Milton Three Ponds

Watershed Management Plan

September 2025

Prepared by
FB Environmental Associates

MILTON THREE PONDS

WATERSHED MANAGEMENT PLAN

Prepared by **FB Environmental Associates**

In collaboration with **Strafford Regional Planning Commission**

SEPTEMBER 2025

Three Ponds Protective Association
https://www.threeponds.net/

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Cover photo: Northeast Pond photographed by the Strafford Regional Planning Commission

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ABBREVIATIONS

ACRONYM	DEFINITION
AC	Assimilative Capacity
AIPC	Aquatic Invasive Plant Control, Prevention and Research Grants
ACEP	Agricultural Conservation Easement Program
ALI	Aquatic Life Integrity
ARM	Aquatic Resource Mitigation Fund
BMP	Best Management Practice
CAGR	Compound Annual Growth Rate
CHL-A	Chlorophyll-a
CNMP	Comprehensive Nutrient Management Plan
CSP	Conservation Stewardship Program
CWA	Clean Water Act
CWP	Center for Watershed Protection
CWSRF	Clean Water State Revolving Fund
DO	Dissolved Oxygen
DPW	Department of Public Works
EMD	Environmental Monitoring Database
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESRI	Environmental Systems Research Institute
FBE	FB Environmental Associates
FT	Feet
Gg	Gigagrams
HAB	Harmful Algal Bloom
ILFP	In-Lieu Fee Program
KG	Kilogram
Kg/yr	Kilograms per year
LCHIP	Land and Community Heritage Investment Program
LID	Low Impact Development
LLMP	Lay Lakes Monitoring Program
LLRM	Lake Loading Response Model
LWCF	Land and Water Conservation Fund
M	Meter
Mg/L	Milligrams per Liter

ACRONYM	DEFINITION
NAWCA	North American Wetlands Conservation Act
NERFG	New England Forest and River Grant
NFWF	National Fish and Wildlife Foundation
NH GRANIT	New Hampshire Geographically Referenced Analysis and Information Transfer System
NHACC	New Hampshire Association of Conservation Commissions
NHD	National Hydrography Dataset
NHDES	New Hampshire Department of Environmental Services
NHDOT	New Hampshire Department of Transportation
NHFG	New Hampshire Fish and Game Department
NHLCD	New Hampshire Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
NRI	Natural Resources Inventory
NWI	National Wetlands Inventory
PCR	Primary Contact Recreation
PCS	Potential Contamination Source
ppb, ppm	parts per billion, parts per million
RCCP	Regional Conservation Partnership Program
RCRA	Resource Conservation and Recovery Act
SCC	State Conservation Committee
SDT	Secchi Disk Transparency
TP	Total Phosphorus
TPPA	Three Ponds Protective Association
Ug/L	Micrograms per liter
UNH	University of New Hampshire
USLE	Universal Soil Loss Equation
WMP	Watershed-Based Management Plan
YR	Year

DEFINITIONS

Adaptive management approach recognizes that the entire watershed cannot be restored with a single restoration action or within a short time frame. The approach provides an iterative process to evaluate restoration successes and challenges to inform the next set of restoration actions.

Aerial water load describes pollutants that reach the lake straight from the air. Substances such as nutrients, metals, and other harmful chemicals are carried by wind and settle into the water through a process known as atmospheric deposition.

Anoxia is a condition of low dissolved oxygen.

Assimilative Capacity is a lake's capacity to receive and process nutrients (phosphorus) without impairing water quality or harming aquatic life.

Best Management Practices (BMPs) are conservation practices designed to minimize discharge of NPS pollution from developed land to lakes and streams. Management plans should include both non-structural (non-engineered) and structural (engineered) BMPs for existing and new development to ensure long-term restoration success.

Build-out analysis combines projected population estimates, current zoning restrictions, and a host of additional development constraints (conservation lands, steep slope and wetland regulations, existing buildings, soils with low development suitability, and unbuildable parcels) to determine the extent of buildable areas in the watershed.

Chlorophyll-a (Chl-a) is a measurement of the green pigment found in all plants, including microscopic plants such as algae. Measured in parts per billion or ppb, it is used as an estimate of algal biomass; the higher the Chl-a value, the higher the number of algae in the lake.

Clean Water Act (CWA) requires states to establish water quality standards and conduct assessments to ensure that surface waters are clean enough to support human and ecological needs.

Cyanobacteria are photosynthetic bacteria that can grow prolifically as blooms when enough nutrients are available. Some cyanobacteria can fix nitrogen and/or produce microcystin, which is highly toxic to humans and other life forms.

Dissolved Oxygen (DO) is a measure of the amount of oxygen dissolved in water. Low oxygen can directly kill or stress organisms and stimulate release phosphorus from bottom sediments.

Epilimnion is the top layer of lake water directly affected by seasonal air temperature and wind. This layer is well-oxygenated by wind and wave action.

Eutrophication is the process by which lakes become more productive over time (oligotrophic to mesotrophic to eutrophic). Lakes naturally become more productive or "age" over thousands of years. In recent geologic time, however, humans have enhanced the rate of enrichment and lake productivity, speeding up this natural process to tens or hundreds of years.

Fall turnover is the process of complete lake mixing when cooling surface waters become denser and sink, especially during high winds, forcing warmer, less-dense water to the surface. This process is critical for the natural exchange of oxygen and nutrients between surface and bottom layers in the lake.

Flushing rate (also called retention time) is the amount of time water spends in a waterbody. It is calculated by dividing the flow in or out by the volume of the waterbody.

Full build-out refers to the time and circumstances in which, based on a set of restrictions (e.g., environmental constraints and current zoning), no more building growth can occur, or the point at which lots have been subdivided to the minimum size allowed.

Hypolimnion is the bottom-most layer of the lake that experiences periods of low oxygen during stratification and is devoid of sunlight for photosynthesis.

Impervious surfaces refer to any surface that will not allow water to soak into the ground. Examples include paved roads, driveways, parking lots, and roofs.

Internal Phosphorus Loading is the process whereby phosphorus bound to lake bottom sediments is released back into the water column during periods of anoxia. The phosphorus can be used as fuel for plant and algae growth, creating positive feedback to eutrophication.

Low Impact Development (LID) is an alternative approach to conventional site planning, design, and development that reduces the impacts of stormwater by working with natural hydrology and minimizing land disturbance by treating stormwater close to the source, and preserving natural drainage systems and open space, among other techniques.

Nitrogen is a nutrient that occurs in several forms (e.g., nitrate, nitrite, ammonium) and is essential for plant and animal life. Excess nitrogen from sources like wastewater, fertilizers, and stormwater runoff can cause water quality degradation.

Nonpoint Source (NPS) Pollution comes from diffuse sources throughout a watershed, such as stormwater runoff, seepage from septic systems, and gravel road erosion. One of the major constituents of NPS pollution is sediment, which contains a mixture of nutrients (like phosphorus) and inorganic and organic material that stimulate plant and algae growth.

Non-structural BMPs, which do not require extensive engineering or construction efforts, can help reduce stormwater runoff and associated pollutants through operational actions, such as land use planning strategies, municipal maintenance practices, and targeted education and training.

Oligotrophic lakes are less productive or have fewer nutrients (i.e., low levels of phosphorus and chlorophyll-a), deep Secchi Disk Transparency readings (8.0 m or greater), and high dissolved oxygen levels throughout the water column. In contrast, **eutrophic** lakes have more nutrients and are therefore more productive and exhibit algal blooms more frequently than oligotrophic lakes. **Mesotrophic** lakes fall in-between with an intermediate level of productivity.

pH is the standard measure of the acidity or alkalinity of a solution on a scale of 0 (acidic) to 14 (basic).

Riparian refers to wildlife habitat found along the banks of a lake, river, or stream. Not only are these areas ecologically diverse, but they are also critical to protecting water quality by preventing erosion and filtering polluted stormwater runoff.

Secchi Disk Transparency (SDT) is a vertical measure of the transparency of water (ability of light to penetrate water) obtained by lowering a black and white disk into the water until it is no longer visible. Transparency is an indirect measure of algal productivity and is measured in meters (m).

Structural BMPs, or engineered Best Management Practices, are often at the forefront of most watershed restoration projects and help reduce stormwater runoff and associated pollutants.

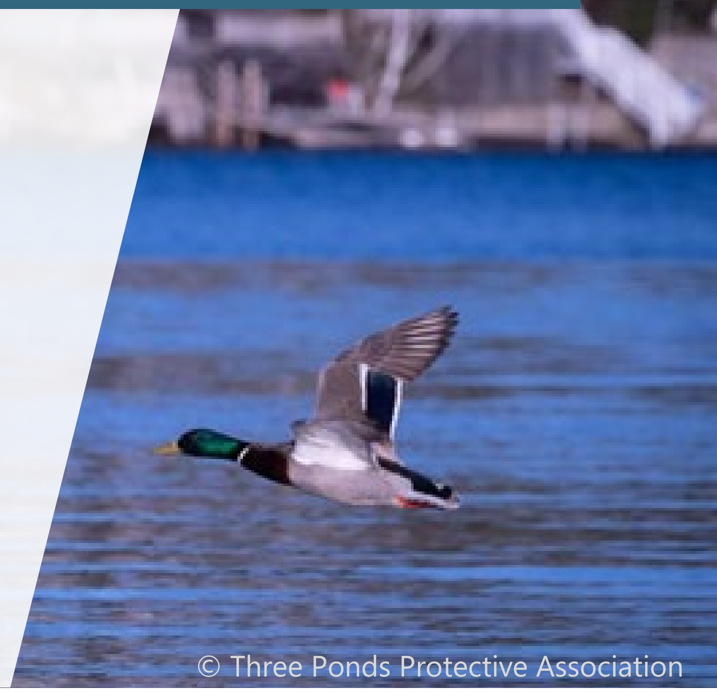
Thermal stratification is the process whereby warming surface temperatures in summer create a temperature and density differential that separates the water column into distinct, non-mixable layers.

Thermocline or **metalimnion** is the markedly cooler, dynamic middle layer of rapidly changing water temperature. The top of this layer is distinguished by at least a degree Celsius drop per meter of depth.

Total Phosphorus (TP) is one of the major nutrients needed for plant growth. It is generally present in small amounts (measured in parts per billion (ppb)) and limits plant growth in lakes. In general, as the amount of TP increases, the number of algae also increases.

Trophic State is the degree of eutrophication of a lake and is designated as oligotrophic, mesotrophic, or eutrophic.

EXECUTIVE SUMMARY



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Milton Three Ponds encapsulates three ponds formed by an impoundment along the Salmon Falls River: **Northeast Pond**, **Townhouse Pond**, and **Milton Pond** (a.k.a., Depot Pond). Together, the watershed spans approximately 68,485 acres into the towns of Milton, Middleton, Brookfield, New Durham, Wolfeboro, and Wakefield, NH; and Lebanon, and Acton, ME.

THE PROBLEM

NHDES Lake Trophic Survey Reports (1980, 1995) categorized all three ponds as mesotrophic largely due to low dissolved oxygen in bottom waters. Townhouse Pond was classified as borderline oligotrophic-mesotrophic since there was only a one-point difference between the 1980 and 1995 surveys due to slightly elevated chlorophyll-a measured during the 1995 survey. All three ponds were assessed by the New Hampshire Department of Environmental Services (NHDES) as impaired (5-M) for Aquatic Life Integrity due to low pH. The ponds were also assessed by NHDES as potentially not supporting (3-PNS) for Aquatic Life Integrity due to low alkalinity (all three ponds) and elevated total phosphorus (all except for Northeast Pond), and for Primary Contact Recreation due to the presence of cyanobacteria hepatotoxic microcystins.

Cyanobacteria blooms in the ponds have been reported in recent years, with three NHDES-issued warnings occurring within the last 10 years (one for Townhouse Pond and two for Northeast Pond). The most recent blooms occurred in 2023 and 2024 in Northeast Pond, the former of which occurred following record-high precipitation for New Hampshire according to the National Oceanic and Atmospheric Administration. Enhanced loading of phosphorus to surface waters can stimulate excessive plant, algae, and cyanobacteria growth and degrade water quality. Sources of excess phosphorous are influenced by human activity including land use and development practices, and can be compounded by environmental variability.

THE GOAL

The goal of the Milton Three Ponds Watershed Management Plan (WMP) is to improve the water quality of Northeast Pond, Townhouse Pond, and Milton Pond such that they meet state water quality standards for the protection of Aquatic Life Integrity (ALI) and substantially reduce the likelihood of harmful cyanobacteria blooms through the following objectives:

> **OBJECTIVE 1:** Reduce phosphorus loading from existing development by 253 kg/yr to Northeast Pond, 216 kg/yr to Townhouse Pond, and 385 kg/yr to Milton Pond to improve the average in-lake summer total phosphorus concentration to 8.4 ppb, 7.2 ppb, and 7.2 ppb, respectively.
>
> **OBJECTIVE 2:** Mitigate (prevent or offset) phosphorus loading from future development by 72 kg/yr to the Milton Three Ponds system to maintain average summer in-lake total phosphorus concentration for Milton Pond in the next 10 years (2035).

THE SOLUTION

To achieve this, the WMP recommends structural BMPs (e.g., erosion control, stormwater fixes), long-term monitoring, and targeted education/outreach. Additional actions include ordinance updates, septic system repairs, and road maintenance improvements. Implementation, led by the Three Ponds Protective Association (TPPA) and partners, is expected to cost $4.39–$5.63 million over 10+ years. Ongoing volunteer involvement and adaptive management will be essential for success.

THE KEY TO SUCCESS

The success of this plan depends on the continued dedication of volunteers and a strong, diverse stakeholder group that meets regularly to coordinate resources, track progress, and adjust actions as needed. Reducing nutrient loading is challenging due to widespread phosphorus sources and will require a collaborative, adaptive approach across the watershed community.

While the plan outlines ideal strategies, some may be difficult to implement given aging infrastructure, limited access to key areas, and constrained funding and staffing. Private landowners play a critical role in protecting lake health, but engaging this group remains a challenge. TPPA will continue public outreach to encourage participation to ensure lasting protection of Milton Three Ponds water quality.

