



2014 Squam Watershed Report

compiled and published by the Squam Lakes Association

In 2013, the Squam Lakes Association published the first Squam Watershed Report. This document gathered the results of decades of study on Squam – water quality, loons, fisheries, boat counts, and invasive plant management – to paint a picture of health of the watershed. This first report examined the rich history of data collected on the lake and in the watershed. In 2014, as in subsequent years, we are narrowing our focus to data collected in 2013, all while keeping the historical context and important trends in mind.

This year we assigned a color code to each parameter examined in this report. Water quality and the warmwater fishery in Squam are considered healthy. Loons on Squam are considered to be an impaired population. The state of variable milfoil on both lakes is fair. It is still present, yet we are seeing success in our management activities. Milfoil in the Squam River is affecting the system to the point of impairment.

Assessment Parameters

Lake Water Quality

-  Total Phosphorus
-  Chlorophyll
-  Transparency
-  Dissolved Oxygen

Boating Census



Variable Milfoil Management



Fisheries

-  Rainbow Smelt
-  Large and Smallmouth Bass

Common Loons

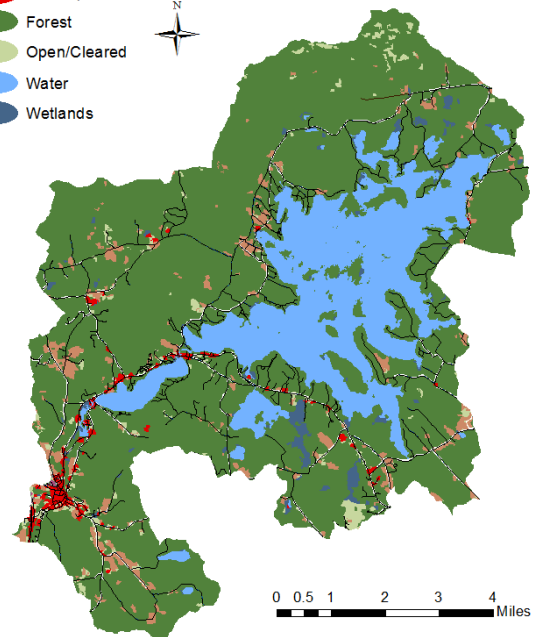


healthy

fair

impaired

-  Agriculture
-  Developed
-  Forest
-  Open/Cleared
-  Water
-  Wetlands



map provided by the Squam Lakes Conservation Society

The Squam Watershed

The Squam Watershed encompasses 42,418 acres across eight towns in central New Hampshire. Of this, 20% is open water. Of the total land area, 86% is forested and 24% is protected. To the north, the watershed is bounded by the Squam Range. The outlet of the Squam Lakes is at the Squam River where it flows into the Pemigewasset River. Squam Lake is 6,765 acres, has a 60.5 mile shoreline, and is 99 feet at its deepest point. Little Squam is 408 acres, has 4.3 miles of shoreline length, and is 84 feet deep at its deepest spot. Squam is divided into 18 distinct basins with high barriers that minimize water exchange when the lake is stratified during the warm months. Squam Lake flushes its entire volume once every five years, while Little Squam Lake flushes 2.8 times per year.

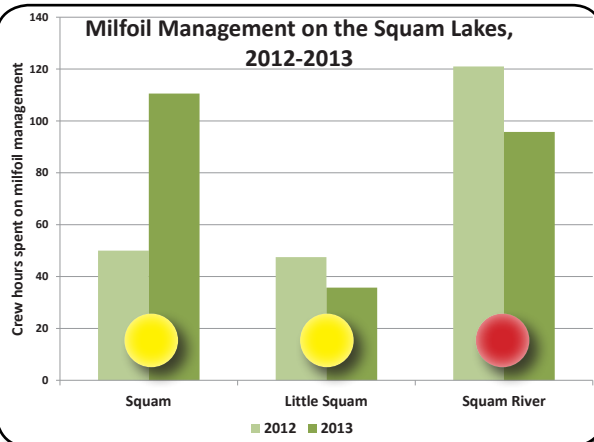
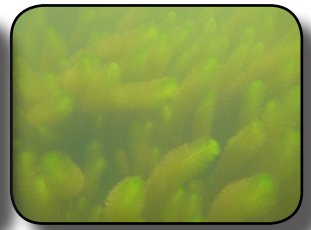
Variable Milfoil Management

data collected by the SLA

Variable milfoil (*Myriophyllum heterophyllum*) was first discovered on Squam in the summer of 2000. Since that time, there has been an increasing and collaborative effort to control and eradicate this invasive aquatic nuisance species.

