

Progress on Developing a Gregg Lake Watershed Management Plan

Joan Gorga

The indomitable Gregg Lake Watershed Management Plan Committee has made substantial progress toward defining the issues Gregg Lake is facing and figuring out what we can do to make long-term improvements.

Septic Inventory

With great cooperation from area residents, we recently completed a survey of the characteristics of the septic (and other) systems within 250 feet of the lake, which will help us calculate the actual contribution waste systems make to pollutant levels in Gregg Lake, rather than making assumptions based on state averages. Along with the survey results, we were treated to an extensive list of thoughtful comments and suggestions that will be incorporated into the Watershed Management Plan. It was heartening to see just how much people care about Gregg Lake.

Erosion Hotspots

Working with our professional consultants, FB Environmental Associates, we have completed a survey of erosion “hotspots” around Gregg Lake. Based on soil composition and precipitation data, FB Environmental provided estimates of the amounts of sediment, nitrogen and phosphorus that could be kept from the lake by erosion control at those locations, along with rough estimates of the cost, so we can begin to plan our approach to those problem areas.

Water Quality Summary

Our other major effort this winter has been analyzing and writing a summary of data collected since 1978 concerning the water quality of Gregg Lake. This project was not for the faint of heart, and we challenge you to take a look at the results of our efforts, which will be on display at several places around town (Town Hall, Tuttle Library) and posted online at <http://glwmp.antrimlimrik.org/> as soon as the report is declared finished. Some of what we've learned:

Weather. Total annual precipitation in southwestern New Hampshire has shown a statistically significant increase since 1978. It is also important to recognize that Gregg Lake will be subjected to more extreme weather events in the future. Heavy storms will carry more sediment, phosphorus and nitrogen into the water. Nutrients are washed into Gregg Lake from a relatively large watershed area (15 times the area of the lake) and are flushed out at a relatively low rate of only 1.6 lake volumes per year.

Temperature. Mean summer temperatures have remained approximately the same since 1978, and recorded Gregg Lake water temperatures do not show a difference between historical and recent mean temperatures, either at the Town Beach or at the deepest spot. With Gregg Lake consistently being kept higher than historical levels, however, the frac-

tion of shallow water has increased and will likely contribute to warming water temperatures. Increased color in the water will lead to further warming. The length of time each year that the lake is free of ice may also affect the growth of aquatic plants and algae. Long-term data for Gregg Lake are not available; however, data for other New England lakes show clear trends toward later ice-in and earlier ice-out dates. Thus, the lake “growing season” for plants and algae is likely increasing, even if water temperatures have not yet risen significantly.

Phosphorus. Phosphorus can occur naturally in lakes, but human activities have resulted in excessive amounts of phosphorus entering many lakes and streams, resulting in elevated nutrient loads. Phosphorus is usually the limiting plant nutrient in New Hampshire lakes, and too much phosphorus can impair water quality by promoting excess growth of algae. Phosphorus in the warm upper water layer in Gregg Lake, calculated to be 6.8 µg/L, remains below the “Impaired” threshold of 8 µg/L set by the New Hampshire Department of Environmental Services (NHDES) for lakes with low nutrient loads, and does not appear to be increasing. However, to protect our surface waters from degrading, NHDES “Antidegradation” provisions recommend a 10% reserve, or assimilative capacity, and the current phosphorus level doesn't give Gregg Lake much leeway before it falls within that 10% reserve (between 7.2 and 8 µg/L) and is considered at risk for supporting aquatic life based on phosphorus levels.

Samples taken at the inlet (Gregg Lake Road bridge) and farther upstream show phosphorus entering Gregg Lake from the upstream wetlands. A late-summer rise in phosphorus in the cold lower water layer suggests release of phosphorus from bottom sediments (called internal loading) caused by the very low oxygen conditions there. Substantial amounts of phosphorus also enter the lake via stormwater runoff, septic systems and groundwater.

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Measured phosphorus amounts in Gregg Lake water samples, along with models of phosphorus carried into lakes with stormwater runoff, allow us to estimate the contributions made to Gregg Lake phosphorus loading from the various sources. Using bathymetry data (depth contours) to estimate volumes at different depths, the total phosphorus content in Gregg Lake was calculated to be 32 kg (70 lb). FB Environmental estimated that phosphorus loading to Gregg Lake could be reduced by 10 kg/yr (31% of the total lake phosphorus content) by implementing fixes at the top ten erosion “hotspots.” Reducing the phosphorus load by this amount would likely have a tremendous effect on algal growth in Gregg Lake. The phosphorus content due to internal loading was estimated to be 5 kg/yr, or approximately 16% of the total phosphorus in Gregg Lake. We’re still in the process of calculating the phosphorus load due to septic systems in the area.

Algae. Chlorophyll-*a*, a green plant pigment, is used as a measure of the amount of algae in the water. Peaks of chlorophyll-*a* in June and again in October were consistent with normal seasonal cycles of algal growth. However, the median chlorophyll-*a* value of 3.9 µg/L was above the NHDES threshold of 3.3 µg/L for a low-nutrient lake and indicates that Gregg Lake is “Impaired” for support of aquatic life. Algal growth is usually a response to nutrient loading, especially of phosphorus.

Dissolved Oxygen. Oxygen dissolved in the water is critical for aquatic organisms. Oxygen levels at the bottom of Gregg Lake fall below those supporting aquatic life early in the summer and remain low through October. We estimate that during the summer months Gregg Lake does not support aquatic life below a depth of about 20 feet—about 20% of the lake volume. Extremely low oxygen at depths below 30 feet—covering about 4% of the lake bottom—likely contributes to internal phosphorus loading by promoting release of bound phosphorus from rocks and sediment.

Water Quality Advisory Committee

In early June, we’ll be convening a Water Quality Advisory Committee, whose mission it will be to set long-range water quality goals for Gregg Lake using our analysis of the water quality data collected since 1978 and additional information from NHDES, FB Environmental and NH Fish & Game to make informed decisions. In setting our goals, we’ll need to consider the limited remaining assimilative capacity for phosphorus, the “Impaired” status for chlorophyll-*a*, the low oxygen levels in the deepest waters, decreasing transparency, increasing turbidity and color, the trend of increasing bacteria at the Town Beach and possible cyanobacteria outbreaks. The water quality goals will form the basis for the watershed management plan we’ll be completing over the next year, which will outline realistic and achievable actions we can take to meet the goals we’ve set, such as reducing the amount of sediment, nitrogen and phosphorus carried into the lake by stormwater runoff. Since identified erosion “hotspots” account for approximately 30% of the total lake phosphorus load, implementing erosion controls in these areas would have a dramatic long-term effect on Gregg Lake’s water quality.

We anticipate that the Water Quality Advisory Committee will meet only once or twice this summer, and it is important that it be made up of people with different stakes and interests in Gregg Lake. NHDES and FB Environmental will guide us in setting goals. NH Fish & Game will also be invited to contribute. If you would like to take part in this important discussion, please contact Joan Gorga at 588-2569 or jgorga2@gorga.org.



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