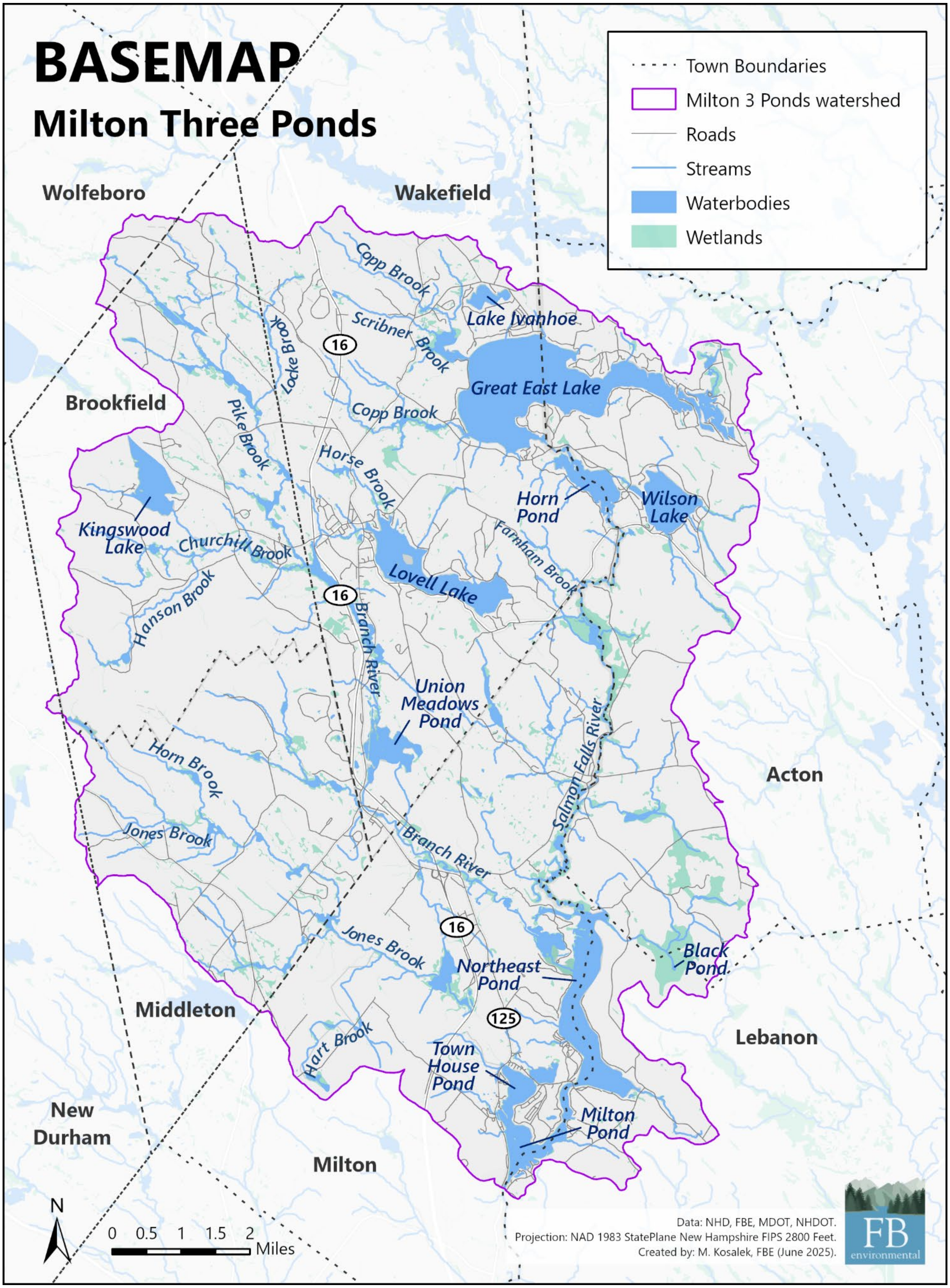

Figure 1. Milton Three Ponds watershed basemap.

1 INTRODUCTION

1.1 WATERBODY DESCRIPTION AND LOCATION

Milton Three Ponds, comprising Northeast Pond, Townhouse Pond, and Milton Pond, is a glacially formed waterbody system spanning approximately 1,078 acres across the towns of Milton, Middleton, Brookfield, New Durham, Wolfeboro, and Wakefield, NH, and Lebanon, and Acton, ME. The combined watershed area is approximately 68,485 acres, characterized by forested land, scattered residential development, and several inlets that drain the surrounding landscape. Key tributaries include Salmon Falls River (upper reach), Hart Brook, and smaller unnamed streams entering from the north, west, and east. The watershed also includes that of Great East Lake, Wilson Lake, Horn Pond, Lovell Lake, Kingswood Lake, and Union Meadows Pond (Figure 1).

Water flows generally southward, connecting the three ponds and eventually continuing on as the Salmon Falls River, which continues downstream to the Piscataqua River and ultimately the Atlantic Ocean. The three ponds are hydrologically connected by narrows and control structures and outlet at a dam at the southern end of Milton Pond.

Regional climate data from 1994 to 2023, sourced from Daymet show average monthly air temperatures ranging from about 10°F in winter to 70°F in summer, with a mean annual temperature of 46°F (Figure 2), The watershed receives approximately 48–52 inches of precipitation annually, including both rain and snow.

The highest elevations in the watershed occur near Prospect Hill and Teneriffe Mountain on the northeastern side, reaching approximately 1,100 feet above sea level, while the elevation of the ponds is around 415 feet. These figures are based on digital elevation models from NH GRANIT and Maine GIS.

Located within a temperate climate zone, the Milton Three Ponds watershed experiences a range of weather conditions, including snowstorms, thunderstorms, and occasional tropical systems. The landscape is largely forested with mixed hardwood and conifer species such as red oak, sugar maple, white pine, and eastern hemlock.

This diverse natural environment supports a wide variety of wildlife, including moose, deer, black bear, bobcat, coyote, otter, beaver, muskrat, turtles, frogs, salamanders, numerous fish species, and a rich array of birds—notably loons, herons, ducks, bald eagles, and songbirds.

1.2 WATERSHED PROTECTION GROUPS

The **Three Ponds Protective Association** (TPPA) is a volunteer-run, nonprofit organization dedicated to protecting and improving water quality in Milton Three Ponds. Founded in 2005, TPPA carries out water quality monitoring, invasive species tracking, and educational outreach to promote lake stewardship. TPPA collects water samples and tracks conditions to understand nutrient loading and lake health. The association also works closely with local partners, such as the Milton Conservation Commission, to educate residents about responsible land and water use.

The **Milton Conservation Commission** (MCC) works to preserve water quality through land conservation, permitting review, public education, and collaboration with local organizations such as the Three Ponds Protective Association. It helps enforce state and local regulations related to wetlands, shoreland protection, and stormwater management, and provides guidance to property owners on best practices for reducing runoff and erosion. The Commission also supports outreach efforts to raise awareness about water quality threats and promotes stewardship across the community.

Lebanon Conservation Commission (LCC) is a volunteer board within the Town of Lebanon, Maine, to protect town-owned open spaces, wetlands, wildlife areas for future generations.

The **Strafford County Conservation District** (SCCD) is one of 10 county conservation districts in New Hampshire that operate as resource management agencies and a subdivision of local governments. New Durham is in SCCD’s service area. The organization works with farmers, forest owners, landowners, schools, and municipalities to help protect and conserve the area’s natural resources through projects such as stream bed restoration, invasive species management, and pollinator plantings.

The **Acton Wakefield Watersheds Alliance (AWWA)** encompasses an upstream portion of the Salmon Falls River Watershed which is part of the Milton Three Ponds watershed. This area includes Lake Ivanhoe, Great East Lake, Lovell Lake, Horn Pond, and Wilson Lake, in Acton, ME, and Wakefield, NH. Their mission, "is to protect and restore water quality to maintain the social, economic, and environmental stability in [their] towns and in the region."

The **Lovell Lake Association** encompasses the direct watershed to Lovell Lake in Wakefield, NH. Since 1963, this community has been "dedicated to the preservation of Lovell Lake."

The **Great East Lake Improvement Association** (GELIA) focuses on the water and land surrounding Great East Lake in Wakefield, NH, and Acton, ME. The GEILA is "a non-profit organization dedicated to the welfare of Great East Lake, its wildlife and environment. [They] see education as a primary function of this organization. Only through vigilant action and financial support can [they] hope to ensure that future generations will share the experience of stewardship for the treasure that is Great East Lake."

The **New Hampshire Association of Conservation Commissions** (NHACC) works to provide educational assistance to conservation commissions throughout New Hampshire (216 in total). As a non-profit organization, the NHACC's mission is to instill responsible use of the available natural resources by promoting conservation and serving as the communication link between conservation commissions, while providing technical support on the logistics of conservation commission meetings and document language.

NH LAKES the mission of NH LAKES is to "restore and preserve the health of New Hampshire's lakes. Our vision is a New Hampshire where all our lakes are clean and healthy, and caring for them is a way of living, doing business, and governing."

The **University of New Hampshire Lakes Lay Monitoring Program** engages volunteers and local groups in collecting and analyzing water quality data for lakes across New Hampshire, including Milton Three Ponds. The data support informed decision-making for lake management and protection strategies.

The **New Hampshire Department of Environmental Services** (NHDES) works with local organizations to improve water quality in New Hampshire at the watershed level. NHDES works with communities to identify water resource goals and to develop and implement watershed-based management plans. This work is achieved by providing financial and technical assistance to local watershed management organizations and by investigating actual and potential water contamination problems, among other activities.

The **Maine Department of Environmental Protection** (MEDEP) works to manage, protect, and improve the natural resources of Maine. MEDEP implements water quality programs under the Clean Water Act with local, state, and federal agencies to help bring resources, education, to communities to put implementation strategies to use.

1.3 PURPOSE AND SCOPE

The purpose and overarching goal of the Milton Three Ponds Watershed Management Plan (WMP) is to guide implementation efforts over the next 10 years (2025-2035) to improve the water quality of Milton Three Ponds, and substantially reduce the likelihood of harmful cyanobacteria blooms in the lake.

As part of the development of this plan, water quality and **assimilative capacity** analysis, and shoreline and watershed surveys, a **build-out analysis**, and land-use model were conducted to better understand the sources of phosphorus and other pollutants to the lake (Sections 2 and 3). Results from these analyses were used to establish the water quality goal and objectives (Section 2.5), determine recommended management strategies for the identified pollutant sources (Section 4), and estimate pollutant load reductions and costs needed for remediation (Sections 5 and 6). Recommended management strategies involve using a combination of **structural and non-structural Best Management Practices** (BMPs), as well as an **adaptive management approach** that allows for regular updates to the plan (Section 4). An Action Plan (Section 5) with associated timeframes, responsible parties, and estimated costs was developed in collaboration with the **Watershed Management Plan Steering Committee** and the Technical Advisory Committee (Section 1.4). This plan meets the nine elements required by the United States Environmental Protection Agency (EPA) so that communities become eligible for federal funding opportunities, including Clean Water Act Section 319 Grants (Section 1.5).

1.4 COMMUNITY INVOLVEMENT AND PLANNING

The plan was developed through the collaborative efforts of numerous meetings, public presentations, and conference calls between FB Environmental Associates (FBE), Strafford Regional Planning Commission (SRPC), NHDES, and representatives from the towns of Milton, NH, and Lebanon, ME.

1.4.1 Plan Development Meetings

Four meetings were held over the duration of the plan development.

November 6, 2024. FBE met with SRPC and the Steering Committee for the project kickoff meeting.

May 8, 2025. FBE and SRPC facilitated the second Steering Committee meeting to review findings of the water quality data evaluation, discuss assimilative capacity, and make recommendations for future monitoring.

August 16, 2025. FBE presented at the annual meeting of the Three Ponds Protective Association (TPPA) to provide a project update and summary.

September 4, 2025. FBE and SRPC facilitated the third Steering Committee meeting to review the assimilative capacity and Water Quality Goal objectives and calculations.

1.4.2 Draft WMP

A draft copy of the complete WMP document was provided to the Steering Committee for review and comment. The Steering Committee and local residents were encouraged to provide comments and recommendations on the plan. All feedback that was submitted to the SRPC and FBE was thoughtfully considered when developing the final WMP for Milton Three Ponds.

1.5 INCORPORATING EPA'S NINE ELEMENTS

The EPA outlines nine key elements (a-i) that must be included in a WMP intended to restore impaired waters or protect those threatened by **nonpoint source (NPS) pollution** (EPA, 2013). These elements highlight important steps in restoring and protecting water quality for any waterbody affected by human activities. Adherence to the nine-element framework makes the watershed eligible for federal funding opportunities, including Clean Water Act Section 319 Grants (Section 1.5).

The nine elements are as follows:

a. IDENTIFY CAUSES AND SOURCES OF POLLUTION

   Sections 2 and 3 highlight pollution sources and stressors to Milton Three Ponds and describe the results of assessments conducted in the watershed. These sources of pollutants must be controlled to achieve the water quality targets outlined in this plan.

b. ESTIMATE POLLUTANT LOADING INTO THE WATERSHED AND THE EXPECTED LOAD REDUCTIONS

   Sections 2, 4, and 5 quantify the magnitude of water quality impairment in Milton Three Ponds and pollutant load reductions that would be achieved through various management strategies.

c. DESCRIPTION OF MANAGEMENT MEASURES

   Sections 4 and 5 identify ways to improve water quality conditions and in-stream habitat to achieve the appropriate water quality targets. The Action Plan focuses on several major topic areas that address nonpoint source pollution. Management options in the Action Plan focus on non-structural and structural BMPs integral to implementation.

d. ESTIMATE OF TECHNICAL AND FINANCIAL ASSISTANCE AND RELEVANT AUTHORITIES

   Sections 5 and 6 describe the associated costs, sources of funding, and primary authorities responsible for implementation. Sources of funding need to be diverse and should include local, state, and federal granting agencies, local groups, private donations, and landowner contributions for implementation of the Action Plan.

e. EDUCATION & OUTREACH

Section 4 describes how the educational component of the plan is already being and will be implemented to enhance public understanding of the project. Specific education and outreach action items are also presented in section 5.

f. PROJECT SCHEDULE DEVELOPMENT

Each item in the Action Plan (Section 5) has a set schedule that defines when the action should begin and end or run through (if an ongoing activity). The schedule should be reviewed and adjusted if needed on an annual basis (see Section 4 on Adaptive Management).

g. DESCRIPTION OF INTERIM MEASURABLE MILESTONES

Section 6 outlines key indicators and milestones for tracking the success of implementation, with progress to be monitored annually.

h. IDENTIFY INDICATORS TO MEASURE PROGRESS

Sections 2 and 6 provide indicators for determining whether water quality targets are being achieved over time and if substantial progress is being made towards achieving the water quality goal. If progress is not satisfactory, criteria outlined in these sections can guide the decision on whether revisions to the plan are necessary.

i. MONITORING COMPONENT

Section 6 describes the long-term water quality monitoring strategy for Milton Three Ponds, the results of which can be used to evaluate the effectiveness of implementation efforts over time as measured against the criteria in item “h” above. The success of this plan cannot be evaluated without ongoing monitoring and careful tracking of water quality improvements following implementation actions.

2 ASSESSMENT OF WATER QUALITY

This section provides an overview of the past, current, and future state of water quality based on the water quality assessment and watershed modeling, which identified pollutants of concern and informed the established water quality goal and objectives for Milton Three Ponds.

2.1 WATER QUALITY SUMMARY

2.1.1 Water Quality Standards & Impairment Status

2.1.1.1 Designated Uses & Water Quality Criteria

The Clean Water Act (CWA) requires states to identify designated uses for all surface waters under their jurisdiction. These designated uses describe the intended functions of waterbodies, such as aquatic life integrity (ALI), fish consumption, drinking water supply, primary contact recreation (PCR, e.g., swimming), secondary contact recreation (e.g., boating and fishing), and wildlife habitat. Most lakes in New Hampshire like Milton Three Ponds are designated for both ALI and PCR. In New Hampshire, surface waters are also classified as Class A or Class B, with the majority—including Milton Three Ponds—designated as Class B under state rules (Env-Wq 1700).