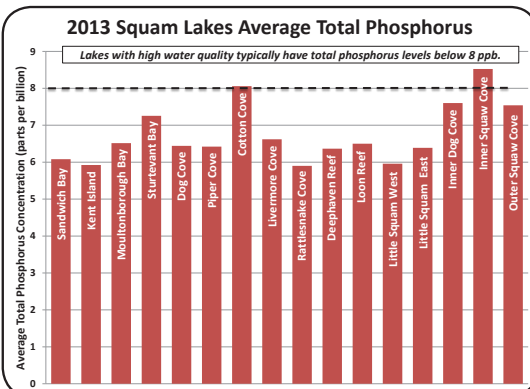
The SLA separates the Squam Watershed into three distinct milfoil management zones: Squam Lake, Little Squam Lake (including the Channel), and the Squam River. Milfoil in Squam Lake is sparse. Little Squam Lake and the Channel have more milfoil requiring regular attention. The Squam River currently needs intensive and consistent management mostly with the Diver Assisted Suction Harvester (DASH) system.

In 2013, the SLA focused much of its management activities in Squam Lake. This doubled effort proved to be successful. Milfoil in Squam Lake has been significantly reduced to just several plants.



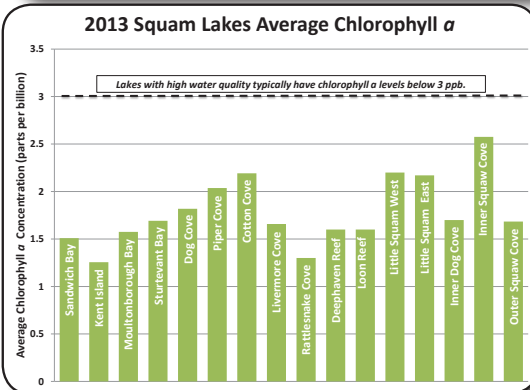
Lake Water Quality

data collected by the SLA and the University of New Hampshire



The Squam Lakes exhibit excellent water quality. The lakes are classified as oligotrophic because of low levels of microscopic plant growth, low phosphorus and nutrient concentrations, clear waters, and high oxygen concentrations throughout the water column. During the summer months, deeper sampling locations tend to experience a lack of oxygen near the lake bottom.

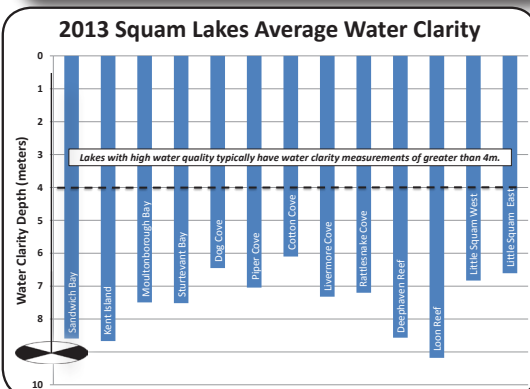
Total Phosphorus: Phosphorus is the most important nutrient in freshwater systems. The New Hampshire Department of Environmental Services (NHDES) considers phosphorus levels at eight parts per billion (ppb) to be the cutoff between a high quality lake and a lake that is susceptible to higher levels of algal growth. Phosphorus levels in Squam fall below the 8 ppb level, except for Squaw Cove and Cotton Cove. The higher phosphorus levels in shallower sites such as Squaw Cove and Inner Dog Cove are due to different ecology in those locations and do not necessarily indicate poor water quality. Elevated average phosphorus levels in Cotton Cove are likely from stormwater impacts.



Chlorophyll *a*: The chlorophyll *a* concentration is an indication of photosynthesis and plankton growth that is occurring in the lake. Higher chlorophyll *a* levels indicate nutrient enrichment. In 2013, average chlorophyll *a* concentrations fell well below the 3 ppb level, determined by NHDES to be healthy.

Water Clarity: Water clarity measures sunlight penetration by using a secchi disk. The deeper this disk can be viewed in the water, the higher the water clarity. Water clarity measurements are impacted by dissolved and suspended solids or plankton. In the Squam Lakes, water clarity measurements are higher in open water and the deeper reaches of the lake, such as Loon and Deephaven Reefs. Healthy, oligotrophic lakes have water clarity measurements of four meters or deeper. Though some sites on Squam experience a slight trend toward decreasing water clarity, all sites have water clarity levels that are greater than four meters and are considered healthy. In 2013, the highest water clarity measurement observed was 10.2 meters, taken at both Loon and Deephaven Reefs on July 17th.

The SLA is participating in a statewide stream monitoring program. There are two sensors in Squam tributaries that are taking regular measurements of stream depth, temperature, and conductivity. The water coming out of Belknap Woods into Dog Cove has high conductivity levels, likely indicating an impact from road salt.



The Squam Lakes are classified as healthy, oligotrophic lakes because of low levels of microscopic plant growth, low phosphorus and nutrient concentrations, clear waters, and high oxygen levels.

