2012-2013 Private Donor Report: Conservation Through the Lives of Adirondack Loons
CONSERVATION THROUGH THE LIVES OF ADIRONDACK LOONS

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SUBMITTED ON:

July 1, 2014
Biodiversity Research Institute (BRI) is a 501(c)(3) nonprofit organization located in Gorham, Maine. Founded in 1998, BRI is dedicated toward supporting global health through collaborative ecological research, assessment of ecosystem health, improving environmental awareness, and informing science based decision making.

Biodiversity Research Institute’s Adirondack Center for Loon Conservation is dedicated to improving the overall health of the environment, particularly the protection of air and water quality, through collaborative research and education efforts focusing on the natural history of the Common Loon (*Gavia immer*) and conservation issues affecting loon populations and their aquatic habitats.

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**Front Photo Caption:** Common Loon chick captured from Honnedaga Lake, Adirondack Park, New York, to collect blood sample for mercury analysis. Photo by Nina Schoch.
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1.0 Summary

Biodiversity Research Institute’s Adirondack Center for Loon Conservation is most grateful to the many private donors who provided critical support enabling us to conduct our conservation research and outreach efforts in 2012 and 2013. In this project, we utilized the Common Loon as an indicator species to assess the risk environmental mercury pollution poses to aquatic ecosystems in New York’s Adirondack Park. Through our research and outreach efforts, we also worked to address conservation concerns affecting Adirondack loons and to learn more about the natural history of the Adirondack loon population.

Our research in 2012 and 2013 focused on 1) assessing temporal trends in biotic mercury exposure by resampling previously sampled Adirondack loons; 2) evaluating how spatial mercury exposure changes over time by sampling new loons on former capture lakes; 3) assessing the biotic impacts of mercury pollution and lake acidity by monitoring the reproductive success of uniquely color-banded loons in the Adirondack Park; 4) evaluating the effectiveness of recently implemented local and regional mercury emission and acid deposition regulations by continuing to monitor the mercury body burden of Adirondack loons; 5) continuing our investigation about the impact of mercury pollution on the immune system of loons to learn more about how mercury contamination affects wildlife health; 6) integrating our studies with other Adirondack research by sampling loons at study lakes where water quality and mercury data is being collected by other scientists; 7) identifying potential threats to loon nesting success by placing trail cameras at nest sites; and 8) determining the status and trends in the Adirondack breeding loon population through the Annual Loon Census.

We monitored 65 and 68 lakes in 2012 and 2013, respectively, to determine the return rates and reproductive success of more than 240 potentially returning banded loons. An additional 25 (2012) and 28 (2013) lakes were monitored intermittently to determine the breeding success of the study birds. In 2012, we monitored 61 territorial pairs with at least one banded loon, of which 52 (85%) pairs nested with 61 nesting attempts. We observed a return rate of 45% of the banded adult loons and 11% of loons who were originally banded as juveniles. Eighty-six percent of the chicks that hatched survived to fledging. The productivity rate for 2012 was 0.49 chicks fledged per territorial pair. In 2013, we observed 39% of the banded adult loons returning to former territories and 7% of the loons who had been banded as juvenile birds. Fifty-three territorial pairs were monitored in 2013, and of these, 42 (79%) pairs nested, with a total of 46 nesting attempts. In 2013, the productivity rate of the returning banded loons was 0.58 chicks fledged per territorial pair.

In 2012, we captured and sampled 21 loons on 11 Adirondack lakes. Of these birds, 10 were adults (four male and six females) and 11 were juvenile loons. Thirteen nonviable eggs were also collected from abandoned loon nests in 2012. A total of 17 loons were captured over a one-week period in early August, 2013, from 10 Adirondack lakes, including eight adult (five males and three females) and nine juvenile loons. Additionally, mercury analyses were conducted on five loons (four Common and one Red-throated) who were rescued in 2013 after being iced in or blown down by a storm; these birds were banded and released on Lake Champlain. Nineteen non-viable loon eggs were collected for mercury analysis from 13 lakes in 2013. Laboratory results of the samples collected in 2012 and 2013 will be evaluated as part of our long-term study on the Adirondack loon population.

Over the two field seasons, we deployed geolocators on the bands of nine Adirondack loons. These birds will be recaptured in subsequent years to retrieve the geolocators to determine their migratory routes and learn about their wintering areas.
In 2013, we initiated a pilot project using cameras at four Adirondack lakes to identify factors affecting nest success. Images obtained from these cameras documented nest abandonment at two lakes, human disturbance at a state campground lake with heavy recreational activity, and chicks hatching at one lake.