Water quality criteria are developed to protect the designated uses (ALI and PCR) of Milton Three Ponds. These criteria serve as a benchmark for determining whether water quality meets state standards and for guiding pollution control efforts. If water quality data show that criteria for key parameters—such as total phosphorus, chlorophyll-a, dissolved oxygen, and pH—are not met, the waterbody is considered impaired for that designated use. Portions of Milton Pond, Northeast Pond, and Townhouse Pond are currently impaired for aquatic life integrity and potentially not supporting primary contact recreation, as documented in the New Hampshire Department of Environmental Services (NHDES) 2024 Surface Water Quality Assessment.

Milton Pond, Northeast Pond, and Townhouse Pond have been identified by NHDES as impaired for ALI, primarily due to pH below the acceptable range set by NHDES. Additionally, Milton Pond and Townhouse Pond are classified as potentially not supporting PCR due to elevated concentrations of total phosphorus. All three ponds are potentially not supporting primary contact recreation due to the presence of cyanobacteria hepatotoxic microcystins. Water quality data collected through local and state efforts indicate consistent exceedances of nutrient thresholds, which increase the risk of algal blooms and threaten the health of aquatic ecosystems.

While historic data on the trophic status of Milton Three Ponds is limited, current conditions suggest a shift toward mesotrophic or eutrophic states in some areas. Continued nutrient loading from both external sources (e.g., runoff, erosion, failing septic systems, historic acidic rain) and internal recycling (e.g., anoxic phosphorus release from sediments) has contributed to the degradation of water quality. As a result, portions of the system are now listed as Category 5-M impaired waters under the state's Integrated List of Waters.

Table 1. NHDES Assessment of Milton Three Ponds and Associated Water Quality Ratings (NHDES, 2024a).

Assessment Unit Name	AUID	Water Quality
Northeast Pond	NHLAK600030403-01	Impaired for Aquatic Life Integrity due to low pH. Potentially not supporting Primary Contact Recreation due to the presence of cyanobacteria hepatotoxic microcystins, and low alkalinity.
Townhouse Pond	NHLAK600030403-02	Impaired for Aquatic Life Integrity due to low pH. Potentially not supporting Primary Contact Recreation due to elevated total phosphorus concentrations, the presence of cyanobacteria hepatotoxic microcystins, and low alkalinity.
Milton Pond	NHLAK600030404-01	Impaired for Aquatic Life Integrity due to low pH. Potentially not supporting Primary Contact Recreation due to elevated total phosphorus concentrations, the presence of cyanobacteria hepatotoxic microcystins, and low alkalinity.
Milton Pond Rec Area Beach (Milton Town Beach)	NHLAK600030404-01-01	Impaired for Primary Contact Recreation due to elevated levels of E. coli bacteria and potentially not supporting due to the presence of cyanobacteria hepatotoxic microcystins.

2.1.1.2 Antidegradation Provisions

New Hampshire's Antidegradation Provision (Env-Wq 1708) aims to protect or improve water quality by limiting pollutant increases, especially in already impaired or high-quality waters. For Milton Three Ponds – which includes several impaired waterbodies – this means that new or expanded discharges of pollutants (like phosphorus) are generally prohibited for the specific parameters already exceeding standards. Development projects that may affect water quality could be subject to review under this provision, particularly if they require permits such as the Alteration of Terrain Permit or 401 Water Quality Certification.

2.1.2 Water Quality Data Collection

Water quality monitoring in the Milton Three Ponds watershed has been conducted over several decades through a combination of state agency programs, academic institutions, and local volunteer efforts. Monitoring data used in this summary were obtained from the NHDES Environmental Monitoring Database (EMD) and directly from Bob Craycraft of the University of New Hampshire Lakes Lay Monitoring Program (LLMP).

A total of 26 water quality monitoring stations were identified across the watershed, with variable sampling frequency and data availability. The following key sites represent the most consistent long-term monitoring locations, shown in Figure 3:

j. NEPLD (Northeast Pond Deep Spot), also known as "1 Milton" by the UNH LLMP: Comprehensive lake sampling occurred from 1989–2024, with vertical profiles and grab samples collected from the epilimnion, metalimnion, and hypolimnion. Parameters measured include temperature, dissolved oxygen, Secchi disk transparency, chlorophyll-a, total phosphorus, pH, and specific conductance.

k. THPLD (Townhouse Pond Deep Spot): Monitored from 1989–2024 with similar sampling depth and parameters as Northeast Pond, providing a robust long-term dataset.

l. MILPD (Milton Pond Deep Spot): Sampling extended from 1989–2024, with full vertical profiles and water chemistry data including total phosphorus, chlorophyll-a, and temperature/oxygen stratification.

These deep spot sites are critical for understanding seasonal patterns and long-term trends in nutrient enrichment, algal productivity, and oxygen depletion across the three ponds.

Additional tributary and nearshore sites—such as MILPIN (Milton Pond Inlet), THPIN (Townhouse Pond Inlet), and NEPIN (Northeast Pond Inlet)—were sampled for total phosphorus, pH, turbidity, and chloride, with consistent annual data available for many parameters since the 1990s. Monitoring for E. coli at recreational beaches (e.g., Milton Town Beach, Northeast Pond Beach, and camp properties) has also occurred intermittently from the 1990s to present, supporting public health risk assessments.

Collectively, these monitoring efforts provide a strong baseline for assessing water quality conditions and identifying areas of concern within the Milton Three Ponds watershed.

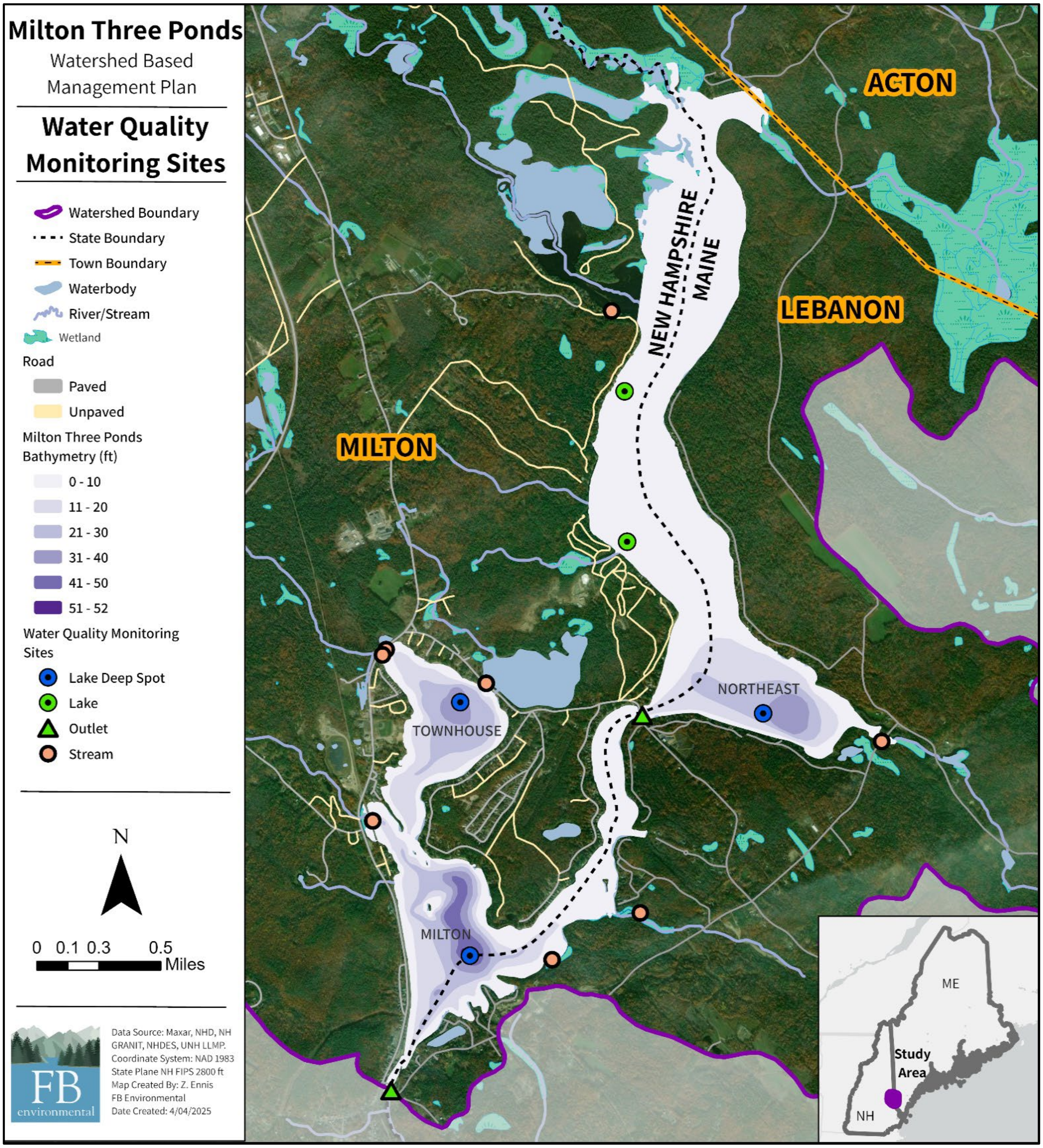

Figure 2. Map of water quality monitoring sites and bathymetry of Milton Three Ponds.

2.1.3 Trophic State Indicator Parameters

Total phosphorus, chlorophyll-a, and Secchi disk transparency are trophic state indicators, or indicators of biological productivity in lake ecosystems. The combination of these parameters helps determine the extent and effect of eutrophication in lakes and helps signal changes in lake water quality over time. For example, declining Secchi disk transparency may be due to a change in the amount and composition of algae communities (typically because of greater total phosphorus availability) or increasing dissolved or particulate materials in a lake. Such changes are typically the result of human disturbance, sometimes exacerbated by periods of heavy precipitation, along with possible other causes. For the deep spots of Northeast, Townhouse, and Milton Ponds, generally higher total phosphorus concentrations were measured in the hypolimnion compared to the epilimnion (both grab and composite) and metalimnion, indicating some amount of internal phosphorus loading is possibly occurring in these waterbodies (Figure 3).

Across all three ponds, no statistically significant trends were identified for epilimnion composite total phosphorus over the period of 2006-2024 (Figure 4). Total phosphorus data were missing from 1997 to 2005, and were not consistently collected in prior years, and were thus excluded from the trend analysis.

Milton Pond showed a statistically significant decreasing (improving) trend in chlorophyll-a (p-value = 0.03) for the period of 1995-2024 (Figure 4). In contrast, Northeast Pond had a statistically significant decreasing (worsening) trend in Secchi disk transparency (p-value = 0.02) during the period of 1995-2024 (Figure 4).

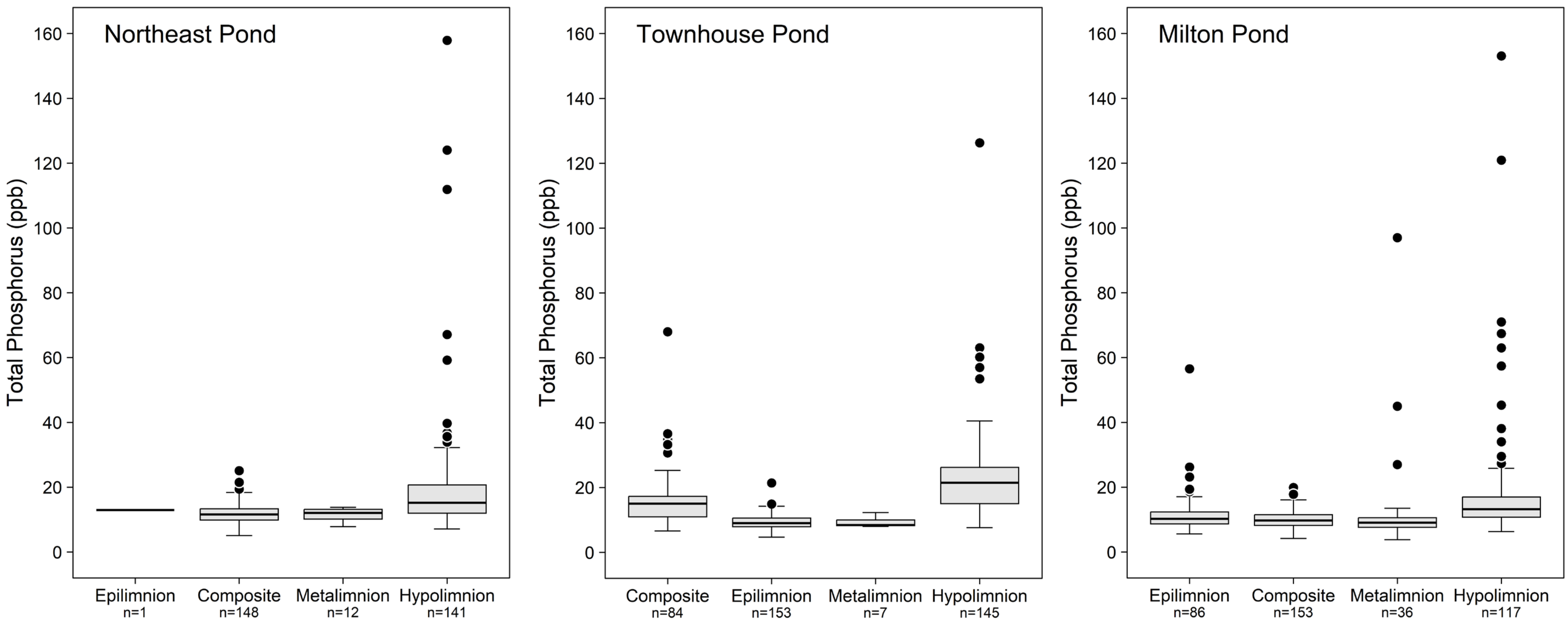

Figure 3. Boxplots showing median total phosphorus concentrations in Milton Three Ponds.

Notes: Data compiled from sampling locations "Northeast Pond [1 Milton]" (left), "Townhouse Pond [THPLD]" (center), and "Milton Pond [MILPD]" (right) for the period of 1980-2024. Four high values (183.1, 234.9, and 361.7 ppb for Townhouse Pond hypolimnion and 329.3 ppb for Milton Pond hypolimnion) are not shown within the scale cutoff. The boxplots show the data distribution, with the median (middle horizontal line) and first (25th) and third (75th) quartiles (upper and lower boundaries) for the box representing the interquartile range and the whiskers representing 1.5 times the interquartile range. Dots represent outliers. Labels (e.g., n=20) indicate number of samples.

