MCGRATH POND-SALMON LAKE WATERSHED-BASED PROTECTION PLAN




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McGrath Pond & Salmon Lake Association

McGrath Pond-Salmon Lake Association
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Prepared for:

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ACKNOWLEDGEMENTS

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Watershed Protection Plan Steering Committee Members

Charlie Baeder	7 Lakes Alliance
Nathan Durant	7 Lakes Alliance (YCC)
Dave Hallee	McGrath Pond-Salmon Lake Association
Kim Hallee	McGrath Pond-Salmon Lake Association
Lenny Reich	McGrath Pond-Salmon Lake Association
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COMMONLY USED ACRONYMS

The following acronyms are used throughout this document:

7LA	7 Lakes Alliance (formerly Belgrade Regional Conservation Alliance)
BMP	Best Management Practice
CHL-A	Chlorophyll-a
MDEP	Maine Department of Environmental Protection
MLS	Maine Lakes Society
MPSLA	McGrath Pond-Salmon Lake Association
NPS	Nonpoint Source (pollution)
ppb	Parts Per Billion
ppm	Parts Per Million
SDT	Secchi Disk Transparency
TP	Total Phosphorus
US EPA	United States Environmental Protection Agency
VLMP	Volunteer Lake Monitoring Program
WBPP	Watershed-Based Protection Plan

GLOSSARY OF TERMS

BEST MANAGEMENT PRACTICE Best Management Practices (BMPs) are conservation practices designed to minimize discharge of nonpoint source (NPS) pollution from developed land. BMPs include planting buffers, stabilizing steep slopes, upgrading culverts, using erosion control mulch on bare soil. "Non-structural" BMPs include road salt management, land conservation and improving ordinances to protect water quality.

CHLOROPHYLL-A (CHL-A) A measurement of the green pigment found in all plants, including microscopic plants such as algae. It is used as an estimate of algal biomass; higher Chl-a equates to greater amount of algae in the lake.

DISSOLVED OXYGEN Dissolved oxygen (DO) is the measure of the amount of oxygen dissolved in the water. Organisms living in lakes use the oxygen in the water to breathe. Low DO conditions can severely reduce the diversity and populations of aquatic organisms. Water with < 1 part per million (ppm) of oxygen is considered anoxic (no oxygen present); less than 5 ppm of oxygen is considered so stressful that most coldwater fish will avoid these areas. Anoxic conditions can also promote phosphorus release (internal loading) from the lake sediments.

MIDAS (Maine Information Display and Analysis System) MIDAS numbers are unique identification numbers assigned in the 1970's to Maine lakes and ponds monitored and managed by Maine state agencies.

NONPOINT SOURCE POLLUTION Nonpoint Source (NPS) pollution, or polluted stormwater runoff comes from a number of diffuse sources within a watershed. This includes soil, fertilizers, septic waste and other pollutants from diffuse sources across the landscape that are carried into a waterbody by rainfall.

SECHHI DISK TRANSPARENCY (SDT) A vertical measure of water transparency (ability of light to penetrate water) obtained by lowering a black and white disk into the water until it is no longer visible. Measuring SDT is one of the most useful ways to show whether a lake is changing over time. Changes in transparency may be due to increased or decreased algal growth, or the amount of dissolved or particulate materials in a lake, resulting from human disturbance or other impacts to the lake watershed area. Factors that affect transparency include algae, water color, and sediment. Since algal density is usually the most common factor affecting transparency in Maine lakes, transparency is an indirect measure of algae abundance.

TOTAL PHOSPHORUS (TP) The total concentration of phosphorus found in the water, including organic and inorganic forms. TP is one of the major nutrients needed for plant growth. It is generally present in small amounts and limits plant growth in freshwater ecosystems. As phosphorus increases, the amount of algae generally increases. Humans can add phosphorous to a lake through stormwater runoff, lawn or garden fertilizers, and leaky or poorly maintained septic tanks.

FLUSHING RATE The number of years the volume of water in a lake is replaced. For example, a lake with a flushing rate of two flushes twice per year. A lake with a flushing rate of 0.5 flushes once every two years.

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DOCUMENT SCOPE AND PURPOSE

The purpose of this Watershed-Based Protection Plan, herein referred to as the "Plan" or "WBPP", is to outline a plan and strategy for nonpoint source (NPS) pollution mitigation and water quality protection efforts for the McGrath Pond-Salmon Lake Watershed over the next 10 years (2018-2027).

This Plan was developed to satisfy national watershed planning guidelines provided by the United States Environmental Protection Agency (US EPA). US EPA requires nine-element plans for impaired watersheds, but allows alternative plans in several cases including for protection of high quality or unimpaired waters. The Maine Department of Environmental Protection (MDEP) accepts alternative plans for unimpaired lakes that have completed a recent watershed survey, provided that the plan follows US EPA and MDEP guidelines and minimum planning elements. McGrath Pond and Salmon Lake meet these eligibility criteria because this Plan was developed to include these required planning elements.

Information collected during the 2017 McGrath Pond-Salmon Lake Watershed Survey establishes a baseline of watershed conditions, and a starting point for plan development. A copy of the Watershed Survey report is provided in Appendix B.

LAKE & WATERSHED INFORMATION

McGrath Pond (MIDAS 5348) & Salmon Lake (a.k.a. Ellis Pond) (MIDAS 5352) are located in the central Maine towns of Oakland and Belgrade in the Belgrade Lakes Region. McGrath Pond is 467 acres, has a perimeter of 6.9 miles, a maximum depth of 27 feet, and average depth of 16 feet. Salmon Lake covers 666 acres, has 7.9 miles of shoreline, a maximum depth of 57 feet, and an average depth of 23 feet. Salmon Lake is connected to McGrath Pond by a shallow channel, known as "The Narrows" that connects the two waterbodies.

McGrath Pond and Salmon Lake are the smallest of the seven lakes that make up the Belgrade lakes

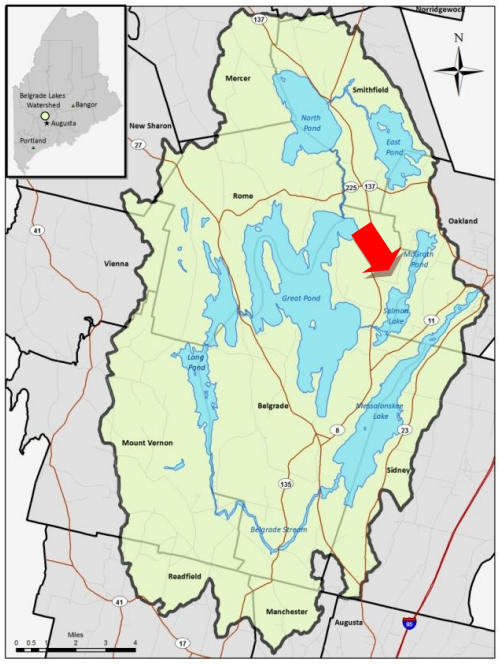


Figure 1. Map of the Belgrade Lakes watershed. (Colby.edu)

chain. McGrath Pond flows into Salmon Lake, and Salmon Lake flows into Great Pond (MIDAS 5274) via the outlet stream (a.k.a. Hatchery Brook) over the Salmon Dam spillway.[1] Great Pond flows into Long Pond, which flows into Messalonskee Lake, which eventually flows into the Kennebec River and onto the Gulf of Maine.

[1] The dam is owned and operated by the Belgrade Area Dam Committee. This group also manages water level.

Figure 2. Map of the McGrath Pond-Salmon Lake watershed.

The combined watershed area for the two lakes is approximately 8.7 square miles.[2] The watershed contains several small hills on its west side, including Mutton Hill (544 ft.) and Howland Hill (702 ft.) in Oakland on the northwest corner of the watershed, and Bickford Hill (510 ft.) in Belgrade. Runoff from both Howland Hill and Bickford Hill flows into Cold Brook at Arcadia Cove. The east shore of these lakes is relatively steep in the short section between the shoreline and Town Farm Road. The lowest elevations are located at lake level (277 ft.).

The watershed includes several conservation properties including (see Figure 2):

Pleasant Point Park- Town of Oakland (30 acres)

Public Lands- Town of Oakland (108 acres in watershed)

Conservation Easement- Maine Farmland Trust (20 acres in watershed)

Public Boat Launch- Maine Dept. of Inland Fisheries & Wildlife (MDIFW) (3 acres)

McGrath Pond and Salmon Lake receive inflow from a number of small, unnamed, intermittent streams and drainages throughout the watershed, as well as many wetlands bordering the lakes and streams. The largest area of contiguous freshwater wetlands is on the northeast end of McGrath Pond near Pleasant Point Park in Oakland. The primary inlet to Salmon Lake is Cold Brook- the only formally named stream in the watershed (Hatchery Brook at the outlet on the south end of Salmon Lake does not appear on USGS maps).

Land cover in the watershed is dominated by mixed forest (43%), coniferous forest (11%) and open water (20%) (Figure 3). Agriculture and forestry are estimated to account for approximately 8% of the watershed area. Agriculture in the watershed is clustered on the west shore of Salmon Lake, and the north end of McGrath Pond, with smaller patches of agriculture throughout the watershed.

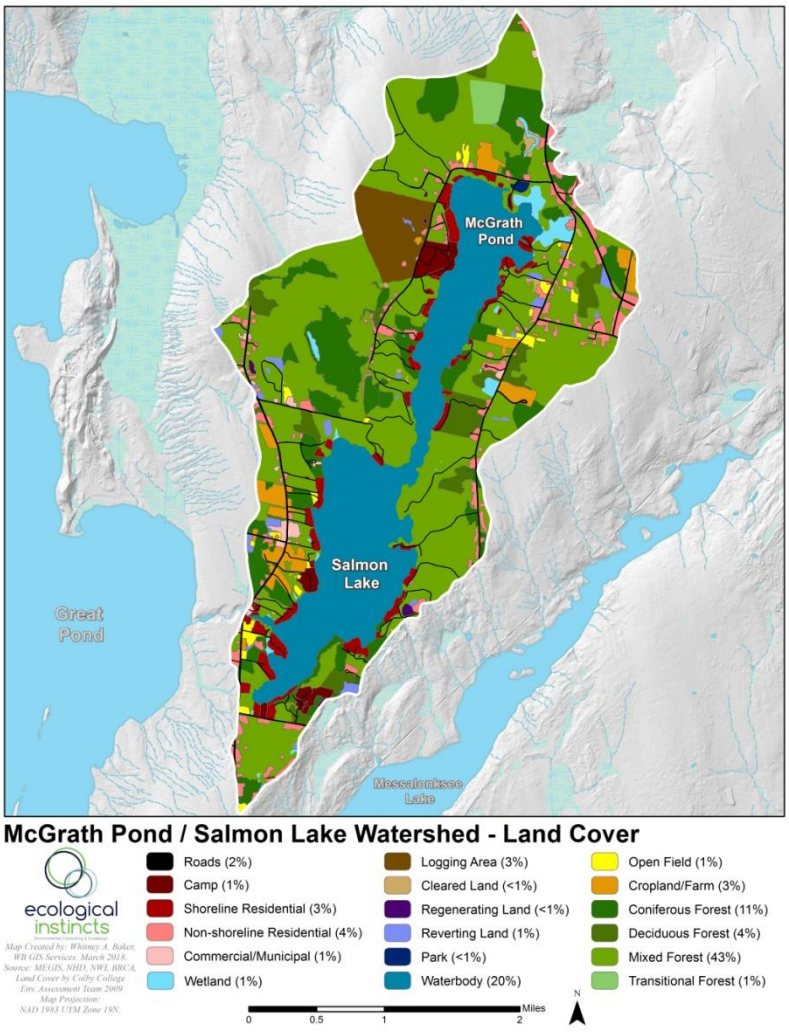


Figure 3. Land cover in the McGrath Pond-Salmon Lake watershed.

[2] Maine DEP lists the direct watersheds of McGrath Pond and Salmon Lake at 3.8 and 3.1 sq. mi, respectively. The lake itself covers 1.8 sq. mi. for a total combined area of 8.7 sq. mi.

The largest area of forestry is located around Mutton Hill on the northwest side of the watershed.

Development in the watershed is accessed by a network of town and private roads, including three major state roads: Route 8, Route 137, and Route 11. The most prominent town roads include McGrath Pond Rd. (on the west and north side of McGrath Pond) and Town Farm Rd. Many unimproved, private, gravel roads run perpendicular to the lake off of the state and town roads directly to the lake, servicing both commercial development and areas of dense residential development along the shoreline. These roads have a high potential for soil erosion if not well maintained, and can result in delivery of large amounts of sediments and nutrients directly to the lakes.

One of approximately 66 camp roads throughout the watershed servicing shoreline development.

In 2009-2010, Colby College conducted an analysis of roads in the watershed.[3] This included total road length and type, as well as condition of camp roads.[4] This study reported:

- There are 66 camp roads, 3 state road and 12 town roads in the watershed;
- Camp roads cover 13.2 miles, state and town roads cover 27.7 miles;
- Over half of the camp roads surveyed were ranked either fair (35%) or poor (23%) condition. The remaining ranked good (15%) or acceptable (27%) condition.

The assessment also examined the extent of residential development in the watershed:

- There are approximately **611** residential properties in the watershed including **275** houses on the shoreline and **336** houses outside of the immediate shoreline (>250 ft);
- **63%** of homes in the watershed were built before 1974- before current shoreland zoning and septic system regulations;
- The estimated number of year-round homes **(446)** exceeds the number of seasonal homes **(165)** in the watershed, and approximately half of all shoreline homes are seasonal;
- Along with the state-owned public boat launch, there are approximately **24 private boat launches**, many of which are unpaved;
- A 2009 shoreline survey found that **86%** of properties require improvements of existing shoreline vegetated buffers or creation of new buffers to protect/improve water quality;
- McGrath Pond had a higher percentage of excellent buffers compared to Salmon Lake;
- **63%** of shoreline houses have lawns, many of which extend to the shoreline.

[3] CEAT, 2010. A Watershed Analysis of Salmon Lake and McGrath Pond: Implications for Water Quality and Land Use Management. Problems in Environmental Science, Colby College, Waterville, ME. Accessed online: https://digitalcommons.colby.edu/salmonmcgrath/1/

[4] The watershed area used for this study does not include a large area on the west side of the watershed. Therefore, these totals may underestimated the total road length/number and type of roads.

The McGrath Pond-Salmon Lake watershed is also home to the following large properties:

- **Large summer camps** (Camp Modin, New England Golf and Tennis Camp, and Camp Tracy/YMCA);
- **Commercial Camps** (Whisperwood Lodge, Wheeler's Camps, Ellis Pond Camps, and Woodrest Cottages);
- A **sawmill and gravel pit**;
- **30-Acre Town Park** (Pleasant Point Park in Oakland) with athletic fields and carry-in boat launch;
- Town of Oakland **Transfer Station**;
- Undeveloped **Subdivision** (Lake Vista Drive, Oakland);
- **Public Boat Launch** on Salmon Lake (Spaulding Pt.).

Colby's 2009-2010 watershed analysis also aimed to examine the effects of land cover on water quality in McGrath Pond and Salmon Lake. The study assessed changes in land cover over a 50-year period (1965-2007) and determined that, not surprisingly, overall development in the watershed has increased over time:

- **Non-shoreline residential development** increased by 143% over this time period;
- **Shoreline residential development** increased by 29.5%;
- **Youth camp land** has increased (through expansion of existing facilities) by 96.7%
- **Logged area** in the northwest corner of the watershed increased from 3.3% to 8.2% of the watershed area;
- **Agricultural land** decreased by 60.1%.

