**Limnology Basics—An introduction to the Squam Lakes**

By LRCC AmeriCorps member Amanda Carron (March 2019)

**How Squam Lake was formed...**

Squam Lake was carved out by glaciers from the most recent ice age, during the Pleistocene epoch (a subdivision of the geologic time scale). As Rachel Carley wrote in her book *Squam*:

“During the Pleistocene epoch, a period of intense cold beginning about two million years ago, a sequence of glaciers advanced and receded over various parts of the earth. Toward the end of the Pleistocene, a vast mass of glacial ice known as the Laurentide Ice Sheet covered the northern part of North America. The ice advanced from Canada into New England about 30,000 years ago, eventually reaching as far south as Long Island, New York. The epoch ended with a reverse polar trek as the ice melted, and by about 13,000 years ago the southern edge of the ice sheet had retreated to present day Quebec” (pg. 7).

Glaciers scoured out the lake as well as the surrounding landscape, forming valleys and rounding hilltops, travelling southeasterly. Specifically, the Laurentide Ice Sheet measured more than a mile deep, taller than the White Mountains’ tallest peaks! Evidence of this glacial movement can be seen by way of “...parallel striations, which may be visible where ledges have been smoothed by glacial scouring and are not too weathered... [and] Boulders known as erratics, dragged in the same direction by moving ice from their original location...” (p. 10-11). Glacial erratics can be found throughout the region, scattered randomly, and gracing many of our trails.

While the glaciers helped form our watershed and lake, the actual lake levels today for Squam Lake and Little Squam Lake are regulated by a dam in Ashland,

A part of the Squam Lakes Association’s mission is to conserve for public benefit the natural beauty, peaceful character, and resources of the watershed. To carry out this mission, the SLA has been collecting
The SLA studies certain indicators to see if human influence is catalyzing the trophic status of the lake. “Trophic” means nutrition or growth. Over long periods of time, all lakes eventually become highly nutrient rich and productive, this is called eutrophication. However, humans can speed up this process by nutrient loading through such actions as run-off from roads, ineffective sewage management, excessive fertilizer usage... the list goes on! According to “Understanding Lake Ecology,” there are three main factors that affect the trophic status of a lake:

1. Rate of nutrient supply
   - Bedrock geology of the watershed
   - Soils
   - Vegetation
   - Human land-uses and management

2. Climate
   - Amount of sunlight
   - Temperature
   - Hydrology (precipitation + lake basin turnover time)

3. Shape of lake basin (morphometry)
   - Depth (maximum and mean)
   - Volume and surface area Watershed to lake surface area ratio

What Squam Lakes Association studies:

Limnology: “The broad study of inland waters, including, physical and chemical characteristics, the biota and the interact among all three.”

Specifically, we are currently monitoring water quality parameters such as:

- **Water transparency, or clarity**: determined by the depth that sunlight penetrates in water. The further sunlight can reach, the higher the water clarity. This is the most visible indicator of water quality.
- **Chlorophyll a**: a color pigment found in plants, algae, and phytoplankton. This parameter can help us determine the level of productivity in the lake.
- **Total phosphorus**: A nutrient that can stimulate algae growth. We measure this to provide an indication of the possible nutrient enrichment of a lake.
- **Temperature**: an important factor to consider because temperature can influence several other parameters and it can alter the physical and chemical properties of water.
  - More specifically, **thermal stratification** on Squam Lake is studied to better understand the distribution of particles in the water column since there is a direct relationship between density and temperature. In the figure below, a typical thermal stratification is shown during the summer months.
Squam Lake is a *dimictic lake*, or a lake with a pattern of two mixing periods: one in the fall and one in the spring. As temperatures change through the seasons, so do the density proportions, which in turn causes the distribution of particles to change. These changes affect not only the chemical parameters of the lake, but also the physical parameters such as where organisms like fish will be able to function. The figure below simply shows these distributions through the seasons on Squam Lake.

Check out [this video](#) that describes Lake Mixing and Stratification from the North American Lake Management Society Student Video Series.
- **Dissolved oxygen**: the level of oxygen present in the water that is not bonded to any other element. Important in assessing water quality because of its influence on the organisms living in the lake.

More details regarding Squam Lakes Association’s conservation practices can be found in our [Squam Watershed Reports](#) and on our [Water Quality Monitoring](#) page.

**Why is limnology important?** The science behind inland waters can provide a better understanding of the dynamics of our lake ecosystem. Such information can lead to more sound management practices.

**Video links:**

A great series of short videos created by college students nation-wide, who are members of the North American Lake Management Society (NALMS): [click here!](#)

These videos pertain to important topics such as...

- Harmful algal blooms: important in understanding what could happen to Squam Lake
- Aquatic invasive species
- **Limnology in winter**
- Aquatic flora, or macrophytes: could be helpful in understanding more about SLA vs. Variable milfoil
- **Lake mixing & Stratification**
- Secchi disk readings

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**Sources**


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