We partnered with the Wildlife Conservation Society’s Adirondack Program to conduct the New York Annual Loon Census in July, 2012 and 2013. More than 570 and 440 observers participated in the event in 2012 and 2013, respectively, looking for loons on 207 (2012) and 189 (2013) water bodies throughout New York. In 2012, observers reported seeing 750 loons on 159 (77%) of the 207 Census lakes, including 632 (84%) adults, 89 (12%) chicks, and 29 (4%) immature loons. In 2013, 596 loons were observed on 147 (78%) of the 189 Census lakes, including 509 (85%) adults, 76 (13%) loon chicks, and 11 (2%) immature loons. Adult loons without chicks were observed on 84 (41%) of the 2012 and on 95 (50%) of the 2013 Census lakes, and loon chicks or immature birds were observed on 74 (36%) of the 2012 and on 52 (28%) of the 2013 lakes. No loons were observed on 48 (23%) of the 2012 and 42 (22%) of the 2013 lakes.

We also utilized the captivating nature of Common Loons in our educational and outreach programming to actively engage the public and students in conservation, and to enhance public and policy-maker awareness of key conservation concerns affecting the Northeast, particularly the ecological impact of environmental pollutants. The results of our scientific research were translated into readily interpretable outreach materials, including technical and lay-audience reports, brochures, and scientific publications; our website, www.briloon.org/adkloon, and Facebook page, www.facebook.com/adkloon; an annual newsletter, The Adirondack Tremolo; interactive school curricula (e.g.: Science on the Fly!); public and scientific presentations; and educational signs at Adirondack boat launches. We also directly involved volunteers and students in our field research, providing them with valuable experience in conservation and field research.

In 2012 and 2013, we reached almost 3400 members of the public and scientific communities through our presentations, displays, and field trips at 52 events. Additionally, the media produced 28 articles over the two years that provided information about BRI’s Adirondack Center for Loon Conservation and loon natural history. We established a fishing line recycling program throughout the Adirondack Park to increase awareness of, and help address, the increasing incidence of loons becoming entangled in fishing line. In 2013, we also held our first “Adirondack Loon Celebration” a fun-filled and free event that engaged the whole family in learning about the natural history of loons, as well as our research and outreach endeavors focusing on the Adirondack loon population.

Our research and outreach efforts in 2012 and 2013 contributed to increased public and scientific awareness about Common Loon natural history and anthropogenic threats to aquatic ecosystems in North America and the Adirondacks. The results of our investigations provide key scientific evidence for the critical need to stringently regulate environmental pollutants, such as mercury, on local, national, and global scales to protect ecological health, based on the health and reproductive impacts to the Common Loon, an emblematic symbol of northern aquatic ecosystems.
2.0 Introduction

In 2012 and 2013, Biodiversity Research Institute (BRI) received generous support many private donors to conduct research and outreach in New York’s Adirondack Park through our Adirondack Center for Loon Conservation. Our investigations utilize the Common Loon (Gavia immer) as a sentinel of Adirondack aquatic ecosystems to provide an assessment of the effect of long-term mercury accumulation and acid deposition on wildlife and aquatic ecosystem health. We also employ the charismatic appeal of loons to inform and actively engage the public in environmental conservation.

The Common Loon is a fish-eating waterbird that breeds on waterbodies throughout New York’s six-million acre Adirondack Park. Loon populations experience a variety of conservation threats, including airborne mercury pollution, acid rain, fishing line entanglement, and human disturbance. A Species of Special Concern in New York State, loons have proved to be excellent biotic monitors for tracking the ecological impacts of mercury pollution. They are predators at the top of the aquatic food chain, and thus, have potential to be adversely impacted by toxins, such as mercury, that bioaccumulate and biomagnify through the environment (Evers 2006).

An insidious pollutant, mercury is especially abundant in aquatic ecosystems in northeastern North America. Current levels of environmental mercury contamination and acid deposition pose significant risks to human and ecological health in this region, including in the Adirondacks, which has been identified as a biological “hotspot” where high levels of mercury were found in several fish and wildlife species (Evers 2005; Driscoll et al. 2007; Evers et al. 2007). Anthropogenic activities associated with the combustion of fossil fuels, such as emissions from coal-fired electrical power plants, have been the primary source of mercury pollution and acid deposition.

In acidic conditions, as in many Adirondack lakes, elemental mercury is converted at a higher rate to methylmercury, the toxic form that magnifies up the food web. Thus, in these waters, mercury is of especially high concern, as reflected in the number of human fish consumption advisories for Adirondack waterbodies (New York State Dept. of Health, 2013). Although environmental mercury exposure rarely results in wildlife mortality, it is toxic to the neurologic system, causing subtle effects, such as behavioral changes that impair reproductive success (Thompson 1996; Evers 2001; and Evers et al. 2008). Loons with high body burdens of mercury behave abnormally, including being more lethargic and failing to incubate eggs, care for chicks, and defend territories normally (Scheuhammer and Blancher 1994; Meyer et al. 1995, 1998; Nocera and Taylor 1998; Counard 2001; Fevold et al. 2003; and Evers et al. 2008).

