Watchic Lake Association

WATER QUALITY RISK ASSESSMENT

FINAL REPORT

MARCH 2016

PREPARED BY

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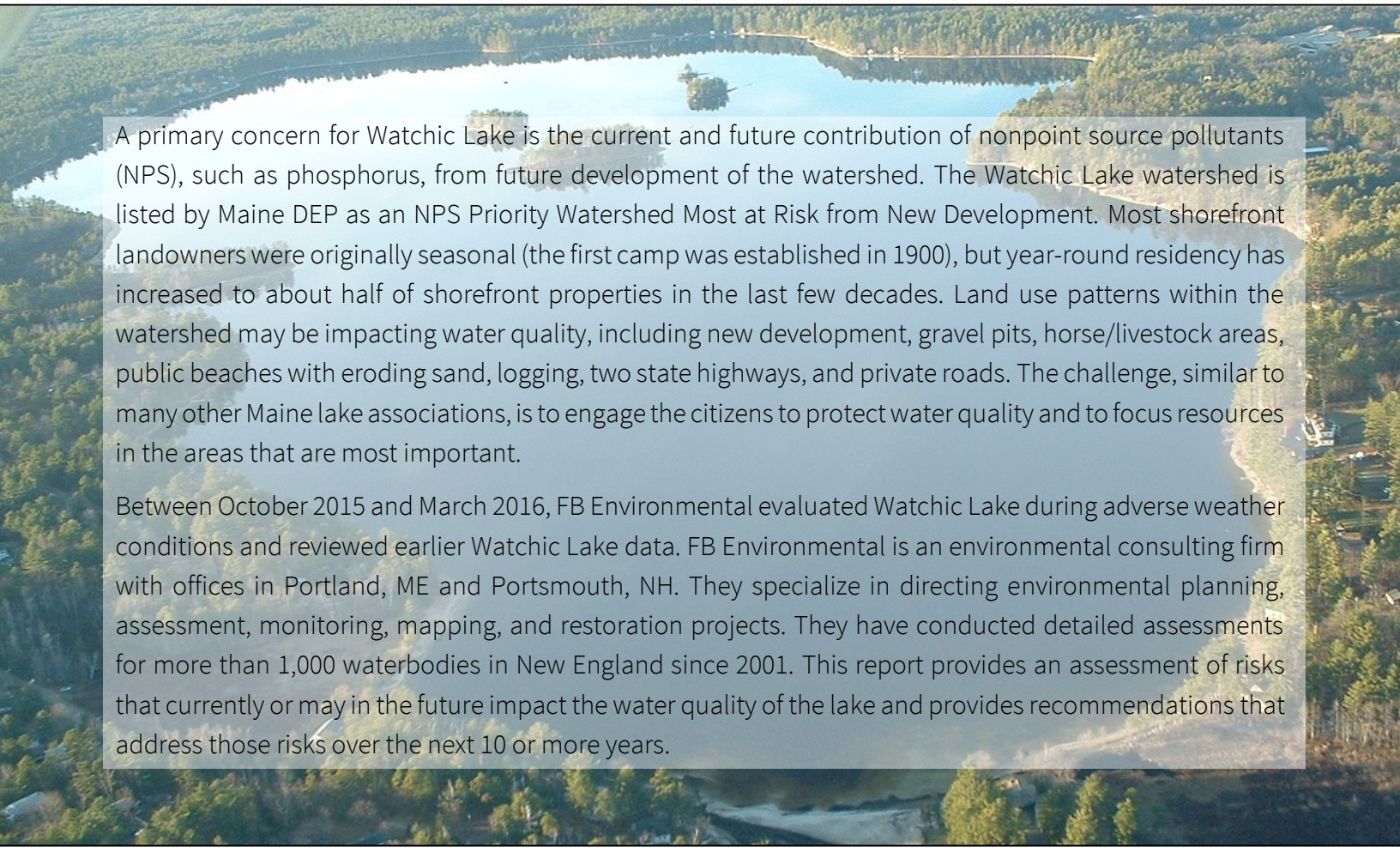
BACKGROUND

Watchic Lake is a 443-acre lake located in the Town of Standish, Maine. It has an average depth of 18 feet, a maximum depth of 41 feet, and a shoreline length of 5.5 miles. The water quality is listed by the State of Maine Volunteer Lake Management Program as "average," and there is evidence of low dissolved oxygen in bottom waters of the lake, likely a result of algal growth and decay stimulated by excess phosphorus input from watershed development. There are currently no known reports of aquatic invasives in the lake.