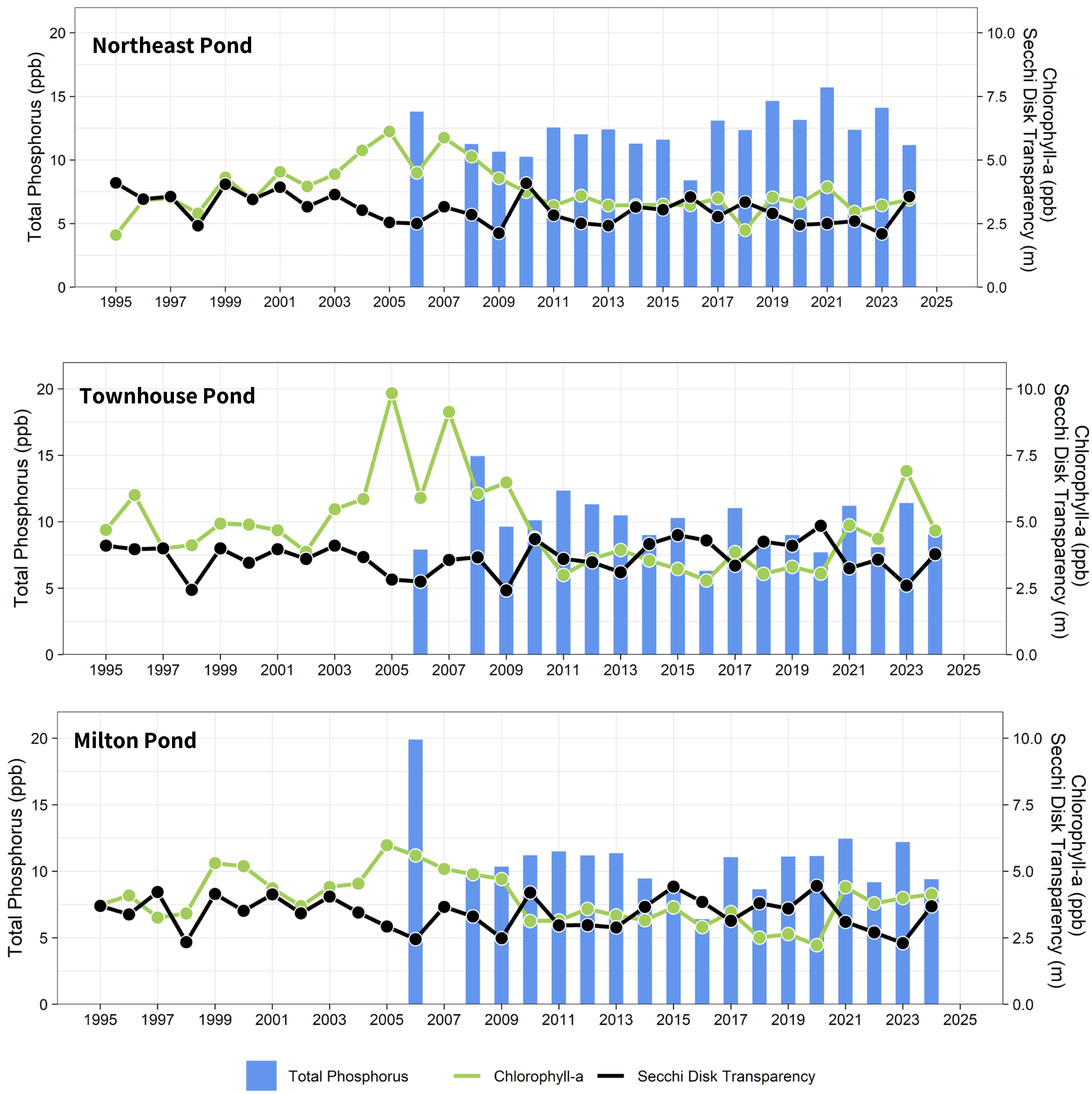

Figure 4. Median total phosphorus, chlorophyll-a, and water clarity in Milton Three Ponds.

Notes: Data compiled from epilimnion at the deep spots of Northeast Pond [1 Milton] (top), Townhouse Pond [THPLD] (center), and Milton Pond [MILTD] (bottom) in the period May 24th to September 15th. Chlorophyll-a and Secchi Disk Transparency are shown from 1995-2024, while total phosphorus is shown from 2006-2024. Statistically significant trends in chlorophyll-a for Milton Pond (improving) and Secchi disk transparency for Northeast Pond (worsening) were identified by the Mann-Kendall nonparametric trend test using rkt package in R Studio.

2.1.4 Dissolved Oxygen & Water Temperature

Depletion of dissolved oxygen in the deepest part of lakes is common throughout the summer months. This occurs when thermal stratification prevents warmer (less dense), oxygenated surface waters from mixing with cooler (denser), oxygen-depleted bottom waters in the lake. Chemical and biological processes occurring in bottom waters deplete the available oxygen throughout the summer, and because these waters are colder and denser, the oxygen cannot be replenished through mixing with surface waters. Dissolved oxygen levels below 5 ppm (and water temperature above 24 °C) can stress and reduce habitat for coldwater fish and other sensitive aquatic organisms. In addition, anoxia (low dissolved oxygen) at lake bottom can result in the release of sediment-bound phosphorus (otherwise known as internal phosphorus loading), which can become a readily available nutrient source for algae and cyanobacteria. While thermal stratification and depletion of oxygen in bottom waters is a natural phenomenon, it is important to track these parameters to make sure the extent and duration of low oxygen does not change drastically because of human disturbance in the watershed resulting in excess phosphorus loading.

> ***Lake Stratification and Mixing***
>
> *Milton Three Ponds is a dimictic lake system, undergoing two cycles of stratification and mixing annually. Stratification takes place during summer, as surface waters warm, forming a thermal barrier due to differences in water densities. Additionally, winter months see stratification when the ponds freeze over, with colder surface waters sitting atop warmer bottom waters. Dimictic lakes undergo both "fall turnover" and "spring turnover," characterized by the loss of these temperature gradients which enable water mixing once again.*

Figure 5 shows temperature and dissolved oxygen profiles averaged across sampling dates (generally 2009-2024) during thermal stratification largely in summer (between spring and fall turnover) for the Northeast, Townhouse, and Milton Ponds deep spots. The change in temperature, seen most dramatically between 4 and 8 m, indicates thermal stratification in the water column. Dissolved oxygen of <2 ppm typically starting between 6-10 m depth in the ponds highlights the risk of internal loading under anoxic conditions, which was further explored and quantified for the modeling assessment. In individual profiles, anoxia appears to begin abruptly just below the top of the thermocline. During periods of stratification and minimal mixing between upper and lower thermal layers in the water column, oxygen is rapidly consumed, suggesting a potentially high biological and/or chemical oxygen demand at the sediment-water interface, while the surface remains well-mixed and oxygenated from surface inflow currents through the near-riverine system, which flushes dozens of times per year (though less during baseflow periods in summer). Secchi disk readings are notably shallow and around the top of the thermocline, which further suggests a distinct boundary formation between upper and lower thermal layers at which neutrally-buoyant plankton may be residing to capitalize on available nutrients from the bottom and sunlight from the surface (any deeper may be too limited given the high tea-coloration and turbidity in bottom waters). However, Toupin (2009) found that plankton may be able to migrate to these deeper, light-lighted and anoxic depths to avoid predation by alewives.

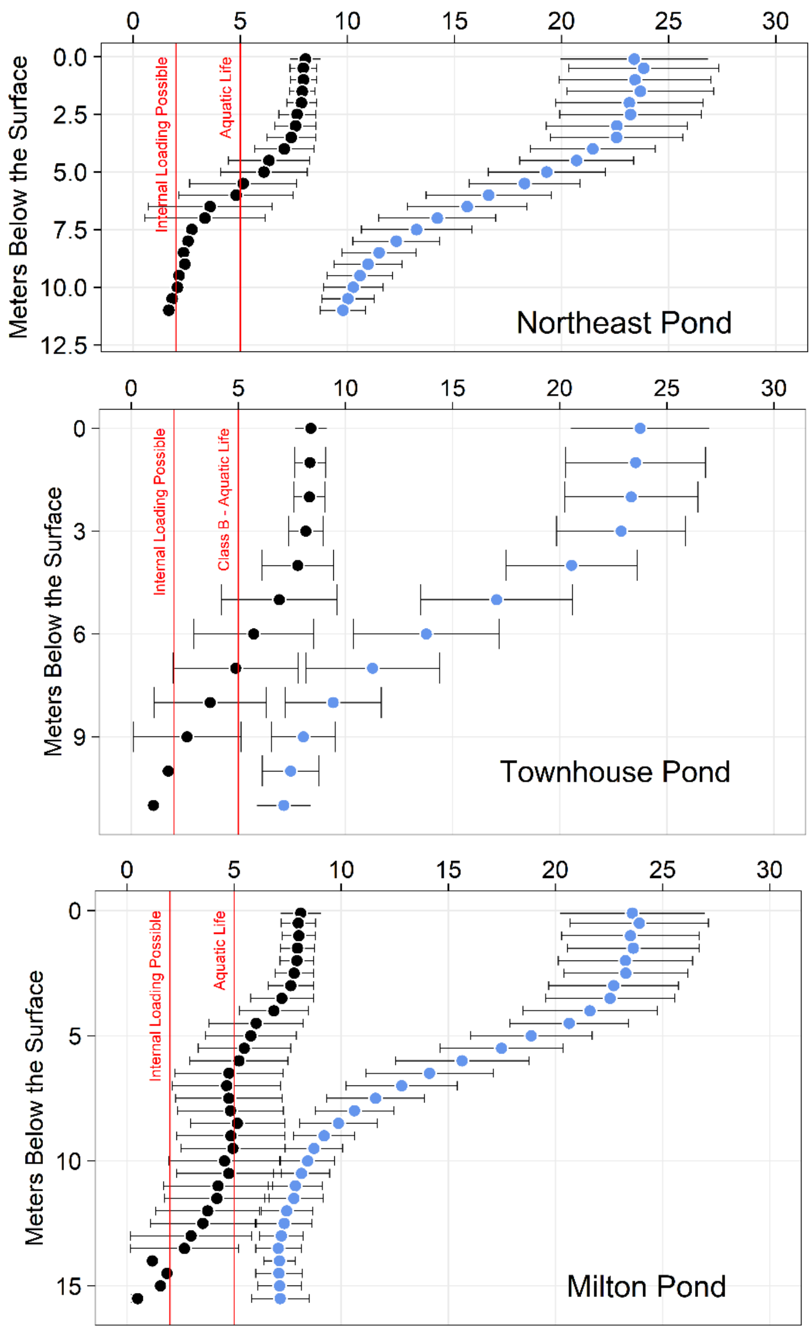

Figure 5. Dissolved oxygen and water temperature depth profiles for Milton Three Ponds.

Notes: Dissolved oxygen shown in black and water temperature shown in blue. Averages (dots) and standard deviation (bars) from 2009-2024 with a few additional observations in 1996 for Northeast Pond (n=31); 1970 and 1996 for Townhouse Pond (n=42); and 1995, 1996, and 2006 for Milton Pond (n=41). The maximum depths for the three ponds are 12.2 m, 11.3 m, and 15.8 m, respectively.

2.1.5 Phytoplankton and Zooplankton

Cyanobacteria Bloom History

There have been three NHDES-issued cyanobacteria bloom warnings for Milton Three Ponds since 2016. The first was in Townhouse Pond, issued 6/16/2016, and lasted for seven days. The dominant taxon of the bloom was *Anabaena* (now *Dolichospermum*) with an initial cyanobacteria cell density of 150,000 cells/mL. The second warning occurred in Northeast Pond, issued on 6/30/2023, and lasted for six days. Prior to the warning, a cyanobacteria watch was in effect for three days. The dominant taxon was *Dolichospermum* with an initial cell density of 79,800 cells/mL. The third warning occurred in Northeast Pond, issued on 6/13/2024, and lasted for seven days. The dominant taxon was again *Dolichospermum* with an initial cell density of 2,790,000 cells/mL. *Dolichospermum*, the dominant taxon observed in these blooms, is a potentially toxin-producing cyanobacteria that can outcompete other phytoplankton due to its ability to fix atmospheric nitrogen into a usable form and regulate its buoyancy in the water column to optimize its access of nutrients near the bottom and sunlight near the surface. There have been no NHDES-issued cyanobacteria bloom warnings for Milton Pond.

The waterbodies upstream of Milton Three Ponds have experienced recent cyanobacteria blooms. Lovell Lake, in Wakefield, NH and part of the Salmon Falls Headwaters, has one reported NHDES-issued cyanobacteria bloom warning on 10/4/2023, lasting seven days. The dominant taxa of this bloom were *Dolichospermum* and *Microcystis* with an initial cell count of 115,400 cells/mL. *Microcystis* is a potentially toxin-producing taxon that can regulate its buoyancy in the water column but lacks the nitrogen-fixing capabilities of *Dolichospermum*. Watches for *Gloeotrichia* have been reported by NHDES for Great East Lake in Wakefield, NH for 2022 and 2023.

Phytoplankton/Zooplankton Trophic Survey Results

Phytoplankton and zooplankton samples were collected and identified to the genus level during the winter/spring and summer of the 1980 and 1995 NHDES Trophic Surveys of all three ponds (NHDES, 1980a,b,c, NHDES 1995a,b,c).

- Dominant phytoplankton in **Northeast Pond** were *Melosira* (diatom) (65%), *Chrysosphaerella* (golden-brown) (55%), *Dinobryon* (golden-brown) (10%-90%), *Rhizosolenia* (diatom) (10%), and *Synura* (golden-brown) (5%). Dominant zooplankton in Northeast Pond were *Keratella* (rotifer) (25-42%), *Polyarthra* (rotifer) (31%), *Nauplius* larva (copepod) (19-25%), and cyclopoid copepod (15%). The summer 1980 survey noted zooplankton as sparse with no dominant taxa.
- Dominant phytoplankton in **Townhouse Pond** were *Chrysosphaerella* (golden-brown) (65%), *Dinobryon* (golden-brown) (10-60%), *Synura* (golden-brown) (50%), *Asterionella* (diatom) (20-35%), and *Fragilaria* (diatom) (20%). Dominant zooplankton in Townhouse Pond were *Keratella* (rotifer) (30%), *Polyarthra* (rotifer) (13-30%), other rotifer spp. (20-26%), *Nauplius* larva (copepod) (14-25%), and *Bosmina* (cladoceran) (20%).
- Dominant phytoplankton in **Milton Pond** were *Asterionella* (diatom) (85%), *Dinobryon* (golden-brown) (40-75%), *Chrysosphaerella* (golden-brown) (45-50%), *Rhizosolenia* (diatom) (10%), and

Anacystis (cyanobacteria) (10%). Dominant zooplankton in Milton Pond were *Synchaeta* (rotifer) (37-40%), *Keratella* (rotifer) (26%), *Nauplius* larva (copepod) (24%), *Bosmina* (cladoceran) (23%), other rotifer spp. (15%), and *Polyarthra* (rotifer) (14%). The summer 1980 survey noted zooplankton as sparse with no dominant taxa.

The three ponds were dominated by golden-browns and diatoms for phytoplankton and rotifers, copepods, and cladocerans for zooplankton. Copepods and cladocerans are small crustaceans that eat phytoplankton and provide an important food source for fish. The cladoceran, *Bosmina*, was dominant and is known to consume larger phytoplankton despite its small size (Dr. Amanda McQuaid, pers. comm.). *Daphnia* are among the most efficient cladoceran grazers but were not observed to be a dominant zooplankton in Milton Three Ponds. The relative abundance of phytoplankton and zooplankton community assemblages changes seasonally and over time; therefore, these results should be considered as a snapshot in time and space and interpreted with caution.