Changes in land use can be tracked over time and correlated with changes in water quality, or used to examine if existing ordinances are doing a good job of protecting water quality, or if changes are needed at the town level to update ordinances to keep the water clean.

A painted turtle peeks through spadderdock (Nuphar variegata) in McGrath Pond. (Photo: Dave Hallee)

The watershed contains a wealth of water resources including 1.8 square miles of lakes/ponds, 1.6 miles of perennial streams, 49.9 miles of ephemeral/intermittent streams, 0.5 square miles of wetlands, and 4.3 square miles of freshwater riparian habitat[5] (Figure 4). The majority of smaller wetlands (<10 acres) are primarily associated with the many small, intermittent, headwater streams surrounding the lake. The largest wetland is located on the northeast corner of McGrath Pond near Pleasant Point Park. Intact and undeveloped riparian areas (or buffers) provide habitat for many plants and animals, and serve as a filter for pollutants that flow into the lakes.

[5] Riparian habitat was calculated using GIS as the land within 250 ft. of Great Ponds (>10 acres) and wetlands >10 acres, as well as land within 75 ft. of all streams.

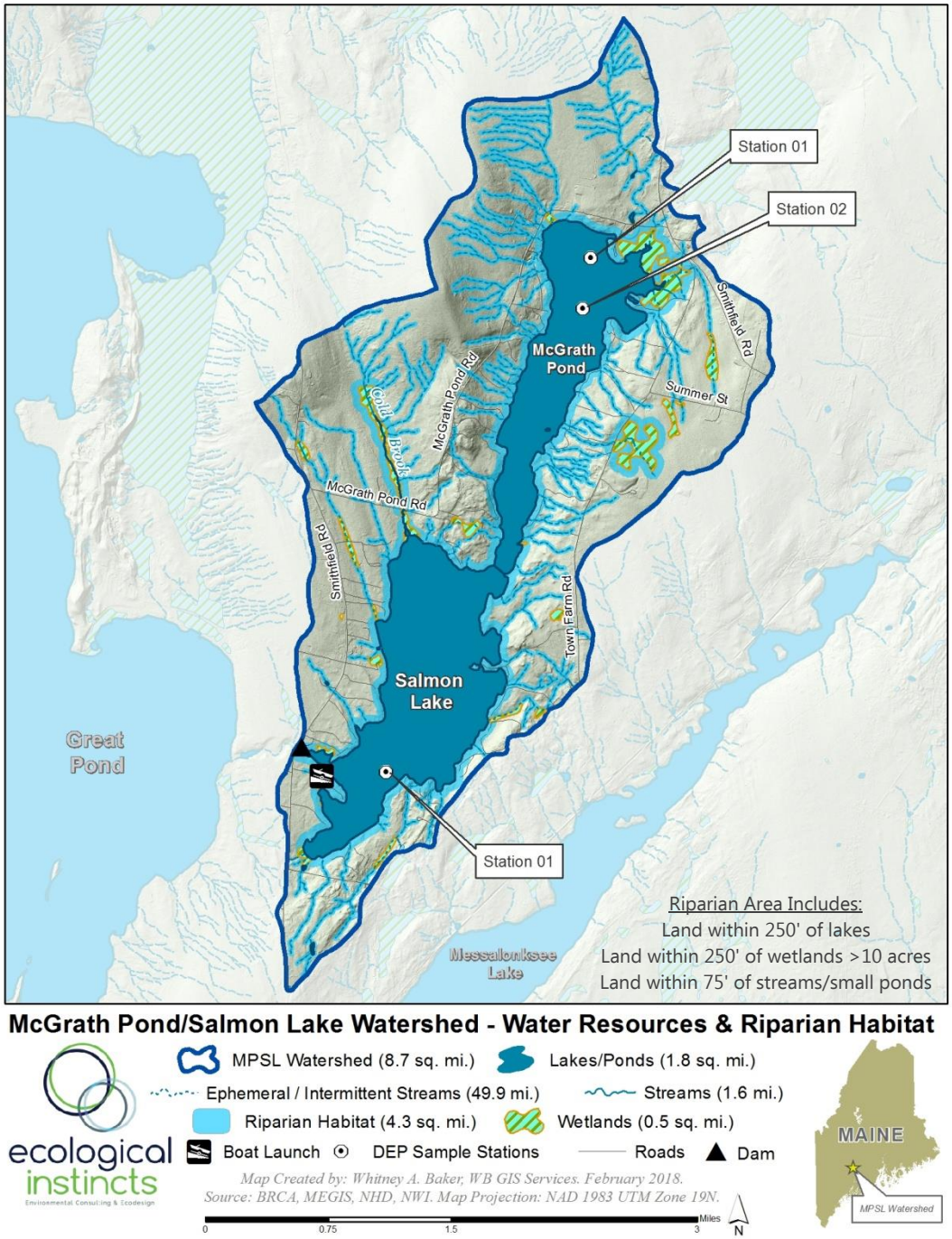


Figure 4. Water resources and riparian habitat in the McGrath Pond-Salmon Lake watershed.

Wetlands of Special Significance (WoSS) in the McGrath Pond-Salmon Lake watershed include:

- McGrath Pond-Salmon Lake;
- Wetlands containing significant wildlife habitat (see Figure 5);
- Wetlands within 250 ft. of the normal high water line of McGrath Pond-Salmon Lake;
- Wetlands with >20,000 square feet of aquatic vegetation, marsh vegetation or open water;
- Wetlands within 25 ft. of a river, stream or brook.

Maine DEP defines **Protected Natural Resources** as the area within 75 ft., measured horizontally, of the normal high water line of a great pond, river, stream or brook or the upland edge of a coastal wetland or freshwater wetlands. An additional level of permitting is required for activities with the potential for impacting these protected resource areas.

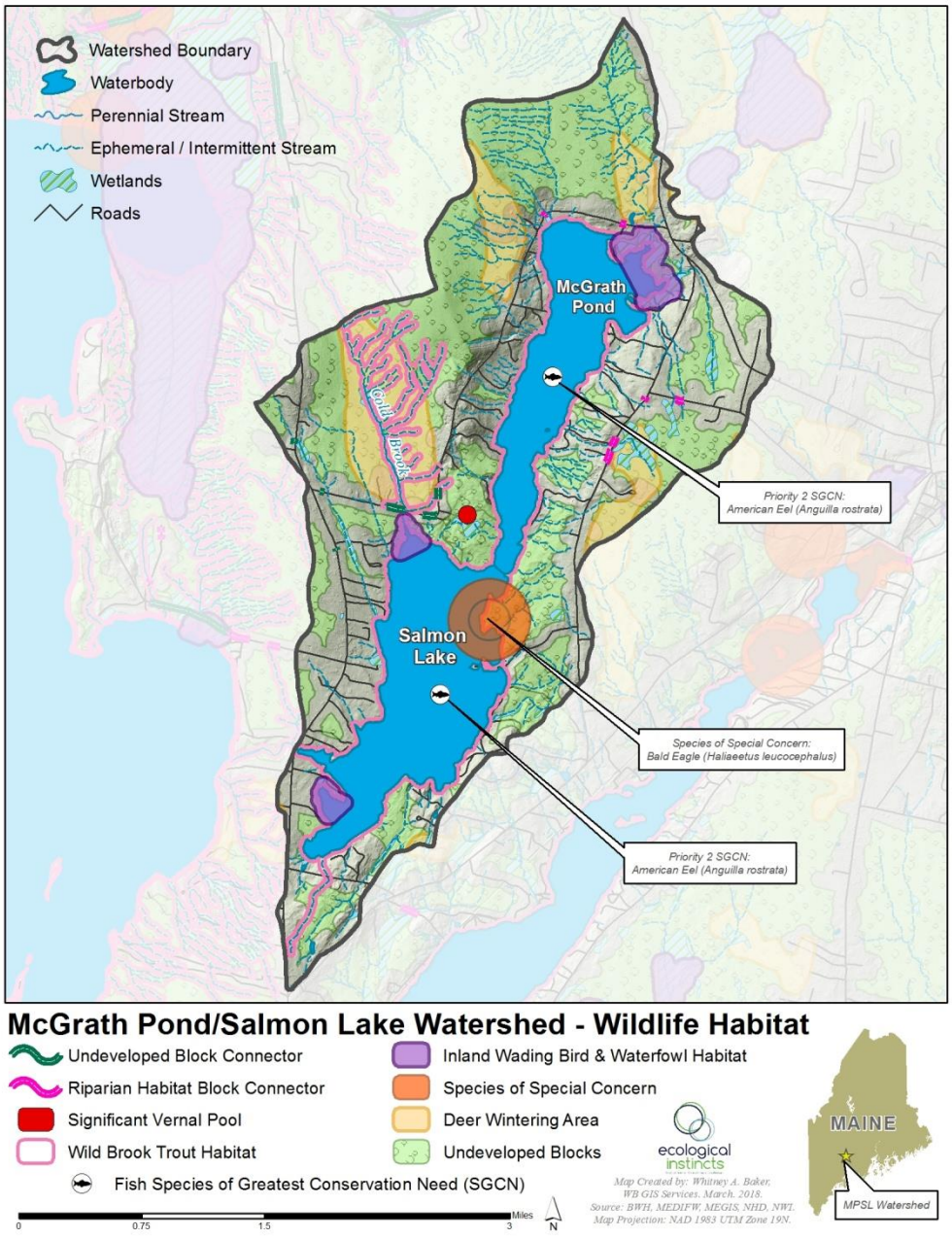


Figure 5. High value plant and animal habitat in the McGrath Pond-Salmon Lake watershed.

Mapping data from the State's Beginning with Habitat program highlights the high-value plant and animal habitat in the watershed including: large undeveloped land blocks, inland wading bird and waterfowl habitat, deer wintering areas, wild brook trout habitat (several tributaries and both lakes), significant vernal pools (west shore) and special concern species (American eel and bald eagle) (Figure 5). American eels are Priority 2 Species of Greatest Conservation Need

(SGCN). Bald eagles were removed from federal and state endangered species lists, but remain on State BwH maps as a Species of Special Concern for public conservation planning purposes.[6]

The McGrath Pond-Salmon Lake Watershed provided habitat for wild brook trout (Salvenlinus fontinalis). (Image: MDIFW)

McGrath Pond and Salmon Lake are used extensively for swimming, fishing, and boating and are important to the local economy. McGrath Pond contains 15 species of fish[7] including both coldwater (brown trout, brook trout) and warmwater fish (e.g., small and largemouth bass, chain pickerel, white and yellow perch). McGrath Pond (and Salmon Lake) is stocked annually with fall yearling brown trout (*Salmo trutta*) due to lack of sufficient spawning and nursery habitat.[8] Salmon Lake's historic nutrient loading has resulted in low-levels of dissolved oxygen and the presence of blue-green algal blooms, causing a shift from a coldwater fishery to a predominantly warmwater fishery that is maintained by natural reproduction. Salmon Lake contains 14 species of fish, and was renowned for its smelt fishery in the 1980's. Black crappie (*Pomoxis nigromaculatus*) was introduced to both lakes in the 1980's and may pose a threat to the forage fish in the lakes-including smelt.[9]

Eurasian water-milfoil (Myriophyllum spicatum). (Image: Wisconsin DNR)

Eurasian water-milfoil (*Myriophyllum spicatum*), is an invasive, emergent, herbaceous aquatic plant species native to Europe, Asia and North Africa that forms dense mats on the surface of waterbodies. This plant was first confirmed in Salmon Lake in 2008. This infestation is currently assumed eradicated and removed from the Maine DEP list of infected lakes in 2015.[10] Ongoing annual invasive aquatic plant surveys are conducted on both Salmon Lake and McGrath Pond, and a courtesy boat inspection (CBI) program is active during the summer at the State boat launch to help prevent new occurrences of invasive plants in these lakes.

[6] Bill Hancock, personal communication. Beginning with Habitat, MDIFW.
[7] Maine VLMP, Lakes of Maine, McGrath Pond, Lake Life, Fish. Accessed online: https://www.lakesofmaine.org/lake-fish.html?m=5348
[8] MDIFW, 1990. McGrath Pond. Accessed online: http://www.maine.gov/ifw/docs/lake-survey-maps/kennebec/mcgrath_pond.pdf
[9] MDIFW, 1989. Salmon Lake (Ellis Pond). Accessed online: http://www.maine.gov/ifw/docs/lake-survey-maps/kennebec/salmon_lake.pdf
[10] Maine VLMP, Lakes of Maine, Salmon Lake (Ellis Pond), Monitoring, Accessed online: https://www.lakesofmaine.org/lake-monitoring.html?m=5352

SUMMARY OF PAST WATERSHED PROTECTION WORK

The McGrath Pond-Salmon Lake Association (MPSLA) and its partners and landowners have already begun taking steps to protect the water quality of McGrath Pond and Salmon Lake. In addition to the activities listed below, MPSLA holds an annual meeting for its members and the public each July (odd years) or August (even years), hosts a boat parade on July 4th, attends Oakfest and the Oakland Open Air Market in July to distribute educational materials, participates in invasive plant patrols and water quality monitoring, and attends various educational workshops sponsored by neighboring lake associations to raise awareness about lake protection. A summary of primary historical watershed activities is provided below:

Landowners in the watershed are taking part in free programs such as YCC and LakeSmart to protect the lakes.

- **1975-** First year of water quality monitoring on McGrath Pond and Salmon Lake.
- **1989-** McGrath Pond-Salmon Lake Association is formed to help address water quality and development concerns and to manage the dam (c. 1908) at the outlet of the lake.
- **1987-** Maine DEP Restoration Project focused on addressing NPS from agriculture in the Salmon Lake watershed. The project was funded under EPA's Clean Lakes Program (Section 314).
- **1994-** Colby CEAT conducted a watershed survey of Salmon Lake and McGrath Pond.
- **1996-** BRCA begins installing Best Management Practices (BMPs) on properties in the McGrath Pond-Salmon Lake watershed through the Youth Conservation Corps (YCC) program. Over the past 20 years, 127 BMPs have been installed in the watershed by BRCA.
- **1998-** McGrath Pond and Salmon Lake added to the Maine DEP Nonpoint Source Priority Watersheds List.
- **1998-** First watershed survey of McGrath Pond and Salmon Lake. 131 NPS sites documented. This was a locally-funded survey with support from Maine DEP.
- **2000-** Courtesy Boat Inspections (CBI) begin at the Salmon Lake boat launch. The launch is staffed daily during the summer to keep invasive species out of the lakes. Local towns help fund the program.
- **2000-2003-** Thirty-two NPS sites were addressed during the Phase I watershed restoration project utilizing EPA Clean Water Act Section 319 funding. This was the first of three phases to address NPS pollution identified during the 1998 watershed survey.
- **2001-** McGrath Pond & Salmon Lake included in the Great Pond Watershed Management Plan developed by BRCA.

