

The Adirondack Cooperative Loon Program: Loon conservation in the Adirondack Park

By NINA SCHOCH

Abstract:

The Adirondack Cooperative Loon Program (ACLP) is dedicated to improving the overall health of the environment, particularly the protection of air and water quality. Collaborative research and education efforts focus on the natural history of the common loon (Gavia immer) and conservation issues affecting loon populations and their aquatic habitats. Using the common loon as an indicator species, the ACLP works to increase knowledge and improve awareness in the scientific community, policy makers, and the general public about environmental conservation.

Introduction

Thick tendrils of fog swirled around us as we slowly motored into the loon territory on an Adirondack lake late one summer night. The fog was almost mesmerizing as it reflected the beam of the spotlight. We played the tape again, this time a chick call, and an adult loon responded with a hoot and short wail. The bird, accompanied by a large chick, swam towards the boat. The loons approached within inches of the boat, and a biologist from BioDiversity Research Institute quickly plunged the large net into the water and caught the adult as it dove. The chick was captured a few minutes later and brought on board the boat as well.

Blood samples for mercury analysis were collected from both birds, and feather samples from the adult. The adult loon was also banded with a U.S.

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Fish and Wildlife Service band and a unique color combination of plastic bands. Body measurements were taken, and then the birds were released back onto the lake. The Adirondack Cooperative Loon Program field staff monitored the banded loon and its chick for the rest of the summer to determine if the chick survived until fall, when it was able to fly and care for itself.

The Adirondack Cooperative Loon Program (ACLP) is coordinated by the Wildlife Conservation Society's Adirondack Program in partnership with the Natural History Museum of the Adirondacks – The Wild Center, New York State Department of Environmental Conservation (NYS DEC), BioDiversity Research Institute, and the Audubon Society of New York State. Bridged by common interests, the Adirondack Cooperative Loon Program is an excellent model of cooperation among conservation, wildlife management, and education organizations. Initiated in 2001, the ACLP has conducted this field work to evaluate the effect of mercury pollution on the reproductive success of Adirondack loons.

A Species of Special Concern in New York State, the common loon breeds on water bodies throughout North America, including the Adirondack Park, which is at the southernmost extent of its breeding range. Long-lived and territorial, loons are fish-eating predators at the top of the aquatic food chain, characteristics which make them excellent bio-indicators of the health of the lakes and ponds they inhabit.

Research conducted by the Adirondack Cooperative Loon Program uses the common loon as a sentinel of the

health of aquatic ecosystems to understand the biotic response to environmental pollutants from anthropogenic sources of energy production. Impacts of pollutants on loon behavioral and physiological characteristics are compared temporally and spatially throughout the Adirondack Park and the Northeast.

The ACLP has also developed education and outreach programs based on its research to improve environmental health through public involvement in conservation. Participants in these programs gain an increased understanding and appreciation of conservation concerns affecting the common loon and its habitat, and of the connections among wildlife, environmental quality, and human health.

Adirondack Loons as a Sentinel of Mercury Pollution

The effect of environmental pollution on wildlife species and their habitats is a growing concern worldwide. Although one of the largest relatively intact forested ecosystems in the Northeast, New York's six-million-acre Adirondack Park is significantly impacted by atmospheric pollutants, particularly mercury and acidic emissions from coal-fired power plants. Such emissions contaminate both aquatic and terrestrial ecosystems in the Park.