Because loons are live 20-30 years, long-term monitoring is critical to correctly interpret the impact of mercury contamination and acid deposition on their survival and reproductive success. This study continues the long-term investigation conducted by BRI and its partners since 1998 on the impact of environmental mercury pollution to the Adirondack Common Loon population. The results of our loon-mercury monitoring project to date found that Adirondack loons with territories on acidic lakes had extremely elevated blood mercury levels and decreased reproductive success, potentially leading to a population impact if enough birds are affected. Population modeling analysis indicated that the portion of the Adirondack loon population exposed to high mercury levels has a reduced growth rate, compared to birds with lower body burdens of mercury (Schoch and Evers 2002; Schoch et al. 2011). Continuing to monitor loon mercury levels and how mercury levels contribute to population dynamics is important to fully understanding how changes in state, federal, and global, missions policies, such as the US Environmental Protection Agency’s proposed Mercury and Air Toxics Standards, will affect these organisms and the habitats in which they live.
Another aspect of our research is to learn more about the natural history of Common Loons breeding in the Adirondacks, including their migration and wintering areas, where they have potential to be exposed to a variety of potential threats, such as oil spills, commercial fishing nets, and coastal storms. Thus, in 2012, we initiated a migration study, using geolocators (www.Lotek.com), lightweight and non-invasive units, based on global positioning system (GPS) technology, which attach to the leg bands of the birds. Through this study, we seek to answer previously unresolved questions about their migration, such as: (1) Do loons from different areas of the Park have different migratory pathways and use different wintering areas? (2) Do male and female members of a loon pair use the same migratory routes and winter in the same area? and (3) Do they travel at the same time, or separately? Results of this project will provide much needed information about the stresses Adirondack loons face during migration and while wintering along the coast, enabling wildlife managers to better address threats to loon populations throughout their entire range.

The nesting period is one of the most critical stages during the annual life cycle of loons to ensure continued survival, long-term sustainability, and potential growth of their populations. Thus, enhancing scientific understanding of activities and threats impacting nesting Adirondack loons will help guide management of New York’s loon population. In 2013, we initiated a pilot project to utilize nest cameras to document the breeding activities and behavior patterns of nesting loons, and to assess factors (e.g., predation, human disturbance) impacting nesting loons in the park.

Employing the captivating beauty and allure of Common Loons as an environmental educational tool, we interweave our scientific studies with education and outreach to enhance awareness about Common Loons and the risk mercury contamination and other threats pose to the environment. Adirondack Park residents and visitors actively participate in our loon research and monitoring studies to learn first-hand about loon conservation. Our outreach materials, including our website, www.briloon.org/adkloon; public and scientific presentations; Facebook page, www.facebook.com/adkloon; newsletters (“The Adirondack Tremolo”); displays; school curricula (e.g., Science on the Fly!); and volunteer opportunities enable the public and students to increase their understanding of and become directly involved in environmental conservation.

In recent years, we have documented an increased incidence of loons becoming entangled in abandoned fishing line. Thus, in 2012 and 2013, we expanded our outreach endeavors to initiate a fishing line recycling program throughout the Park to address this growing conservation concern. We employ a variety of outreach methods to increase angler and public awareness about the two critical conservation concerns of fishing line entanglement and toxicity due to lead fishing tackle ingestion.

This report summarizes the results of our loon research and outreach endeavors in the Adirondack Park during 2012 and 2013. Our long-term investigations on Adirondack loons will provide a temporal and spatial assessment of mercury exposure, and of population and reproductive impacts, to a top trophic-level piscivorous predator living in freshwater aquatic ecosystems. This study will also provide policy makers with a unique and valuable resource to help assess the effectiveness of newly proposed or implemented regional, national, and global mercury emission regulations at decreasing the ecological impacts of airborne mercury pollution. Our education and outreach activities increase public understanding about and address conservation concerns affecting Adirondack loons and their habitats.
3.0 Objectives

The primary objective of our scientific research is to use the Common Loon, a fish-eating predator at the top of the aquatic food web, as an indicator of how mercury pollution affects freshwater ecosystems in New York’s Adirondack Park. Our research in 2012 and 2013 focused on:

1. Assessing temporal trends in biotic mercury exposure by resampling previously sampled Adirondack loons to determine lifelong mercury accumulation through repeat analysis of feather and blood samples.