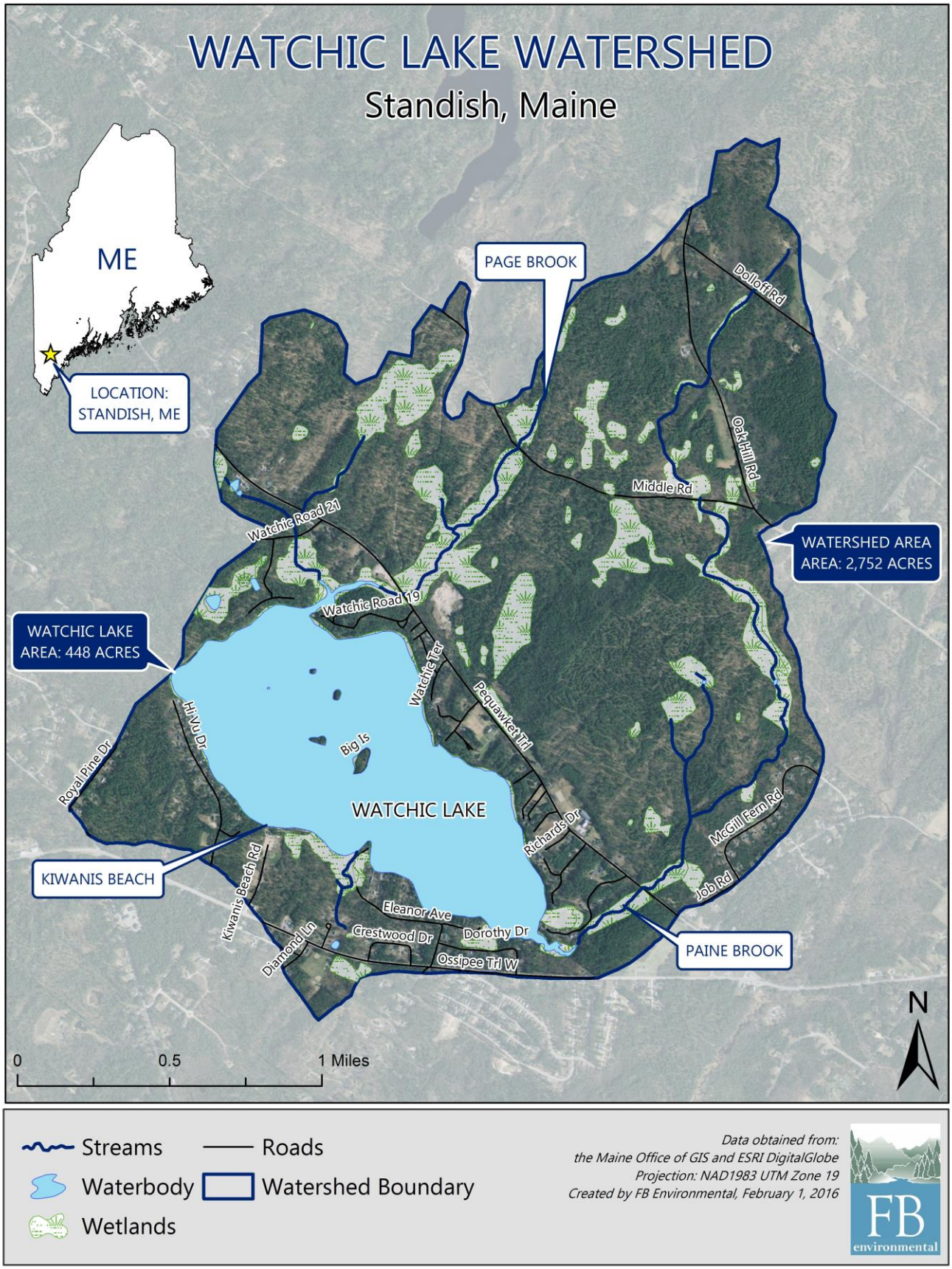
Watchic Lake is fed by two major tributaries – Page and Paine Brooks. The lake outlets through Watchic Brook on the northwest corner of the lake and continues to the Saco River. Since 1850, a dam at the outlet controls the lake's water level, which was 1.5 feet higher than it is today. The dam was deeded to the Watchic Lake Association (WLA) by Central Maine Power in 1956 and was rebuilt in 2010. There are no public boat launches, but non-motorized craft can launch off Kiwanis Beach, a public beach located on the western side of the lake.

The lake was managed for brown trout by the Maine Department of Inland Fisheries and Wildlife until the 1980's. Largemouth bass was introduced in 1956. Other fish present are perch and pickerel. According to the 1999 Watchic Pond Watershed Nonpoint Source Pollution Survey Project, coldwater fisheries habitat in the Watchic Lake watershed has degraded over the last several decades.



A primary concern for Watchic Lake is the current and future contribution of nonpoint source pollutants (NPS), such as phosphorus, from future development of the watershed. The Watchic Lake watershed is listed by Maine DEP as an NPS Priority Watershed Most at Risk from New Development. Most shorefront landowners were originally seasonal (the first camp was established in 1900), but year-round residency has increased to about half of shorefront properties in the last few decades. Land use patterns within the watershed may be impacting water quality, including new development, gravel pits, horse/livestock areas, public beaches with eroding sand, logging, two state highways, and private roads. The challenge, similar to many other Maine lake associations, is to engage the citizens to protect water quality and to focus resources in the areas that are most important.

Between October 2015 and March 2016, FB Environmental evaluated Watchic Lake during adverse weather conditions and reviewed earlier Watchic Lake data. FB Environmental is an environmental consulting firm with offices in Portland, ME and Portsmouth, NH. They specialize in directing environmental planning, assessment, monitoring, mapping, and restoration projects. They have conducted detailed assessments for more than 1,000 waterbodies in New England since 2001. This report provides an assessment of risks that currently or may in the future impact the water quality of the lake and provides recommendations that address those risks over the next 10 or more years.


