

NESTING IN THE NORTH WOODS

Identifying environmental threats to Common Loon reproductive success in New York's Adirondack Park



The Common Loon (*Gavia immer*) is an icon of New York's six-million acre Adirondack Park. Each spring, thousands of loons migrate to this remote, mountainous region of northeastern New York to claim a territory and raise their chicks. The breeding season is a critical and vulnerable time for loons. Adults are fiercely protective of their chicks, but despite their diligence, many environmental factors threaten a loon's ability to nest and raise their young.

The characteristics of a loon's breeding territory, such as the size of the lake, presence of a dam, percentage of shoreline development, frequency of lake use by humans, number of other territorial loon pairs, amount of rainfall, and level of mercury pollution, all have potential to affect the likelihood of its chicks surviving, in addition to other threats, such as predators.

To determine which factors affect loon reproductive success the most, the Adirondack Center for Loon Conservation and its partners, including Biodiversity Research Institute, the Wildlife Conservation Society, and the New York State Department of Environmental Conservation, with support from the New York State Energy Research and Development Authority, have been conducting a long-term study in the Adirondack Park to investigate the impacts of multiple environmental factors on the probability of chick hatching and fledging success.



In this ongoing study, individual Common Loons were banded, assessed for mercury exposure, and then monitored annually to determine their reproductive success over time. Factors causing nest failure and loss of chicks were identified when possible. Chick survival was determined by monitoring loon pairs on a weekly basis during the breeding season. Statistical techniques were then utilized to analyze the data from 2001-2017 to assess the relative impact of the different factors affecting the nesting and fledging success of both male and female adult loons.

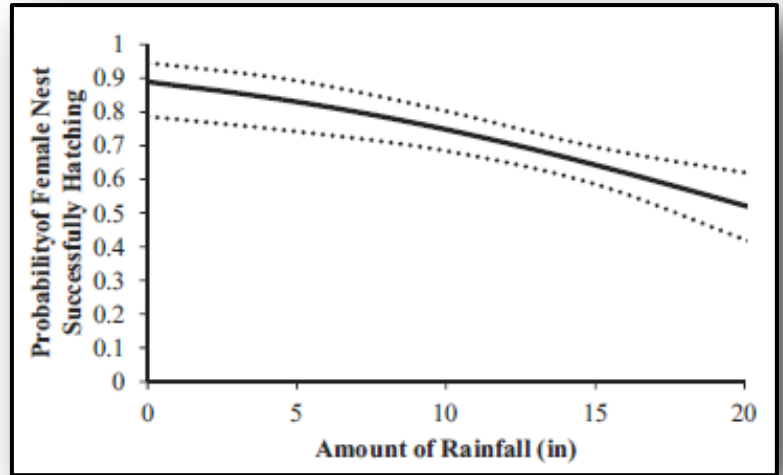
HATCHING SUCCESS:

The number of loon eggs that hatch from a clutch.

Loons usually lay 1-2 eggs in a nest, but on rare occasions, they will lay 3.



Rainfall was determined to be the most influential environmental factor affecting the reproductive success of female loons. As rainfall increased, female loon hatching success decreased.



Probability of adult female loon hatching success compared to amount of rainfall.

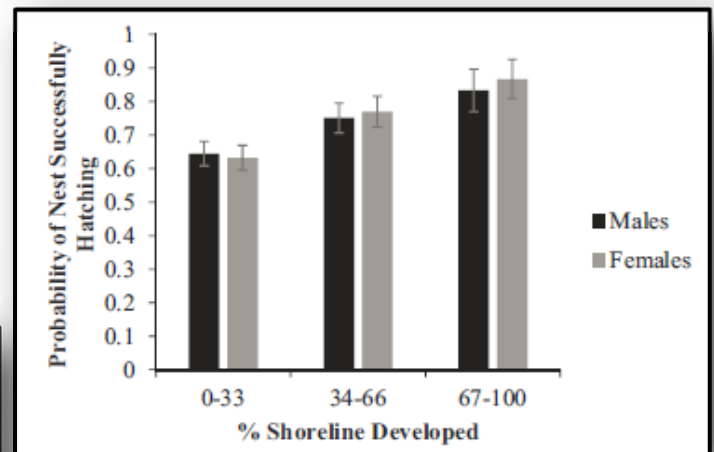
Loon nests are vulnerable to flooding due to their location on the shore's edge. Loons build their nests at the water's edge because their bodies are so specialized for living in the water that they have nearly lost the ability to walk on land.

Torrential rain events during the loon breeding season have been increasing in frequency in the Adirondacks with the changing climate over the last few decades.

Thus, the amount and intensity of rainfall during the nesting season is a critical factor impacting loon reproductive success, and potentially the population as a whole.



For male loons, nesting success was best predicted by shoreline development. Historically, loons have been perceived as a symbol of wilderness, yet male loons in this study who nested on more developed lakes with human activity had greater hatching and fledging success. This may be due to the low sample size of lakes with developed shorelines in our study.



Probability of hatching success for adult loons in comparison to shoreline development from 2001-2017.