- **2003-** The first invasive aquatic plant survey was conducted on McGrath Pond and Salmon Lake by volunteers. Since then, nine formal surveys have been conducted by volunteers and Maine DEP (annually since milfoil was found in 2008).
- **2003-2005-** KCSWCD and BRCA teamed up to address 25 NPS sites (Phase II) in the McGrath Pond-Salmon Lake watershed utilizing EPA Clean Water Act Section 319 funding to address erosion throughout the watershed.
- **2005-2007-** KCSWCD and BRCA worked collaboratively to address 19 NPS sites (Phase III) in the McGrath Pond-Salmon Lake watershed utilizing EPA Clean Water Act Section 319 funds. During Phase II and III, an estimated 13.9 tons of sediment and 14 lbs. of phosphorus were prevented from entering the lakes, and 620 feet of shoreline was restored.
- **2009-2010-** Colby College students conduct a watershed analysis of Salmon Lake and McGrath Pond.
- **2011-2012-** The first two Lakesmart properties receive awards from Maine DEP on McGrath Pond.
- **2013-** MPSLA starts a LakeSmart program. To date, 11 LakeSmart awards have been given out to landowners in the watershed (Figure 6).
- **2015-** Colby College begins a 3-year intensive water quality sampling initiative in the Belgrade Lakes watershed, which includes McGrath Pond and Salmon Lake.
- **2016-** BRCA's (7 Lake's Alliance) Youth Conservation (YCC) program visited 10 sites in the watershed to provide technical assistance to landowners and install conservation practices that prevent pollution from running off developed properties (see Figure 6 for all sites completed since 2014).
- **2017-** MPSLA conducts the McGrath Pond-Salmon Lake watershed survey to document current sources of nonpoint source (NPS) pollution in the watershed. Thirty people were trained on how to identify NPS pollution and the different types of Best Management Practices (BMPs) to fix the problems. The survey was locally funded.
- **2018-** MPSLA begins planning for development of the McGrath Pond-Salmon Lake Watershed-Based Protection Plan.

2017 McGrath Pond-Salmon Lake Watershed Survey Volunteers.

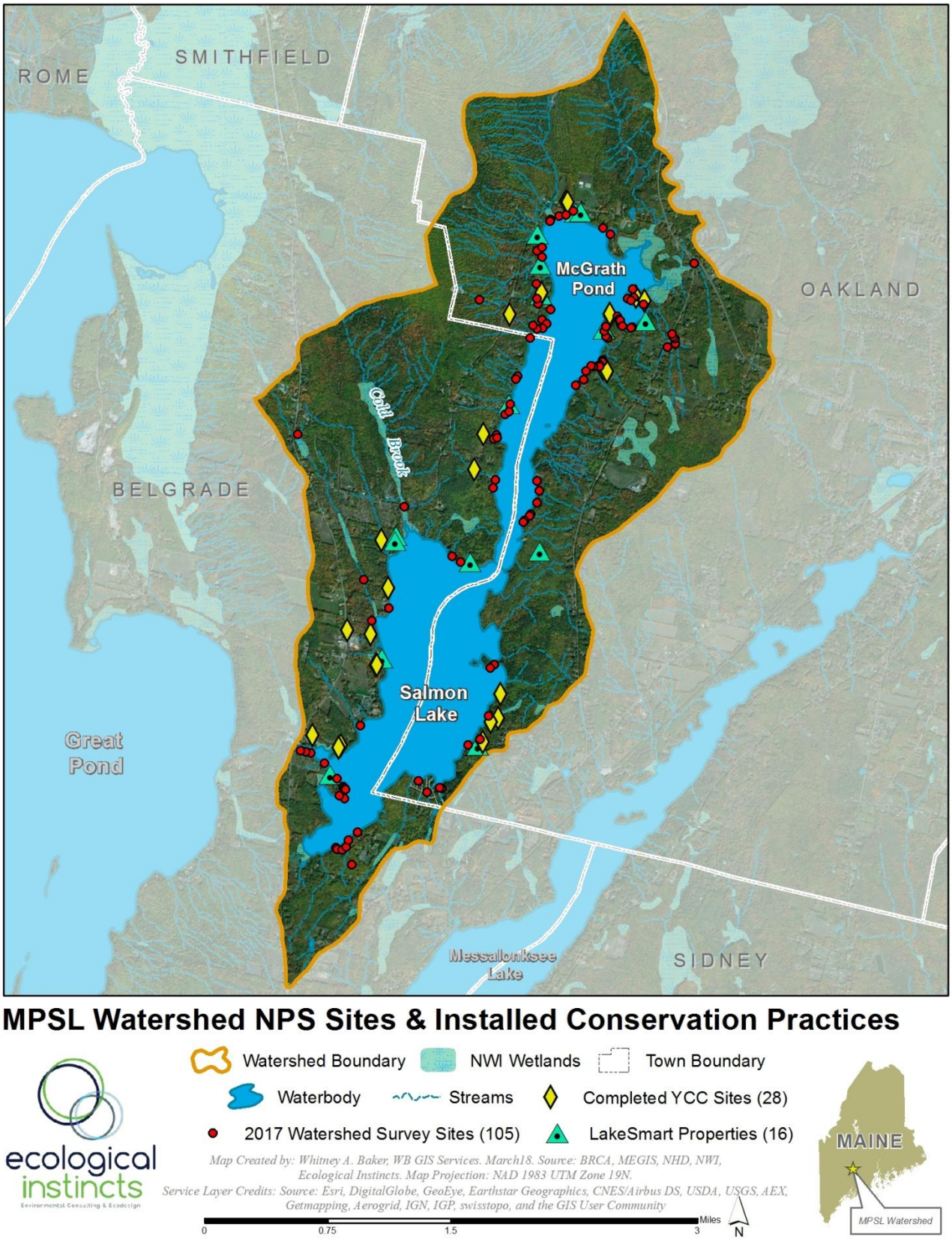


Figure 6. NPS sites, YCC sites, and LakeSmart properties in the McGrath Pond-Salmon Lake watershed.

Identification of Causes or Sources of the NPS Threat

WATER QUALITY SUMMARY

The natural characteristics of McGrath Pond and Salmon Lake (e.g., lake depth, surface area, and flushing rate), and the history of land use in the watershed, all play a role in the current water quality in the lakes- as well as the trends in water quality over time. For example, the shallower depth in McGrath Pond (max 27 ft) allows sunlight to penetrate to the bottom of the lake and the lake typically does not stratify (no distinct change in temperature or dissolved oxygen from the surface to the bottom of the lake) (Figure 7). Salmon Lake (max depth of 57 ft) does stratify during the summer, and exhibits low levels of dissolved oxygen (anoxia) and increased concentrations of total phosphorus (TP) due to internal recycling at the bottom of the lake. Table 1 (below) provides a comparison of lake characteristics for these two waterbodies.

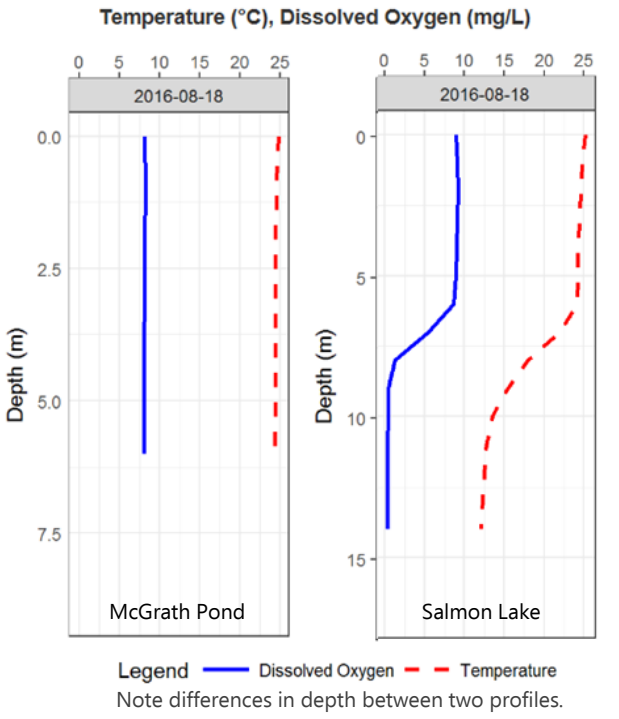


Figure 7. Temperature and Dissolved Oxygen profiles for McGrath Pond (left) and Salmon Lake (right). (Source: LakesofMaine.org)

Measures of Secchi disk transparency (SDT) provides important information about the long-term annual average water clarity for both lakes over time (Figure 8). Note that the lakes track each other very closely, but McGrath Pond clarity is generally better (deeper readings) than Salmon Lake. Variability in water clarity measurements over time may be influenced by weather (e.g., annual fluctuations in rain/snow), or land-use changes in the watershed (e.g., period of heavy development, forestry activities, watershed improvements), which can influence algal productivity.

Water quality data has been collected in McGrath Pond and Salmon Lake since 1975 at Station 1. A summary of water quality data for each lake is provided below:

Table 1. Lake characteristics.

Lake Characteristics	McGrath Pond	Salmon Lake
Surface Area	467 ac	666 ac
Perimeter	6.9 mi	7.9 mi
Maximum Depth	27 ft	57 ft
Average Depth	16 ft	23 ft
Flushing Rate	0.69/yr	0.54/yr
DEP Classification	Interior Pond	Interior Lake
Stratifies?	No	Yes
Algal Blooms	No	Yes

McGrath Pond:

Water quality data has been collected at Station 1 in McGrath Pond since 1975. This includes 41 years of Secchi disk transparency (SDT) readings and 28 years of water chemistry (e.g., color, alkalinity, pH, total phosphorus, Chlorophyll-a). SDT readings were also collected at Station 2 in 1989, 2015 and 2016 (see Table 2).

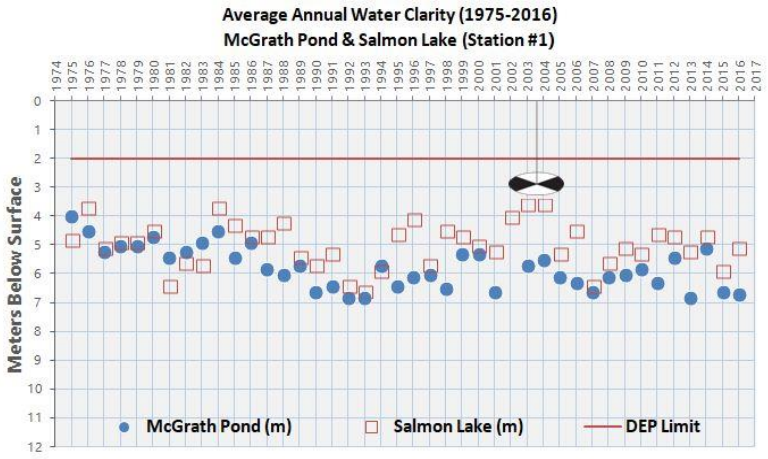


Figure 8. Average annual water clarity data for McGrath Pond & Salmon Lake Station 1. (Ecological Instincts, data from LakesofMaine.org)

Table 2. Water quality summary for key trophic parameters in McGrath Pond (Data source: LakesofMaine.org)

Parameter	Min	Max	Avg
SDT	2.3 m (1980)	8.0 m (1995)	5.7 m
TP	7.0 ppb (1990)	21 ppb (1978)	11 ppb
Chl-a	1.7 ppb (2013)	10.3 ppb (1977)	3.2 ppb

Water quality in McGrath Pond is considered above average based on measures of SDT, total phosphorus and Chlorophyll-a. The potential for nuisance algal blooms in the lake is moderate, and the potential for internal loading (phosphorus leaving bottom sediments and becoming available to algae) is low. Dissolved oxygen (DO) profiles show very little DO depletion in deep areas of the lake, largely due to its shallow nature, which limits temperature stratification and oxygen. SDT readings often reach the bottom, indicating that readings of water clarity in McGrath Pond are often limited by depth.

Secchi Disk Transparency (SDT): A vertical measure of water transparency (ability of light to penetrate water) obtained by lowering a black and white disk into the water until it is no longer visible. Measuring SDT is one of the most useful ways to show whether a lake is changing from year to year. Changes in transparency may be due to increased or decreased algal growth, or the amount of dissolved or particulate materials in a lake, resulting from human disturbance or other impacts to the lake watershed area. Factors that affect transparency include algae, water color, and sediment suspension. Since algal density is usually the most common factor affecting transparency in Maine lakes, transparency is an indirect measure of algae abundance.

Total Phosphorus (TP): The total concentration of phosphorus found in the water, including organic and inorganic forms. TP is one of the major nutrients needed for plant growth. It is generally present in small amounts and limits plant growth in freshwater ecosystems. As phosphorus increases, the amount of algae generally increases. Humans cause phosphorous to reach lakes through stormwater runoff, lawn or garden fertilizers, and leaky or poorly maintained septic tanks.

Chlorophyll-a (Chl-a): A measurement of the green pigment found in all plants, including microscopic plants such as algae. It is used to estimate algal biomass; higher Chl-a equates to greater amount of algae in the lake.

Maine DEP recently conducted a Lake Type and Watershed Condition Index for Maine lakes.[11] Based on this analysis, McGrath Pond is an "interior pond". Table 3 (below) shows the ranges of water quality parameters observed in interior ponds (SDT was too variable within this lake type to provide ranges). Watershed condition index is representative of varying levels of watershed alteration, and the range of values presented for each are representative of typical lakes from each lake type. "Reference" represents lakes with the lowest amount of watershed alteration, "Altered" represents lakes with the greatest amount of watershed alteration, and "Average" refers to lakes that make up the remaining lakes that have typical amounts of watershed alteration for that lake type.

Table 3. Interior Pond Lake Type: Water Quality Parameter Ranges (Maine DEP)

	Watershed Condition Index			*McGrath Pond*
Parameter	**Reference**	**Average**	**Altered**	
Chlorophyll-a (ppb)	< 4.6	4.6 - 5.7	≥ 5.7	**3.2**
Total Phosphorus - Epilimnion Core (ppb)	< 10.0	10.0 - 14.2	≥ 14.2	**11**
Specific Conductivity (µS/cm)	<23.9	23.9 - 49.6	>49.6	**80**

The watershed of McGrath Pond is considered "altered" due to the high amount of human activity within its watershed compared to other Interior Ponds. However, some water quality parameters suggest better water quality than other Interior Ponds in altered watersheds. McGrath Pond is within the reference range for Chlorophyll-a, is considered "average" for phosphorus, and "altered" for specific conductivity. This parameter is directly related to the level of dissolved ions in the water. Higher levels of conductivity may indicate a greater concentration of pollutants in the water.[12]

A statistical analysis was conducted by Maine DEP to determine whether the water clarity in McGrath Pond has changed over time. Figure 9 shows the results of a Mann-Kendall tau trend test. The blue line is a lowess (locally weighted scatter plot smoothing) curve. The tau value of 0.413 and p-value of 0.000 indicate a significant positive increase in water clarity between 1995-2016. The greatest improvement occurred between 1975 - 1990; water clarity has remained stable since 1990.

A similar analysis was used to evaluate trends in both long-term (1975-2016), and short-term water

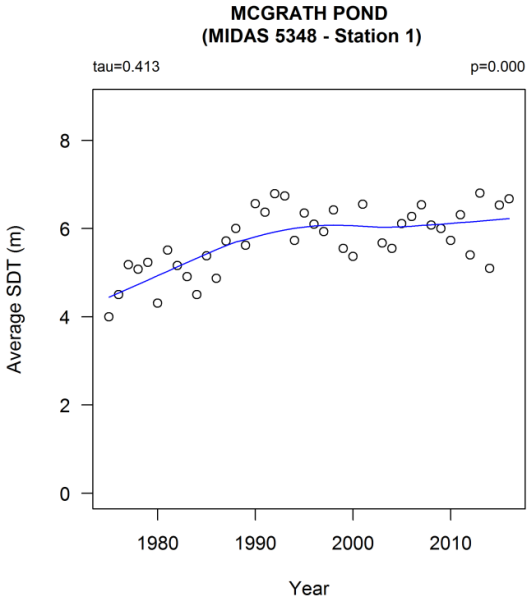


Figure 9. A Mann-Kendall trend test using water clarity data collected in McGrath Pond shows a significant positive water clarity trend over the historical sampling period (Source: Maine DEP).