Common Loons

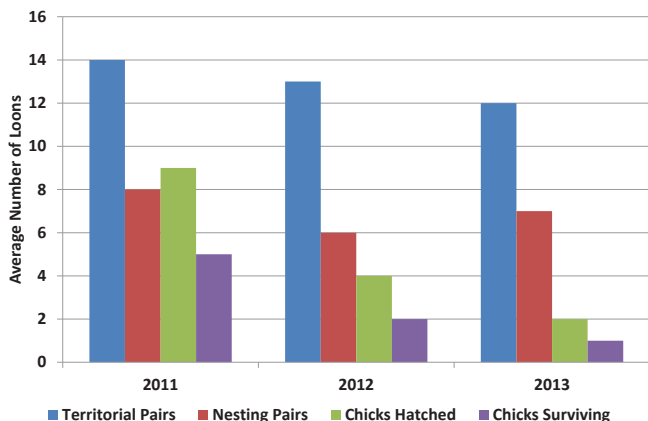


data collected by the Loon Preservation Committee

2013 was a difficult year for loons on Squam Lake. Twelve pairs of loons held territories on Squam (one less than in 2012), seven of these pairs nested, but only two chicks hatched and one survived. Productivity remains less than half the rate needed to maintain a stable population. In recent years, there have been high levels of adult loon mortality on Squam, and new loons immigrating to the lake to occupy vacant territories can disrupt nesting and productivity of existing pairs. The key to restoring a healthy population of loons on Squam Lake is to help ensure the survival of adult loons, while doing everything possible to assist their efforts to nest successfully. To help loons, please use only non-lead fishing tackle, maintain a safe distance of at least 150 feet away from loons, respect signed and roped nesting areas, and boat slowly through areas signed to indicate the presence of loon chicks. Please report any sick, injured, or dead loons to the Loon Preservation Committee at (603) 476-5666 and visit www.loon.org for more information.



Squam Lakes Loons 2011-2013



The SLA is working with the Loon Preservation Committee to protect loons and educate boaters through the Loon Chick Watch volunteer program (learn more on the SLA website).

Land Conservation

A quarter of the land in the Squam watershed is protected through conservation easements with the Squam Lakes Conservation Society, the Lakes Region Conservation Trust, the Society for the Protection of NH Forests, and other organizations. In 2013, the Squam Lakes Conservation Society protected five new properties (more than 100 acres) in conservation easements within the Squam Watershed. Land protection is an important aspect of protecting both the watershed and the quality of the Squam Lakes.

Squam Fisheries



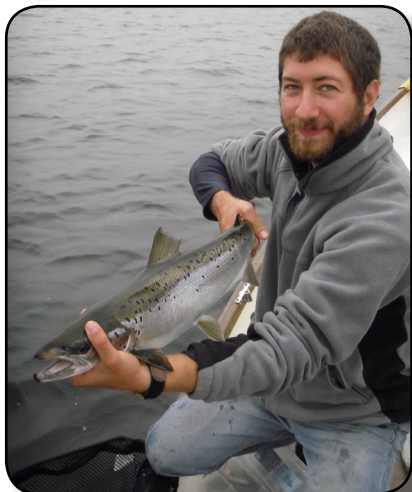
data collected by New Hampshire Department of Fish and Game

Coldwater fishery (smelt, salmon, trout)

Summer 2013 surveys for primarily rainbow smelt indicated exceptional density, the highest in the past five sample years. Once again, fall 2013 salmonid netting revealed some exceptionally large and robust landlocked salmon and rainbow trout although the number netted in 2013 was down from the previous two years (2011: 340, 2012: 235, 2013: 100). It is not clear yet whether this decrease is ecologically significant and a cause for concern.

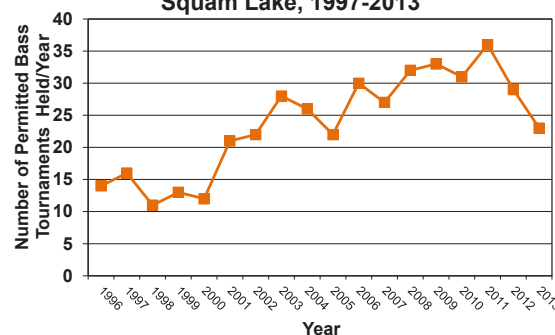
Warmwater fishery (largemouth bass and smallmouth bass)

The warmwater fishery on Squam remains healthy. Though Squam sees a number of bass tournaments throughout the spring, summer, and fall, there is little evidence that fishing tournaments on Squam are causing negative biological impacts. Squam has seen no overall decline in catch rates or average weights of bass. In fact, Squam experiences high bass weights and smallmouth catch rates compared to statewide values.