WATCHIC LAKE WATERSHED
Standish, Maine
ME
LOCATION: STANDISH, ME
PAGE BROOK
Dolloff Rd
Oak Hill Rd
Middle Rd
Watchic Road 21
Watchic Road 19
WATERSHED AREA
AREA: 2,752 ACRES
WATCHIC LAKE
AREA: 448 ACRES
Watchic Ter
Pequawket Trl
Hi Vu Dr
Big Is
Royal Pine Dr
WATCHIC LAKE
Richards Dr
McGill Fern Rd
Job Rd
KIWANIS BEACH
Kiwanis Beach Rd
Eleanor Ave
Crestwood Dr
Dorothy Dr
Diamond Ln
Ossipee Trl W
PAINE BROOK
N
0
0.5
1 Miles
Streams
Roads
Waterbody
Watershed Boundary
Wetlands
Data obtained from:
the Maine Office of GIS and ESRI DigitalGlobe
Projection: NAD1983 UTM Zone 19
Created by FB Environmental, February 1, 2016
FB
environmental

CURRENT EFFORTS

The Watchic Lake Association (WLA) is a very active organization that has undertaken recent projects to repair the outlet dam, treat runoff from the Paine neighborhood, and survey citizens on what they believe are key issues related to the lake.

YEAR	ACCOMPLISHMENT
1956	WLA founded.
1974	State and WLA volunteers begin water quality monitoring program.
1998	WLA, Cumberland County SWCD, and Maine DEP completed a Nonpoint Source Pollution Survey and 12 technical assistance visits to shorefront properties; 31 volunteers assisted project staff to identify and prioritize existing sources of polluted runoff, particularly soil erosion sites, in the watershed; identified 135 sites impacting water quality (55% residential, 15% private roads, 15% driveways, 8% State roads, 4% boat access, 2% beach, and 2% town roads).
2000-2004	Watchic Lake Demonstration Project, sponsored by the Cumberland County SWCD; installed 13 BMPs (Kiwanis Beach, 1 State road, 2 private roads, 2 driveways, 1 boat launch, 6 residential sites); one site on Watchic Terrace Road included the installation of several catch basins, curbing, a settling pool, and paving of the entire road; success of this project was achieved only through strong local commitment of lake association members and landowners; another site at Kiwanis Beach included the installation of water-bars, retaining walls, stairs, and plantings by 38 volunteers; Bonny Eagle High School students helped plant buffers around multiple residences; all projects estimated to reduce 38 tons/yr of sediment from reaching the lake; public presentations were made; watershed boundary and demonstration project signs were installed.
2002	Aquatic Invasive Plant (AIP) survey completed by volunteers.
2003	AIP Rapid Assessment Survey conducted by Maine DEP.
2004-2015	WLA and shorefront residents have actively participated in the LakeSmart Program and are on target to receive the Gold Award by the Maine Lakes Society once 30 LakeSmart awards are achieved (currently at 25 awards; 12 properties were reviewed in 2015).
2005	WLA recognized the need to redo 1955 Association Articles of Incorporation and Bylaws, as well as establish operational strategy and measurable goals. Chemical analyses of lake water stopped; Secchi disk transparency readings continued by volunteers.
2006	WLA developed Mission and Vision Statements and set forth strategic imperatives with goals and action plans. From direction provided, WLA developed Articles of Incorporation and Bylaws in conjunction with an outside law firm, received approval by Association membership, and filed.

YEAR	ACCOMPLISHMENT
2007	WLA applied for and received 501(c)(3) status.
2008	WLA revised Articles of Incorporation and Bylaws and approved. This was required for better alignment with long term objectives.
2009	Initial evaluation of dam indicated structural issues; significantly higher risk of dam failure than originally believed.
	Chemical analyses of lake water at multiple lake sites began again to assess the potential impact of runoff from a horse farm near the lake. Monitoring completed by volunteer.
2010	WLA set forth Capital Fund Drive from membership and prepared to implement a dam rebuild. WLA secured financing and completed the dam work and Phase I of the Capital Fund Drive.
2011	WLA continued Capital Fund Drive Phase II.
	WLA and the Town of Standish worked together to plan, engineer, and raise funds to address erosion issues coming from the Paine Neighborhood. In fall 2011, project staff retrofitted horse farm runoff that was impacting water quality in the lake, diverted water and added riprap to runoff point to lake, installed overflow measures, and added a settling pond at the outfall.
2012	Some adjustments to construction work on Paine Neighborhood project addressed and completed by WLA and the Town of Standish.
2013	WLA added fencing and other safety measures around the dam.
	Capital Fund Drive pledges far exceeded WLA expectations.
2015	WLA surveyed 230 property owners to determine what they view as key concerns, issues, and activities in the watershed. Received 81 responses (35%). Top 5 concerns were invasive species infestation, water clarity, loon populations, nutrient runoff pollution, and septic system maintenance. Survey showed that most members understand WLA activities, but non-members do not fully understand the work or the importance of the work that WLA carries out. Once people understand what WLA does, then they are more apt to become a member.
	FBE technical staff conducted a nonpoint source pollution survey around the shoreline of the lake to identify sources of sediment and phosphorus. See results in Appendix A.
	WLA installed a new dam gate that will be easier to operate and achieve a consistent water level in the lake.
	Six association board members received Maine VLMP Invasive Plant Patrol training.
	Volunteer(s) received Maine VLMP Secchi certification.