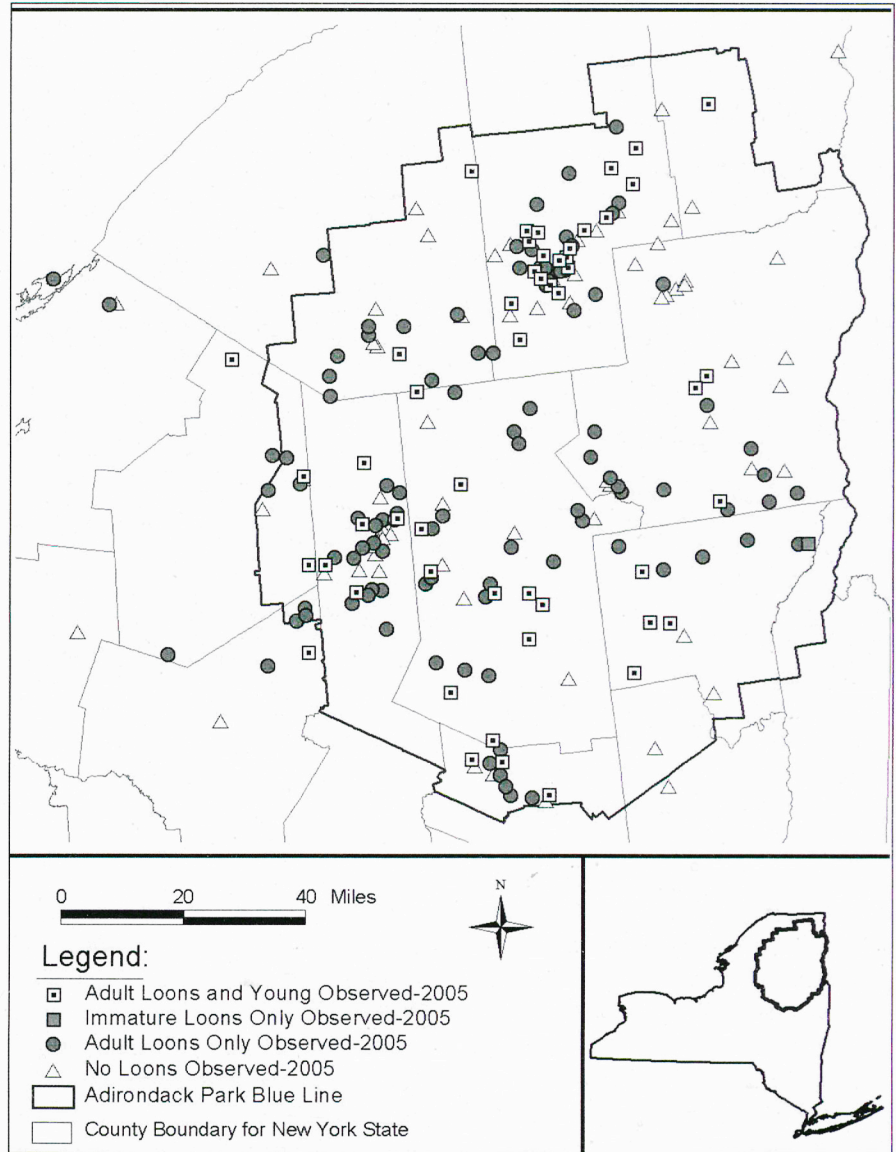
Emissions from coal-fired electrical power plants in the Midwest are transported to the Northeast on prevailing westerly winds. Mercury and acids are deposited in the form of rain or snow. The ability of soils to buffer acidic inputs is compromised, and the ecological processes of surrounding lakes and streams are detrimentally affected. The

thin, acidic soils in the Adirondack Park make its lakes and ponds particularly susceptible to acidification.

In acidified lakes, the indirect effects on common loons include decreased prey abundance and diversity. A reduction in the abundance of prey requires adult loons to spend more time searching for food and feeding their young. As the diversity of species available within the affected lakes is diminished, adults provide chicks with less suitable or less nutritious prey items than normally preferred. Acid deposition also contributes to increased availability of methylmercury, the toxic form of mercury, in affected waters. Elemental mercury is converted to methylmercury at a higher rate in acidic conditions. Common loons living on acidic lakes, particularly in the southwest region of the Adirondacks, have higher tissue mercury levels than those birds living on less acidic waters.

