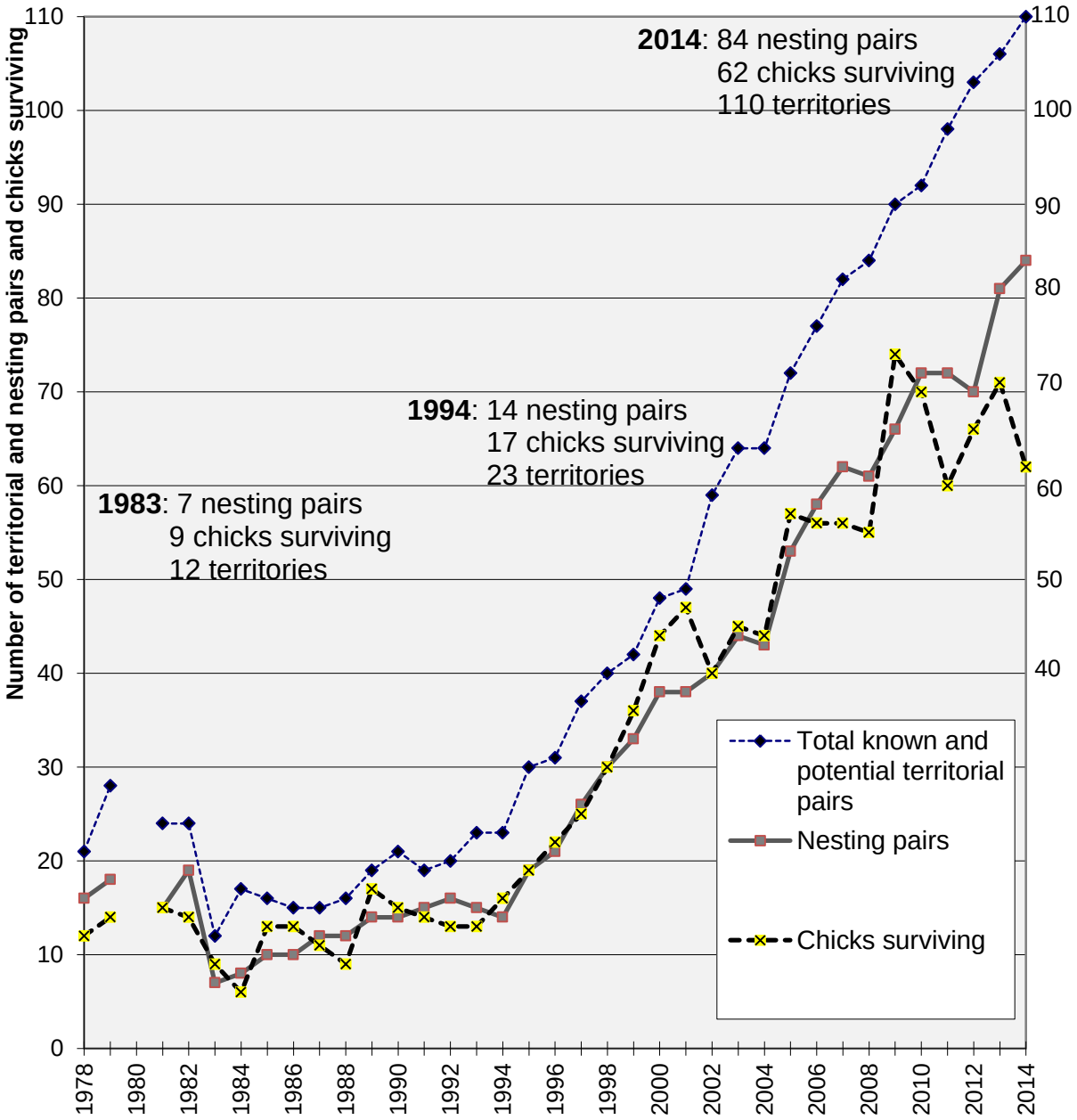


Table 2. Summary of population changes and reproductive success of Common Loons in Vermont, 1979-2014.

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
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
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
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
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**
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
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
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
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
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
% 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%
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
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
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
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
Number of lakes surveyed																					150	107	131	133	123	98	122	133	148	148	129	129	162	150	162	161
Number of lakes occupied																										68	69	84	86	84	89	76	102	98	106	103