[11] Maine DEP Draft Lake Classification and Condition Analysis, unpublished.
[12] Maine VLMP. Distribution of Water Quality Data, Specific conductance. Online:http://www.mainevlmp.org/distribution-of-water-quality-data/

quality data (2007-2016).[13] Table 4 and Appendix A provide an overview of statistical analysis for these trends in McGrath Pond for multiple parameters.

Table 4. Statistical significance of long- and short-term water quality data in McGrath Pond, Station 1.

Water Quality Parameter	*Long-Term Trend (1975-2016)	Short-Term Trend (2007-2016)	**Comments
Secchi Disk Transparency (SDT)	**significant increase (improving water quality)**	**No significant trend**	Long-term SDT data shows a significant positive increase in water clarity over the historical sampling period. Clarity has remained stable since 1990.
Total Phosphorus (TP)	**no significant trend**	not enough data to run 10-year analysis	Total phosphorus concentrations have remained stable in McGrath Pond over time. No data was collected between 1979-1990.
Chlorophyll-a (Chl-a)	**no significant trend**	not enough data to run 10-year analysis	No data was collected between 1984-1997. Consistent annual monitoring will help inform both short and long-term trends in McGrath Pond.

** Non-significant trends (p> 0.05) can be a result of stable data or if the results are to variable to determine a trend.*
*** See Appendix A for graphical representations of Mann-Kendall trend tests for each data set.*

§465-A. Standards for Classification of Lakes and Ponds

The department shall have one standard for the classification both of great ponds and of natural lakes and ponds less than 10 acres in size. Impoundments of rivers that are defined as great ponds pursuant to section 480-B are classified as GPA or as specifically provided in sections 467 and 468.

1. **Class GPA waters. Class GPA is the sole classification both of great ponds and of natural lakes and ponds less than 10 acres in size.**
   A. Class GPA waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, agriculture, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life. The habitat must be characterized as natural.
   B. Class GPA waters must be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters must have a stable or decreasing trophic state, subject only to natural fluctuations, and must be free of culturally induced algal blooms that impair their use and enjoyment...
   C. There may be no new direct discharge of pollutants into Class GPA waters (see exemptions from this provision: http://www.mainelegislature.org/legis/statutes/38/title38sec465-A.html)

Discharges into these waters licensed prior to January 1, 1986 are allowed to continue only until practical alternatives exist. Materials may not be placed on or removed from the shores or banks of a Class GPA water body in such a manner that materials may fall or be washed into the water or that contaminated drainage may flow or leach into those waters, except as permitted pursuant to section 480-C. A change of land use in the watershed of a Class GPA water body may not, by itself or in combination with other activities, cause water quality degradation that impairs the characteristics and designated uses of downstream GPA waters or causes an increase in the trophic state of those GPA waters. *Source: Maine Revised Statutes- Title 38, Chapter 3, Subchapter 1, Article 4-A.*

[13] Analysis conducted by Maine DEP; 2017 data were not included in this analyses, nor does it include data collected by Colby College 2015-2017.

Salmon Lake:

Water quality data has been collected at Station 1 in Salmon Lake since 1975. This includes 41 years of Secchi disk transparency (SDT) readings and 38 years of water chemistry (e.g., color, alkalinity, pH, total phosphorus, etc.). Algal blooms on Salmon Lake were first reported in the 1971, '76, '77, and '79 prompting more intensive water quality monitoring and watershed surveys to identify the sources of nutrient loading that resulted in loss of dissolved oxygen in the lake.[14] This explains why there is more available water chemistry data for Salmon Lake than McGrath Pond.

Table 5 (right) provides an overview of minimum, maximum, and average SDT, TP and Chl-a between 1975-2016. Phosphorus concentrations in water samples collected at the bottom of the lake (not shown in Table 5) have been consistently between 150 - 375 ppb over the past ten years. The highest concentrations of phosphorus in bottom samples were documented in 2015 (375 ppb) and 2016 (340 ppb) indicating that internal loading is a significant concern in Salmon Lake. The documented increase in the area of anoxia in Salmon Lake, elevated phosphorus in bottom sediments, and visual observations of algal blooms in the lake is a serious cause for concern. Studies by Colby College indicate a growing area of anoxia (low oxygen) at the bottom of Salmon Lake that negatively impacts fish habitat and increases the risk of algal blooms from internal loading (Figure 10).

Table 5. Water quality summary for key trophic parameters in Salmon Lake (Data source: LakesofMaine.org)

Water Quality Parameter[1]	Min	Max	Avg
SDT	1.0 m (1976/84)	9.4 m (1981)	5.0 m
TP	8.0 ppb (2015)	25 ppb (1976)	15 ppb
Chl-a	1.4 ppb (1982)	26 ppb (1980)	6.4 ppb

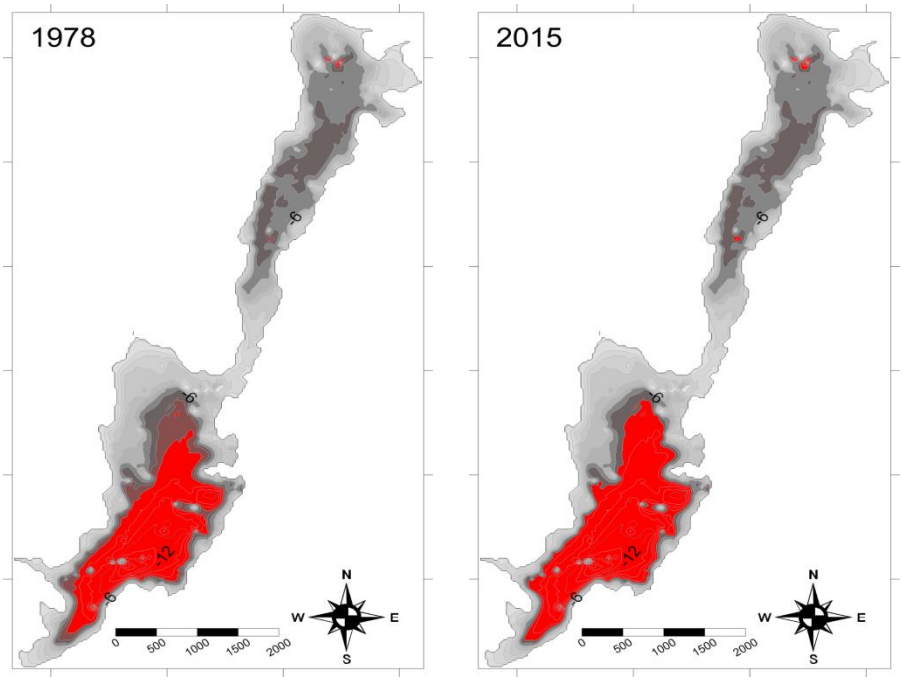


Figure 10. Area of anoxia (red) in Salmon Lake and McGrath Pond between 1978 and 2015 (Source: Colby College).

The water quality in Salmon Lake is considered average based on measures of SDT, TP

[14] Colby 2009.

and Chl-a. Potential for nuisance algal blooms on Salmon Lake is moderate to high, and potential for internal loading (release of phosphorus into the water column under low-oxygen conditions) is high due to high DO depletion in deep areas of the lake.[15] Unlike McGrath Pond, Salmon Lake is deeper and stratifies. Salmon Lake has experienced algal blooms in the past, and a fish kill in June 2016 due to warmer-than-usual early-summer water temperatures. Salmon Lake is an "interior lake", and its watershed is considered "altered" due to the high level of human activity it contains compared to other Interior Lakes. Table 6 (below) shows the ranges of water quality parameters observed for interior lakes (SDT was too variable within these classes to provide ranges). Salmon Lake falls outside the reference and average range and into the altered category for all three water quality parameters.

A statistical analysis was conducted by Maine DEP to determine whether the water clarity in Salmon Lake has changed over time. Figure 11 (right) shows the results of a Mann-Kendall trend test. The blue line is a lowess (locally weighted scatter plot smoothing) curve. Results of this analysis did not result in any significant water quality trends in Salmon Lake for SDT, Chl-a or TP over the long- (1975-2016), or short-term sampling period (2007-2016).[16] Table 7 (next page) and Appendix A provide an overview of the statistical analysis for both long- and short-term water quality data trends in Salmon Lake.

Table 6. Interior Pond Lake Type: Water Quality Parameter Ranges (Maine DEP)

	Watershed Condition Index			*Salmon Lake*
Parameter	**Reference**	**Average**	**Altered**	
Chlorophyll-a (ppb)	< 3.4	3.4 - 4.5	≥ 4.5	6.4
Total Phosphorus - Epilimnion Core (ppb)	< 6.7	6.7 - 9.0	≥ 9.0	15
Specific Conductivity (µS/cm)	<23.6	23.6 - 41.0	>41.0	66

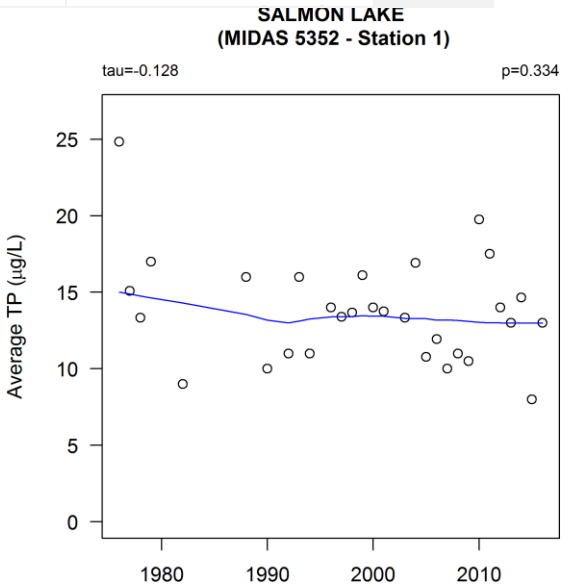


Figure 11. A Mann-Kendall trend test for total phosphorus data in Salmon Lake from 1975-2016. (Source: Maine DEP)

Recent data collected by Colby College shows that Salmon Lake experiences a period of anoxia between June and September each year, and significantly elevated levels of total phosphorus in the hypolimnion. Phosphorus is released from the sediment into the water column during periods of anoxia, with phosphorus concentrations increasing from 78 ppb in mid-July to 999 ppb by early October (Figure 12).

[15] Water Quality Summary. Salmon Lake (AKA Ellis P), Belgrade. MIDAS: 5352, Sample Station #1. Updated 2/11. Online: http://lakesofmaine.org/data/texts/5352.pdf

[16] Analysis conducted by Maine DEP; 2017 data were not included in these analyses.

Table 7. Statistical significance of long- and short-term water quality data in Salmon Lake, Station 1.

Water Quality Parameter	*Long-Term Trend (1975-2016)	Short-Term Trend (2007-2016)	**Comments
Secchi Disk Transparency (SDT)	no significant trend	no significant trend	The short-term trend indicates a high level of variability in average SDT from year to year.
Total Phosphorus (TP)	no significant trend	no significant trend	TP trends appear stable in the epilimnion; elevated TP due to anoxia in the hypolimnion is not reaching the surface layers.
Chlorophyll-a (Chl-a)	no significant trend	no significant trend	Chl-a in Salmon Lake is highly variable. Short-term trends follow a similar pattern to neighboring East Pond, with annual shifts from high to low from year to year.

** Non-significant trends (p> 0.05) can be a result of stable data or if the results are to variable to determine a trend.*
*** See Appendix A for graphical representations of Mann-Kendall trend tests for each data set.*

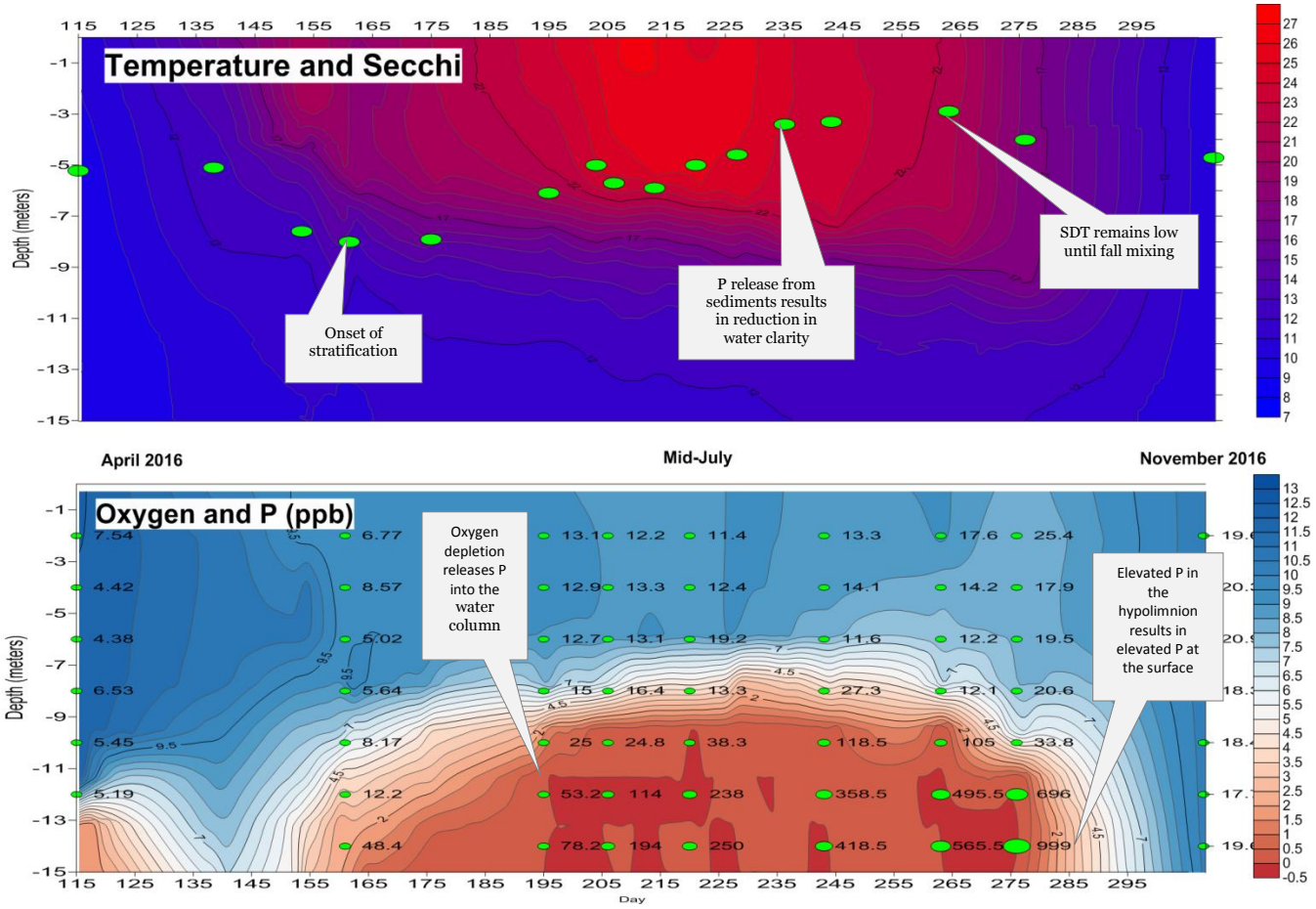


Figure 12. Temperature and SDT (green dots) profile (top), and Oxygen and Phosphorus (green dots) (bottom) at Salmon Lake, Station 1. Numbers on the bottom represent the day of the year based on the Julian calendar representing the time period April 24, 2016 through October 26 (Source: Colby College)

Concentrations of total phosphorus at the surface doubled between April and October, providing food for algae in the lake. Historical land uses such as agriculture, logging, the fish hatchery, and residential development in the watershed have all contributed to the deposition of phosphorus into Salmon Lake's bottom sediments. Visual observations of algal blooms (onset and duration of blooms, and make-up of algal community) would be beneficial for tracking the effects of anoxia and ensuring the safety of recreational users during periods of high bloom probability.