2. Evaluating how spatial mercury exposure changes over time by sampling new loons on former capture lakes.

3. Assessing the biotic impacts of mercury pollution and lake acidity by monitoring the reproductive success of uniquely color-banded loons in the Adirondack Park.

4. Evaluating the effectiveness of recently implemented local and regional mercury emission and acid deposition regulations by continuing to monitor the mercury body burden of Adirondack loons.

5. Continuing our investigation about the impact of mercury pollution on the immune system of loons to provide insight into how mercury contamination affects wildlife health.

6. Integrating our studies with other Adirondack mercury exposure and water quality investigations by sampling loons at sites where such data is being collected by these scientists. Such collaboration will provide a more robust assessment of how airborne pollutants such as mercury and acid deposition affect the aquatic ecosystem as a whole, as well as a broader scientific basis for policy-makers to better regulate airborne pollutants.

7. Identify potential threats to loon nesting success by placing trail cameras at nest sites.

8. Determining the status and trends in the Adirondack breeding loon population through the Annual Loon Census, in which more than 500 volunteer observers participate on lakes and ponds throughout New York.

We also utilized the charismatic nature of the Common Loon as an environmental educational tool to inspire the general public and students, as well as policy-makers, to better understand critical conservation concerns and actively engage them in caring for the environment. Our outreach efforts in 2012-2013 included:

1. Providing undergraduate and graduate students with internship training and field staff opportunities, enhancing student understanding and knowledge of conservation, and the process of conducting research.

2. Providing interactive presentations to the public, including New York college classes, environmental and ornithological groups, and community groups.

3. Providing a variety of opportunities for volunteers to participate in our research and education efforts, enabling them to be directly involved in the field of environmental conservation.
4. Distributing our newsletter, *The Adirondack Tremolo*, to more than 6000 people, informing the public and scientific communities about our current activities.

5. Utilizing our website, www.briloon.org/adkloon, to provide information and resources about loon natural history, environmental conservation concerns, and updates about our research and educational projects.

6. Establishing a Facebook page, www.facebook.com/adkloon, to enable us to update the public regularly about our work.

7. Initiating an “Adirondack Loon Celebration” a fun-filled and free event that engaged the whole family in learning about the natural history of loons, as well as our research and outreach endeavors focusing on the Adirondack loon population.

8. Placing educational signage at public boat launches throughout the Adirondack Park during the loon breeding season to increase public awareness about recreational impacts to loons, and to encourage responsible fishing and boating to minimize disturbance of breeding birds.

9. Establishing a fishing line recycling program throughout the Adirondack Park to increase awareness of, and help address, the increasing incidence of loons becoming entangled in fishing line.

10. Disseminating the results of our loon-mercury research to the public and scientific communities through scientific publications.
4.0 Study Area

The study area includes lakes and ponds in every watershed in New York’s six million acre Adirondack Park (Figure 1). Specific study lakes were selected based on past loon-mercury research by Biodiversity Research Institute and its collaborators, on locations where returning banded loons were found, and to complement existing datasets by other acid deposition and mercury monitoring studies in the Adirondack Park, including the Adirondack Lakes Survey Corporation, Adirondack Effects Assessment Program, and the US EPA’s Environmental Monitoring and Assessment Program. Uniquely color-banded loons were monitored each summer on these lakes to determine their return rates and reproductive success.

Figure 1. Loon Study Lakes in New York’s Adirondack Park.
5.0 Data Collection Methods

5.1 Loon-Mercury Research

Observations of uniquely color-banded loons were conducted during the 2012 and 2013 breeding seasons on the original capture territories, or where they have been observed in subsequent years, to assess the annual survival and reproductive success of the birds. At each loon territory, we monitored the breeding and nesting behavior of the resident loons to determine if: 1) the banded individuals returned to the lake where they were originally banded; 2) the loon found a mate and they formed a territorial pair; 3) they nested one or more times; and 4) any chicks hatched or fledged (defined as a chick that survived to 6 weeks of age or older, as chicks that survive past 6 weeks are likely to live to the actual fledging age of 11 weeks; Evers et al. 2005). If a banded loon was not found on the lake (or territory) it had occupied in previous years, then lakes (or territories) in close proximity were also periodically surveyed throughout the field season to determine if the bird had returned to the area, but changed territories.

In addition to our seasonal field staff, in-kind staff were provided to monitor banded loons by the Paul Smith’s College, and SUNY’s College of Environmental Science and Forestry’s Adirondack Ecological Center. A training session was held for the loon monitoring field staff at the beginning of each field season to ensure consistency of observations and reporting of data. The field staff conducted regular observations throughout each summer using 10x40 binoculars from a canoe or kayak on 90 study lakes where the color-banded loons were originally captured or where they had been observed in subsequent years.