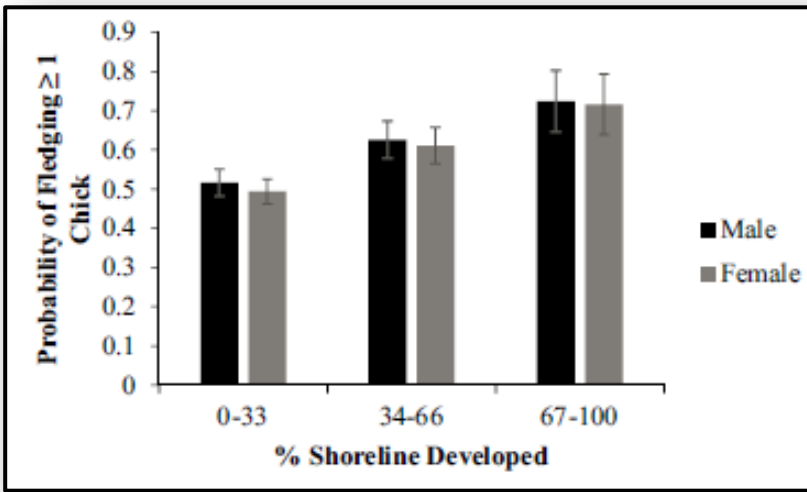
Another explanation could be that bald eagles may be less likely to be present on lakes with lots of human activity. Bald Eagles are a natural predator of loons, and will harass adult loons as well as prey on loon eggs and chicks.



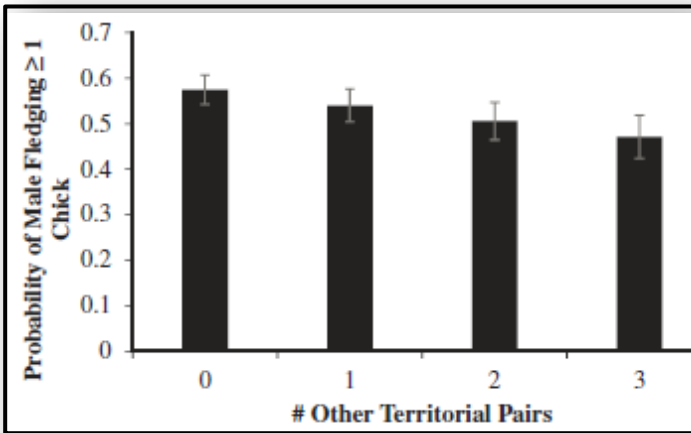
One of two Bald Eagles eating the eggs at an Adirondack loon nest, June, 2019.

Further research is necessary to assess the relationship between Common Loons, Bald Eagles, and shoreline development.

Female loon fledging success was best predicted by shoreline development and total lake use by humans. As lake use and shoreline development increased, female loon fledging success increased. Similar to the findings for male loon hatching success, these results may reflect the low sample size of lakes with developed shorelines, which also had fewer bald eagles.



Probability of adult loons fledging one or more chicks compared to shoreline development from 2001-2017.



Probability of adult male loons successfully fledging one or more chicks in comparison to the number of territorial pairs on a lake.

FLEDGING SUCCESS

The number of loon chicks that reach 11 weeks of age (when they are capable of flying)

In this study, chicks were considered to be fledged at 6 weeks, because if they survive that long, they are highly likely to survive to the actual fledging age of 11-12 weeks.



The number of territorial pairs on a lake was the factor that most greatly affected male loon fledging success. As the number of territorial pairs on a lake increased, male loon fledging success decreased.

Loons fight by “penguin dancing,” diving, and puncturing the sternum of a rival bird. Territory intrusions by other loons are a frequent occurrence during the breeding season. To prevent intrusions, mating pairs spend a significant amount of time defending their territory (Piper et al. 2000). Territory battles between male loons can often be fatal (Piper et al. 2008), thus, having more territorial pairs on a lake would be more costly for male loons.

This study highlights several factors affecting the success of Common Loon reproductive success in New York’s Adirondack Park. Climate change, as evidenced by torrential rainfall events, and predation are increasing factors of concern for loon nest and chick survival in this beautiful forested region of mountains intermingled with the lakes where loons spend their summers raising chicks.



SUMMARY OF NEW YORK'S MERCURY SYNTHESIS PROJECT*

In 2018, to inform policy efforts and advance public understanding, the New York State Energy Research and Development Authority, sponsored a synthesis of scientific information on mercury in air, water, fish, and wildlife in New York's ecosystems, which resulted in the publication of over 20 papers in the journal *Ecotoxicology*.

1. New York State's natural areas are widely contaminated with mercury and the scope of the impact of mercury on fish and wildlife in New York State is much greater than had previously been thought, exceeding human and ecological risk thresholds in many areas, especially in freshwater habitats.
2. Landscape characteristics of the Adirondack and Catskill Parks, and areas of Long Island, exacerbate the impacts of mercury emissions. Forests facilitate mercury deposition, while wetlands are hotspots for methylation, leading to elevated levels in aquatic and terrestrial food webs.
3. Overall, environmental mercury concentrations in New York State have decreased in recent decades. However, in some areas such as the Adirondacks, the mercury levels in some fish and birds have only stabilized or even increased, thus indicating that environmental mercury recovery can be complex.
4. It is expected that further controls on mercury emission sources will continue to lower mercury concentrations in the food web, particularly in inland lakes.

*For more information, visit www.adkloon.org/research and www.briloon.org/nymercury

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