Coal-fired power plant emissions are currently the primary source of mercury deposition in the Northeastern United States. Such environmental pollution affects both wild and human inhabitants, as illustrated by the New York State Department of Health's recent Adirondack Park-wide fish consumption advisory in response to elevated mercury levels in many fish species living in Adirondack lakes. The U.S. Environmental Protection Agency and 48 states have also issued human fish consumption advisories for many of North America's waterways because of the toxic potential of ingesting mercury contaminated fish.

Mercury is a neurotoxin and concentrates as it progresses up the aquatic food chain. At high levels, mercury can significantly impact the behavior, reproduction, and survival of top predators, such as loons. Loons are able to reduce the concentrations of mercury in their bodies through molting of feathers and deposition in eggs. However, continued ingestion of fish with elevated mercury content results in the birds accumulating mercury faster than they can remove it from their bodies. This is particularly



true for male loons, since they are capable of consuming bigger fish than are females, due to their larger size, and because they are unable to deposit mercury in eggs.

In common loons, high levels of mercury result in behavioral changes that lead to decreased productivity and decreased survival of juvenile loons, as well as compromised immune systems. Adult birds with high mercury concentrations exhibit deviations from normal activities, such as reduced foraging and defense from other loons and predators, and decreased incubation of eggs. Due to their size, immature loons are more susceptible to the toxic effects of mercury than are adult birds. Significant behavioral differ-

ences occur in loon chicks with elevated mercury levels, including increased preening and decreased time spent riding on the parents' backs. These behavioral changes cause increased exposure to predators and to low temperatures, resulting in the decreased survival of young loons. From a population standpoint, loons with elevated mercury levels fledge fewer young than those pairs with lower mercury concentrations.

To determine the impact of airborne mercury pollution on the Adirondack loon population, the ACLP evaluates the reproductive success and survival of banded loons in relation to the blood and feather mercury concentrations in the birds. Preliminary results of this



A loon on Green Pond.

study has determined that almost 20% of the loons sampled in the Adirondack Park have blood mercury levels high enough to potentially impact their reproductive success. Birds that are recaptured provide valuable data for temporal comparison. The ACLP field staff conducts intensive weekly monitoring of the uniquely color-banded birds and their offspring to assess loon survival and reproductive success during the annual breeding season. Currently, the ACLP is monitoring the productivity and survival of more than 180 loons on over 70 lakes in the Park.

The ACLP has also recently conducted a study to evaluate the mercury that common loons are exposed to at each level in the aquatic food chain. Water, zooplankton, sediment, crayfish, and prey fish species were sampled in Adirondack loon territories to establish how mercury is moving through Adirondack aquatic ecosystems. The results of this project will be used to develop a wildlife criterion value, a mathematical model to evaluate the risk that mercury poses to the aquatic ecosystems in the Adirondack Park, and that will assist policy makers in better regulating mercury

emissions in the future.

The research efforts of the ACLP provide a scientific basis to focus wildlife and environmental conservation efforts in the Adirondack Park and North America by improving scientific and public understanding of the human-related and natural risks wildlife species are exposed to throughout their range. When combined with other ecological and human health studies, data clearly supports limiting airborne mercury emissions from coal-fired power plants. The ACLP's research will provide additional information to improve the regulation of atmospheric contamination and contribute to the development of management strategies for affected water bodies and regional populations of fish-eating wildlife species. New York State has used the results of this long-term project as evidence in the recent proposal to strictly regulate mercury emissions from New York's coal-fired power plants.

Migration of Adirondack Loons

Although much is known about where Adirondack loons live in the breeding season, little is known about their migratory pathways and winter

habitat utilization. Migrating or wintering loons have potential to be exposed to a variety of conservation concerns not encountered during the summer months in the Park, including the outbreak of botulism in the Great Lakes, oil spills along the coast, or entanglement in commercial fishing nets.