During the summers of 2012 and 2013, in collaboration with the NYS Department of Environmental Conservation, the Wildlife Conservation Society, and Calvin College, we captured Adirondack loons using nightlighting and playback techniques (Evers 2001) to collect blood and feather samples for mercury and immunology analysis. Blood samples were collected from the tibiotarsal vein to evaluate short-term mercury accumulation in the loons. Feather samples were collected from the adults and from juvenile loons with fully emerged feathers to provide an indication of long-term mercury accumulation. Feather samples included two central tail feathers and the second secondary feather from each wing. Bill and leg measurements and weight of the birds were recorded. Adult and juvenile loons (if large enough) were banded with U.S. Fish and Wildlife Service aluminum bands and a unique combination of plastic colored bands, enabling identification of individual birds to be made from a distance in future observations. We also opportunistically collected abandoned non-viable loon eggs to assess them for mercury contamination.

5.2 Loon Migration

To better understand the migratory pathways of Adirondack loons, we placed Lotek geolocators (www.Lotek.com) on the leg bands of nine of our study birds. These lightweight and non-invasive units are based on global positioning system (GPS) technology, and will document movements of the birds for up to two years. The geolocator birds will be recaptured in future years to retrieve the geolocators and review the data to learn about their migratory patterns.

5.3 New York Annual Loon Census

In collaboration with the Wildlife Conservation Society’s Adirondack Program, we conducted the New York Annual Loon Census, a citizen science project, on the third Saturday in July, 2012 and 2013, from 8 to 9 in the
morning. The New York Loon Census is held on the same date and time as other counts throughout the Northeast as part of a regional assessment of loon population trends.

Prior to the Census day, volunteer participants were assigned a specific lake to observe to determine the presence or absence of adult loons, loon chicks, or immature loons. Lake assignments were made to minimize duplication of observer effort and to ensure that larger lakes were completely observed by dividing up the lake body among multiple observers. Participants reported their observations on a standardized data form by August 1 each year, and the results were entered into our NY Annual Loon Census database for analysis.

5.4 Loon Nest Monitoring
In a pilot project in 2013, Moultrie 990i trail cameras were installed at loon nest sites on four Adirondack lakes to document factors affecting their nesting success. Three additional nest sites were considered for inclusion in this study, but one nest hatched a chick and the other two nests failed prior to camera placement.

6.0 Results
6.1 Loon-Mercury Research
Fifteen field staff, including students from Paul Smiths College and the Adirondack Ecological Center and four volunteers, monitored 65 and 68 lakes on a weekly basis in 2012 and 2013, respectively, to determine the return rates and reproductive success of more than 240 potentially returning banded loons. An additional 25 and 28 lakes were monitored intermittently during the summers of 2012 and 2013, respectively, to determine the breeding success of the study birds.

In 2012, we observed a return rate of 45% of the banded adult loons and 11% of loons who were originally banded as juveniles. We monitored 61 territorial pairs (with at least one banded loon), of which 52 (85%) pairs nested with 61 nesting attempts. Eighty-six percent of the chicks that hatched survived to fledging. The productivity rate for 2012 was 0.49 chicks fledged per territorial pair. In 2013, we observed 39% of the banded adult loons returning to former territories and 7% of the loons who had been banded as juvenile birds. Fifty-three territorial pairs were monitored in 2013, and of these, 42 (79%) pairs nested, with a total of 46 nesting attempts. In 2013, the productivity rate of the returning banded loons was 0.58 chicks fledged per territorial pair.

In the summer of 2012, we captured and sampled 21 loons on 11 Adirondack lakes. Of these birds, 10 were adults (four male and six females) and 11 were juvenile loons. Three of the adult males had been captured previously, thus, samples collected from these birds provided valuable information about changes in their mercury levels over time. Thirteen nonviable eggs were collected from abandoned loon nests in the Park during the 2012 loon breeding season.

A total of 17 loons were captured over a one-week period in early August, 2013, from 10 lakes in the Adirondack Park. Eight adult (five males and three females) and nine juvenile loons were captured. Of these birds, six adults and three juveniles were banded, and two adult females were recaptured and re-sampled. Six chicks were caught and released, but were not banded due to their small size. We were able to obtain a blood sample from five of the six loon chicks. Additionally, mercury analyses were conducted on three Common Loons who were rescued from the ice on Lake George in February, 2013, and banded and released on Lake Champlain. Nineteen non-viable loon
eggs were collected from 13 lakes. Since 1998, a total of 303 loons have been captured and banded on 89 Adirondack lakes.

