EXECUTIVE SUMMARY

PROVINCE LAKE WATERSHED MANAGEMENT PLAN

July 2014

Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency.

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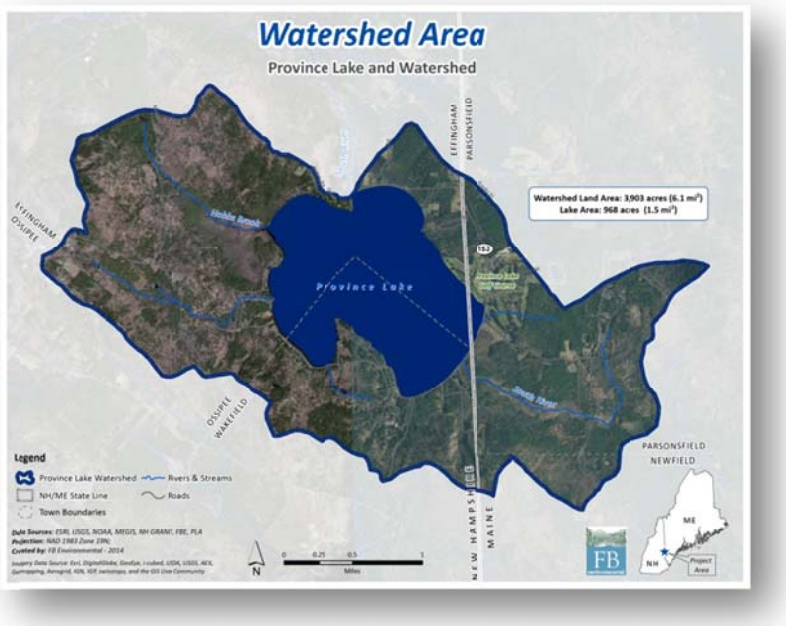
PURPOSE OF THE PLAN

The Province Lake Watershed Management Plan describes the water quality conditions, watershed characteristics, and steps that can be taken to improve and restore the lake's water quality. The Plan establishes water quality goals and objectives, and outlines the actions needed to reach them. Long-term management and funding options for water quality improvements are also discussed. The Plan is the culmination of a major effort led by the Province Lake Association in cooperation with many local and state partners. The Plan is intended to serve as a roadmap for collaborative water quality restoration.

THE PROVINCE LAKE WATERSHED

Within the White Mountain Region of north-central New Hampshire, and southwestern Maine, the Province Lake watershed is located in the towns of Effingham (45%), Wakefield (17%), and Ossipee (4%) in Carroll County, New Hampshire, and Parsonsfield (30%) and Newfield (4%) in York County, Maine. Province Lake flows north into the South River, which flows north to the Ossipee River, a tributary of the Saco River.



The Province Lake watershed covers 6.1 square miles on the New Hampshire/Maine border (Map 1, Appendix A).

Province Lake's watershed (3,903 acres) is small relative to the size of the lake (968 acres). The watershed contains a large percentage of forestland (84%), as well as developed land (12%) (including shoreline development, a golf course, and several private campgrounds), wetlands (3%), and agriculture (1%).

THE PROBLEM

Province Lake is listed on the New Hampshire Department of Environmental Services (NH DES) 2010 and 2012 303(d) list as impaired for Aquatic Life Use due to low pH, high levels of chlorophyll-a and total phosphorus, and is impaired for fish consumption due to mercury. It is also on the 2012 303(d) list as impaired for Primary Contact Recreation (swimming) due to reoccurring cyanobacteria blooms.

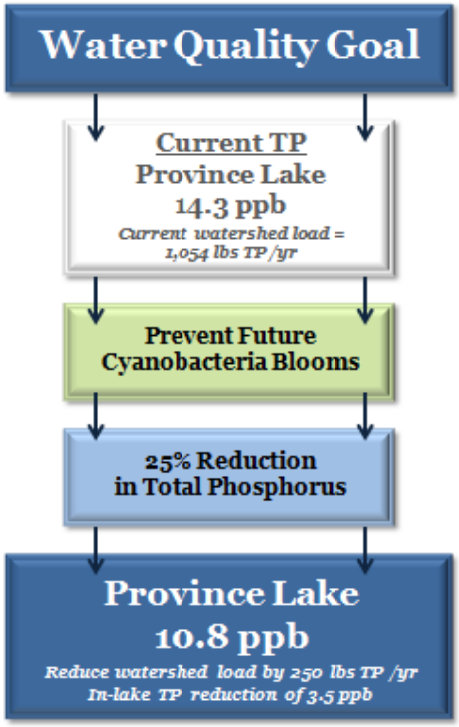
Since the fall of 2010, there has been an increasing prevalence of documented cyanobacteria blooms in localized areas within Province Lake. An abundance of cyanobacteria may indicate excessive phosphorus inputs in the lake, or that the lake ecology is out of balance.