RISK ASSESSMENT & RECOMMENDATIONS

This section provides an expert assessment of major risks and potential threats that are currently or may in the future impact the water quality of Watchic Lake. For each of these threats, we provide specific recommendations that address those major risks over the next 10 or more years. Five major risks were identified:

1) Polluted runoff from new and existing development

2) Declining water quality and wildlife habitat

3) Invasive species

4) Climate change

5) Educational Awareness

Each recommendation was assigned a responsible party or parties, potential funding source(s), tentative timeframe for implementation, and estimated cost. Most of the estimated costs are based on our professional experience carrying out those tasks for other projects that we have worked on over the last 20 years. Our opinion of top priority items in each category are written in blue.

FUNDING

To implement the recommendations in the following sections, it is critical to establish and maintain a sustainable funding mechanism. A long-term funding mechanism should be established to provide financial resources for restoration actions and should be guided by an advisory committee that would include representatives from the Town of Standish, WLA, watershed residents, land trusts, and more. Funding is a critical element of sustaining the restoration process, and once it is established, the recommendations can be fully vetted and restoration activities can move forward.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Sustainable Funding Mechanism	Continue Capital Fund Drive activity with Town participation to ensure progress on action plan.	WLA, Town of Standish	Donations, Volunteer Members	2017, 2022	NA
	Create a funding advisory committee that determines how funding is spent on priority action items.	WLA, Town of Standish, Landowners, Land Trusts	Volunteer Members	2016-26	NA

POLLUTED RUNOFF FROM NEW AND EXISTING DEVELOPMENT

New and existing development is most often the greatest threat to lake water quality because eroding soils at construction sites or along unbuffered shorelines can carry phosphorus-laden sediment to the lake. Phosphorus is a key limiting nutrient for algal and plant growth, which can decrease water clarity and dissolved oxygen levels at the lake bottom. Fortunately, this risk to water quality can be addressed through responsible stewardship of properties in the watershed. This includes the implementation of structural Best Management Practices (BMPs) that slow and filter runoff from the landscape, trapping sediment and phosphorus before reaching the lake. Focus should be given to those recommended BMPs that are most cost-efficient for the amount of phosphorus and sediment treated. Direct shoreline areas are typically among the highest for pollutant loading given their proximity to lakes and desirability for development. The BMPs recommended in this plan are restoration tools that property owners can use to minimize impacts from stormwater runoff and restore degraded shoreline areas. This could be as simple as planting vegetated buffers, installing driplines along roof edges, and ensuring that path and driveway runoff is filtered into the ground rather than running overland and into the lake.

Water quality can also be protected through non-structural BMPs, which are restoration practices that prevent or reduce stormwater-related runoff problems by providing a regulatory framework for managing pollutants. Non-structural approaches to watershed restoration can be the most cost-effective and holistic practices within a watershed management framework. In watersheds with future development potential, it is critical for municipalities to develop and enforce stormwater management criteria to prevent any increase in pollutant loadings. Municipal land-use regulations are a guiding force for where and what type of development can occur in a watershed, and therefore, how water quality is affected because of this development. One of the biggest threats to water quality are old or improperly-maintained septic systems. Inundation of systems by groundwater greatly enhances the transport of phosphorus and pathogens to the lake. Therefore, it is critical to ensure adequate setbacks and good vertical separation from the seasonally-high groundwater table.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Phosphorus-laden sediment in stormwater runoff	1. Follow-up on BMP sites identified during FBE 2015 rainy day survey for more specific design plans and cost estimates for implementation (refer to Appendix A). Start NPS Site Tracker. *Cost does not include implementation, but design work should be followed up with DEP 319 funding or other sources for site remediation.*	WLA, Consultant	WLA, Donations	2016-17	$5,000
	2. Assess condition of 13 BMP sites installed from 2000-2004; prioritize for any maintenance needed.	WLA, Consultant	WLA, Donations	2016-17	$1,000

