Gregg Lake Watershed Management Plan Development

A Final Report to

The New Hampshire Department of Environmental Services

Submitted by

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Executive Summary

The project developed a watershed management plan for Gregg Lake in Antrim, New Hampshire, to reverse a trend in declining water quality and restore conditions that will continue to support wildlife and recreation. Available data suggested that a higher-than-desired phosphorus level was resulting in algae proliferation and low dissolved oxygen. Further data analysis would allow us to calculate watershed phosphorus loading, set specific target nutrient levels, model future watershed loads, identify areas of special concern and set specific goals for reducing nutrient loads. A community outreach plan would increase awareness of the threats to the health of Gregg Lake and pursue buy-in from area landowners and recreational users for future implementation of the management plan.

The project was performed between 12/6/2017 and 3/31/2020 at a total cost of $64,900. A Watershed Assistance Grant from the New Hampshire Department of Environmental Services (NHDES) provided $25,000 in funding with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency; the remaining $39,900 came from volunteer match time.

The project objectives were to: 1) issue a RFQ to aid in the development of the WMP; 2) prepare a SSPP; 3) assemble water quality data and calculate the assimilative capacity for phosphorus; 4) establish a water-quality goal; 5) identify current and future pollution sources; 6) estimate the pollution reduction and determine actions needed; 7) develop an implementation schedule, identify milestones and establish a tracking strategy; 8) develop an outreach strategy; 9) publish a WMP; and 10) prepare reports. All project objectives were met.

Introduction

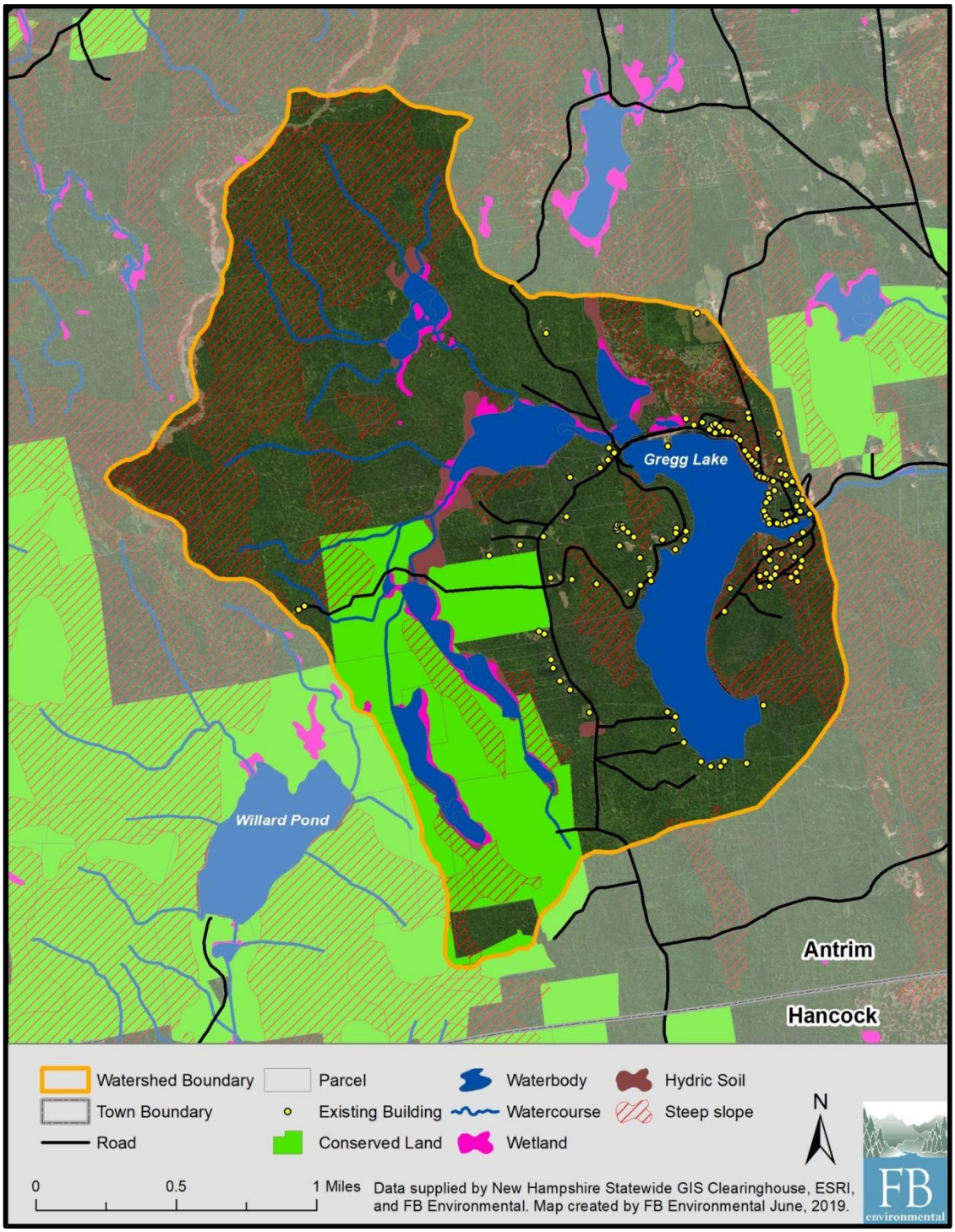
Gregg Lake (NHLAK700030108-02-1) is located in the Town of Antrim in New Hampshire's Monadnock Region. It is part of the Great Brook–Antrim Tributaries watershed of the Contoocook River, a tributary of the Merrimack River. Gregg Lake is a 195-acre water body with a mean depth of 5.3 meters and a maximum depth of 11 meters. It is rated as oligotrophic. The 2,944-acre watershed is largely undeveloped, with 34% of the area conserved by NH Audubon, the Harris Center for Conservation Education and other conservation easements. Much of the watershed is considered "highest rank habitat" by the NH Fish and Game Department. Drainage from approximately 70% of the watershed enters Gregg Lake through the major inlet stream, Hattie Brown Brook. Although Gregg Lake is a natural lake, the outflow at Great Brook is dam-controlled and raises the lake by approximately 3 meters.