Phytoplankton, Zooplankton, and Fish Studies

Prior research on phytoplankton, zooplankton, and alewife (fish) dynamics was conducted by Bradt and Chungu (1999) in Milton Three Ponds. They found that alewife predation resulted in reduced abundance of large zooplankton species (*Daphnia* and *Holopedium*). Phytoplankton were dominated by Chrysophyceae (golden algae) with moderate abundance of Bacillariophyceae (diatoms). Two golden-brown algae, *Dinobryon* and smaller populations of *Synura*, are known to form colonies resistant to grazing. When they die and sink, they may remove nutrients from the water column to bottom sediments. In short, these findings suggest that alewife pressure has reduced the abundance of efficient grazers, and the dominant phytoplankton present are largely resistant to grazing, suggesting some potential vulnerabilities in the ponds. However, net phytoplankton biotic index (NPBI), which is based on the relative abundance and pollution tolerance of various taxa, indicated good to excellent water quality (1 to 2.7) in Milton Three Ponds. They also found there was no oxidized microzone (OMZ), which is a very thin (mm range) zone above the lake sediments containing oxidized iron (or other material) which can effectively seal in toxins in lake sediments. Without it, reduced substances migrate from the lake bottom into the water column (Bradt and Chungu, 1999).

An updated investigation on plankton and alewives in Townhouse Pond was completed by Toupin (2009). Clear signs of top-down ecosystem effects from alewife predation were documented. Since alewives are visual predators, most zooplankton migrated below the epilimnion to depths of 6 to 8 m during the day (indicated by greater turbidity at that depth) where cooler temperatures and lower oxygen essentially barred alewife below 5 m depth. A large proportion of the depth profile (6-13 m) was anoxic. Furthermore, light availability was low starting at 2 m depth (~10% light penetration) and very low (~1% light penetration) beginning at 5 m, also impairing alewife predation selectivity at depths where zooplankton aggregated during the day. Despite the anoxic conditions, the "compensation zone" (where photosynthesis equals respiration) extended to 8 m depth, and maximum cyanobacteria abundance coincided with maximum zooplankton concentration, apparently allowing zooplankton adequate respiration for survival despite anoxia (Toupin, 2009).

Alewife presence appeared to result in smaller zooplankton body length, consistent with prior findings in this and other lakes. *Daphnia* (large zooplankton preferred by alewives) were absent, allowing *Bosmina* to dominate among zooplankton. *Bosmina* in turn prey on the phytoplankton Chlorophyceae (greens), increasing Chrysophyceae (golden-browns) and other phytoplankton biomass (Toupin, 2009).

Phycocyanin (pigment found primarily in cyanobacteria or blue-greens) was higher at shallow depths (0-3 m) than chlorophyll-a, but the two showed roughly the same profile at deeper depths, which showed pigment abundances around 6 m depth. Picoplankton were determined to provide half the productivity of whole lake water. Zooplankton grazing upon phytoplankton was assessed as very inefficient with clearance rates of ~24% of water per day for chlorophyll-a and ~20% of water per day for phycocyanin. Inefficient grazing was attributed to the predation of zooplankton by alewives (Toupin, 2009).

2.1.6 Chloride & Specific Conductivity

Chloride pollution from winter road salt, wastewater input, and fertilizers can cause harm to aquatic organisms and disrupt internal lake mixing processes when chloride concentrations reach chronically high levels. The State of New Hampshire sets a chronic threshold of 230 ppm for chloride (which roughly equates to 835 µS/cm for specific conductivity). Chloride concentrations in the three ponds are well below the chronic threshold but minorly elevated compared to what is typical for a high-quality waterbody. Most New Hampshire lakes are around 4 ppm and 40 µS/cm compared to 21 ppm and 88 µS/cm for Northeast Pond, 19 ppm and 94 µS/cm for Townhouse Pond, and 14 ppm and 78 µS/cm for Milton Pond for chloride and specific conductivity, respectively (Figure 6). There are too few recorded values to determine a trend from the dataset.

Chloride and specific conductivity values higher than the state medians indicate that chloride from winter salting practices for deicing roads and other surfaces in the watershed may be contaminating the ponds. Another potential source of chloride and specific conductivity is sediment loading from eroding, unpaved roads throughout the watershed. A portion of the roads in the watershed are unpaved and are located on moderately steep slopes and are susceptible to soil loss and road erosion. Other sources of pollution that may increase chloride and specific conductivity levels include wastewater inputs and fertilizers. While not an immediate threat to the health of the ponds, chronic chloride toxicity will likely become an issue in the future without a proactive reduction in salt use in the watershed.

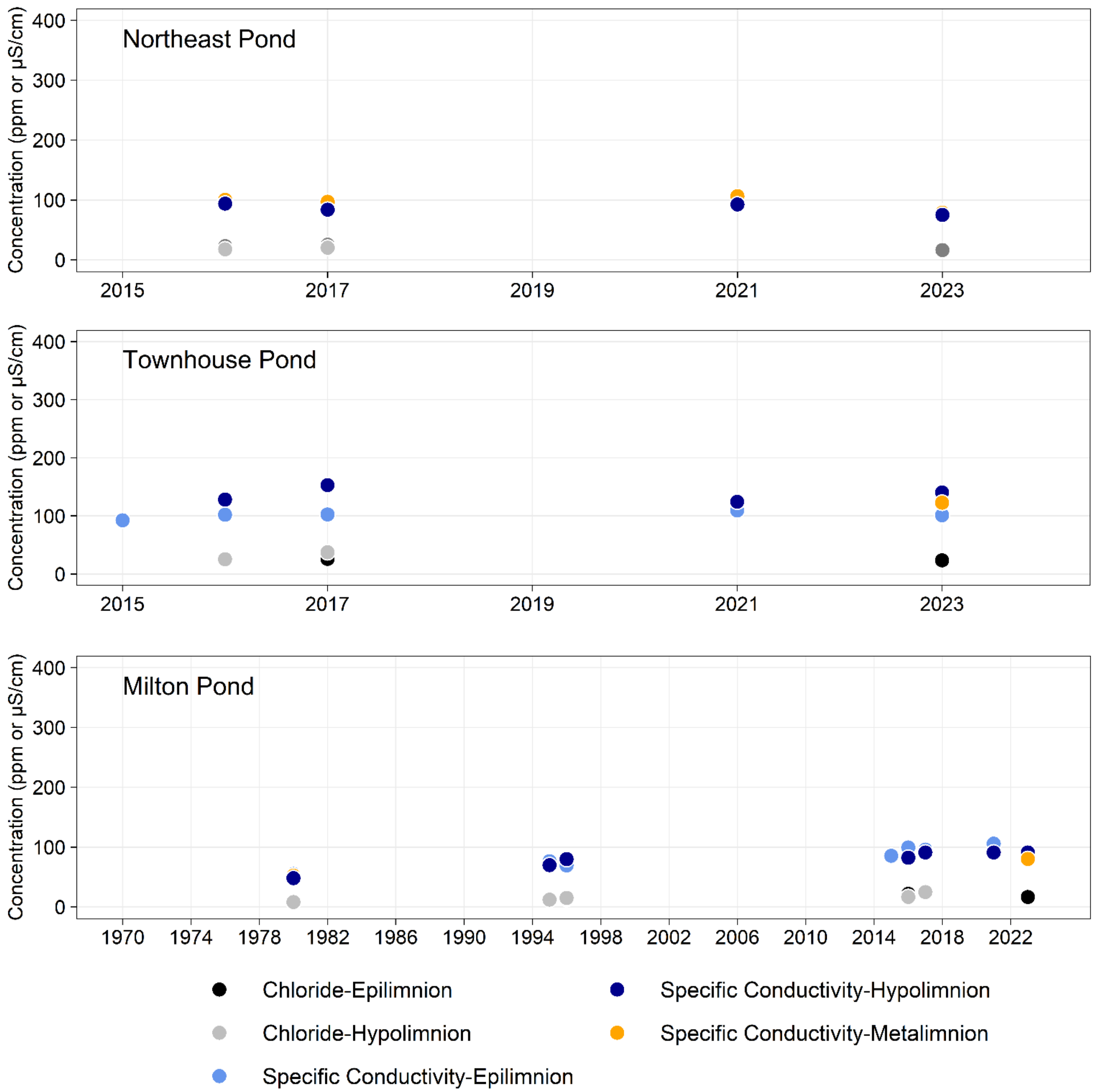

Figure 6. Yearly median of monthly medians for chloride and specific conductivity in Milton Three Ponds.

Notes: Data compiled from Northeast Pond deep spot [1 Milton] (top), Townhouse Pond [THPLD] (middle), and Milton Pond [MILTD] (bottom). Chronic chloride impairment roughly equates to 835 µS/cm for specific conductivity, far above current levels.

2.1.7 Invasive Species

The introduction of non-indigenous invasive aquatic plant species to New Hampshire's waterbodies has been on the rise. These invasive aquatic plants are responsible for habitat disruption, loss of native plant and animal communities, reduced property values, impaired fishing and degraded recreational experiences, and high removal costs. Once established, invasive species are difficult and costly to remove. There are multiple programs that help prevent the introduction of invasive species and monitor the lake, including the Lake Host Program and the Weed Watcher Program of which the TPPA is a part. Since 2015, Milton Three Ponds, particularly Northeast Pond according to the NHDES Lake Information Mapper, has experienced outbreaks of Brittle Naiad (*Najas minor*), aka European naiad. This annual invasive aquatic plant can grow up to 2.5 meters in height and can spread via seeds or fragmentation. In 2022, a Long-Term Brittle Naiad Management Plan was developed for Milton Three Ponds (NHDES, 2022). This plan established a baseline of the area affected, identified short and long-term goals for management, and recommended actions and evaluations to take. Areas of Milton Three Ponds that were treated with AquaStrike in 2024 showed very little regrowth in 2025. This was particularly apparent along the New Hampshire shoreline of Northeast Pond. Other areas near Bon Fire Island also showed reduced growth of Brittle Naiad in 2025.

2.2 ASSIMILATIVE CAPACITY

The assimilative capacity of a waterbody describes the amount of pollutant that can be added to a waterbody without causing a violation of the water quality criteria and is based on lake trophic designation. NHDES has developed water quality criteria for lakes and ponds, which were utilized for this assessment.

Milton Three Ponds are designated as mesotrophic waterbodies, though they have displayed eutrophic characteristics for one or more key parameters. For enhanced protection of water quality, the mesotrophic and oligotrophic designations were used to run separate assimilative capacity analyses for Milton Three Ponds.

For mesotrophic waterbodies, the water quality criteria are set at 12 ppb for total phosphorus and 5.0 ppb for chlorophyll-a, above which the waterbody is considered impaired (28 ppb and 11 ppb, respectively, for eutrophic waterbodies). For oligotrophic waterbodies, the water quality criteria are set for 8.0 ppb for total phosphorus and 3.3 ppb for chlorophyll-a, above which the waterbody is considered impaired (Table 2. Aquatic life integrity (ALI) nutrient criteria ranges by trophic class in New Hampshire.). NHDES requires a portion of the difference between the best possible water quality and the water quality standard be kept in reserve as described in the 2024 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology (CALM); therefore, according to Table 3-17 of the CALM, total phosphorus and chlorophyll-a must be at or below 11.6 ppb and 4.8 ppb, respectively, to achieve Tier 2 High Quality Water status under a mesotrophic designation. Total phosphorus and chlorophyll-a must be at or below 7.2 ppb and 3.0 ppb, respectively, to achieve Tier 2 High Quality Water status under an oligotrophic designation. Support determinations are based on the nutrient stressor (phosphorus) and response indicator (chlorophyll-a), with chlorophyll-a dictating the assessment if both chlorophyll-a and total phosphorus data are available and the assessments differ.

Table 2. Aquatic life integrity (ALI) nutrient criteria ranges by trophic class in New Hampshire.

Trophic State	TP (ppb)	Chl-a (ppb)
Oligotrophic	< 8.0	< 3.3
Mesotrophic	> 8.0 - 12.0	> 3.3 - 5.0
Eutrophic	> 12.0 - 28.0	> 5.0 - 11.0

Notes: TP = total phosphorus. Chl-a = chlorophyll-a, a surrogate measure for algae.

Results of the mesotrophic assimilative capacity analysis show that Northeast Pond, Townhouse Pond, and Milton Pond meet Tier 2 (High Water Quality) for the mesotrophic designation (Table **3**). Both Milton Pond and Townhouse Pond meet the mesotrophic thresholds for chlorophyll-a and total phosphorus, while Northeast Pond does not meet the mesotrophic threshold for total phosphorus. As tea-colored ponds, high total phosphorus for the trophic class paired with comparatively low chlorophyll-a may suggest that other factors, such as restricted light availability, may be limiting eutrophication. Results of the oligotrophic assimilative capacity analysis show that Northeast Pond, Townhouse Pond, and Milton Pond all fail to reach Tier 2 High Quality Water status (Table 4) and thus do not meet the water quality thresholds.

Table 3. Mesotrophic assimilative capacity (AC) analysis results for Milton Three Ponds using mesotrophic thresholds.

Station	Parameter	Mesotrophic AC Threshold (ppb)	Existing Median WQ (ppb)*	Remaining AC (ppb)	Results
Northeast Pond– DEEP SPOT[1 Milton	Total Phosphorus	11.6	13.1	-1.5	Attaining Tier 2 (High Water Quality)
	Chlorophyll-a	4.8	3.5	1.3	
Townhouse Pond – DEEP SPOT [THPLD]	Total Phosphorus	11.6	9.4	2.2	Attaining Tier 2 (High Water Quality)
	Chlorophyll-a	4.8	3.9	0.9	
Milton Pond – DEEP SPOT [MILTD]	Total Phosphorus	11.6	10.9	0.7	Attaining Tier 2 (High Water Quality)
	Chlorophyll-a	4.8	3.5	1.3	

Notes: Chlorophyll-a dictates the assessment results.

** Existing water quality data truncated to May 24-Sept 15 in the previous 10 years (2015-2024) for composite, epilimnion, or upper samples (in order of priority on a given day). Data were summarized by day, then month, then year using median statistic.*

Table 4. Oligotrophic assimilative capacity (AC) analysis results for Milton Three Ponds using oligotrophic thresholds.