Because Salmon Lake SDT readings are not consistently less than 2 m, Salmon Lake remains on the Maine DEP "Watch List", rather than the "Impaired Lakes List". Further data collection and analysis is needed to support this listing if in fact Salmon Lake is experiencing regular and predictable nuisance algal blooms each year.

Volunteers from the MPSLA collect SDT and dissolved oxygen data to track long-term changes in the water quality of both McGrath Pond and Salmon Lake. More recently, MPSLA has been coordinating with Colby College, 7 Lakes Alliance (formerly known as Belgrade Regional Conservation Alliance) and Maine DEP on an intensive three-year Belgrade Lakes water quality sampling initiative (2015-2017) which included weekly Secchi disk measurements, sediment and phytoplankton sampling, as well as water chemistry. Results of this work is extremely beneficial for gaining a better understanding of lake processes and for guiding future management strategies to reduce internal loading and improve water quality in order to reduce the probability of nuisance algal blooms in Salmon Lake.

THREATENED STATUS

McGrath Pond and Salmon Lake are both listed on the Maine DEP's 2017 Nonpoint Source Priority Watershed List, as "Sensitive" and "Watch List", respectively. McGrath Pond flows into Salmon Lake, which flows into downstream Great Pond, an impaired lake listed on the federal 303(d) list due to declines in water quality. Great Pond is a significant contributor of water and phosphorus loading in Long Pond, another impaired lake. Long Pond's water clarity has been declining over time.

Water flows south from McGrath Pond into Salmon Lake and onto downstream Great Pond and Long Pond. (Photo: Dave Hallee)

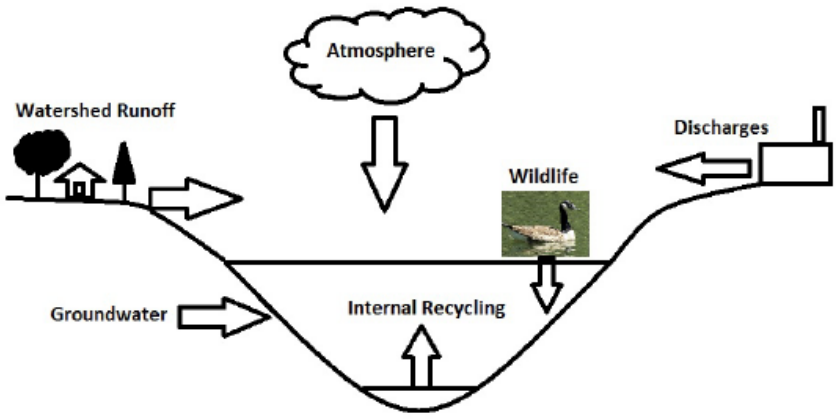
Actions to reduce phosphorus loading to McGrath Pond and Salmon Lake will not only help improve water quality locally, but also regionally, by improving the quality of the water flowing downstream into Great & Long Pond. All of these lakes are sensitive to increases in nonpoint source pollution.

WATERSHED NPS THREATS

The McGrath Pond-Salmon Lake watershed has a history of water quality problems dating back to 1926 when the Maine Dept. of Inland Fisheries and Wildlife recorded the occurrence of low dissolved oxygen at the landlocked salmon hatchery, which ultimately led to the closure of the hatchery in 1942.[17] Algal blooms were reported on Salmon Lake in 1971 and again in 1975, prompting the Maine DEP to begin studies within the watershed to determine the sources of the problems. This included logging, agriculture, and the landfill as potential sources of nutrient loading. Several more blooms through the 1970's prompted additional watershed surveys, and identified a large dairy farm and lumberyard as major contributors.[18] The delivery of nutrient-laden sediment into McGrath Pond and Salmon Lake has resulted in low-levels of dissolved oxygen in deep areas of Salmon Lake, release of phosphorus from bottom sediments into the water column, and algal blooms during the summer months.

The internal loading caused by historical land-uses in the watershed is compounded by delivery of sediments and nutrients from current land uses in the watershed.

A phosphorus budget for the lake estimates 871 kg of phosphorus enters the lake annually, and 68% of that phosphorus in generated internally (internal load).[19] Phosphorus loading from septic systems (26%), atmospheric deposition (13%), agriculture (11%) and shoreline (10%) and non-shoreline (9%) development are estimated to be among the top contributors of phosphorus loading from the watershed.[18] More information is needed to quantify the effects of septic systems from developed properties, including development of a septic system database.



Phosphorus in lakes comes from many different sources, both external (watershed inputs) and internal.(release from sediments). (Source: WRS, 2016).

Approximately 300 kg phosphorus/year (or 7.7% of the total phosphorus load in Great Pond) is estimated to flow out of Salmon Lake and into Great Pond (which is also experiencing anoxia and internal phosphorus loading). Therefore, reducing the phosphorus load in McGrath Pond and Salmon Lake will also benefit downstream waterbodies including not only Great Pond but

[17] Nicols, et. al., 1984. Phosphorus Loading to McGrath and Ellis Ponds, Kennebec County, Maine. USGS and MDEP, Washington, DC and Augusta, ME. In Colby College, 2010. Accessed online: https://www.colby.edu/biology/BI493/Reports/Salmon-McGrath2010.pdf

[18] Colby College, 2010. See above.

[19] Memo to Charles Baeder, BRCA from Ken Wagner, Water Resources Services, Inc., April 13, 2017.

also Long Pond, which is also on the Maine DEP's list of impaired lakes due to declining water clarity.

The McGrath Pond-Salmon Lake watershed is considered to have a high lake surface area to land area ratio compared to the other lakes in the Belgrade Lakes Watershed.[18] This means that the lakes make up a large percentage of the area within the watershed. Because the distance from the outer edge of the watershed to the lake is short compared to lakes with larger watershed areas, there is a higher likelihood that erosion occurring in the watershed will get to the lake.

Runoff

The problem with runoff is not the water itself, but the sediment and nutrients that get carried by the water and delivered to the lake.

Stormwater runoff from camp roads, private boat launches, driveways, and shoreline development are likely the largest current threats to these lakes. Of particular concern is the proximity of shoreline development and clearing of the vegetation on the lakeshore. Inputs from septic systems are also a concern based on best estimates of proximity, age and seasonal vs. year-round use, but is not well documented.

Rain water picks up speed as it flows across impervious surfaces like rooftops, compacted soil, unpaved camp roads, pavement, and lawns, and becomes a destructive erosive force. The volume and velocity of stormwater that flows off roads and driveways into ditches and through culverts can cause significant soil erosion that is delivered directly to the lake.

The problem with runoff is not necessarily the water itself, but the sediment and nutrients that get carried by and delivered to lake. **Phosphorus**, a naturally occurring element is considered a nutrient which provides food for algae and other aquatic plants. Phosphorus is found in soils, septic waste, animal waste and fertilizers.

Under natural conditions, phosphorus is limited in freshwater systems, which helps limit algae growth. However, when a lake receives extra phosphorus from developed land, algae growth increases dramatically. Sometimes this growth causes choking blooms, but more often it results in small changes in water quality that, over time, damage the ecology, aesthetics and economy of our lakes.

To assess the current state of erosion and delivery of pollutants into the lakes, the McGrath Pond-Salmon Lake watershed survey was conducted on September 28, 2017 with the help of more than 30 volunteers from the MPSLA, local residents, and interested individuals from the nearby Belgrade Lakes watersheds. Trained technical staff from Ecological Instincts, BRCA, and Maine DEP helped lead volunteers across seven watershed survey areas (Figure 13). Prior to the survey, MPSLA sent out 604 letters and an informational

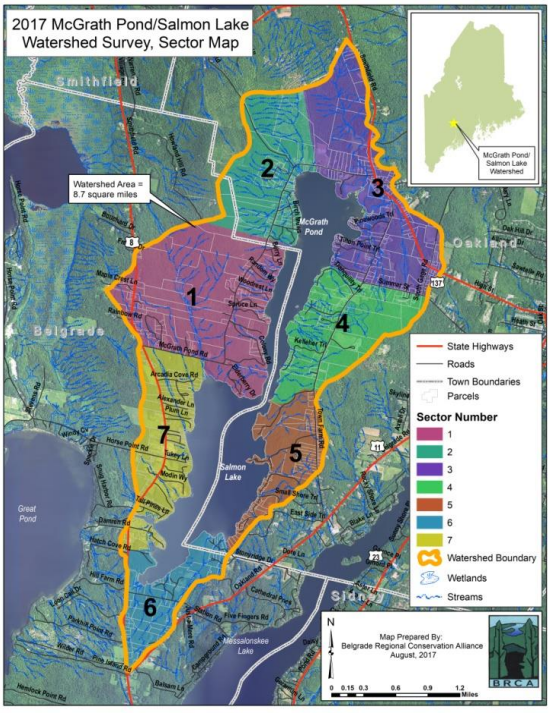


Figure 13. Map showing the seven designated survey sectors for the 2017 McGrath Pond-Salmon Lake watershed survey.

handout to all of the property owners in the watershed.

Thirty volunteers were trained in survey techniques during a two-hour classroom workshop led by Ecological Instincts and Maine DEP at Camp Tracy Lodge in Oakland. Following the training, volunteers and technical staff spent the remainder of the day documenting sources of NPS pollution across a number of land uses, including roads and road crossings, commercial and residential properties and beach/boat-road sites, using digital cameras, GPS units and standardized watershed field survey forms. Potential solutions, rough estimates for the cost of labor and materials for improving the sites, the overall impact to water quality, and the level of technical assistance to complete the recommendations were determined in the field for each site.

Survey results were summarized in the McGrath Pond-Salmon Lake Watershed Survey Report (Appendix B, Figure 14). A total of 105 sites were identified across ten different land-use types in the watershed (Table 8). The number of documented problems on residential properties far outweighed the other land-use types. Geographically, the majority of NPS Sites in the McGrath Pond-Salmon Lake watershed are located around McGrath Pond (70 sites, or 67%), while the remainder of sites are located in the Salmon Lake direct watershed (35 sites or 33%). The majority of sites are located near the shoreline, with a handful of sites associated with roads and stream crossings in the outer watershed.

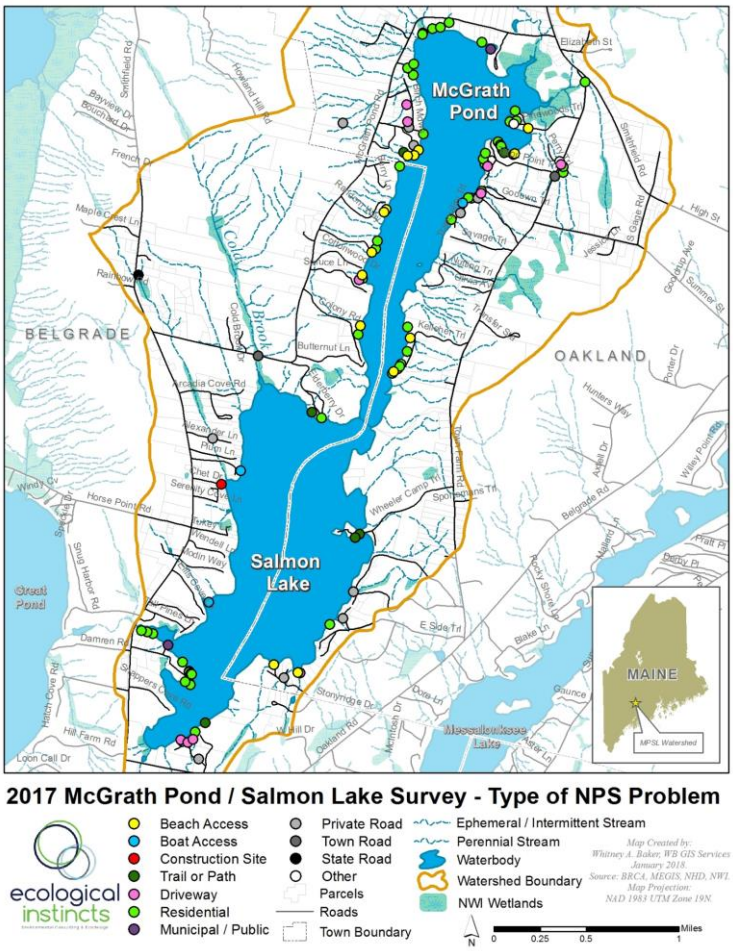


Figure 14. Map showing the seven designated survey sectors for the 2017 McGrath Pond-Salmon Lake watershed survey.

Residential sites account for almost half of the total number of sites (49%), followed by beach access (14%), driveways (12%), private roads (10%) and trails/paths (5%). The remaining 10% of sites included boat access, town and state roads and municipal/public sites. The impact of residential sites is greater than the numbers suggest however, because the majority of driveway, beach access, boat access, and trail/path sites are also located on residential properties.

On the whole, only 12 of the 105 sites ranked high-impact, compared to 45 medium- and 47 low-impact sites (Table 8). Residential NPS sites had the greatest number of medium and low-impact sites.

Table 8. Total number of NPS sites by land use and impact in the McGrath Pond-Salmon Lake watershed.

Land Use	High Impact	Medium Impact	Low Impact	Unknown	Total	% of Total
Residential	3	18	30	0	51	49%
Beach Access	2	7	6	0	15	14%
Driveway	1	10	2	0	13	12%
Private Road	1	6	4	0	11	10%
Trail/Path	1	1	3	0	5	5%
Boat Access	2	0	1	0	3	3%
Other	1	0	0	1	2	2%
Town Road	1	1	0	0	2	2%
State Road	0	1	0	0	1	1%
Municipal/Public	0	1	1	0	2	2%
TOTAL	**12**	**45**	**47**	**1**	**105**	**100%**

The McGrath Pond-Salmon Lake Watershed Planning Steering Committee met on August 29, 2017 to review maps and discuss survey objectives. Follow-up survey work was conducted during the two weeks following the survey, and again in early December to finish up survey work at Spaulding Point.

The committee met again on January 30, 2018 to develop a prioritized list of sites and began development of a watershed action plan. A final meeting on March 13, 2018 was held to review and discuss goals and planning objectives, review watershed maps, and provide input on the water quality summary. The committee developed goals and objectives described in the next section. A list of priorities for addressing NPS sites is provided in Table 9.

Example of an eroding driveway on the shore of Salmon Lake.

Table 9. Prioritized list of NPS sites in the McGrath Pond-Salmon Lake watershed.