Loon blood, feather, and egg samples were analyzed for mercury concentrations by BRI. Laboratory protocols for analyzing total mercury in Common Loon tissues followed Evers et al. (2003) for eggs, and Evers et al. (1998) for blood and feathers. Dr. Keith Grasman, a specialist in immunology from Calvin College, analyzed the loon blood samples to evaluate the immune function of the study birds. He utilized slow-spin centrifugation to isolate lymphocytes, cryopreservation, and proliferation techniques to assess potential interactions between the mercury body burden of loons with their immune systems. Preliminary results of this study from 2008-2009 indicate that exposure to high levels of mercury in loon chicks is associated with altered immune function. These results are consistent with the general sensitivity of the developing immune system to contaminants, and with a previous laboratory study that demonstrated immunotoxicity of environmentally relevant exposures of mercury in young loons (Kenow et al. 2007).

6.2 New York Annual Loon Census

In collaboration with the Wildlife Conservation Society’s Adirondack Program, we assisted with conducting the New York Annual Loon Census on July 21, 2012, and on July 20, 2013, from 8-9a.m. More than 570 and 440 observers participated in the event in 2012 and 2013, respectively, looking for loons on 207 (2012) and 189 (2013) water bodies throughout New York, 189 (91%, 2012) and 166 (88%, 2013) of which were located in the Adirondack Park. The inclement weather in 2013 likely contributed to the lower turnout of Census observers, as we received several reports from people who said they decided to not go out on a lake due to the weather.

Adult loons without chicks were observed on 84 (41%) of the 2012 and on 95 (50%) of the 2013 Census lakes, and loon chicks or immature birds were observed on 74 (36%) of the 2012 and on 52 (28%) of the 2013 lakes. No loons were observed on 48 (23%) of the 2012 and 42 (22%) of the 2013 lakes (Figure 2). The summer loon population on lakes in and around the Adirondacks appears to have remained relatively stable from 2001-2013. Although the number of lakes included in the New York Loon Census has varied from year to year, the percentage of lakes with loons has been quite consistent, averaging 74%, over the 13 years of the Census.

The percent of lakes with and without loon chicks has varied year to year, corresponding with the percent of lakes with adult loons only. The percent of Census lakes with only adult loons was on a decreasing trend between 2001 (48%) - 2012 (41%), but it increased in 2013 to 50%. There was also an increasing trend over time in the percentage of lakes with loon chicks or immatures, ranging from a low of 23% in 2005 to a high of 36% in 2012, but, in 2013, the percent of lakes with chicks decreased to 28% (Figure 2).

Figure 2. The percentage of NY Annual Loon Census lakes where loons and loon chicks were and were not observed from 2001 to 2013.
In 2012, observers reported seeing 750 loons on 159 (77%) of the 207 Census lakes, including 632 (84%) adults, 89 (12%) chicks, and 29 (4%) immature loons. In 2013, 596 loons were observed on 147 (78%) of the 189 Census lakes, including 509 (85%) adults, 76 (13%) loon chicks, and 11 (2%) immature loons. The proportion of adult and young loons on the Census lakes has remained relatively constant from 2001 to 2013 (Figure 3).

Figure 3. Summary of the percentage of adult, chick, and immature loons observed during the NY Annual Loon Census from 2001 to 2013.

6.3 Loon Nest Monitoring

In 2013, a pilot study was initiated to assess factors impacting loon nesting success in the Adirondacks. Nest cameras were attempted to be installed at seven Adirondack study lakes to monitor Common Loon nesting behavior and associated activities. However, cameras were not placed at three of these lakes due to nest failure from flooding during the heavy rain that was experienced early in the summer of 2013, and one lake had hatched a chick just prior to the attempt to place the camera. Thus, cameras were successfully placed at four Adirondack lakes, which documented nest abandonment at two lakes (Big Moose and Deer Pond), human disturbance at one lake (Limekiln), and chicks hatching at one lake (Wolf Pond).

6.4 Loon Rescues

Each summer since we initiated our studies on Adirondack loons in 1998, we have responded to calls from the public about loons entangled in fishing line or who were acting sick and beaching themselves on shore. Although rescuing loons is not a primary focus of our work, we do strive to respond to every report we receive and attempt to rescue the birds when indicated. We network with wildlife rehabilitators (including Dr. Schoch) throughout New York and the Northeast to ensure the injured loons receive the best care possible, in the hopes they may be again released to the wild.