SPECIFIC THREAT		ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
	3.	Revisit 135 sites in 1998 NPS survey to re-evaluate current site conditions.	WLA, Consultant	WLA, Donations	2016-17	$7,000
	4.	Continue LakeSmart Program. Goal: increase to 50% of shorefront properties and achieve "Gold Award."	WLA, Landowners, Maine Lakes Society	WLA	2016-26	NA
	5.	Conduct shoreline survey of lake and repeat every 5 years to assess and document change in shoreline condition over time. Assumes volunteer help. *Could be done in conjunction with shoreline zone enforcement purposes.*	WLA, Consultant	WLA, Donations	2016, 2021, 2026	$4,000 each survey
	6.	Re-survey all implemented BMP sites every 5 years to assess functionality.	WLA, Consultant	WLA, Donations	2016, 2021, 2026	$5,000
	7.	Consider adding a "Self-Assessment Quiz" to the WLA website that helps homeowners determine whether or not they have a stormwater runoff or buffer problem on their property.	WLA	WLA, Donations	2016-18	$500
	8.	Organize and host an annual spring plant sale. Locally-sourced, native plants can be used for shoreline buffer plantings by landowners. Assumes volunteer coordination with local greenhouse.	WLA	WLA, Donations	2016-26	$500/yr
Improper road maintenance	9.	Work with road agents, associations, and landowners to manage sediment and salt runoff from roads (private, town, and state).	Town of Standish, Road Associations, Landowners	Town of Standish, Road Associations	2016-26	TBD
	10.	Require training for road agents on proper salt, sand, and equipment use to minimize water quality impact.	Town of Standish	Town of Standish	2016-26	$5,000
Improper septic system maintenance	11.	Inspect all home conversions from seasonal to permanent residences and property transfers for proper septic system size and design. Goal: 20 systems.	Town of Standish	Town of Standish	2016-26	$250/system
	12.	Consider developing an ordinance that requires regular septic system pump-outs.	Town of Standish	Town of Standish	2016-26	TBD

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Inadequate regulatory protection of land development	13. Review and revise local ordinances to include better site design, low impact development, and green infrastructure principles that limit the amount of phosphorus, nitrogen, sediment, and acidic waters from reaching waterbodies. Consultant can provide technical review of local ordinances and provide suggestions for improvement.	Town of Standish, Consultant	Town of Standish	2016-18	$7,000
	14. Fund tools, such as build-out scenario programs, GIS based natural resource inventories/critical area habitat assessments, to help target critical land for protection or where current zoning may threaten forested areas.	Town of Standish, WLA	Town of Standish, WLA	2016-20	$18,000 ($6,000 for build out analysis; $12,000 for NRI/critical area habitat assessment)
	15. Permanently protect undeveloped parcels to increase watershed resiliency to extreme weather events and prevent potential polluted runoff.	Town of Standish, WLA	Town of Standish, WLA	2016-26	TBD
	16. Control and monitor maximum occupancy levels for shorefront residential homes.	Town of Standish	Town of Standish	2016-26	$5,000

DECLINING WATER QUALITY/WILDLIFE HABITAT

Watchic Lake faces elevated historical averages of total phosphorus (TP) and chlorophyll-a (Chl-a) that place it in the category of a moderately-productive lake (mesotrophic) at 10 ppb and 5.6 ppb, respectively. While water quality has been collected in Watchic Lake by Maine DEP and volunteers since 1974, chemical analyses of the epilimnion ceased in 2006, though Secchi disk readings continued. Surface sampling began in 2009 through present following concerns of the impact a horse farm may have on lake water quality (1-2 samples per year for nitrogen, phosphorus, and *E. coli* at four sites, *E. coli* at two Kiwanis Beach sites).

Water quality monitoring approaches have evolved over time. A stronger, more robust monitoring program that is more in keeping with today's best practices should be established to continue to track changes over time in water quality at the deep spot of Watchic Lake. This is done by collecting epilimnetic core samples for TP, Chl-a, alkalinity, pH, and color, as well as profile readings for dissolved oxygen and temperature at 1-meter intervals. This monitoring will pick up where historic monitoring from 1974-2005 left off and continue to expand the water quality database and track the health of the lake. Monitoring programs are crucial to evaluating the effectiveness of watershed improvement activities and to determining trends in water quality as a result of other factors (e.g., climate change). We provide recommendations for enhancing current water quality monitoring efforts, including sample collection at tributaries.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Lack of long-term planning and historic analyses	17. Develop a watershed management plan for the lake that summarizes water quality conditions, sets a water quality goal, and details next steps for improvements (expansion of current action plan).	WLA, Consultant	WLA, Donations	2016-20	$20,000 (Nine element plan); $5,000 (LWBPP)
	18. Complete full water quality analysis of existing Watchic Lake water quality data.	WLA, Consultant	WLA, Donations	2016-18	$4,000
Inconsistent lake water quality data record	19. Fund a lake monitoring program that includes 4 summer epilimnion samplings (June, July, August, September) of TP, TN, TOC, Chl-a, alkalinity, pH, and color, plus DO/temp profiles and SDT readings. Includes cost for formal annual water quality report.	WLA, Consultant	WLA, Donations	2016-26	$5,000/yr
	20. Consider expanding lake monitoring program to include sampling at other critical times, such as spring and fall turnover.	WLA, Consultant	WLA, Donations	2016-26	$2,000/yr