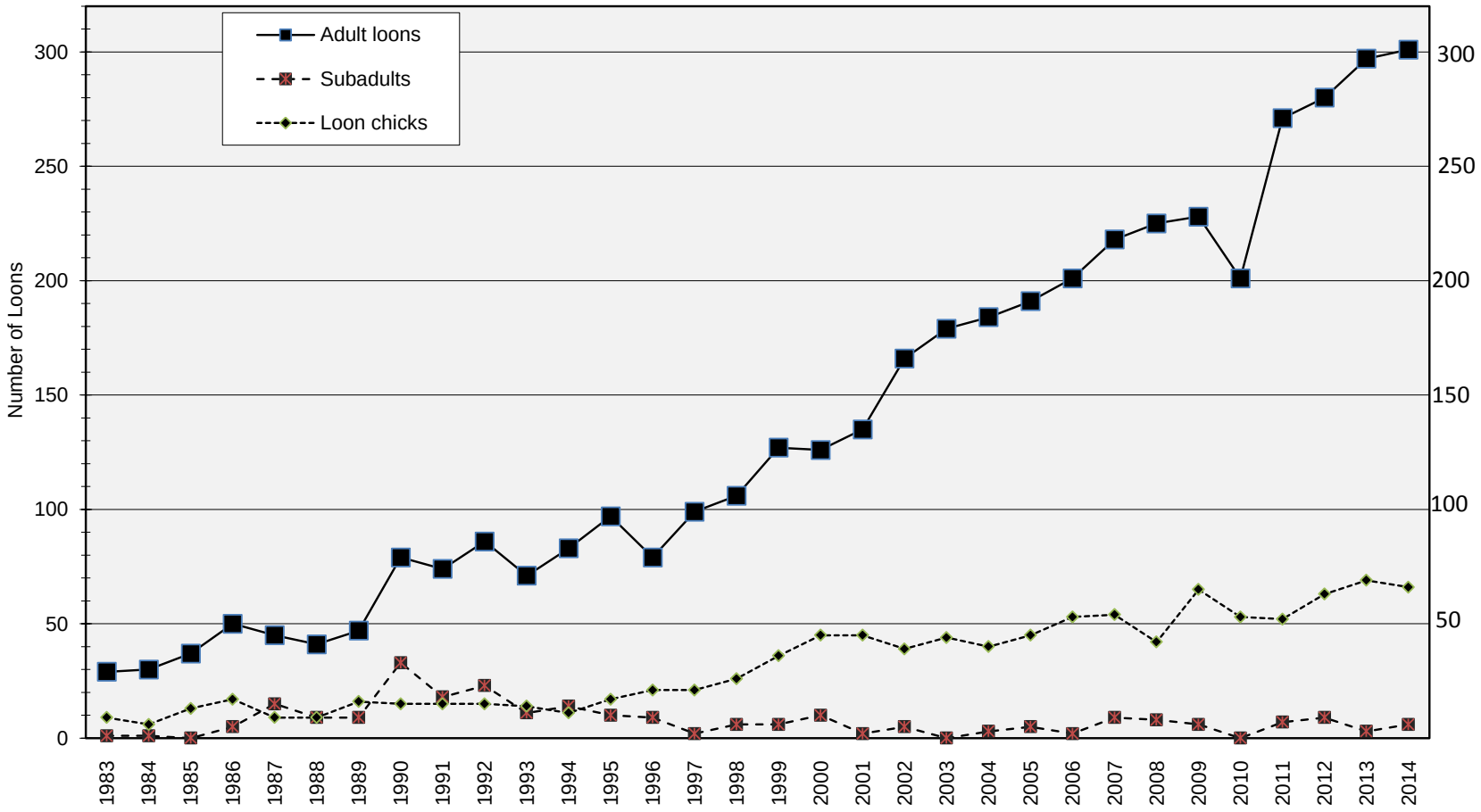
[a] The number of lakes surveyed for Loonwatch increased in 1999. It is possible survey adult loon counts during the mid-1990s were slightly lower.

[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, 1983-2014
(an annual statewide loon census on the third Saturday of July)



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 45 of the 64 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 and identifying all 5 of the new nesting pairs. 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.

Five adult loons died after ingesting fishing gear of which at least 3 contained lead. We are awaiting more detailed necropsies by Tufts University Wildlife Medicine Program. The source of this lead should be evaluated in regard to legislation banning the sale and use of lead sinkers ½ ounce or less in size in 2006 and 2007, respectively. New Hampshire passed additional legislation in 2014 adding 1 ounce or smaller lead jig heads to the sale and use ban. It was determined that banning only 1 ounce or smaller lead sinkers was not adequate in protecting loons and other wildlife as 52% of adult loon mortalities in New Hampshire were caused by jigs.

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.

In 2013, the VLCP developed a new brochure promoting better stewardship of lakeshore habitat which will benefit both in-lake and riparian flora and fauna. The health of our lakes and ponds is critical for the long-term sustainability of Vermont's Common Loon population. In conjunction with the Dr. Theresa Donovan at the University of Vermont, a database is being developed for the loon data collected since 1978.

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. An initiative involved contacting the Vermont Land Trust, the Vermont Housing and Conservation Board, and the Vermont Nature Conservancy about the use of conservation easements and land acquisition to permanently protect nest sites.
2. Once a protocol is developed for both the donation and purchase of conservation easements, landowners should be approached with information about various options. An explicit protocol for the acquisition and/or long-term conservation of nest sites should be developed, so that opportunities can be quickly acted upon.
3. We would like to provide more detailed training packets for adopt-a-lake volunteers. Funding was turned down in two recent proposals.
4. Development of a comprehensive database in conjunction with the LPC in New Hampshire and BRI in Maine would allow us to better assess and summarize Vermont's loon population trends, share and compare data with New Hampshire and Maine, develop a detailed population viability assessment for Vermont, and more efficiently coordinate volunteers.
5. 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.
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 thank the VFWD for ongoing, core financial support through the federal State Wildlife Grant program and the Nongame Wildlife Fund and other contributors to VLCP fundraising efforts, including Trans Canada Hydro and many individual donors. The Vermont Watershed Grant program and many individuals and lake associations provided support to replace loon nest warning signs.

Professional assistance: Angela Apicelli provided support as a VLCP 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, Mike Scarzello and 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. Kappy Sprenger and VINS Wildlife Services 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. Steve Faccio of VCE helped to create the VLCP section on the VCE website, ***www.vtecostudies.org***, and prepare Figure 1. Chris Rimmer, Susan Hindinger, 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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