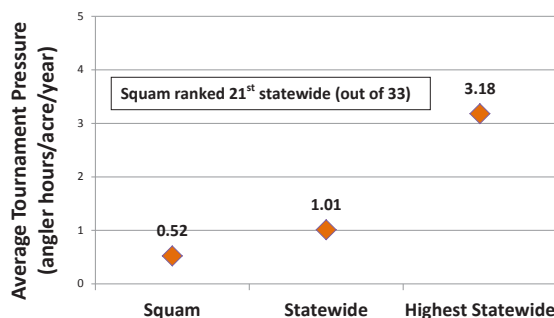


In 2014, the SLA is partnering with the NH Department of Fish and Game in a three-year study funded by NH Bass Nation to investigate if bass will migrate back to Squam Lake after being released in Little Squam. Results of this study could help to reduce fish mortality and reduce conflict between lake users.

Permitted Bass Tournaments on Squam Lake, 1997-2013



Tournament Pressure on the Squam Lakes



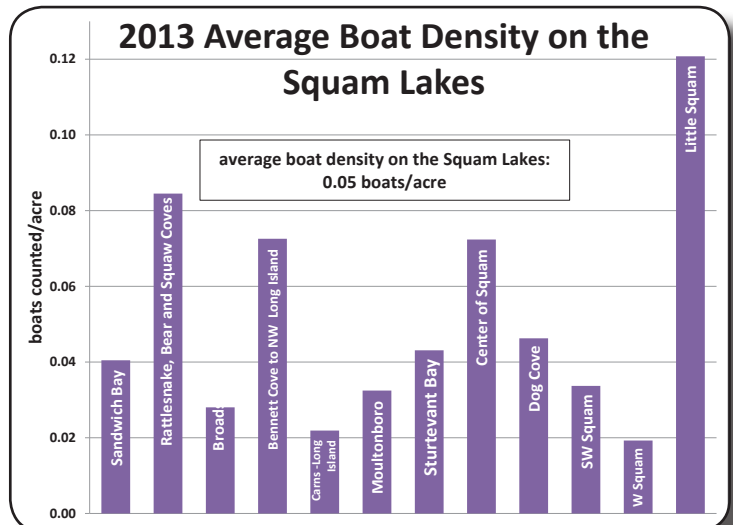
Boating Census



data collected by the SLA

The SLA has conducted both active and static boat counts on Squam since 1988. Since weather can vary widely on census days, boat census data are also variable. Despite this variation, the SLA has noted that certain areas experience higher boat densities consistently throughout the years. Two areas, Little Squam Lake and Rattlesnake Cove, typically exhibit the highest boat densities on the lakes. In 2013, boat census volunteers counted an average of 337 boats over two different census dates. On average, 71% of these boats are motorboats with motors that are greater than 25 horsepower. Human-powered boats, such as canoes, kayaks, and stand up paddleboards make up about 14%, and sailboats and motorboats 25 horsepower or less take up about seven percent each of the total number of boats on the lake.

In 2014, the SLA will conduct two aerial surveys of the Squam Lakes on typical weekend summer days to further investigate boating patterns and densities on the lakes.



Squam Conservation Internship

The Squam Conservation Internship gives future conservation leaders skills and experience while carrying out the SLA's mission. Interns serve as campsite hosts and caretakers at our backcountry campsites, help with the eradication of variable milfoil, perform water quality monitoring, help with public education and outreach projects, perform other conservation duties such as shoreline restoration and trail maintenance, and educate lake users about the dangers of invasive species. Read more about the intern experience online: squamlakes.org/squam-conservation-intern-journal.



Get Involved!

Participate. Protect the Squam Lakes watershed for present and future generations.

- Report what you see to the SLA
- Read and live *50 Ways to Care for the Squam Lakes*
- Adopt and practice conservation habits

Volunteer. Help monitor the watershed for the proactive protection of lake resources.

- Protect loons and their chicks
- Conduct water quality testing
- Become a Weed Watcher
- Become a Lake Host

Support. Be a champion of the SLA's mission by donating to these programs:

- Eradication of invasive weeds
- Monitoring water quality
- Squam Watershed Report
- Restoration and research
- Squam Conservation Internships

Acknowledgements

Thank you to the following for contributing data, analysis, and expertise to this report:

- Bob Craycraft, University of New Hampshire Lakes Lay Monitoring Program
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- IAN (Integration and Application Network, University of Maryland) Image Library
- Squam Lakes Conservation Society
- John Viar, NH Fish and Game
- SLA Staff and Volunteers

The Squam Lakes Association is dedicated to conserving for the public benefit the natural beauty, peaceful character and unique resource values of the lakes and surrounding watershed. In cooperation with local and state authorities and other conservation organizations, the Association promotes the protection, careful use and shared enjoyment of the lakes, mountains, open spaces and wildlife of the Squam Lakes region.

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