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
	21. Consider installing a buoy system at the deep spot to continuously monitor the DO/temperature profile of the lake. Cost includes first year setup and equipment purchase.	WLA, Consultant	WLA, Donations	2016-26	$10,000
	22. Increase number of certified Secchi and DO volunteer monitors.	WLA, Volunteers	Volunteers	2016-26	NA
	23. Increase frequency of Secchi and DO readings each year. Aim for at least one reading every 2 weeks at the deep spot from June-September.	WLA, Volunteers	Volunteers	2016-26	NA
	24. Purchase a portable DO meter to be used by certified DO monitors.	WLA	WLA, Donations	2016-17	$750
Unknown tributary water quality data record	25. Develop tributary monitoring program that includes taking water quality samples at the mouths of both Paine and Page Brooks. This can be included in the lake monitoring sample events.	WLA, Consultant	WLA, Donations	2016-26	$2,500/yr
	26. Deploy data loggers in tributaries that capture continuous water quality information on specific conductivity, DO, temperature, and water level. Goal: 2 sites. Cost includes first year setup and equipment purchase.	WLA, Consultant	WLA, Donations	2016-26	$8,000
Sustainable loon populations	27. Continue to collect loon count data. Data begins in 1983 (Don Blake).	WLA, Volunteers, Maine Audubon	Volunteers	2016-26	NA
	28. Continue to track banded loons to assess population status and movement.	WLA, Wildlife Biologists	Wildlife Biologists	2016-26	NA
	29. Consider creating loon nesting boxes. Goal: 2 locations around lake in minimally-disturbed area.	WLA, Wildlife Biologists	Wildlife Biologists	2016-26	NA

INVASIVE SPECIES

The introduction of non-indigenous invasive aquatic plant species to Maine's waterbodies has been on the rise. These invasive aquatic plants are responsible for habitat disruption, loss of native plant and animal communities, reduced property values, impaired fishing and degraded recreational experiences, and high control costs. Once established, invasive species are difficult and costly to remove. Fortunately, there are no known reports of any aquatic invasive plants (AIP) in Watchic Lake. Multiple AIP surveys have been conducted to confirm absence of invasives, such as milfoil. In addition, six association board members received Maine VLMP Invasive Plant Patrol training. This is a great start to a more formal Invasive Species Prevention Program that should be developed for the lake.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Future presence of aquatic invasive plants	30. Create an Invasive Species Prevention Committee that will oversee an Invasive Species Prevention Program for the lake.	WLA, Volunteers	WLA, Volunteers	2016-26	NA
	31. Enhance watch programs that help prevent and control invasive plants. Coordinate with trained volunteers to conduct annual surveys.	WLA, Volunteers	WLA, Volunteers	2016-26	NA
	32. Report survey results to Maine VLMP. Last survey reported in 2003.	WLA, Volunteers	WLA, Volunteers	2016-26	NA
	33. Continue to encourage Invasive Plant Patrol training through Maine VLMP (currently 6 members trained in 2015).	WLA, Volunteers	WLA, Volunteers	2016-26	NA
	34. Develop a response plan if invasives are detected in the lake.	WLA, Volunteers, Consultants	WLA, Volunteers	2016-26	$2,000
	35. Develop educational pamphlets about the threat of aquatic invasive plants and the importance of boat owners to check their boats, especially if coming from a different waterbody. Distribute to all shorefront owners and post a sign at the public beach. Cost includes design by consultant, plus printing for 500 copies.	WLA, Volunteers, Consultants	WLA, Volunteers	2016-26	$3,000

CLIMATE CHANGE

Climate change is a real and imminent threat to our local, regional, and global ecosystems, most especially our treasured lakes. Lakes are recognized as "sentinels of climate change" because their physical, chemical, and biological responses to climate change can provide the first signal of the effects of climate change. In New England, we can expect warmer air temperatures, more intense and frequent precipitation events, increased flooding, reduced snow cover duration, enhanced species migration and extirpation, and earlier lake ice-out. The following provides adaptation strategies for the Watchic Lake watershed community.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Warmer air temperatures	36. Incorporate climate change language in updated town comprehensive plan.	Town of Standish	Town of Standish	Next Plan Update	NA
	37. Provide incentives (e.g., tax breaks) for homeowners to reduce carbon footprint.	Town of Standish	Town of Standish	2016-26	TBD
	38. Review and improve energy usage of buildings.	Town of Standish	Town of Standish	2016-26	TBD
Greater precipitation; more intense storm events	39. Conduct culvert study of public and private roads in the watershed to assess sizing and condition and prioritize for replacement. Improve infrastructure to accommodate higher and more frequent flow volumes.	Town of Standish, WLA, Consultants	Town of Standish, WLA	2016-18	$5,000
	40. Develop emergency management plans based on climate projections. Include a current and projected flood risk map for residents with homes in low-lying areas. Consider requiring septic system evaluations for all homes within this projected flood zone to assess potential for failure due to rising water tables. Consider rezoning this projected flood zone for non-development.	Town of Standish	Town of Standish	2016-26	TBD
Earlier Ice-Out	41. Designate an individual or organization to begin recording annual ice-out dates.	WLA, Volunteers	WLA, Volunteers	2016-26	NA
	42. Encourage town to establish a "Climate Change Adaptation" webpage that directs residents to important climate change information and WLA webpages.	Town of Standish, WLA	Town of Standish, WLA	2016-26	TBD