Location	Notes
McGrath Pond (focus on clusters of sites within residential neighborhoods)	
Tilton Point Trail	Residential & driveway sites
Pinewoods Trail	Residential & beach access sites
Camp Tracy/YMCA	Multiple high & medium-impact sites; meet with property manager to review findings and offer YCC assistance
Tranquility Trail	Residential, boat access, & private-road sites
Kelleher Trail	Residential & beach access sites
Location	**Notes**
Salmon Lake (focus on private-road sites and high-impact boat-access sites)	
Private Roads	Conduct spring site visits to private-road sites in Sectors 5 & 6
Various	High-impact boat-access sites
New England Golf & Tennis Camp; Camp Modin	Conduct outreach and site visit in the spring of 2018
Stream Assessment	Conduct site visit to Arcadia Cove stream
Pleasant Point Park	Focus on public access areas

** The list of sites is not in order of priority.*

Examples of conservation practices for residential properties and driveways: 1) Erosion control mulch and roof dripline trench, 2) Erosion control mulch and infiltration steps, 3) Rubber razor. (Photos: AWWA, J. Jespersen)

Watershed Protection Plan Goals and Objectives

The overall goal of this WBPP is to protect and improve the water quality of McGrath Pond and Salmon Lake by reducing the amount of phosphorus and sediment being delivered to the lake. This will be achieved through the following objectives over the next ten years (2018-2027).

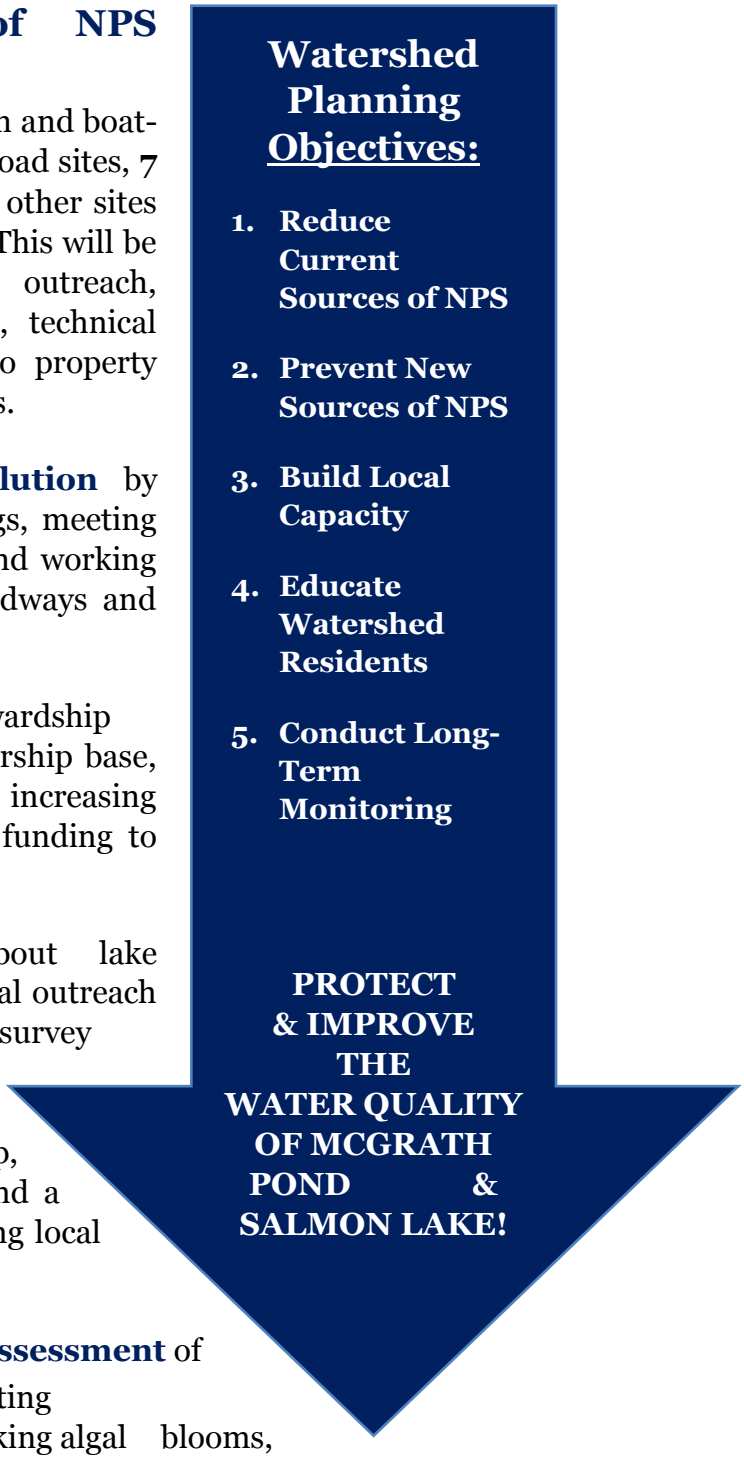
1. **Reduce current sources of NPS pollution** by addressing **51** residential sites, **23** beach and boat-access sites, **13** driveway sites, **11** private-road sites, **7** town, state, municipal/public sites, and **2** other sites identified in the watershed survey report. This will be achieved by providing targeted outreach, coordination with project partners, technical assistance, and cost-sharing assistance to property owners for installing conservation practices.

2. **Prevent new sources of NPS pollution** by attending regular planning board meetings, meeting regularly to review the watershed plan, and working with watershed partners to maintain roadways and shoreline areas.

3. **Build local capacity** for watershed stewardship recruiting new officers, increasing membership base, by strengthening operating committees, increasing participation in LakeSmart, and seeking funding to support watershed protection projects

4. **Educate watershed residents** about lake protection strategies by developing a formal outreach plan, spreading word about watershed survey results, conducting targeted outreach to landowners and summer camp managers, hosting a gravel road workshop, organizing residential BMP workshops and a public demonstration project, and involving local schools in community service projects.

5. **Conduct long-term monitoring and assessment** of watershed conditions by lake and conducting ongoing baseline in-lake monitoring, tracking algal blooms, measuring cyanotoxins, assessing the need for addressing the internal load, conducting aquatic invasive plant surveys, creating a septic system data base, and developing and maintaining the NPS Site Tracker.



Schedule & Milestones to Guide Plan Implementation

ACTION PLAN & SCHEDULE

The McGrath Pond-Salmon Lake Watershed Planning Committee developed action items, milestones and an estimated schedule for implementing the WBPP (Table 1). This included an in-depth review of watershed survey results, and a facilitated group planning session. The actions were further refined by the committee at a second meeting in March 2018. The final action plan (Table 10) includes management actions to meet the goals and objectives of this watershed plan over the next 10 years (2018 - 2027).

Table 10. McGrath Pond-Salmon Lake Implementation Schedule.

Year(s)	Actions
Ongoing Activities *(Annual)*	**Planning/Meetings** • Hold annual Steering Committee meetings to review & update WBPP • Develop and implement a formal Outreach Plan **Funding/Administrative/Capacity Building** • Seek grants that support identified actions • Recruit new lake association members and officers • Strengthen MPSLA operating committees **Education & Outreach** • Provide watershed project updates in MPSLA newsletters and website • Distribute information about MP-SL water quality at annual events such as Oakfest and MPSLA annual meetings • Attend regular planning board meetings to update watershed towns on watershed activities and needs • Build support for LakeSmart (60 new certifications in 10 years) • Involve schools in community service projects/demonstration projects • Partner with the towns to provide outreach to landowners about the dam **NPS Implementation** • Work with the state, towns, and road associations to promote ongoing road maintenance and repairs • Update NPS Site Tracker **Monitoring/Assessment** • Support 7LA/Colby water-quality monitoring initiatives • Collect water samples for cyanobacteria testing • Analyze and present results of annual water quality monitoring efforts • Conduct annual IPP surveys & support CBI program

2018 *Year 1*	**Planning/Meetings** • Form MP-SL WBPP Steering Committee • Meet with the Town of Oakland to discuss a public demonstration project at Pleasant Point Park • Conduct a feasibility study to determine the need for addressing the internal phosphorus load in Salmon Lake **Funding/Administrative/Capacity Building** • Develop a detailed funding plan to support watershed planning activities • Apply for Clean Water Act Section 319 watershed implementation grant funds from US EPA **Education & Outreach** • Post a copy of the Watershed Survey Report & Summary Handout to the MPSLA website • Prepare a press release about watershed survey results and send to local papers • Distribute post-survey landowner letters and summary handout to all landowners with a documented NPS site- include information about LakeSmart and YCC • Present watershed survey results at MPSLA Annual Meeting • Conduct outreach and spring site visits to commercial summer camps **NPS Implementation** • Address high- and medium-impact residential NPS sites (2 sites) • Address low-impact residential NPS sites through YCC (3 sites) • Set up NPS Site Tracker • Increase number of new LakeSmart certifications (6 new certifications) **Monitoring/Assessment** • Add spring baseline monitoring, Chl-a and color monitoring schedule • Determine the procedure and cost for testing Salmon Lake for cyanotoxins

2019-2021 *Years 2 - 4*	**Planning/Meetings** • Form MP-SL WBPP Steering Committee • Set up meeting with municipal officials to review survey results & discuss next steps • Set up meetings with commercial summer camps to review survey results & discuss next steps • Meet with Town of Oakland to discuss a public demonstration project at Pleasant Point Park • Review town ordinances and make recommendations for improvements to meet WQ goals **Funding/Administrative/Capacity Building** • Apply for Clean Water Act Section 319 watershed implementation grant funds from US EPA • Apply for other state, federal or private foundation grants that support planning recommendations • Look into forming a Watershed District **Education & Outreach** • Organize a public demonstration project at Pleasant Point Park • Conduct residential BMP workshops in neighborhoods with clusters of NPS sites (3 workshops) • Host a gravel road workshop and invite road associations to attend (1 workshop) • Reach out to local schools to recruit volunteers for the public demonstration project • Distribute press releases about upcoming workshops • Send follow-up letters to landowners with low-impact sites to get LakeSmart certified **NPS Implementation** • Implement BMPs at high- and medium-impact residential sites (15 sites) • Implement BMPs at low-impact residential sites through YCC (10 sites) • Address all high-impact beach and boat-access and trails/paths (4 sites) • Address high- and medium-impact driveway sites (5 sites) • Implement BMPs on private roads (6 sites) • Implement BMPs at the public boat launch • Implement BMPs on State and Town roads (3 sites) • Increase number of new LakeSmart evaluations (18 new certifications) **Monitoring/Assessment** • Conduct follow-up visits to "Other" NPS sites documented in the watershed survey • Develop a septic system data base & require landowners to register their system

2022-2024 *Years 5 - 7*	**Funding/Administrative/Capacity Building** • Apply for Clean Water Act Section 319 watershed implementation grant funds from US EPA • Apply for other state, federal or private foundation grants that support planning recommendations **Education & Outreach** • Sponsor a LakeSmart Boat Tour of recently certified properties • Host a gravel road workshop and invite road associations to attend (1 workshop) • Distribute press releases about LakeSmart certifications and boat tour **NPS Implementation** • Implement BMPs at high and medium-impact residential sites (9 sites) • Implement BMPs at low-impact residential sites through YCC (17 sites) • Address beach and boat-access sites and trails/paths (9 sites) • Address high and medium-impact driveway sites (5 sites) • Implement BMPs on private roads (5 sites) • Increase number of new LakeSmart evaluations (18 new certifications) • Review NPS Site Tracker and determine which sites need follow-up/implementation
2025-2027 *Years 8 - 10*	**Funding/Administrative** • Apply for state, federal or private foundation grants that support planning recommendations • Review and update funding plan **NPS Implementation** • Review NPS Tracker to determine implementation strategies • 15 new LakeSmart evaluations (2018-2027) • Target remaining sites through LakeSmart, YCC and 1:1 landowner contact - 7 boat and beach access sites - 3 driveway sites - 5 private road sites **Monitoring/Assessment** • Review water-quality data and update historical trend analysis to determine if water quality is improving • Determine need for updating watershed survey

Natural shoreline vegetation protects the shoreline from erosion caused by stormwater runoff and ice and wave action.
(Photo: Robyn Deveney)

Table 11. McGrath Pond- Salmon Lake Watershed Action Plan (2018 - 2027)

Action Plan & Milestones	Schedule	Who	Potential Funding Sources
Address Current Sources of NPS Identified in the Watershed Survey Report			
Residential Properties Goal: 51 sites			
Address high- & medium-impact residential sites with a focus on clusters of sites within neighborhoods utilizing cost sharing & YCC (3 high-impact, 18 medium-impact)	2018 (2 sites) 2019-2021 (10 sites) 2022-2024 (9 sites)	Landowners, 7LA	Landowners, MPSLA, EPA (319), Maine DEP, 7LA
Address low-impact residential sites utilizing YCC, LakeSmart, and neighborhood "Erosion Control Parties" (30 sites)	2018 (3 sites) 2019-2021 (12 sites) 2022-2024 (15 sites)	Landowners, MPSLA, 7LA	Landowners, MPSLA
Beach & Boat Access & Trails/Paths ~ Goal: 23 sites			
Address all beach and boat-access sites (4 high-impact, 7 medium-impact, 7 low-impact). Priority on high-impact sites.	2019-2021 (4 sites) 2022-2024 (7 sites) 2025-2027 (7 sites)	Towns, MPSLA, 7LA	EPA (319), Maine DEP
Conduct outreach and spring site visits to commercial summer camps	2018	MPSLA, 7LA, property managers	n/a
Address all eroding trails & paths (5 sites)	2019-2021 (3 sites) 2022-2024 (2 sites)	Landowners, 7LA	EPA (319), Maine DEP
Driveways ~ Goal: 13 sites			
Address driveway sites (1 high, 10 medium, 2 low-impact)	2019-2021 (5 sites) 2022-2024 (5 sites) 2025-2027 (3 sites)	Landowners, MPSLA, 7LA	Landowners, EPA (319), Maine DEP
Private Roads ~ Goal: 11 sites			
Conduct spring site visits to private road sites to meet with road association representatives and landowners and estimate costs to fix	2018	MPSLA, 7LA, Road Associations	n/a
Address private road sites (1 high, 6 medium, 4 low-impact)	2019-2021 (6 sites) 2022-2024 (5 sites)	Road Associations, Landowners, 7LA	Road Associations Landowners, EPA (319), Maine DEP

Action Plan & Milestones	Schedule	Who	Potential Funding Sources
Town & State Roads, Municipal/Public ~ Goal: 7 sites			
Send letters and set up meeting with State and Town officials to review survey results & discuss next steps	2018-2019	MDOT, Towns, MPSLA, 7LA	n/a
Coordinate with the Town of Oakland to address public access areas at Pleasant Point Park	2018-2021	Town of Oakland, MPSLA, 7LA	EPA (319), Maine DEP, Town
Partner with the Maine DIFW to address erosion at the Spaulding Point Public Boat Launch	2019-2020	MDIFW, MPSLA, 7LA	EPA (319), Maine DEP, MDIFW
Other ~ Goal: 2 sites			
Conduct follow-up field visits to "other" sites to determine source/impact on lake water quality	2018-2019	MPSLA, 7LA	n/a
Prevent New Sources of NPS Pollution			
Meet once/year to discuss action items and goals within the Watershed Plan and adjust plan as needed	2018 & Ongoing	Steering Committee	n/a
Attend regular planning board meetings to update watershed towns on MPSLA activities and needs	Ongoing	MPSLA	n/a
Review town ordinance and determine the need for strengthening ordinances as needed to meet water quality goals; ensure ordinances are effective and enforced.	2020-2021	7LA, Towns	Towns, 7LA, Towns
Inspect and repair all roads following large storm events and each spring and fall	Ongoing	Towns, Road Associations, Contractors	Towns, Road Associations
Work with the state and towns to promote cleaning up winter sand and ongoing road maintenance	Ongoing	MPSLA, 7LA	n/a
Build Local Capacity			
Lake Association Capacity			
Prepare a list of prospective candidates to serve as MPSLA officers to replace long-serving officers; meet with candidates and make nominations in preparation for the 2018 annual meeting.	2018	MPSLA Board of Directors	n/a
Strengthen MPSLA operating committees (Membership, Outreach, Dam) • Update member database, reach out to prospective members, increase membership	2018-2020	MPSLA	MPSLA, capacity building grants