Gregg Lake has been protected by active Weed Watcher and Lake Host programs for many years, and water quality data has been collected through the VLAP program since 1997. Gregg Lake was added to the New Hampshire Department of Environmental Services (NHDES) 303(d) list in 2004 as impaired for aquatic life use due to elevated levels of phosphorus and chlorophyll-*a*. In 2015, unprecedented algal blooms first appeared, and 2018 brought the first documented appearance of cyanobacteria.

Concerned Antrim residents formed a committee to address the apparent decline in water quality in Gregg Lake and applied for 303(d) funding to help develop a watershed management plan, proposing to perform much of the work on the project ourselves. Most of the grant funding was used to hire FB Environmental Associates to advise as needed; the bulk of the work was performed by community

volunteers. Volunteers who worked on the project represented a broad spectrum of seasonal and year-round community residents, including several town officials.

Watershed Map



Project Objectives

Objective 1 was to develop and issue a Request for Qualifications (RFQ) to aid in the development of the Gregg Lake WMP.

Objective 2 was to prepare a Site-Specific Project Plan (SSPP).

Objective 3 was to assemble water quality data and determine the assimilative capacity for phosphorus for Gregg Lake.

Objective 4 was to establish a water-quality goal for Gregg Lake.

Objective 5 was to identify current and future pollution sources.

Objective 6 was to estimate the pollution reduction and determine actions needed to maintain the water quality goal and predicted future watershed conditions.

Objective 7 was to develop an estimated schedule for implementing prioritized BMP strategies, interim measurable milestones for determining whether actions are being implemented and a water quality monitoring and tracking strategy to identify shortcomings in the existing data and guide future monitoring to assess the plan's success in meeting the water quality goals.

Objective 8 was to develop a watershed outreach strategy and provide multiple opportunities for participatory involvement for watershed residents and education through outreach.

Objective 9 was to publish a Watershed Management Plan for Gregg Lake.

Objective 10 was to prepare semi-annual reports and a final project report for NHDES.

Project Objective Verification

Objective 1. The RFQ was developed and issued. Two well-qualified responses were received, and FB Environmental Associates (FBE) was chosen as the project consultant to advise us as needed in developing the WMP for Gregg Lake.

Objective 2. In collaboration with FBE, the SSPP was prepared and approved by NHDES to define the methods to be used to develop the WMP.

Objective 3. Water quality data collected over forty years were analyzed and summarized in the Gregg Lake Water Quality Summary document. The total assimilative capacity, reserve assimilative capacity and remaining assimilative capacity for phosphorus and chlorophyll-*a* were calculated. Gregg Lake was found to have no reserve assimilative capacity for chlorophyll-*a*, and therefore to be impaired overall. These calculations provided quantitative values to be used for setting water quality goals.

Objective 4. A public Water Quality Advisory Committee meeting, including representatives from NHDES, FBE and the Town of Antrim and local community members, reviewed the existing data and set a goal to restore the water quality of Gregg Lake to remove the impaired status. The process set a quantitative water quality goal and was documented in the Water Quality Goal Memorandum.

Objective 5. A Build-out Analysis for the Gregg Lake watershed was prepared and the Lake Loading Response Model was used to determine annual pollutant source loads for the watershed. Estimates of the pressures of future development on Gregg Lake's water quality allowed us to include those potential loads in determining required load reductions. Modeling allowed us to quantify pollutant loading from different sources and prioritize sites for remediation.