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
	43. Conduct bathymetry and topographic mapping of shoreline habitats and model the effects of changing lake levels on shoreline stability.	WLA, Consultants	WLA, Donations	2016-26	$10,000
Reduction in coldwater fish populations and aquatic bird species.	44. Classify streams based on climate resiliency for supporting certain fish species. This will help target streams in need of restoration. Restoration techniques include increasing overhead vegetative cover to help reduce stream water temperatures.	WLA, Consultants	WLA, Donations	2016-26	$10,000
Increased threat from aquatic pathogens, including bacteria, protozoa, and parasites.	45. Create a public notification system for swimming advisories following major rain events and during significant algal blooms when waters may be harmful to human health.	WLA, Town of Standish	WLA, Town of Standish	2016-26	NA
Shifts in the habitat ranges of native plant and bird species.	46. Conduct habitat and species-level vulnerability assessments based on regional scales.	WLA, Consultants	WLA, Donations	2016-20	$10,000
Increased threat from insects and pathogens.	47. Disseminate public notices during peak tick and mosquito season. Prohibit outside influx of firewood and other materials that potentially harbor invasive insects.	Town of Standish	Town of Standish	2016-26	NA

EDUCATIONAL AWARENESS

One of the greatest risks to water quality for any lake is lack of educational awareness and active participation in watershed improvement. Previous activities in the Watchic Lake watershed were only realized from the active involvement of an engaged group of watershed stakeholders with diverse skills and interests. Acting on these recommendations will require their continued and ongoing participation as well as additional community outreach efforts to involve even more stakeholders throughout the watershed. A sustained public awareness and outreach campaign is essential to secure the long-term community support that will be necessary to successfully implement these recommendations.

SPECIFIC THREAT	ACTION RECOMMENDATION	RESPONSIBLE PARTY	FUNDING SOURCE	TIMEFRAME	ESTIMATED COST
Awareness of and participation in WLA activities	48. Resurvey watershed citizens every 5 years to track changes in social behavior and awareness.	WLA, Volunteers	WLA	2020, 2025	NA
	49. Encourage membership to lake association (currently 50% of shorefront landowners are members).	WLA, Landowners	WLA	2016-26	NA
Awareness of proper septic system maintenance	50. Distribute educational pamphlets on septic system function and maintenance.	WLA, Consultant	WLA, Donations	2016-17	$1,500
Awareness of proper shorefront buffer maintenance	51. Create flyers/brochures for shorefront homes regarding BMPs, no wake zone rules, and fire pit use.	WLA, Consultant	WLA, Donations	2016-18	$3,000
Awareness of boat pollution	52. Educate boaters who have inboard motors to use oil absorbing pillows or “bilge snakes” to prevent pollutants from entering the lake. Consider giving out free pillows to interested boaters.	WLA, Maine DEP, Town of Standish	WLA, Town of Standish, Donations	2016-26	TBD

APPENDIX A – 2015 WATERSHED SURVEY

On November 20, 2015, FB Environmental (FBE) staff surveyed the Watchic Lake watershed in Standish, Maine to identify areas of runoff erosion that may reach Watchic Lake and impact water quality. Areas along and near roads within the watershed were inspected during a storm event (~1.47 inches of rain), specifically noting gravel camp roads along the direct shoreline area of the lake. Lakes are sensitive to nutrients that are carried by sediments in runoff water because nutrients fuel excess algal growth. Algal growth can be detrimental to both the ecological and recreational aspects of the lake. Furthermore, the sites identified in this survey are underlain by Hinckley loamy sand soils; the high sand content can exacerbate the erosion and transport of nutrient-laden soil to the lake.

The purpose of this memo is to provide a summary of the top five sites identified during this survey (Map 1) and identify recommendations for implementation measures to reduce sediment runoff to the lake.

SITE 1: HI VU DRIVE

This site is located approximately halfway down Hi Vu Drive and is a low point in the road where rills and gullies are forming along the road shoulder. It runs parallel to the northwest corner of the lake with only about 200 feet of buffer between the road and the lake. This buffer is comprised of mixed forest as well as significant residential development. At this site, runoff appears to be flowing along the ditch on the west side of the road and then crossing the road through a buried culvert. The "outlet" of the culvert is filled with sediment and is not visible. This outlet is also receiving sediment from a large gully that runs along the eastern side of the road (see Photo 1). The water then continues as surface flow through the woods and down to the lake. Correspondence with a nearby landowner suggests that this strip of land is owned by the Kiwanis Club and is used as a right-of-way for local residents to access the shorefront. The gully along the road at this site is approximately 100 feet long by 1 feet wide by 0.5 feet deep. Using the USEPA Region 5 Pollutant Load Reduction Model, this gully may be contributing 0.7 tons of sediment/year and 0.6 lbs. of total phosphorous (TP) per year to the lake. FBE recommends multiple best management practices (BMPs) at this site, including re-crowning the road to control runoff and enlarging the culvert at the crossing. While it would be ideal to install a settling basin on the west side of the road, this land is private, and therefore it is recommended that a settling basin be created instead on the east side of the road below the outlet of the culvert. This settling basin would need to be large enough to accommodate the high flows that are evidently causing this severe erosion. Furthermore, it would be beneficial to armor and vegetate the area further down on the shoreline access road. This site has been remediated in a past grant project, but no longer seems to be functioning well. Because of this, it may be best to consider paving.

