



MEMORANDUM

To: Falmouth Town Council
From: Kimberly Darling, Energy & Sustainability Coordinator
Nathan Poore, Town Manager
Date: October 5, 2017
Re: **Highland Lake Water Quality**

Highland Lake, a 623-acre lake in the towns of Windham, Falmouth and Westbrook has a watershed area of 8.4 square miles and a mean depth of 25 feet. There are about 900 homes in the watershed, including about 300 homes along its developed shoreline. The lake's hand-carry public boat launch has historically made it an accessible and popular destination for visitors.

The lake has been monitored since the 1970s. In the 1980s and 1990s, Highland Lake began showing troubling signs of declining water quality that threatened the loss of the lake's brown trout fishery. Excessive soil erosion throughout the watershed contributed to significant declines in water clarity and dissolved oxygen levels, prompting the Maine Department of Environmental Protection (DEP) to add Highland Lake to Maine's 1990 Clean Water Act (CWA) section 303(d) list of impaired waters for aquatic life support.

In 1997, Cumberland Country Soil and Water Conservation District (CCSWCD) began working with the Highland Lake Association (HLA) volunteers to conduct a watershed survey which identified 104 erosion sites (phosphorus sources). This data was used by CCSWCD and incorporated into the 1999 Highland Lake Watershed Management Plan. This plan described actions needed to restore the lake. Cost share agreements with public and private landowners for restoration work, including installing erosion control practices (plantings, waterbeds, infiltration steps, rain gardens and riprap), resulted in the amount of phosphorous exported to Highland Lake declining significantly over 13 years. Because of these efforts, the Maine DEP removed Highland Lake from its 2010 CWA section 303(d) list of impaired waters.

From 1999-2010, CCSWCD alongside Highland Lake volunteers applied, was awarded, and implemented the following work in the following phases through a DEP/EPA Nonpoint Source grant:

- 1999-2002—Highland Lake Phase 1—installed best management practices (BMPs) on both residential and road sites. The Highland Lake Youth Conservation Corps was established under this grant and installed BMPs on 88 sites from 2000-2002

- 2004-2008—Highland Lake Phase 2—work addressed export of eroded sediment and phosphorus at 100+ residential road sites
- 2008-2010—Highland Lake Phase 3—CCSWCD implemented BMPs on many of the sites identified in the updated Management Plan

Also during the years above, in 2003 the DEP completed a required Total Maximum Daily Load Report (TMDL) which is included in the Phosphorus Control Action Plan.

Excess nutrients or phosphorus in lakes promote nuisance algae growth/blooms resulting in the violation of water quality standards as measured by water clarity depths of less than 2 meters. A lake TMDL is prepared to estimate the total amount of total phosphorus that a lake can accept on an annual basis without harming the water quality. Historically, development of TMDLs was first mandated by the Clean Water Act in 1972, and was applied primarily to *point sources* of water pollution. Because of public pressure to further clean up water bodies, lake and stream TMDLs are now being prepared for watershed-generated *non-point* sources of pollution.

In 2005, CCSWCD completed an update of the Watershed Management Plan that incorporated all of the required elements of an EPA Watershed Based Plan and identified many new and/or additional sites that needed to be addressed in the watershed.

Although the lake was removed from DEP's list of impaired waters in 2010, it is evident that the lake today is in trouble. A gradual decline in water clarity on Highland Lake has been documented. Based on the lake's Secchi disc trend analysis (which measures the clarity of the water) it appears there has been a negative trend in Highland Lake's mean and seasonal minimum Secchi disk transparency values. The average annual Secchi disc reading for the eleven-year period from 1985-1995 was 5.5 meters, where from 1974 to 1984 the average was 6.4 meters. This average overall decline of nearly one meter corresponds to the decline in dissolved oxygen and signals an increase in algal biomass and sediment deposition.

Since 2010, the seasonal timing of the algal production shifted to a condition where most of the productivity period is during the summer months. From 2014-2017, Highland Lake began to develop short term blue green algal blooms that result in Secchi disc transparencies (SDTs) of less than 2.0 meters. During these last 4 years, the blooms consistently start in the last two weeks of July and end in the first two weeks of August. Given the consistency and timing, appearance and duration of the blooms, it is likely all four years were picoplankton blooms.

Earlier this summer, the HLA informed the towns of Windham and Falmouth about this bloom in the lake. In August, representatives of HLA and staff from both towns met to discuss developing a strategy to address commonly occurring sources of water quality degradation. This group also discussed the need to develop a plan to identify how and why this specific algae and bacteria are blooming in Highland Lake and no other lakes in Maine, and what solutions are necessary to prevent future blooms. In September, the same stakeholders along

with representatives from Maine DEP and CCWCD met to further discuss and refine a strategy. The expanded group categorized the strategy into two tracks:

Track A—Begin work and implement exiting policies, plans and practices that will have a positive impact on water quality.

- a.) Evaluate Falmouth and Windham Ordinances to determine strengths and weakness re: phosphorus control, subdivision regulations density, dock standards etc.;
- b.) Identify all Falmouth and Windham wastewater septic designs to determine how many were installed prior to 1974;
- c.) Identify scope and location (GIS map development) of all building permits issued in both communities since 2005;
- d.) Identify all private and public lots that were deemed important in the 2005 Highland Lake (Windham) Watershed Based Plan

Track B—Schedule stakeholder meeting with professional facilitation that will guide future actions to help determine the cause of current water quality issues and develop solutions.

- a.) Identify stakeholders (HLA, Towns, Maine DEP, CCSWCD, Maine Department of Inland Fisheries and Wildlife, Maine Land Bureau, Scientists, etc.);
- b.) Towns to coordinate logistics (i.e. invitations, location dates, etc.)
- c.) Towns of Windham and Falmouth to pay cost of professional facilitator;
- d.) Select smaller group to develop agenda and objective for the stakeholder meeting.

Lastly, the town managers will be presenting a governance structure for the future work of this group which will likely be proposed as a leadership team or stakeholder group. Representatives will be from groups that have been involved to date. It is also anticipated that the governance moving forward will not request Council appointments. We will submit a proposed resolution to the Town Council at a later date to request support for the governance of the project and general strategic plan.