Station	Parameter	Oligotrophic AC Threshold (ppb)	Existing Median WQ (ppb)*	Remaining AC (ppb)	Results
Northeast Pond – DEEP SPOT [1 Milton]	Total Phosphorus	7.2	13.1	-5.9	Impaired
	Chlorophyll-a	3.0	3.5	-0.5	
Townhouse Pond – DEEP SPOT [THPLD]	Total Phosphorus	7.2	9.4	-2.2	Impaired
	Chlorophyll-a	3.0	3.9	-0.9	
Milton Pond – DEEP SPOT [MILTD]	Total Phosphorus	7.2	10.9	-3.7	Impaired
	Chlorophyll-a	3.0	3.5	-0.5	

Notes: Chlorophyll-a dictates the assessment results.
** Existing water quality data truncated to May 24-Sept 15 in the previous 10 years (2015-2024) for composite, epilimnion, or upper samples (in order of priority on a given day). Data were summarized by day, then month, then year using median statistic.*

Milton Three Ponds straddles the border between New Hampshire and Maine. While New Hampshire water quality criteria are primarily relied on for this assessment, it is important to recognize water quality standards set by the Maine Department of Environmental Protection (DEP) for the protection of Aquatic Life Support in Great Ponds such as Milton Three Ponds. Maine DEP requires Great Ponds to have a stable or decreasing trophic state, defined as the ability of a body of water to produce algae and other aquatic plants as a function of its nutrient content. The Trophic State Index (TSI) formulas for chlorophyll-a, total phosphorus, and Secchi disk transparency are specified in the Regulations Relating to Water Quality Evaluations, 06-096 C.M.R. ch. 581, effective date January 29, 1989 and the DRAFT Maine DEP 2024 305(b) Report and 303(d) List. In addition, a classification and condition analysis for Maine lakes was completed by the Maine DEP and the University of Maine in 2020 (Deeds et al., 2020). Thresholds for reference and altered condition classes were established and provides another means of assessing the water quality status of a waterbody in Maine.

2.3 WATERSHED MODELING

2.3.1 Lake Loading Response Model (LLRM)

Environmental modeling is the process of using mathematics to represent the natural world. Models are created to explain how a natural system works, to study cause and effect, or to make predictions under various scenarios. Environmental models range from very simple equations that can be solved with pen and paper, to highly complex computer software requiring teams of people to operate. Lake models, such as the Lake Loading Response Model (LLRM), can make predictions about phosphorus concentrations, chlorophyll-a concentrations, water clarity, and cyanobacteria bloom frequency under different pollutant loading scenarios. These types of models play a key role in the watershed planning process. EPA guidelines for watershed plans require that pollutant loads to a waterbody be estimated.

The LLRM is an Excel-based model that uses environmental data to develop a water and phosphorus loading budget for lakes and their tributaries. Water and phosphorus loads (in the form of mass and concentration) are traced from various sources in the watershed through tributary basins and into the lake. The model incorporates data about watershed and sub-watershed boundaries, land cover, point sources (if applicable), septic systems, waterfowl, rainfall, volume and surface area, and internal phosphorus loading. These data are combined with coefficients, attenuation factors, and equations from scientific literature on lakes, rivers, and nutrient cycles to generate annual average predictions[1] of total phosphorus, chlorophyll-a, Secchi disk transparency, and algal bloom probability. The model can be used to identify current and future pollutant sources, estimate pollutant limits and water quality goals, and guide watershed improvement projects. A complete detailing of the methodology employed for the Milton Three Ponds LLRM is provided in the *Milton Three Ponds Loading Response Model Report* (FBE, 2025a).

2.3.1.1 Lake Morphology & Flow Characteristics

The morphology (shape) and bathymetry (depth) of lakes and ponds are considered reliable predictors of water clarity and lake ecology. Large, deep lakes are typically clearer than small, shallow lakes as the differences in lake area, number and volume of upstream lakes, and **flushing rate** affect lake function and health.

The surface area of Milton Three Ponds is 1,079 acres (21.7 miles of shoreline), with a maximum depth of 12.2m, 11.3m, and 15.8m for Northeast, Townhouse, and Milton Ponds respectively. Their combined volume is approximately 12,784,023 m^3 with a flushing rate of 30.8 times per year. The flushing rate of 30.8 means that the entire volume of Milton Three Ponds is replaced 30.8 times each year, calculated from the Milton Pond LLRM which encompasses loads and water volume from Northeast Pond and Townhouse Pond.

[1] The model cannot simulate short-term weather or loading events.

2.3.1.2 Land Cover

Characterizing land cover within a watershed on a spatial scale can highlight potential sources of NPS pollution that would otherwise go unnoticed in a field survey of the watershed. For instance, a watershed with large areas of developed land and minimal forestland will likely be more at risk for NPS pollution than a watershed with well-managed development and large tracts of undisturbed forest, particularly along headwater streams. Land cover is also the essential element in determining how much phosphorus is contributing to a surface water body via stormwater runoff and baseflow.

Current land cover in the Milton Three Ponds watershed was determined by FBE using a combination of published datasets on NH GRANIT and ESRI World Imagery from ESRI World imagery dated 5/26/2023 and 10/28/2022 and Google Earth imagery dated 10/31/23 and 5/4/2018 (Figure 8). For more details on methodology, see the *Milton Three Ponds Loading Response Model Report (FBE, 2025a)*. As of the 2023 aerial imagery, development accounts for 7% (4,594 acres) of the watershed, while forested and natural areas account for 84% (56,274 acres). Wetlands and open water represent 7% (4,710 acres) of the watershed, not including the surface area of Milton Three Ponds. Agriculture represents 2% (902 acres).

Figure 7 shows a breakdown of land cover by major category for the entire watershed (not including lake area), as well as total phosphorus load by major land cover category (FBE, 2025a). Developed areas cover 7% of the watershed and contribute 60% of the total phosphorus watershed load to Milton Three Ponds.

Developed areas within the Milton Three Ponds watershed are characterized by **impervious surfaces**, including areas with asphalt, concrete, compact gravel, and rooftops that force rain and snow that would otherwise soak into the ground to run off as stormwater. Stormwater runoff carries pollutants to waterbodies that may be harmful to aquatic life, including sediments, nutrients, pathogens, pesticides, hydrocarbons, and metals.

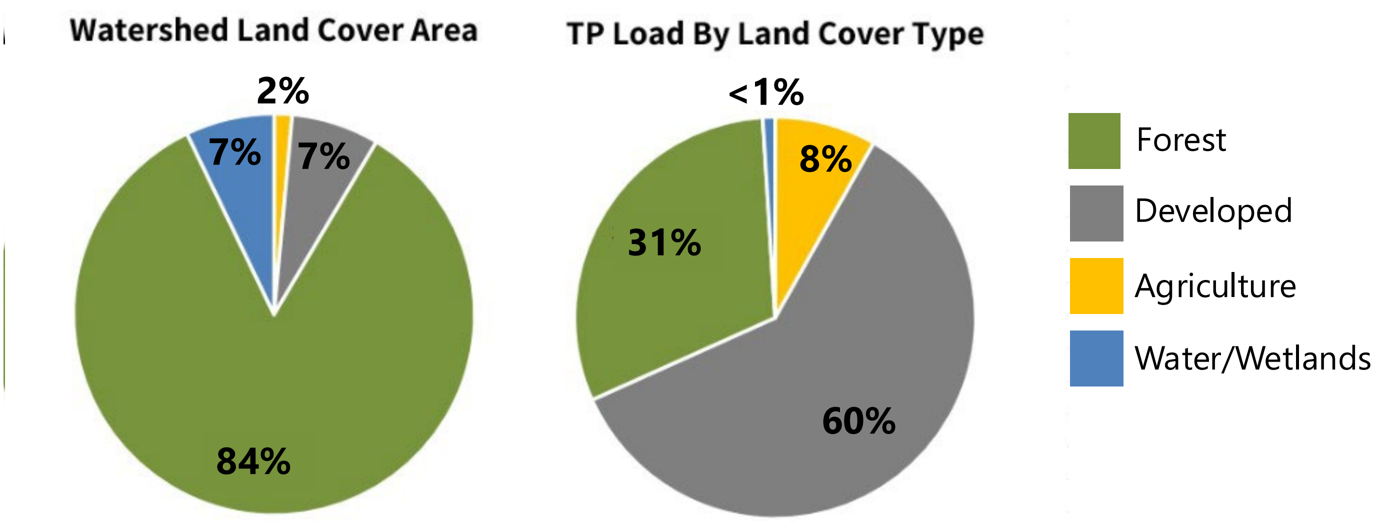

Figure 7. Milton Three Ponds land cover area and total phosphorous watershed load by land cover type.

Notes: Land cover major categories include agriculture, developed, forest, and water/wetlands. This shows that developed areas cover 7% of the watershed and contribute 60% of the TP watershed load to Milton Three Ponds. The water/wetlands category does not include the lake area.

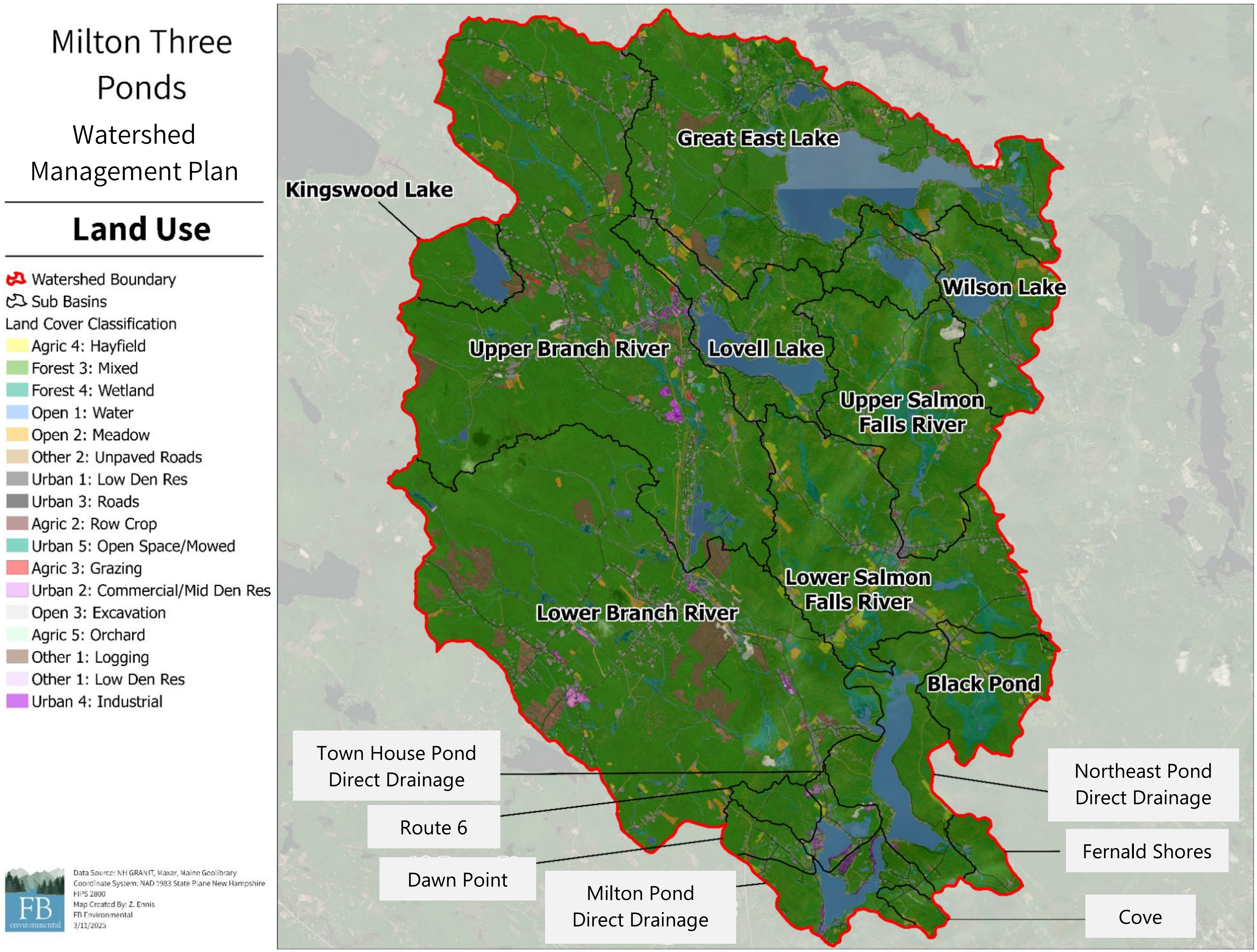

Figure 8. Land use and subbasins within the Milton Three Ponds watershed.

2.3.1.3 Internal Phosphorus Loading

Phosphorus that enters the lake and settles to the bottom can be re-released from sediment under anoxic conditions, providing a nutrient source for algae, cyanobacteria, and plants. Internal phosphorus loading can also result from wind-driven wave action or physical disturbance of the sediment (boat props, aquatic macrophyte management activities). Internal loading estimates were derived from dissolved oxygen and temperature profiles taken at the deep spot of each of the three ponds to determine average annual duration and depth of anoxia defined as <2 ppm dissolved oxygen. Epilimnion/hypolimnion total phosphorus data taken at the deep spot of each pond was also used (to determine average difference between surface (epilimnion) and bottom (hypolimnion) phosphorus concentrations). These estimates, along with anoxic volume and surface area, helped determine rate of release and mass of annual internal phosphorus load. The internal load estimate provided by the model was highly variable and warrants further investigation.

2.3.1.4 LLRM Results

Overall, model predictions for Northeast Pond, Townhouse Pond, and Milton Pond were in good agreement with observed data for total phosphorus (1%, 2%, and 4%, respectively), chlorophyll-a (11%, 30%, and 2%, respectively), and Secchi disk transparency (19%, 6%, and 7%, respectively) (Table 5). It is important to note that the LLRM does not explicitly account for all the biogeochemical processes occurring within a waterbody that contribute to overall water quality and is less accurate at predicting chlorophyll-a and Secchi disk transparency. For example, chlorophyll-a is estimated strictly from nutrient loading, but other factors strongly affect algae growth, including transport of phosphorus from the sediment-water interface to the water column by cyanobacteria, low light from suspended sediment, grazing by zooplankton, presence of heterotrophic algae, and flushing effects from high flows. There were insufficient data available to evaluate the influence of these other factors on observed chlorophyll-a concentrations and Secchi disk transparency readings. The model predicts 15 cyanobacteria bloom days for Northeast Pond, 6 for Townhouse Pond, and 11 for Milton Pond (Table 5), which aligns with the number of bloom warnings and alerts were issued by NHDES in recent years. Bloom warnings/alerts spanned 9 days (*Dolichospermum*) in 2023 and 7 days (*Dolichospermum*) in 2024 in Northeast Pond.

Watershed runoff combined with baseflow (96%) was the largest phosphorus loading contribution across all sources to Milton Pond, which is the final receiving waterbody in the Milton Three Ponds watershed (Table 6; Figure 9). The watershed load (96%) to Milton Pond includes the loads from Northeast Pond (84%), Townhouse Pond (6%), and the direct land area to Milton Pond (7%) (Table 6; Figure 9). Atmospheric deposition (1%), internal loading (<1%), waterfowl (<1%), and septic systems (2%) were relatively minor sources to Milton Pond but may be seasonally important during low flow summer conditions. For Townhouse Pond, 93% of the total phosphorus load is a result of backflow from Milton Pond. Without this backflow flushing, the predicted in-lake total phosphorus concentration in Townhouse Pond would be double and water quality conditions likely much worse.