PHOTO 1. Gully formation along Hi Vu Drive

SITE 2: KIWANIS CLUB BEACH ACCESS

Moderate surface erosion was evident along the road leading to the boat access at the Kiwanis Club (Photos 2, 3). This road runs directly perpendicular to the beach, allowing road runoff to enter the lake without treatment. Additionally, rill and gully formation along this road and beach access can be safety hazards for recreational users of

the area. Due to the high traffic in this area and its proximity to the lake, this site has been identified as a high priority site. It is our recommendation that runoff diverters be installed at multiple areas along the road above the recreation area to divert runoff water to the forest.

PHOTO 2. Shoreline access point below Hi Vu Road erosion.

PHOTO 3. View of Watchic Lake from the Kiwanis Club access road.

SITE 3: WATCHIC ROAD 21

Site 3 was located on Watchic Road 21 at the crossing of a small tributary to Page Brook (Photos 4, 5). This site is noted as low impact because of only minor evidence of erosion; however, some rills in the gravel were present above the stream crossing. High flows were also evident, indicating that nutrients from sediment erosion in this area can easily be transported to the lake. Using the Region 5 model for estimating total phosphorous (TP) inputs, it is estimated that this site contributes 0.2 tons/year of sediment and 0.2 lbs./year of TP to the lake. We recommend widening and vegetating the road shoulder at this crossing to intercept runoff to the stream. Alternatively, it is possible to armor the road shoulder and culvert with geotextile fabric and stone.

PHOTO 4. A view of the stream crossing on Watchic Road 21.

PHOTO 5. Road shoulder erosion on Watchic Road 21.

SITE 4: HI VU DRIVE BOAT ACCESS

Site 4 is an area of high concern due to the steepness of the hill leading directly to the boat launch at the terminus of Hi Vu Drive (Photo 6). The west side of Hi Vu Road has significant ditch erosion that eventually flows to an old turnout off the road and into the woods (Photo 7). Hydrologic markers indicate that this turnout is not at the proper capacity to successfully handle large flows during rain events. We recommend that both the ditch and culvert be enlarged to accommodate greater flow volumes. Additionally, we recommend the installation of a runoff diverter above the boat launch to divert sheet flow from the road to the neighboring woods.

PHOTO 6. View of the boat access at the terminus of Hi Vu Drive

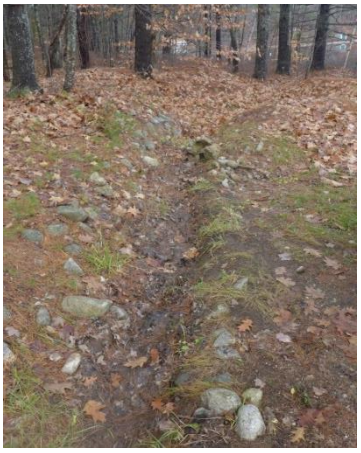


PHOTO 7. Trench along the west side of the boat access diverting water to a settling basin.

SITE 5: WATCHIC ROAD 19

Site 5 was listed as low priority due to its inaccessibility during the 2015 watershed survey; but, it is listed here for further investigation. The end of Watchic Road 19 contains multiple housing units located in proximity to the shoreline. A steep bank connects the gravel road to the lake. Several houses have steep driveways that could be acting as conduits for runoff. We recommend revisiting these properties to complete an evaluation.

PHOTO 8. Google Maps imagery of Watchic Road 19.

SITE 6: WATCHIC TERRACE ROAD

Watchic Terrace Road is a short (~0.1 mile) road located off Route 113 on the northeast side of Watchic Lake. The road cuts across a steep embankment rolling towards the lake and has private residential units situated on both sides. The residential homes along the lake are close to the water with steep driveways acting as conduits for stormwater runoff (photo 9). Furthermore, significant stormwater runoff flows along the northeast (uphill) side of the road, causing visible sediment mobilization. A six-inch-high berm of pavement along the uphill side of the road directs runoff to the paved road shoulder. Three catch basins along this side of the road capture this runoff and direct it to a cross-drainage culvert at the end of the road. This culvert discharges the runoff into riprap (photo 10) along the driveway of house #29. Below the riprap is a large ponding area on a lawn located within proximity of Watchic Lake.

PHOTO 9. An example of a steep driveway on Watchic Terrace Road leading into Watchic Lake.

Because of the steep slopes and private property access, recommendations are limited; however, there are several best management practice (BMPs) options to help improve stormwater management. We suggest installing catch basin filters in each of the three catch basins to help remove sediment. Creating a turnout for stormwater to divert some runoff to vegetated areas for infiltration may be possible in one roadside location near house #15. Lastly, adding infiltration steps or a large bioretention cell below the riprap at the end of the road would infiltrate the water, slow down its path to the lake, and limit ponding in the lawn area. Landowner cooperation would be required to implement these BMPs due to the lack of open space between the road and private land.

PHOTO 10. Riprap along house #29 at end of Watchic Terrace Road.

MAP 1. Watershed Survey Site Identification Map.