Action Plan & Milestones	Schedule	Who	Potential Funding Sources
• Develop outreach plan, calendar of events, coordinate events, etc.; • Coordinate with towns and provide outreach to landowners about the dam			
Increase MPSLA Membership base ~ **Goal:** Increase from 100 to 150 (or 1/2 of total # of properties on the lake)	2018-2027	MPSLA	MPSLA, capacity building grants
Send out annual membership appeals to raise match for grants through MPSLA newsletter and website	Ongoing	MPSLA	MPSLA
LakeSmart			
Increase the # of certified LakeSmart Properties on MP-SL ~ **Goal:** 60 new evaluations (six/year) and 15 new certifications by 2027. • Send follow-up letter to landowners with low-impact NPS sites from the watershed survey • Continue coordination with 7LA's YCC program to help landowners meet certification requirements • Sponsor a LakeSmart Boat Tour to highlight completed projects and increase interest from additional landowners	2018-2027	MPSLA, Maine Lakes Society, Landowners, Summer Camps	MPSLA, EPA (319), Maine DEP
Funding to Support NPS Projects			
Develop a detailed funding plan to support watershed planning activities	2018-2019	Steering Committee	MPSLA
Research potential grants that support watershed plan implementation	2018-2020	Steering Committee, Consultants	MPSLA
Apply for EPA Clean Water Act Section 319 watershed implementation grants	2018 and ongoing	7LA, Steering Committee	MPSLA
Explore the potential of forming a Watershed District to help fund projects on all of the Belgrade Lakes	2019-2021	7LA, MPSLA, Towns	TBD
Apply for other state, federal or private foundation grants that support planning recommendations	Ongoing	7LA, Steering Committee	MPSLA

Action Plan & Milestones	Schedule	Who	Potential Funding Sources
Education & Outreach			
Develop a Watershed Outreach Plan to solidify annual watershed educational activities including OakFest (new volunteers needed to run the table), Are You Buff Enough? Workshops, Facebook and website, Fellowship dinners, etc.	2018-2019	MPSLA Watershed Steering Committee	MPSLA, EPA (319), Maine DEP
Watershed Survey Outreach			
Distribute post-survey landowner letters and summary handouts to all landowners with a documented NPS site	2018	MPSLA	MPSLA
Present watershed survey results at MPSLA Annual Meeting	2018	MPSLA, 7LA	MPSLA
Prepare a press release about watershed survey results and send to local papers	2018	MPSLA	n/a
Post survey results on the MPSLA, 7LA, and town websites	2018	MPSLA, 7LA, Towns	n/a
Conduct targeted outreach to summer camps with documented NPS sites and work with property managers and owners to become LakeSmart certified	2018-2022	MPSLA, 7LA	MPSLA, 7LA
Provide watershed project updates in MPSLA newsletters, Facebook page and website	Ongoing	MPSLA	MPSLA
Workshops & Events			
Host a Road Workshop- Invite road associations for a "How To" training on developing a road management plan, answer concerns about their road, provide resources about contractors and funding sources; update Road Association database.	2019-2020	7LA, KCSWCD, MPSLA	7LA, EPA (319), Maine DEP, MPSLA
Conduct Residential Workshops- Coordinate "Do it Yourself" BMP workshops in several neighborhoods around the lake. Offer free native plants for attending. Offer discount on materials for multiple properties working together.	2019-2022	MPSLA, 7LA, Landowners	7LA, EPA (319), Maine DEP, MPSLA
Organize a Public Demonstration Project- Coordinate with the Town of Oakland to hold a public demonstration project at Pleasant Point Park; develop educational signage at the park that describes the work completed.	2020-2021	Town of Oakland, MPSLA, 7LA	EPA (319), Maine DEP, Town of Oakland

Action Plan & Milestones	Schedule	Who	Potential Funding Sources
Involve local elementary and middle schools or college students in **community service projects** (e.g. Pleasant Point Park demonstration project)	2020-2027	MPSLA	n/a
Conduct Long-Term Monitoring & Assessment			
Support 7LA/Colby water-quality monitoring initiatives: • Weekly insitu, DO, clarity measurements • Bi-weekly TP, Chl-a, Color-Fe, Al	Ongoing	MPSLA, Towns	MPSLA
Add monthly spring baseline monitoring (April/May) and Chl-a and color to existing monitoring program	2018	Colby College, 7LA	7LA, Colby, Foundation Grants, Towns
Work with the 7LA water quality advisory committee to determine the need for addressing internal loading in Salmon Lake	2018-2020	MPSLA	n/a
Collect water samples during bloom conditions and test for cyanotoxins; develop protocol for tracking and documenting algal blooms on Salmon Lake	2018-2027	MPSLA, 7LA, Colby	7LA, Colby, Foundation Grants, Towns
Analyze and send results of annual water quality monitoring efforts to MPSLA	Ongoing	Colby	Colby, 7LA
Create a septic system database; require landowners to register all septic systems with the town	2020-2022	Towns, 7LA, MPSLA	Towns, EPA (319), Maine DEP
Conduct annual IPP surveys & support existing CBI program	Ongoing	MPSLA, 7LA	MPSLA, 7LA, Towns, Foundation Grants
Set up NPS Site Tracker & update annually	2018 & Ongoing	7LA, MPSLA	MPSLA, EPA (319), Maine DEP

PLAN OUTPUTS AND MILESTONES

1. Organizational Outputs

- MP-SL Watershed Steering Committee meets annually to update the plan
- Contact made with all property owners with an NPS site identified in the watershed survey
- Increase in number of new MPSLA members
- Increase in members participating on MPSLA committees
- 7LA applies for EPA Clean Water Act Section 319 project funding with support from MPSLA
- 7LA and MPSLA coordinate through the YCC program to offer landowners assistance with completing recommended conservation practices
- MPSLA's LakeSmart program a catalyst for completing conservation practices at low-impact NPS sites
- NPS Site Tracker created, maintained and used to track projects

MPSLA members assisting with follow-up watershed survey work. (Photo: MPSLA)

2. NPS Mitigation Outputs

- 50 NPS sites addressed through YCC
- 25 NPS sites addressed by residential landowners though private funding
- 3 LakeSmart certified summer camps
- 60 new LakeSmart site visits & 15 new LakeSmart certifications
- 75 people attending workshops
- NPS Site Tracker created, maintained, and used to track projects

Sediment Delta in McGrath Pond (Photo: Lewis Lester)

3. Water Quality Outcomes

- Continues to meet lake Class GPA standards set by DEP over the next ten years (2018-2027)
- Stable or improved trend for water clarity (Secchi disk readings) over the next ten years (2018-2027)
- Stable or improved dissolved oxygen levels over the next ten years (2018-2027)
- Stable or decrease in total phosphorus levels over the next ten years (2018-2027)

Proposed Management Measures

The Watershed Survey Report (Appendix B) lists specific management recommendations for the many NPS sites identified during the 2017 McGrath Pond-Salmon Lake Watershed Survey. Similarly, the report provides a more general list of recommendations for addressing the most common NPS problems. These recommendations can be found in online publications including the Maine DEP online publications:

- **Conservation Practices for Homeowners (24 fact sheets):** http://www.maine.gov/dep/land/watershed/materials.html
- **Erosion & Sediment Control BMPs** http://www.maine.gov/dep/land/erosion/escbmps/index.html
- **Gravel Road Maintenance Manual: A Guide for Landowners on Camp and Other Roads:** http://www.maine.gov/dep/land/watershed/camp/road/gravel_road_manual.pdf
- **Maine Stormwater Best Management Practices Manual** http://www.maine.gov/dep/land/stormwater/stormwaterbmps/index.html
- **The Buffer Handbook:** http://www.maine.gov/dep/land/watershed/buffhandbook.pdf
- **The Buffer Handbook Plant List:** http://www.maine.gov/dep/land/watershed/buffer_plant_list.pdf
- **The Lake Book: A Handbook for Lake Protection** http://mainelakessociety.org/resources/the-lake-book/

Additional resources that may be helpful include:

- **McGrath Pond Online Water Quality Data** https://www.lakesofmaine.org/lake-overview.html?m=5348
- **Salmon Lake Online Water Quality Data** https://www.lakesofmaine.org/lake-overview.html?m=5352

RESIDENTIAL SITES

Fifty-one (51) **residential** sites were documented on the shores of McGrath Pond and Salmon Lake. Three (3) of the 51 documented sites were ranked high-impact, 18 medium-impact, and 30 low-impact. Other documented NPS sites associated with residential development including beach access, boat access, driveways and trail/path, which account for another 27 sites. A few residential sites had more than one NPS site (e.g. eroding driveway and beach access). Residential sites are clustered along the shoreline in lakeshore neighborhoods.

Common problems identified on residential sites include:

- Surface erosion due to bare soil
- Undercutting of the shoreline
- Inadequate/lack of shoreline vegetation
- Roof dripline erosion

Recommended solutions for residential NPS sites include:

- Seed and mulch bare soil
- Establish or enhance shoreline buffers with native woody vegetation
- Stabilize undercut banks with a combination of rock and native vegetation
- Install dripline trenches at rooflines
- Limit foot traffic in areas sensitive to erosion

Maintenance for recommended solutions for residential NPS sites includes:

- Reseed/over-seed bare soil and replenish erosion control mulch every 2 years or more frequently if needed (from plowing or high use)
- Water vegetation frequently during first year of growth, and replace dead/dying plants

This plan seeks to address **21 high- and medium-impact residential sites and another 30 low-impact residential sites over a 10-year planning period** utilizing the 7LA's YCC program, MPSLA's LakeSmart Program, and a series of planned residential workshops.

BEACH & BOAT ACCESS & TRAILS/PATHS

Beach access, boat access and trail/paths sites are largely associated with impacts from residential development with a few sites located at commercial camps on the lake shore.

Common problems include:

- Surface erosion due to bare soil
- Inadequate/lack of shoreline vegetation
- Unstable water access/ boat access

Recommended solutions include:

- Seed and mulch bare soil
- Establish or enhance shoreline buffers with native woody vegetation
- Stabilize undercut banks with a combination of rock and native vegetation
- Place erosion control mulch or stone on heavily used footpaths
- Limit foot traffic in areas sensitive to erosion
- Install infiltration steps on paths with steep eroding trails

Maintenance for recommended solutions for road sites includes:

- Reseed/over-seed bare soil and replenish erosion control mulch every 2 years or more frequently if needed (from plowing or high use)
- Clean out stone in paths every 2-5 years to remove debris and ensure proper infiltration
- Water vegetation frequently during first year of growth, and replace dead/dying plants
- Remove private boat launches and reseed and revegetate shoreline

This plan seeks to address **23 beach and boat access and trail/path sites by 2027.** This will require working with landowners, commercial camp owners.

DRIVEWAYS & PRIVATE ROADS

Driveways and the private unpaved roads that service residential properties around the lake have the potential to deliver high volumes of stormwater and attached sediments and nutrients directly to the lake resulting in a significant impact on water quality. Driveways account for 12% (15 sites) of all documented NPS sites in the McGrath Pond-Salmon Lake watershed. One (1) ranked high-impact, ten (10) ranked medium-impact, and two (2) ranked low-impact. Private roads account for 10% (11 sites) of NPS sites, including one (1) high impact, six (6) medium-impact, and four (4) low-impact sites.

Common problems identified on driveways and private roads include:

- Surface erosion
- Shoulder erosion
- Roadside plow/grader berm
- Unstable culverts

Recommended solutions for roads include:

- Clean up excess winter sand in the spring
- Reshape and line ditches with rock and vegetate for stability
- Replace failing culverts and repair unstable culvert inlets/outlets with rip rap
- Remove plow/grader berms
- Remove sediment from ditches
- Reshape/crown and add gravel to gravel roads
- Install runoff diverters and ditch turnouts on roads and driveways (broad-based dip or rubber razor)

Maintenance for recommended solutions for road sites includes:

- Clean out runoff diverters on driveways annually
- Re-establish and repair road shoulders and ditches following damage by snowplows each spring
- Check ditches and culverts after major storm events
- Remove clogs and debris from culverts annually and after storm events

This plan seeks to address **13 driveway sites and 11 private road sites by 2027.** This will require working with landowners and road associations, seeking funding that supports road projects.

TOWN/STATE ROADS, MUNICIPAL SITES & OTHER

Compared with other land uses in the watershed, there were fewer sites documented on town (2 sites) and state roads (1 site) and municipal properties (2 sites). Two (2) "other" sites need follow-up. One (1) town-road site and one (1) other site ranked high-impact, three of the sites ranked medium-impact (including Pleasant Point Park), and the boat launch at Spaulding Point ranked low-impact.

Problems identified on these sites include:

- Road shoulder erosion
- Winter sand & bare soil
- Ditch erosion
- Unstable culvert inlet/outlet
- Lack of shoreline vegetation/shoreline undercut
- Lack of shoreline vegetation
- Unstable shoreline access
- Roadside plow/grader berm

Recommended solutions for these sites include:

- Clean up excess winter sand in the spring
- Reshape and line ditches with rock and vegetate for stability
- Replace failing culverts and repair unstable culvert inlets/outlets with rip rap
- Remove plow/grader berms
- Remove sediment from ditches
- Install ditch turnouts
- Seed and mulch bare soil
- Establish or enhance shoreline buffers with native woody vegetation

Maintenance for recommended solutions for road sites includes:

- Re-establish and repair road shoulders and ditches following damage by snowplows each spring
- Check ditches and culverts after major storm events
- Remove clogs and debris from culverts annually and after storm events
- Water vegetation frequently during first year of growth, and replace dead/dying plants
- Remove sediment from turnouts regularly

This plan seeks to address a total of **7 sites on state and town roads, Pleasant Point Park and the public boat launch.** This will require working with the towns of Oakland and Belgrade and the State.

WATER QUALITY RESULTS MONITORING

POLLUTANT LOAD REDUCTION ESTIMATES

Pollutant load reductions will be estimated for completed NPS sites to help demonstrate phosphorus and sediment load reductions as a result of BMP implementation and watershed planning in the McGrath Pond-Salmon Lake watershed. Pollutant loading reductions will be made using methods approved and recommended by Maine DEP and the US EPA, and reported to Maine DEP for any work funded by 319 grants.

MONITORING ACTIVITY, FREQUENCY AND PARAMETERS

Maine water quality criteria require that lakes and ponds have a stable or improving trophic state and be free of culturally induced algal blooms. MPSLA will continue to work with project partners including Colby College/7LA, Maine DEP, and VLMP volunteers to conduct long-term water quality monitoring on both McGrath Pond and Salmon Lake. At a minimum, volunteers will collect SDT measurements two times each month between May 1 - September 30.