Oil spills and recreational or commercial fishing line entanglement along the coast contribute to individual mortalities of common loons and other wildlife. Common loons and many other species of waterbirds are extremely vulnerable to the toxic effects of oil and, despite decontamination efforts, are often unable to be successfully rehabilitated after a spill event. Accidents occurring during spring and fall migration in areas where common loons congregate can be especially devastating to the regional population.

A botulism Type E outbreak on Lakes Erie and Ontario has caused massive fish and waterbird mortalities since the year 2000. The bacterium *Clostridium botulinum* produces the botulism toxin under the anaerobic conditions that occur in the sediments at the bottom of the lakes. The introduction and population explosion of two invasive species, quagga mussels and round gobies, into these lakes have contributed to the proliferation of the *C. botulinum* bacteria and toxin during late summer and fall. Common loons and other species of waterbirds migrating through these lakes contract botulism through the consumption of infected prey species. Within hours of ingestion, weakness, inability to fly, respiratory distress, and muscular paralysis set in. The NYS DEC and other scientists are studying the biological and ecological connections between waterbird mortalities and the sources of botulism on these Great Lakes.

To better understand the impacts of such threats on loon populations, the ACLP collaborated with the U. S. Geological Survey (USGS) from 2003-2005 to identify the migration routes and locations of wintering areas of Adirondack loons using satellite telemetry technol-

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ogy. A small number of birds were equipped with satellite transmitters, which signaled their locations every two-three days to the ACLP and USGS scientists throughout the year. This study enabled the scientists to determine when the loons left the Park for the winter, how long they took to migrate to the coast, and where they went, as well as when and where the birds returned to in the spring. Differences in adult and juvenile loon migrations were also examined using this technology. The ACLP-USGS's loon migration project will greatly increase scientific understanding about the conservation concerns the Adirondack loon population is exposed to throughout their entire range, enabling wildlife managers to better develop and implement conservation plans for this species and their habitats.

Changes in the Adirondack Loon Population over Time

In the 1970s and 1980s, NYS DEC conducted population surveys of loons breeding in the Adirondack Park. It was concluded that the loon population had increased between the two studies, and was estimated at ~800-1000 adult birds in the 1980's survey. Anecdotally, many Adirondack residents and visitors think that the population has increased since then, as they are observing loons on lakes where the birds were not present 20 years ago.

To evaluate how the loon population summering in and around the Adirondack region has changed since the last NYS DEC survey, the ACLP initiated an Annual Loon Census in 2001. This citizen-science study provides an excellent opportunity for the general public to participate in learning more about common loons while contributing valuable data to the ACLP. From 2001-2005, observations were reported from more than 300 lakes and ponds in New York State; surveys were repeated for two or more years on over 200 of these lakes.

The results from the Annual Loon Census enable the ACLP to examine the status, distribution, age class, and long-

term trends in the Adirondack loon population. A preliminary analysis of the Census results from 2001-2005 indicated that the loon population in the Park has almost doubled since NYS DEC's survey in the 1980s. The information obtained in the Annual Loon Census has been utilized by the NYS Department of Environmental Conservation in the development of Unit Management Plans, the NYS Natural Heritage Program, Audubon New York for identification of Important Bird Areas, the Adirondack Park Agency for evaluation of potential shoreline development sites, and has contributed to the NYS Breeding Bird Atlas.

Education and Outreach with the Loon Program – Inspiring Conservation

The Adirondack Cooperative Loon Program has developed a diversity of education and outreach projects that complement its research. These programs inspire the public to become better informed about natural history and conservation issues affecting the Adirondack Park and its wild inhabitants. Information obtained through the ACLP's research is communicated to the public and scientific communities utilizing a variety of outreach techniques, including: a biannual newsletter ("The Adirondack Tremolo"); scientific and public presentations; the ACLP and Wildlife Conservation Society websites, www.adkscience.org/loons and www.wcs.org/adirondacks; field trips; lead sinker awareness project; informational boat launch signs; and innovative school curricula, "The Loon Scientists Program" and "Science on the Fly!" Additionally, the ACLP's research has been highlighted in media articles and documentaries, such as the "Call of the Loon," produced in 2006 by Mountain Lake PBS, which discusses the effects of mercury pollution on northeastern North America and the current status of state and national regulations for mercury emissions.