In 2012, we received 23 and, in 2013, 27 reports about potentially injured loons. Of these, ten (20%) loons were related to fishing line entanglement and four (8%) others were behaving normally, but the behavior had been misinterpreted (e.g.: bathing). Twenty-five (50%) loons (including 10 Red-throated and 15 Common Loons) were “iced-in” or blown down in a storm – two events accounted for 21 of these birds: in February, 2013, five Common Loons were found trapped in a small water-hole on Lake George; and between November 24 to December 13, 2013, six Common and ten Red-throated loons were found blown down in an area reaching from Potsdam and Malone to Glens Falls.

6.5 Outreach

We used a variety of outreach techniques, from reports, Facebook, newsletters and website updates to active participation in our fieldwork, to enhance public awareness and understanding of conservation issues affecting Adirondack aquatic ecosystems and their wild inhabitants, and to inform the public and policy-makers about the
results of our research. The results of our outreach efforts from June, 2012, through December, 2013, are summarized below.

6.5.1 Students and Volunteers

Students from Paul Smiths College and the Adirondack Ecological Center, associated with the State University of New York’s College of Environmental Sciences and Forestry, participated in our summer 2012 and 2013 loon monitoring field work on Adirondack lakes. Additionally, nine volunteers regularly assisted our seasonal field staff monitoring banded loons throughout the Park. Through this experience, students and volunteers learned first-hand about loon behavior and natural history, gained experience in field techniques for observing wildlife, and significantly contributed to our loon conservation efforts.

6.5.2 Manuscripts

Three manuscripts summarizing results from our research on the Adirondack loon population were prepared for publication in a special issue of Waterbirds that will be published in the spring of 2014. The manuscripts were titled: “The Impact of Mercury Exposure on the Common Loon (Gavia immer) Population in the Adirondack Park, New York, USA,” “Wildlife Criterion Value for the Common Loon (Gavia immer) in the Adirondack Park, New York, USA,” and “The Effects of Lakeshore Development on Common Loon (Gavia immer) Productivity in the Adirondack Park, New York, USA.” These articles are now available online at www.bioone.org and on our website, www.briloon.org.

6.5.3 Website, www.briloon.org/adkloon

We utilized our website, www.briloon.org/adkloon, to inform the public about conservation concerns affecting loons and their aquatic habitats, and also about our Adirondack loon research and outreach opportunities. The website was extensively updated in the spring of 2012 to provide information about the release of our research reports and such events as the Adirondack Loon Celebration.

6.5.4 Facebook page, www.facebook.com/adkloon

In the fall of 2013, we initiated a Facebook page, www.facebook.com/adkloon, to keep the public better informed about our current projects and upcoming events.

6.5.5 Newsletter, The Adirondack Tremolo

BRI’s Adirondack Center for Loon Conservation’s newsletter, “The Adirondack Tremolo” is distributed annually to approximately 6500 people via email and regular mail. It is also available to the public through our website, www.briloon.org/adkloon. Updates about this project were provided in the 2012 and 2013 issues of the newsletter.

6.5.6 Presentations, Displays, and Articles

In 2012 and 2013, 19 and 21 presentations were provided to the public and scientific communities, reaching an estimated 500 and 850 people, respectively. Additionally, four (2012) and five (2013) displays about our work were presented at public events, reaching approximately 1000 more people each year with information about our research on the impact of airborne pollutants to the Adirondack loon population. Additionally, 32 people participated in three field trips, as part of three birding celebrations. The presentation discusses loon natural history, factors impacting loon populations, and our research and education efforts to better understand and
increase public awareness about these issues, as well as efforts to minimize anthropogenic impacts on wildlife and their habitats.

The media produced 10 articles in 2012 and 18 pieces in 2013 that provided information about BRI’s Adirondack Center for Loon Conservation and loon natural history. Articles were published in such outlets as Audubon magazine, the Adirondack Daily Enterprise, The Chronicle, the Associated Press, North Country Public Radio, the Plattsburgh Press Republican, the Adirondack Explorer, Adirondack Life, Mountain Lake PBS, and the Adirondack Almanac.

6.5.7 Boat Launch Signs
In the 2012 and 2013 loon breeding seasons, we placed our “Help Protect Loons” signs at more than 130 public boat launches throughout the Adirondacks. These signs inform the public about minimizing human disturbance of loons and their nests and chicks through responsible boating, and also promote responsible fishing to prevent needless injuries related to ingestion of toxic lead fishing tackle and entanglement in fishing line.

6.5.8 Adirondack Loon Celebration
On Sunday, October 12, 2013, we held our first “Adirondack Loon Celebration” at the Paul Smiths College VIC in Paul Smiths, NY. The free event was filled with fun loon-related activities for the whole family, including: field trips to Black Pond and Lower St. Regis River; concerts by Jamie Savage and the Rustic Riders; a loon calling contest; our loon presentation; a loon quilt raffle and silent auction; and Merriloons the Clown and other kids activities. It is estimated that ~350 people attended the event, and all the feedback we received was very positive.