Volunteer water quality monitors, courtesy boat inspectors and invasive plant patrollers are important components of a long-term monitoring program. (Photo: Dave Hallee)

If funding is available to continue intensive data collection as completed by Colby College between 2015-2017, other parameters will be collected including in-situ temperature and dissolved oxygen, chlorophyll-a, total phosphorus and color. Spring monitoring in April/May may also be considered. Maine DEP conducts monitoring on a five-year rotating schedule. This includes a full suite of monitoring parameters. Additional monitoring may be needed to assess the effects of internal loading in Salmon Lake, and to test water samples during algal blooms for cyanotoxins. Volunteers could be trained to document and track the location, duration and extent of algal blooms. Annual IPP surveys and daily CBI inspections should continue indefinitely to prevent invasive plants.

PLAN OVERSIGHT AND PARTNER ROLES

McGrath Pond-Salmon Lake Association will serve as the designated entity for overseeing plan implementation and plan updates. MPSLA will provide project match as available and seek funding from outside sources to conduct outreach, increase MPSLA membership and capacity, work with the 7LA's YCC program, continue implementing the MP-SL LakeSmart program in coordination with the Maine Lakes Society, and sponsor educational events including residential and gravel road workshop in coordination with the 7LA.

7 Lakes Alliance (7LA) will assist with plan implementation by providing technical support and resources as requested and provide technical assistance to landowners through the YCC program as funds become available, assist MPSLA with grant applications, and track

projects through the NPS Site Tracker. Work in conjunction with Colby College to conduct long-term monitoring.

Commercial Camps will work with 7LA and MPSLA to implement BMPs on commercial properties with support from the YCC, grant programs and LakeSmart.

Kennebec County Soil & Water Conservation District (KCSWCD) may provide technical assistance, including engineering assistance for road projects and assistance with LakeSmart.

Maine Department of Environmental Protection (DEP) will provide towns with ongoing guidance, technical assistance and resources, and the opportunity for financial assistance through the NPS grants program.

Maine Lakes Society (MLS) will serve as a technical resource for forming and sustaining a watershed association, and support for development of a local LakeSmart program.

Maine Volunteer Lake Monitoring Program (VLMP) will provide initial and ongoing training for new and experienced water quality monitors.

Residential Property Owners & Private Road Associations will address NPS issues on their properties, support MPSLA's mission, provide a private source of matching funds, and participate in local conservation workshops.

Towns of Oakland and Belgrade may provide funding support for 7LA's water quality initiatives and courtesy boat inspection program, assisting with the development of a septic system database, ordinance review, and participating in a feasibility study for a new Watershed District. These towns also play key roles in addressing NPS sites on town roads and providing training and education for municipal employees. The Town of Oakland will partner with 7LA and MPSLA to complete work at Pleasant Point Park.

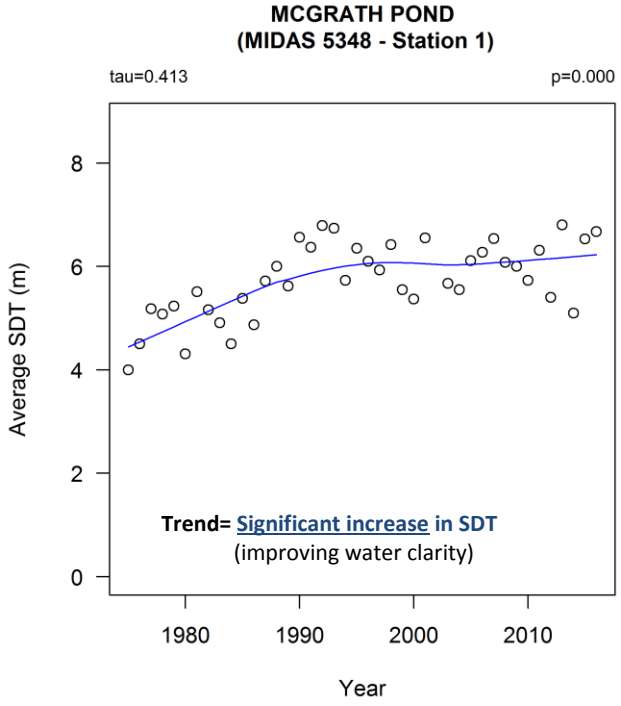
USDA/Natural Resources Conservation Service (NRCS) will provide support to agricultural and forestry operators in the watershed for installing conservation practices that protect water quality.

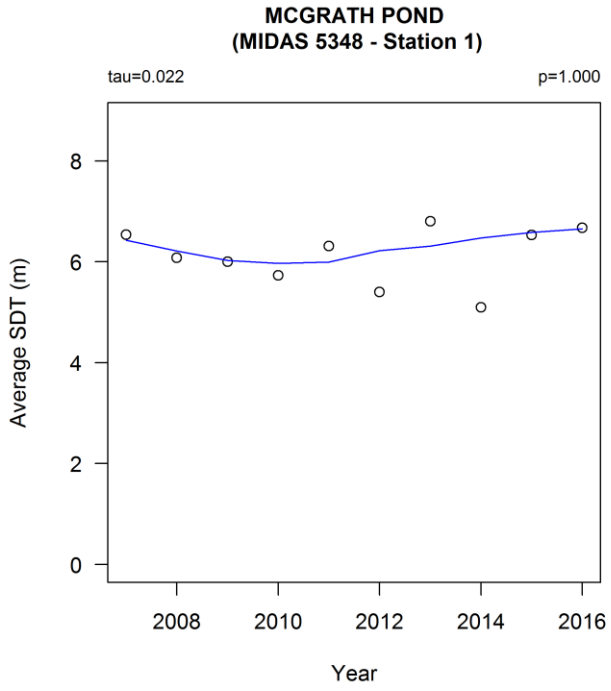
US Environmental Protection Agency (US EPA) may provide Clean Water Act Section 319 funds and guidance.

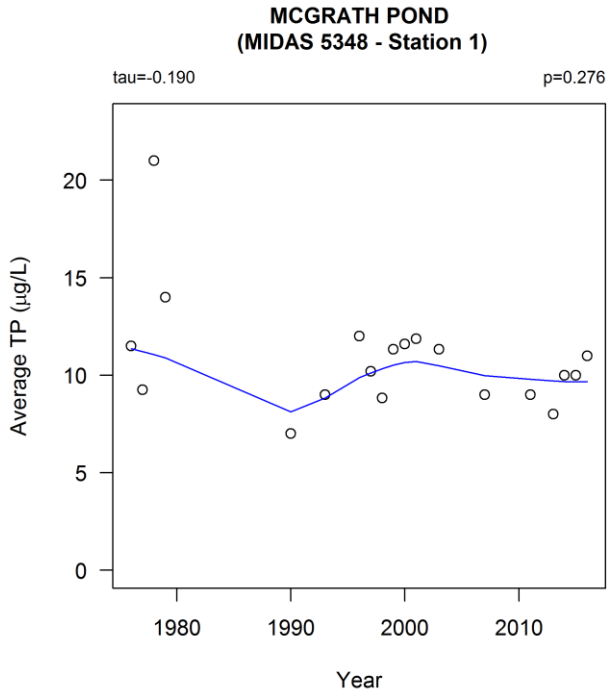
APPENDIX A: MANN-KENDALL TREND TEST RESULTS

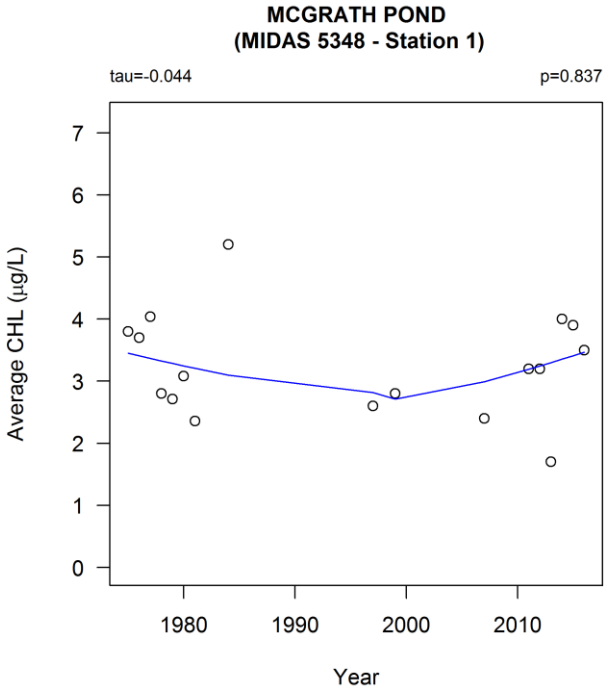
WATER QUALITY TRENDS FOR MCGRATH POND & SALMON LAKE (NEXT PAGE)

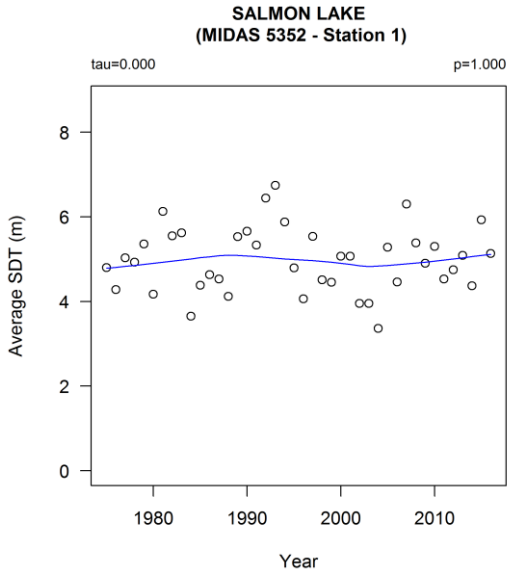
Data range 1975-2016. Analysis conducted by Jeremy Deeds, Maine DEP. Unless otherwise noted, the trend is not significant. Long-term trend (left), short-term trend (2007-2016) (right)







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(MIDAS 5352 - Station 1)
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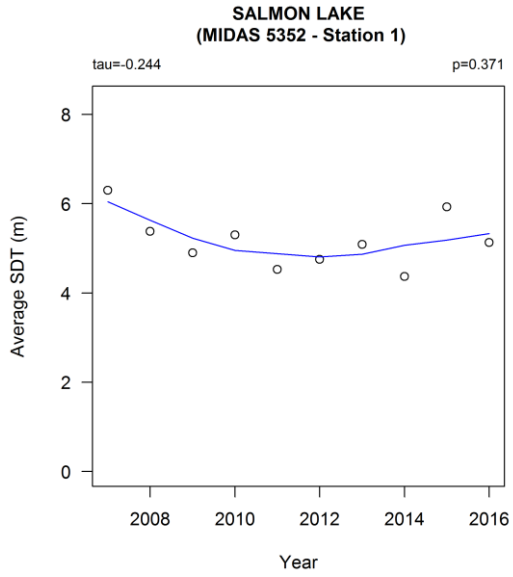
p=1.000
Average SDT (m)
Year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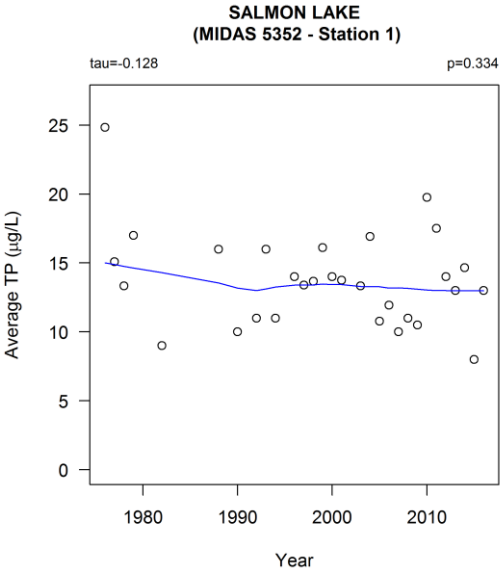
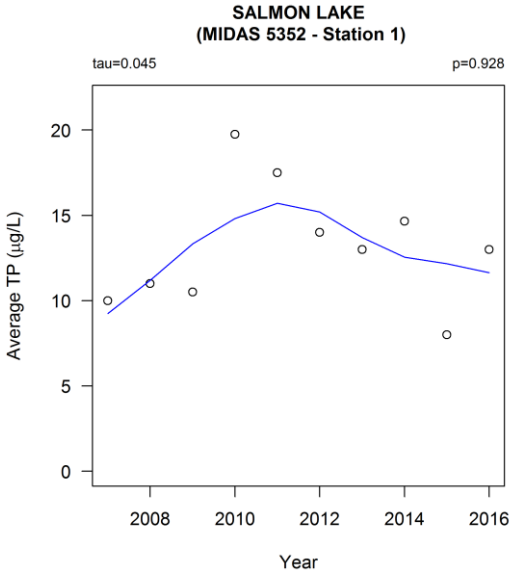
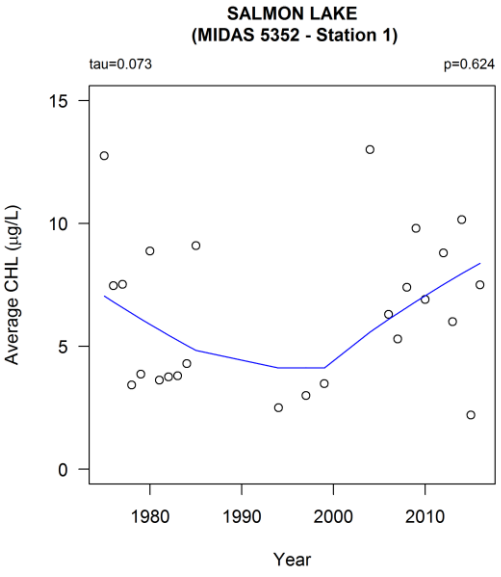
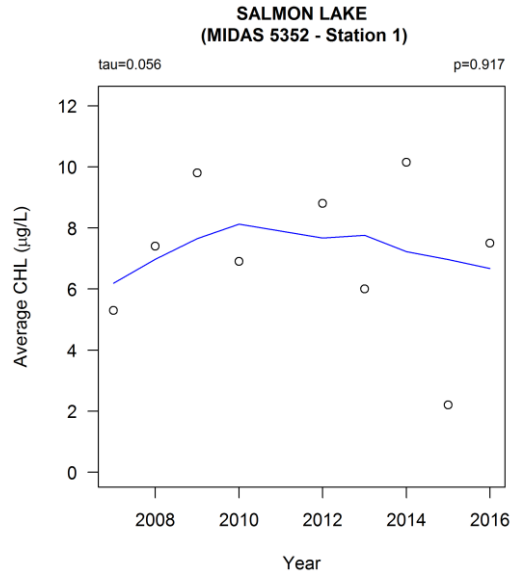
Average SDT (m)
Year


SALMON LAKE
(MIDAS 5352 - Station 1)
tau=-0.128
p=0.334
Average TP (µg/L)
Year


SALMON LAKE
(MIDAS 5352 - Station 1)
tau=0.045
p=0.928
Average TP (µg/L)
Year


SALMON LAKE
(MIDAS 5352 - Station 1)
tau=0.073
p=0.624
Average CHL (µg/L)
Year


SALMON LAKE
(MIDAS 5352 - Station 1)
tau=0.056
p=0.917
Average CHL (µg/L)
Year

APPENDIX B: MCGRATH POND-SALMON LAKE WATERSHED SURVEY REPORT