Objective 6. NPS management measures estimated to achieve the necessary load reduction were prioritized and critical areas needing management measures were identified. Actions were identified that are realistically achievable and collectively will maintain the water quality goal; these actions were summarized in the Action Plan.

Objective 7. As part of the Action Plan, a schedule was developed for implementing prioritized BMP strategies. Interim measurable milestones and a water quality monitoring and tracking strategy, outlined in the Milestones, Monitoring and Tracking document, serve to determine whether actions are being implemented and assess the plan's success in meeting the water quality goals.

Objective 8. The Outreach Strategy document set out the approach to involving watershed residents and lake users in implementing the WMP. Participation by the community will be essential to controlling nonpoint source pollution in Gregg Lake.

Objective 9. The Watershed Management Plan for Gregg Lake was completed and published on the Town of Antrim website. The complete WMP will serve as a useful reference as part of the 2020 Antrim Master Plan and will guide us in carrying out the plan. The Rollout meeting was postponed indefinitely due to efforts to control the COVID-19 outbreak.

Objective 10. All semi-annual reports were submitted on time and kept us aware of where we were in the project. The final project report was prepared and submitted to NHDES.

Project Outcomes and Measurable Results

The desired outcome of this project was the production of a watershed management plan to guide the Town of Antrim in reversing the decline in water quality in Gregg Lake. We undertook a detailed analysis of all water quality data available for Gregg Lake, including statistical analyses of water quality trends, following the methods outlined in the SSPP. Anticipating that the somewhat sparse and variable available data would be a liability, we performed VLAP sampling monthly from April through October in 2017 and 2018 to improve the strength of our data. In addition, we added four upstream sampling stations to get a better view of pollutants being carried into the lake from those areas. The additional data greatly enhanced our understanding of the processes at work in Gregg Lake. Data sorting and statistical analyses were performed by one person and independently checked for errors by another, as

described in the SSPP. The water quality data and analyses are summarized in the Gregg Lake Water Quality Summary.

Instead of asking residents to respond online, we performed a survey of septic systems by visiting all 54 homes within 250 feet of the Gregg Lake shoreline. This provided an opportunity for outreach, discussion and feedback from residents. More than 75% of residents provided information about their septic systems, as well as other observations about the lake. Partial information on other properties was gleaned from property cards to make a fairly complete assessment of ages and locations of septic systems in the watershed. Results are provided in the Septic Summary.

Similarly, to raise lakeshore residents' awareness of their phosphorus loading to the lake, we chose not to set up an online survey, but to hand out brief self-evaluations while discussing the issues. Many of the seasonal residents have limited or no internet access at their lake houses and were less likely to think about taking a phosphorus survey at home. We also chose to spread discussions of stormwater management and lakeshore landscaping over multiple meetings, to culminate in Soak Up the Rain/LakeSmart/Landscaping training in upcoming summer months.

In our first evaluation of erosion hotspots, 31 locations were documented. After FB Environmental calculated phosphorus, sediment and nitrogen loading for those locations, a second shoreline survey was performed. An additional 32 sites were identified and assigned loading values based on those from the initial shoreline survey. This approach allowed us to identify sites not visible from public property, but essential to reaching the targeted water quality goals. The process is discussed in more detail in the Gregg Lake Action Plan document. Consideration of the second set of erosion hotspots brought us close to the target range for phosphorus loading reductions.

Conclusions and Recommendations

The project's desired environmental outcome was the production of a watershed management plan for Gregg Lake, a relatively small lake in a small rural New Hampshire town. We proposed developing the WMP on a small budget, with the Town's contribution being almost entirely volunteer time and a minimal amount of professional support coming from an environmental consultant. Although at times it has seemed to be an overwhelming task, we continue to believe that by performing most of the work ourselves, we have developed a thorough understanding of the issues challenging Gregg Lake. We succeeded in developing a WMP with goals that the Town of Antrim and community residents should be able to implement over the next ten years. Many of the suggested BMPs are fully within the capabilities of the Antrim Highway Department and they have agreed to schedule them. The Gregg Lake community has generally been supportive of developing the WMP and now has increased awareness of the water quality challenges we're facing and possible solutions. Several private landowners have already stepped forward to upgrade failing septic systems or donate conservation easements.

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- Antrim residents site increased Gregg Lake pollution, *Messenger,* 11/17/2017
- Preserving Gregg Lake quality, *Villager,* 6/15/2018
- Meeting to Discuss Gregg Lake Quality, *Monadnock Ledger-Transcript,* 11/26/2019
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- Board Briefed on Gregg Lake Watershed Plan, *Messenger*, 1/17/2020
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