Since 2010, documented cyanobacteria blooms are becoming more frequent on Province Lake- posing a threat to public health. (Photo: AWWA)

Cyanobacteria are a concern in Province Lake for many reasons, including lake aesthetics, concern about declining water clarity and the associated economic effects to the area, and most importantly, the potential affects to wildlife, domestic animals and human health. Cyanotoxins are released into the water when cells die or are consumed by organisms higher in the food chain. Ingesting lake water and/or recreating on a lake with high levels of cyanobacteria can result in both acute and chronic illnesses (NH DES, 2013b) that target the liver, kidney, the central nervous system and skin. Since some forms of cyanobacteria are toxic to people as well as other animals, these blooms have resulted in public beach advisories at targeted areas along the shore to protect public health.

While cyanobacteria are naturally occurring in all lakes, their abundance can increase as lake nutrients increase. Increases in phosphorus, (the limiting nutrient in freshwater systems) provide food for algae and cyanobacteria. Other factors that result in bloom conditions include increased water temperature, sunlight, and wind and motorboat activity which can resuspend sediments and nutrients back into the water column. Province Lake is susceptible to all of the above conditions due to its shallow depth, long pitch, and large photic zone (a lighted and well-mixed portion of the lake that extends from the lake surface down to where the light levels decrease to 1% of that at the surface).

The documented cyanobacteria blooms in Province Lake are a signal that current land-use practices on developed land throughout the watershed may be contributing excess sediment and nutrients from soil erosion, aging septic systems, and roads (among other factors), and affecting the health and function of the lake system. Immediate action is needed to prevent future occurrences of potentially toxic cyanobacteria blooms in Province Lake.



THE GOAL

The Province Lake Project Management Team with technical support from FB Environmental Associates, set a water quality goal to prevent the future occurrence of toxic cyanobacteria blooms on Province Lake. This goal is to reduce the amount of phosphorus entering the lake by 25% (equivalent to 250 pounds of phosphorus) over the next 10-15 years.

A 25% reduction is no easy task, and because there are diffuse sources of phosphorus getting into the lake from existing residential development, roads, septic systems, and other land uses in the watershed, it will require an integrated and adaptive approach across many different parts of the watershed community to be successful.

ACTIONS NEEDED TO ACHIEVE THE GOAL

The Province Lake Watershed Management Plan provides the means to make the water quality goal a reality. An action plan was developed for Province Lake based on feedback from approximately sixty community members that attended the community forum on January 18, 2014. These stakeholders discussed what they perceived to be the greatest threats to Province Lake's water quality, and developed solutions to address them. The Province Lake Project Management Committee helped further refine these inputs into action items with associated time frames and estimated costs as presented in the action plan (Section 5.2).

The action plan is divided into six major categories which are expected to result in the following load reductions:

Category	**Estimated Load Reduction** *(lbs TP/yr)*
Septic Systems	44 - 55
Shoreline BMPs	66 - 99
Roads	110 - 165
Ordinances & Land Conservation	187 - 209
Boating	TBD
Water Quality Monitoring	N/A
TOTAL EST. LOAD REDUCTION	***407 - 528 lbs/yr***

THE 25% TARGET REDUCTION IN PHOSPHORUS CAN BE ACHIEVEDTHROUGH THE FOLLOWING OBJECTIVES:

1) *Utilize the BMP matrix to identify, prioritize, and implement BMPs throughout the watershed to reduce sediment and phosphorus runoff from existing shoreline development and roads;*
2) *Educate landowners through BMP demonstration sites, workshops, and other communication strategies, targeting high priority septic systems (>20 years old, within 50 feet of a water resource, rarely pumped out, or inadequate);*
3) *Institute greater controls on new residential development and conversion of seasonal to year-round homes by requiring low-impact development (LID) in site plans, and encourage regular septic system maintenance;*
4) *Protect high value plant and animal habitat, wetlands, and riparian areas through permanent conservation options such as conservation easements;*
5) *Continue and/or enhance the water quality monitoring and aquatic invasive plant control programs.*

The action plan is not only designed to reduce phosphorus loading to Province Lake, but also to promote communication between citizens, municipalities, and state agencies. The action plan outlines pollution reduction targets, responsible parties, potential funding sources, approximate costs, and an implementation schedule for each task within each of the six categories.