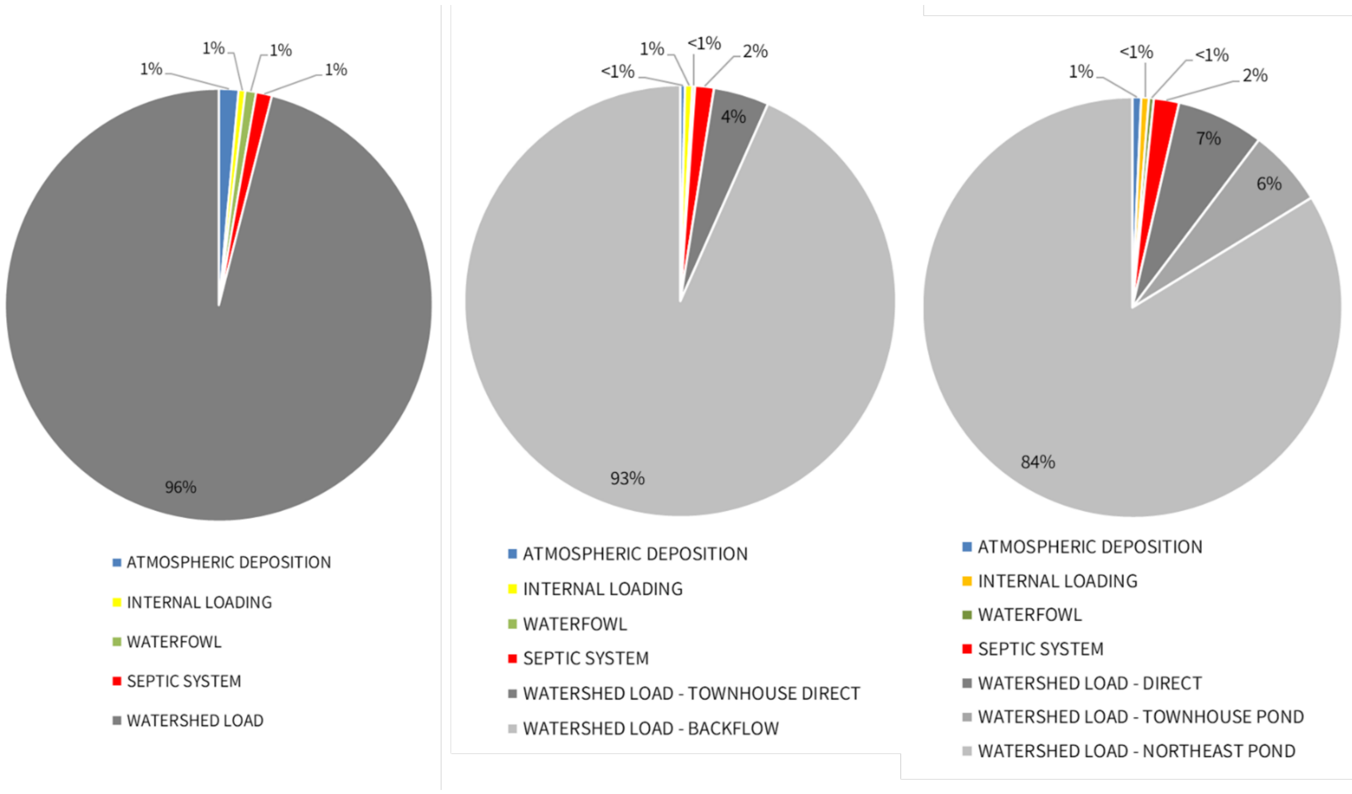

Figure 9. Summary of total phosphorus loading by major source for Northeast Pond (left), Townhouse Pond (middle), and Milton Pond (right).

Notes: Refer to Table 3 for a breakdown.

Development in the watershed is most concentrated along the shorelines of the three ponds, as well as within multiple downtown areas in the upper watershed, including downtown Wakefield (Upper Branch River), Milton Mills (Lower Salmon Falls River), downtown Milton and Route 125 (Milton & Townhouse Pond direct sub-watersheds), and downtown Union (Upper and Lower Branch River). Development is also dense around the shoreline where septic systems or holding tanks are located within a short distance to the water, leaving little horizontal (and sometimes vertical) space for proper filtration of wastewater effluent. Improper maintenance or siting of these systems can cause failures, which leach untreated, nutrient-rich wastewater effluent to the lake. The entirety of the shoreline of the three ponds, except for a small portion of the Milton Pond shoreline in downtown Milton, is serviced by septic systems. Sewer can also represent a potential vulnerability if the sewer systems are old or damaged and leaking wastewater into groundwater near the ponds. Note that the septic system load estimate is only for those systems directly along the shoreline and potentially short-circuiting minimally treated effluent to the ponds. The load from septic systems throughout the rest of the watershed is inherent to the coefficients used to generate the watershed load.

Normalizing for the size of a sub-watershed (i.e., accounting for its annual discharge and direct drainage area) better highlights sub-watersheds with elevated pollutant exports relative to their drainage area. Sub-watersheds with moderate-to-high phosphorus mass exported by area (>0.20 kg/ha/yr) generally had more development (i.e., highly developed urban areas along the three ponds' shorelines and the Upper Salmon Falls sub-watershed; Table 7, Figure 10). Drainage areas directly adjacent to waterbodies have direct connection to lakes and are usually targeted for development, thus increasing the possibility for phosphorus export. Other high loading areas (such as downtown areas in the Upper Branch River, Lower Branch River, and Lower Salmon Falls River sub-watersheds) were embedded in large, mostly undeveloped watersheds which led to generally lower total phosphorus loads when compared to the sub-watershed area.

Once the model is calibrated for current in-lake phosphorus concentration, we can then manipulate land cover and other factor loadings to estimate pre-development loading scenarios (e.g., what in-lake phosphorus concentration was prior to human development or the best possible water quality for the ponds). Refer to Attachment 2 for details on methodology. Pre-development loading estimation showed that total phosphorus loading to Milton Pond (representative of the total loads to all three ponds) increased by 234%, from 554 kg/yr prior to European settlement to 1,853 kg/yr under current conditions (Table 6). These additional phosphorus sources are coming from development in the watershed (especially from the direct shoreline of the three ponds and the multiple downtown areas), septic systems, atmospheric dust, and internal loading (Table 6, Table 7). Water quality prior to settlement was predicted to be excellent with extremely low phosphorus and chlorophyll-a concentrations and high water clarity (Table 5).

We can also manipulate land cover and other factors to estimate future loading scenarios (e.g., what in-lake phosphorus concentration might be at full build-out under current zoning or the worst possible water quality for the ponds). Refer to Attachment C for the 2025 Milton Three Ponds Buildout Report (SRPC, 2025) for details on methodology. Note: the future scenario did not assume a 10% increase in precipitation over the next century (NOAA Technical Report NESDIS 142-1, 2013), which would have resulted in a lower predicted in-lake phosphorus concentration; this is because the future model does not consider the rate and distribution of the projected increase in precipitation. Climate models predict more intense and less frequent rain events that may exacerbate erosion of phosphorus-laden sediment to surface waters and therefore could increase in-lake phosphorus concentration (despite dilution and flushing impacts that the model assumes).

Future loading estimation showed that total phosphorus loading to Milton Pond (representative of total phosphorus loading to all three ponds) may increase by 76%, from 1,853 kg/yr under current conditions to 3,267 kg/yr at full build-out (2216) under current zoning (Table 6). Additional phosphorus will be generated from more development in the watershed (especially in undeveloped headwater areas), greater atmospheric dust, more septic systems, and enhanced internal loading (Table 6, Table 7). The Milton Pond model predicted higher (worse) phosphorus (19.3 µg/L), higher (worse) chlorophyll-a (7.2 µg/L) with 118 bloom days, and lower (worse) water clarity (2.4 m) compared to current conditions for Milton Pond (Table 5). Predicted future water quality was similarly poor for Northeast Pond and Townhouse Pond.

Table 5. In-lake water quality predictions for the Milton Three Ponds.

Pond	Model Scenario	Measured Median TP (µg/L)	Modeled Median TP (µg/L)	Measured Chl-a (µg/L)	Modeled Mean Chl-a (µg/L)	Measured Mean SDT (m)	Modeled Mean SDT (m)	Modeled Bloom Days
Northeast Pond	Pre-Development	--	3.7	--	0.7	--	8.4	0
	Current (2025)	11.5	11.6	3.4	3.8	2.9	3.5	15
	Future (2216)	--	21.1	--	8.0	--	2.2	148
Townhouse Pond	Pre-Development	--	3.3	--	0.6	--	9.3	0
	Current (2025)	9.8	9.9	4.2	3.1	3.7	4.0	6
	Future (2216)	--	17.4	--	6.3	--	2.6	86
Milton Pond	Pre-Development	--	3.3	--	0.6	--	9.3	0
	Current (2025)	10.5	10.9	3.6	3.5	3.5	3.7	11
	Future (2216)	--	19.3	--	7.2	--	2.4	118

Notes: TP = total phosphorus. Chl-a = chlorophyll-a. SDT = Secchi disk transparency. Bloom Days represent average annual probability of chlorophyll-a exceeding 8 µg/L.

Table 6. Total phosphorus (TP) and water loading summary by model output and source for Milton Three Ponds.

		PRE-DEVELOPMENT			CURRENT (2024)			FUTURE (2216)		
POND	**SOURCE**	TP (KG/YR)	%	WATER (CU.M/YR)	TP (KG/YR)	%	WATER (CU.M/YR)	TP (KG/YR)	%	WATER (CU.M/YR)
NORTHEAST POND	ATMOSPHERIC	18.8	3%	2,695,429	29.6	1%	2,695,429	67.2	2%	2,695,429
	INTERNAL	0.0	0%	0	10.3	1%	0	18.7	1%	0
	WATERFOWL	16.1	2%	0	16.1	1%	0	16.1	<1%	0
	SEPTIC SYSTEM	0.0	0%	0	24.2	1%	23,382	28.3	1%	28,492
	WATERSHED LOAD	605.8	95%	132,849,312	1,925.3	96%	132,428,792	3,509.1	96%	131,872,342
	TOTAL LOAD TO POND	**640.7**	**100%**	**135,544,741**	**2,005.5**	**100%**	**135,147,603**	**3,639.4**	**100%**	**134,596,263**
TOWNHOUSE POND	ATMOSPHERIC	3.7	1%	528,589	5.8	<1%	528,589	13.2	<1%	528,589
	INTERNAL	0.0	0%	0	9.1	1%	0	13.0	<1%	0
	WATERFOWL	3.2	1%	0	3.2	<1%	0	3.2	<1%	0
	SEPTIC SYSTEM	0.0	0%	0	23.4	1%	22,407	23.4	1%	22,407
	WATERSHED LOAD	535.8	99%	143,947,890	1,614.2	98%	143,929,319	2,841.1	99%	143,917,241
	Direct Land Use Load	*11.2*	*2%*	*2,153,437*	*68.7*	*4%*	*2,134,865*	*104.5*	*4%*	*2,122,787*
	Backflow from Milton Pond	*524.6*	*97%*	*141,794,454*	*1,545.6*	*93%*	*141,794,454*	*2,736.6*	*95%*	*141,794,454*
	TOTAL LOAD TO POND	**542.7**	**100%**	**144,476,480**	**1,655.8**	**100%**	**144,480,315**	**2,893.9**	**100%**	**144,468,237**
MILTON POND	ATMOSPHERIC	8.0	2%	1,150,405	12.6	1%	1,150,405	28.7	1%	1,150,405
	INTERNAL	0.0	0%	0	10.9	1%	0	19.2	1%	0
	WATERFOWL	6.9	1%	0	6.9	<1%	0	6.9	<1%	0
	SEPTIC SYSTEM	0.0	0%	0	36.1	2%	34,502	37.9	1%	36,760
	WATERSHED LOAD	539.2	97%	141,048,119	1,786.3	96%	140,609,547	3174.2	97%	140,007,886
	Direct Land Use Load	*24.8*	*4%*	*4,476,014*	*124.4*	*7%*	*4,430,745*	*206.2*	*6%*	*4,392,502*
	Townhouse Pond	*18.0*	*3%*	*2,410,738*	*110.2*	*6%*	*2,414,573*	*157.3*	*5%*	*2,402,496*
	Northeast Pond	*496.4*	*90%*	*134,161,366*	*1,551.7*	*84%*	*133,764,228*	*2810.8*	*86%*	*133,212,888*
	TOTAL LOAD TO POND	**554.1**	**100%**	**142,198,524**	**1,852.8**	**100%**	**141,794,454**	**3,266.9**	**100%**	**141,195,051**

Notes: Italicized sources sum to the watershed load.

Table 7. Summary of land area, water flow, phosphorus concentration, and phosphorous loading by model output and sub-watershed for Milton Three Ponds.

		Pre-Development Watershed Loads				Current (2024) Watershed Loads					Future (2216) Watershed Loads			
Sub-Watershed	**Land Area (ha)**	Water Flow (m^3/year)	Calc. P Conc. (mg/L)	P mass (kg/ year)	P mass by area (kg/ha/ year)	Water Flow (m^3/year)	Calc. P Conc. (mg/L)	Measured P Conc. (mg/L)	P mass (kg/ year)	P mass by area (kg/ha/y ear)	Water Flow (m^3/year)	Calc. P Conc. (mg/L)	P mass (kg/ year)	P mass by area (kg/ha/ year)
Northeast Pond														
Fernald Shores	202.2	1,145,935	0.005	6.1	0.03	1,141,560	0.013	0.017	14.5	0.07	1,130,067	0.047	52.6	0.26
Black Pond	746.1	3,392,568	0.005	16.8	0.02	3,380,058	0.014	--	45.7	0.06	3,368,160	0.025	84.7	0.11
Great East Lake	4,098.6	23,268,445	0.005	127.9	0.03	23,177,449	0.021	--	476.6	0.12	23,074,884	0.036	835.2	0.20
Horn Pond*	461.9	2,093,847	0.003	5.6	0.01	2,083,487	0.010	--	20.0	0.04	2,074,672	0.017	35.5	0.08
Kingswood Lake	444.8	2,264,714	0.002	5.2	0.01	2,260,282	0.006	--	13.0	0.03	2,257,300	0.008	17.7	0.04
Lovell Lake	1,235.1	6,338,373	0.002	15.5	0.01	6,291,568	0.011	--	67.7	0.05	6,234,282	0.025	156.7	0.13
Lower Branch River*	6,628.7	32,282,644	0.005	146.5	0.02	32,220,891	0.012	0.013	385.1	0.06	32,132,873	0.020	629.2	0.09
Lower Salmon Falls River*	2,332.6	9,774,112	0.004	41.7	0.02	9,714,141	0.014	0.010	134.8	0.06	9,672,814	0.025	238.5	0.10
Northeast Pond Direct	848.6	4,788,698	0.005	25.0	0.03	4,777,837	0.019	--	88.5	0.10	4,741,454	0.044	209.0	0.25
Upper Branch River*	6,258.1	38,844,430	0.007	256.5	0.04	38,686,236	0.022	0.011	847.9	0.14	38,553,377	0.038	1,464.7	0.23
Upper Salmon Falls River*	1,850.0	17,577,242	0.010	170.2	0.09	17,578,911	0.033	--	574.4	0.31	17,496,067	0.062	1,089.9	0.59
Wilson Lake	999.8	5,744,327	0.006	33.9	0.03	5,730,714	0.019	--	109.6	0.11	5,685,095	0.047	269.1	0.27
Townhouse Pond														
Route 6	196.5	1,114,232	0.005	5.9	0.03	1,110,944	0.011	0.013	12.6	0.06	1,104,147	0.030	32.8	0.17
Townhouse Pond Direct	188.7	1,039,204	0.005	5.3	0.03	1,023,921	0.055	--	56.0	0.30	1,018,641	0.070	71.7	0.38
Milton Pond														
Dawn Point	208.9	1,187,631	0.005	6.4	0.03	1,178,518	0.024	0.018	28.1	0.13	1,169,269	0.041	47.9	0.23
Cove	111.7	634,094	0.006	4.0	0.04	632,268	0.017	0.010	10.9	0.10	627,555	0.033	21.0	0.19
Milton Pond Direct	466.7	2,654,289	0.005	14.4	0.03	2,619,958	0.033	--	85.4	0.18	2,595,678	0.053	137.3	0.29

Notes: Land area does not include the area of the lakes.