6.5.9 Fishing Line Recycling Program
In 2012, with generous support from the Freed Foundation, we initiated a fishing line recycling program in the Adirondacks to help increase public awareness about and address the increasing problem of loons becoming entangled in abandoned fishing line. A brochure, titled “Loons, Lead, and Line Don’t Mix” was developed and 100 fishing line recycling containers were made. Since 2012, these containers were provided to lake associations, the Paul Smiths Watershed Stewardship Program, and other interested organizations throughout the Park to enable anglers to easily recycle fishing line.

7.0 Benefits of Project
This project serves to increase scientific knowledge and to inform the public and policy-makers about the ecological impact of environmental pollutants. Our Adirondack research and outreach efforts in 2012-2013 contributed to:

1. Documenting the extent of environmental mercury contamination and its effects on New York’s aquatic ecosystems by increasing scientific understanding of the health and reproductive impacts of mercury pollution to Common Loons, a fish-eating predator at the top of the aquatic food web. Our investigations into the relationships between loon mercury levels and immune function provide insight into how mercury pollution affects wildlife health, leading to an enhanced understanding of potential interactions between multiple stressors to the health of wildlife. Our Adirondack loon-mercury research also contributes to an improved regional assessment of the behavioral and health impacts of mercury exposure to wildlife (Evers et al. 2008).
2. **Establishing a baseline for detecting future changes in biotic impacts from atmospheric mercury deposition**, as stringent new state and regional mercury and acid emission regulations are implemented. Our research provides a valuable biotic sentinel of mercury pollution in the aquatic foodweb, informing federal and state mercury-related policies; providing data for predictive models; and characterizing the biological effects from the redistribution of anthropogenic mercury on the landscape (Evers et al. 2011). Long-term studies of biotic mercury levels, particularly high-trophic level species such as Common Loons, living in acidic or high mercury habitats, contributes much information about the risks mercury and acidic deposition pose to wildlife and aquatic ecosystems.

3. **Providing science-based justification for, and increasing public and policy-maker awareness of, the critical need to stringently regulate mercury and acidic emissions on all scales** to minimize the ecological injury mercury pollution poses to wildlife and the environment. Airborne deposition is a primary source of environmental mercury contamination, and thus, it is essential to regulate mercury emissions from all sources throughout North America as well as globally, since such deposition does not recognize local or national boundaries. Although mercury emissions from local point sources in the Northeast and New York have recently been regulated, emissions from coal-fired power plants on national and global scales have yet to be controlled, as national mercury emission regulations and a comprehensive global mercury pollution policy have not yet been implemented (US EPA 2011; UNEP 2011).

4. **Inspiring public understanding of and involvement in critical conservation issues** affecting the Adirondacks and the Northeast. Our outreach efforts translate the results of our scientific studies into formats readily understood by the general public and students, encouraging them to become actively engaged in conservation. Enhanced public understanding of and participation in environmental conservation are essential to addressing threats to wildlife and ecosystem health.

5. **Addressing anthropogenic impacts to breeding loons in the Adirondack Park**, including such factors as nest site disturbance, fishing line entanglement, and lead toxicity due to accidental ingestion of lead fishing tackle.

6. **Enhancing public awareness about wildlife natural history and the environmental conservation**. In an increasingly urbanized society, it is ever more critical to actively engage the public in learning about and fully appreciating the environment in which we live. Enhancing people’s awareness about environmental conservation will enable them to better understand the importance of regulating pollution and minimizing human impacts to wildlife and the environment, leading to a healthier planet for us all.
8.0 Budget

The budget for BRI’s Adirondack Center for Loon Conservation in 2012 and 2013 was approximately $130,000 annually, which provided for the salary and benefits of two part-time year-round staff, seasonal field staff, travel, newsletter printing and distribution, and operating and field supplies.

Funding from our private donors provided critical support for our staff to conduct the field work and outreach activities described in this report. Additional funding and in-kind support is provided by the New York State Environmental Research and Development Authority, our partnering organizations, and private foundations.

We are most grateful to our private donors for your ongoing and generous support. By increasing scientific understanding and public awareness of conservation concerns affecting New York’s aquatic ecosystems, we are able to help ensure that the beautiful and symbolic Common Loon will continue to raise its young on Adirondack lakes long into the future.
9.0 Literature Cited


Evers, D.C. 2006. Loons as biosentinels of aquatic integrity. Environ. Biindicators 1:18-21