FUNDING THE PLAN

The cost of successfully implementing this watershed plan, and to improve water quality in Province Lake is estimated at close to $70,000 per year over the next 10 - 15 years (approximately $18/watershed acre/year). However, many costs are estimated, and many have not yet been factored in. Any changes to the plan should be incorporated into the watershed action plan as information becomes available- through research and after factoring in site-specific design considerations including structural BMPs, such as fixing eroding roads and planting shoreline buffers, and non-structural BMPs such as improving ordinances.

Estimated costs by category are presented below:

Category	**Estimated Annual Cost**	**10-year Total**
Education & Outreach	22,000	$220,000
Municipal Ordinances	$9,600	$96,000
Shoreline & Road BMPs	$34,000	$340,000
Monitoring	$3,700	$37,000
TOTAL EST. COST	***$69,300***	***$693,000***

A diverse source of funding and a funding strategy will be needed to fully fund planned implementation activities. Funding for **education and outreach** might come from the PLA and AWWA, or state and federal grants. Funding to cover **ordinance revisions** could be supported by municipalities through tax collection, permit fees, or violation fees. Funding to improve **septic systems, public and private roads, and shoreland buffers** could be matched by the states, road associations, private property owners and commercial campgrounds most affected by the improvements. **Monitoring and assessment** funding could come from a variety of sources, including state and federal grants (Section 319, ARM, Moose Plate, etc.) and the Province Lake Association (PLA). The funding strategy should be incorporated into this plan within the first year, and be revisited on an annual basis.

MEASURING SUCCESS

Environmental, Social and Programmatic Indicators and numeric targets (benchmarks) were established to quantitatively measure the progress of the Watershed Plan (Section 5.3). The indicators were developed to reflect how well watershed implementation activities are working, and provides a means by which to track progress toward the established goals and objectives. The benchmarks represent short-term (1-2 years), mid-term (2-5 years) and long-term (5-10 years) targets for improving water quality.

Indicators	**Benchmarks*** *(1-2 years)*	**Benchmarks*** *(2-5 years)*	**Benchmarks*** *(5-10 years)*
Improvement in average annual water clarity ***Goal: 3.0 meters***	+ 0.1 m	+ 0.25 m	+ 0.4 m
Reduction in the in-lake phosphorus concentration ***Goal: 10.8 ppb***	10% of goal= 14.0 ppb	30% of goal= 13.3 ppb	75% of goal= 11.7 ppb
Percent reduction in the number of reported algal blooms ***Goal: No reported blooms***	10%	50%	90 - 100%
Decreasing trend in apparent color ***Goal: Non-colored, decreasing trend***	< 30 PCU	< 25 PCU	<20 PCU

** Benchmarks are cumulative starting at year 1.*

Much of this progress weighs heavily on the cooperation of local municipalities and key stakeholders to support the plan, and the ability of the Province Lake Watershed Steering Committee to develop a sustainable funding strategy. Setting benchmarks allows for periodic updates to the plan, maintains and sustains the action items, and makes the plan relevant to ongoing activities. The steering committee will review the benchmarks for each indicator on an annual basis to determine if progress is being made, and then determine if the watershed plan needs to be revised if the targets are not being met.

ADMINISTERING THE PLAN

The Province Lake Watershed Management Plan provides a framework for restoring the Province Lake watershed in order to improve water quality conditions so that the lake no longer supports cyanobacteria blooms. The plan includes a series of goals and objectives, or planning actions including: a list of high-priority sites for restoration, phosphorus loading reductions, cost estimates, preliminary funding mechanisms, benchmarks for measuring success, and a timeframe for accomplishing each of the action items.

Rainbow over Province Lake (Photo: Barber, PLA)

The plan will be led by the combined efforts of the Province Lake Association (PLA) and the Acton Wakefield Watersheds Alliance (AWWA), in coordination with a watershed steering committee. Because local participation is an integral part of the success of this plan, the committee should include the leadership of NH Department of Environmental Services (NH DES), Maine Department of Environmental Protection (DEP), local municipalities (including Wakefield, Effingham, New Hampshire and Parsonsfield, Maine) schools, community groups, local businesses, road associations, and individual landowners. The formation of smaller action committees that focus on the six main watershed action categories would result in more efficient implementation of the plan.

The steering committee will need to meet regularly and be diligent in coordinating resources to implement practices that will reduce nonpoint source pollution in the watershed, thereby eliminating the occurrence of toxic cyanobacteria blooms in Province Lake.