The Loon Program has designed two middle school curricula to teach students in and outside the Adirondack Park

about wildlife, the process of scientific inquiry, and environmental conservation. The interactive "Loon Scientists Program" engages students in learning first-hand about loon natural history, how scientists conduct research, and the effects of environmental pollution on wildlife and their habitats. Students analyze real data, interpret results, and present their findings. By gaining a better understanding of factors, such as mercury and acid rain, that affect loon populations, students discover how their own actions can improve the health of wildlife and the environment in which they live.

In 2005, the Adirondack Cooperative Loon Program launched "Science on the Fly! Loon Migration – Linking People and the Environment," to enable students and teachers around the world to engage in the fascinating field of scientific discovery led by the common loons of the Adirondack Park. Scientific inquiry learned through "Science on the Fly!" promotes student-centered, open-ended explorations into natural history and environmental conservation. Through an innovative video, interactive classroom activities, and an award-winning website, www.scienceonthefly.org, students follow the ACLP-USGS' research on the migration of loons to and from the Park to investigate the intriguing role of science in environmental conservation. In addition, students gain an understanding of the connections among people, the environment, and its wild inhabitants by relating their classroom investigations to the ACLP-USGS' research.

Participation in the ACLP's research and monitoring projects encourages Adirondack residents, visitors, and interested members of the public to take a personal role in conservation. Through the ACLP's education and outreach efforts, thousands of Adirondack residents, visitors, and students have become directly involved in learning about natural history and the environment. Year-round public presentations and seasonal field trips enable the public to interact with scientists and learn about the research

conducted by the ACLP in the Adirondack Park. These programs introduce the public and students to loon natural history, factors affecting North American habitats and wildlife, and environmental conservation efforts. For example, the ACLP's "Lead Sinker Awareness Project" informs Adirondack anglers and students about the toxic effects of lead fishing tackle to loons and other wildlife, and New York's regulation banning the sale of small lead sinkers. Participants are encouraged to use non-toxic fishing gear to prevent wildlife deaths from lead fishing tackle ingestion.

The Adirondack Cooperative Loon Program has greatly contributed to increased public, scientific, and policy maker awareness and understanding of sustainable conservation of wildlife populations, as well as to the implementation of higher environmental standards to improve the health of Adirondack and North American ecosystems. The ACLP's research has added to scientific knowledge of loon natural history, migratory pathways, and the impact of pollutants on Adirondack ecosystems and wildlife. The results of the ACLP's efforts have contributed to the scientific basis for policy makers to make sound decisions concerning the environment, such as New York's recent proposal to stringently regulate mercury emissions from its coal-fired power plants. The ACLP's outreach programs enable the public to be more informed about their use of environmental resources and their own role in conservation. By actively engaging citizens, the ACLP inspires the public to increase their appreciation of the unique wildlife and ecosystems of the Adirondack Park, as well as their understanding of regional conservation issues.

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Additional Information

- The Common Loon in the Adirondack Park: An Overview of Loon Natural History and Current Research, Nina Schoch, D.V.M., M.S. Wildlife Conservation Society, Working Paper No. 20, December 2002. www.wcs.org/adirondacks.
- Mercury Connections: The extent and effects of mercury pollution in northeastern North America, David Evers, Ph.D. BioDiversity Research Institute, 2005. www.briloon.org
- www.adkscience.org/loons
- www.wcs.org/adirondacks
- To learn more about the ACLP-USGS' loon migration research, visit: www.umesc.usgs.gov/terrestrial/migratory_birds/loons/migrations.html

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