** Table shows water and P loads for the direct sub-watershed area only.*

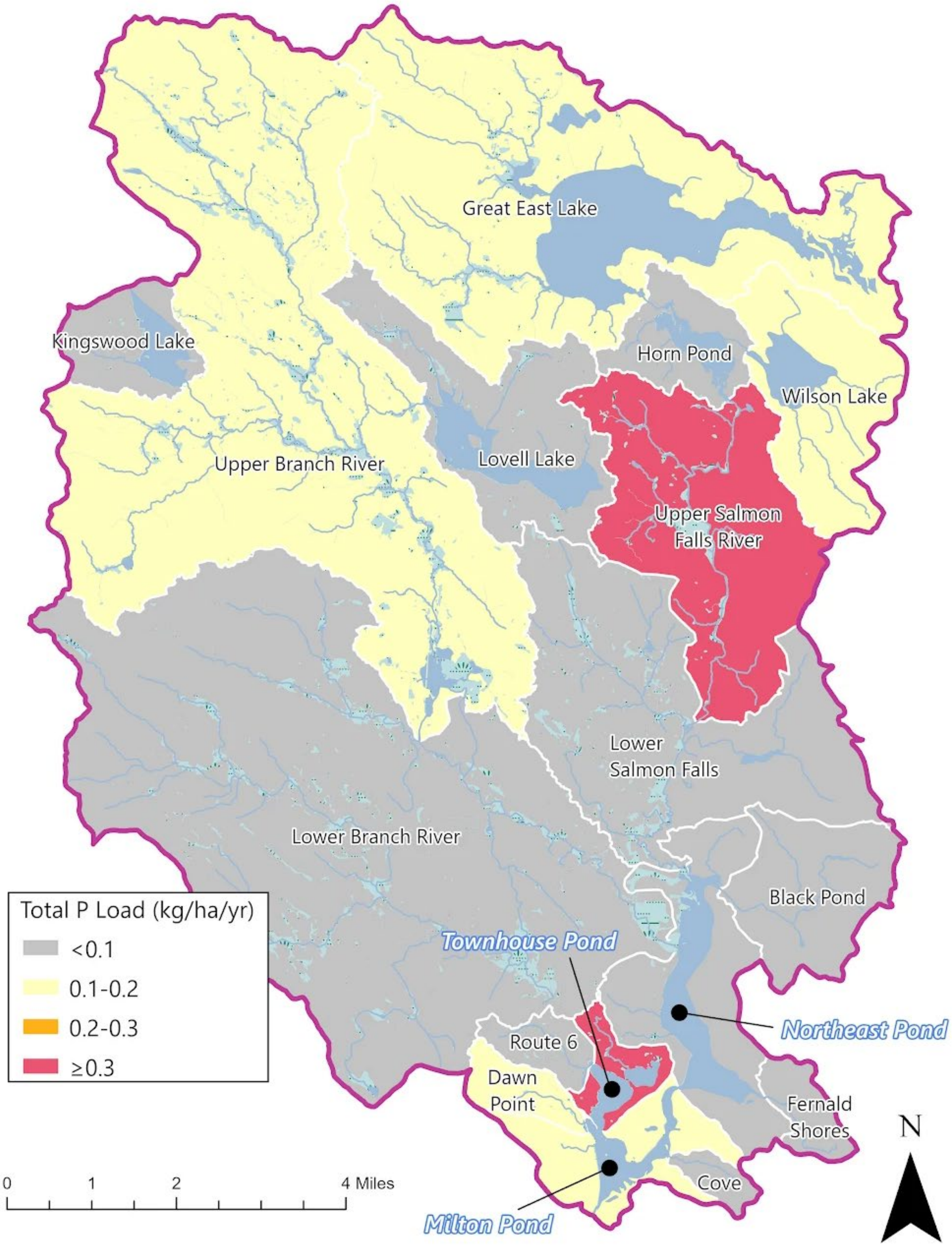

Figure 10. Map of current total phosphorus load per unit area (kg/ha/yr) for each sub-watershed in the Milton Three Ponds watershed.

Notes: Higher phosphorus loads per unit area are concentrated around the Townhouse Pond direct shoreline and in the Upper Salmon Falls River.

2.3.2 Build-out Analysis

A full build-out analysis was completed for the Milton Three Ponds watershed for the municipalities of Brookfield, Middleton, Milton, Wakefield, and Wolfeboro, NH, and Acton and Lebanon, ME (SRPC, 2025). A build-out analysis identifies areas with development potential and projects future development based on a set of conditions (e.g., zoning regulations, environmental constraints) and assumptions (e.g., population growth rate). A build-out analysis shows what land is available for development, how much development can occur, and at what densities. "Full Build-out" is a theoretical condition representing the moment in time when all available land suitable for residential, commercial, and industrial uses has been developed to the maximum capacity permitted by local ordinances and zoning standards. Local ordinances and zoning standards are subject to change, and the analysis requires simplifying assumptions; therefore, the results of the build-out analysis should be viewed as planning-level estimates only for potential future outcomes from development trends.

FULL BUILD-OUT is a theoretical condition representing the moment in time when all available land suitable for residential, commercial, and industrial uses has been developed to the maximum capacity permitted by current local ordinances and current zoning standards.

To determine where development may occur within the study area, the build-out analysis first subtracts land unavailable for development due to physical constraints, including environmental restrictions (e.g., wetlands, conserved lands, hydric soils), zoning restrictions (e.g., shoreland zoning, street Right-of-Ways (ROWs), and building setbacks), and practical design considerations (e.g., lot layout inefficiencies). Existing buildings also reduce the capacity for new development.

SRPC identified 7,095 existing principal buildings within the watershed, and the build-out analysis projected that an additional 8,346 buildings could be constructed in the future resulting in a total of 15,441 buildings in the watershed. Additional roadways would need to be built throughout the watershed for these projected buildings to be accessible.

The date of full build-out was identified using the current growth rate of the municipalities. our iterations of the TimeScope Full build-out is projected to occur in 2216. Note that the growth rates used are based on town-wide census statistics but have been applied here to a portion of the municipalities. If areas closer to the lake within each municipality develop faster than more inland areas, watershed full buildout conditions may occur sooner. Using census data to project population increase and/or development has inherent limitations. For instance, the building rate may increase at a different rate than population, due to factors such as commercial versus residential development and number of people per household. Many projected buildings would also require the development of new roadways which is a factor that would affect the rate of development. As such, the year of full build-out might be an over or underestimation of the time required for the study area to reach full build-out. Numerous social and economic factors influence population change and development rates, including policies adopted by federal, state, and local governments. The relationships among the various factors may be complex and therefore difficult to model.

2.4 WATER QUALITY GOAL & OBJECTIVES

The model estimated changes in total phosphorus loading and in-lake total phosphorus concentrations over time from pre-development through future conditions, showing that the water quality of Milton Three Ponds is threatened by current development activities in the watershed and will degrade further with continued development in the future. We can use these results to make informed management decisions and set an appropriate water quality goal for Milton Three Ponds. In-lake chlorophyll-a and total phosphorus concentrations indicate that there may not be reserve capacity for the lake to assimilate additional nutrients under a "business as usual" scenario. Thus, it is highly recommended that ambitious objectives be established and strongly pursued to protect the water quality of Milton Three Ponds over the long term.

It would be unrealistic to set the water quality goal to meet the oligotrophic standard for all three ponds because, as shown in the reality check below (Table 8), the phosphorus reductions required to do so are infeasibly large. Instead, individual pond-specific goals are more attainable. These will include reducing phosphorus loads as much as possible or reducing phosphorus loads to attain oligotrophic standards, depending on the pond.

Ideally, we would recommend that the annual average total phosphorus concentration for **Northeast Pond** be reduced from a predicted 11.5 ppb to 10.0 ppb full year (8.3 summertime concentration), a well-documented threshold above which there is an increased risk of cyanobacteria blooms. However, that would equate to a 14% (276 kg/yr) reduction in the total phosphorus load to Northeast Pond, slightly exceeding the identified watershed load reduction opportunities (Table 8). Additional reduction opportunities from sites identified in existing reports for some of the headwater communities have been factored in (see footnotes to Table 8 for sources). The ideal goal of 10 ppb might be attainable as load reduction sites (not factored in here) were identified in the 2022 Lovell Lake Watershed Survey Report, but there are no associated load reduction calculations. Given this context, as part of the Milton Three Ponds WMP, we recommend the goal of reducing the annual average total phosphorus concentration for Northeast Pond from 11.5 ppb to 10.1 ppb full year (8.4 summertime concentration) by addressing all identified and calculated watershed sources of phosphorus inputs at a minimum, which equates to a 13% load reduction (253 kg/yr) from current conditions.

We recommend that the annual average total phosphorus concentration for **Townhouse Pond** be reduced from 9.8 ppb to 8.6 ppb full year (7.2 summertime concentration, the oligotrophic threshold). This equates to a 13% (216 kg/yr) reduction in the total phosphorus load to Townhouse Pond; however, 178% (385 kg/yr) of the Townhouse Pond goal would be achieved if all goals are met for Northeast, Townhouse, and Milton Ponds. A reduction of 385 kg/yr results in a modeled in-lake summertime concentration of 6.4 ppb for Townhouse Pond.

We recommend that the annual average total phosphorus concentration for **Milton Pond** be reduced from 10.5 ppb to 8.6 ppb full year (7.2 summertime concentration, the oligotrophic threshold). This equates to a 21% (385 kg/yr) reduction in the total phosphorus load to Milton Pond. If all goals are met for Northeast, Townhouse, and Milton Ponds, the model predicts 100% (385 kg/y) of the Milton Pond total phosphorus reduction goal would be met for Milton Pond.

The goal of the Milton Three Ponds WMP is to improve the water quality of Northeast Pond, Townhouse Pond, and Milton Pond such that they meet state water quality standards for the protection of Aquatic Life Integrity (ALI) and substantially reduce the likelihood of harmful cyanobacteria blooms. This goal will be achieved by accomplishing the following objectives. More detailed action items to achieve these objectives will be provided in the Action Plan of the WMP.

> **Objective 1:** Reduce phosphorus loading from existing development by 253 kg/yr to Northeast Pond, 216 kg/yr to Townhouse Pond, and 385 kg/yr to Milton Pond to improve the average in-lake summer total phosphorus concentration to 8.4 ppb, 7.2 ppb, and 7.2 ppb, respectively.
>
> **Objective 2:** Mitigate (prevent or offset) phosphorus loading from future development by 72 kg/yr to the Milton Three Ponds system to maintain average summer in-lake total phosphorus concentration for Milton Pond in the next 10 years (2035).

Table 8. Reality check of the water quality goal based on the identified external watershed loads.

	Northeast Pond Watershed	Townhouse Pond Watershed	Milton Pond Watershed
Remediating Watershed Assessment Sites Number of sites and total phosphorus load reduction.	49 sites, 31.8 kg/yr [2] 491 sites, 36.8 kg/yr [3] 221 sites, 120.4 kg/yr [4] 136 sites, unknown load [5]	5 sites, 2.9 kg/yr [2]	18 sites, 6.0 kg/yr [2]
Addressing Shoreline Properties Number of sites and total phosphorus load reduction High impact[6] = disturbance score (DS) 11+, Medium impact[7] = DS between 9-10, Low impact[8] = DS between 7-8.	3 high impact sites, 0.4 kg/yr 26 medium impact sites, 7.5 kg/yr 86 low impact sites, 49.7 kg/yr	5 high impact sites, 0.7 kg/yr 32 medium impact sites, 9.3 kg/yr 50 low impact sites, 28.9 kg/yr	8 high impact sites, 1.2 kg/yr 48 medium impact sites, 13.9 kg/yr 97 low impact sites, 56.1 kg/yr
Upgrading Shoreland Zone Septic Systems Number of septic systems > 25 years old and total phosphorus load reduction.	~63 systems 6.3 kg/yr	~47 systems 4.7 kg/yr	~80 systems 8.0 kg/yr
Total Phosphorus Load Reduction Per Individual Watershed Sum of remediating watershed assessment sites, addressing shoreline properties, and upgrading septic systems.	253 kg/yr	47 kg/yr	85 kg/yr
Modeled Total Phosphorus Summer Concentration Goal, and Load Reduction Needed to Meet the Water Quality Goal	8.4 ppb 253 kg/yr	7.2 ppb 216 kg/yr	7.2 ppb 385 kg/yr
Combined Total Reduction When Accounting for Hydrologic Connectivity (Figure 11) Total phosphorus load reduction and percent of the water quality goal.	253 kg/yr 100%	385 kg/yr 178%	385 kg/yr 100%

[2] Identified in the 2025 Milton Three Ponds WMP.

[3] Identified in the 2010 Salmon Falls Headwater Lakes WMP. A 40% attenuation factor was applied to the original load reduction value of 92 kg/yr to account for retention within the lakes.

[4] Identified in the 2022 Great East Lake Watershed-Based Protection Plan. This load reduction is likely an overestimate, and there is likely some site overlap with the 2010 Salmon Falls Headwater Lakes WMP. A 40% attenuation factor was applied to the original load reduction value of 301 kg/yr to account for retention within the lake.

[5] Identified in the 2022 Lovell Lake Watershed Survey Report.

[6] From PLET model bank stabilization estimate for fine sandy loams, using 200 ft (length) by 3 ft (height) and moderate lateral recession rate of 0.1 ft/yr.

[7] From PLET model bank stabilization estimate for fine sandy loams, using 10 ft (length) by 3 ft (height) and moderate lateral recession rate of 0.1 ft/yr.

[8] From PLET model bank stabilization estimate for fine sandy loams, using 50 ft (length) by 3 ft (height) and moderate lateral recession rate of 0.1 ft/yr.

In sum, treating existing pollutant sources identified as coming from the external watershed load could reduce the phosphorus load to Northeast Pond by 253 kg/yr, to Townhouse Pond by 47 kg/yr (216 kg/yr when combined with goal attainment in the other ponds), and to Milton Pond by 85 kg/yr (385 kg/yr when combined). Because these ponds are hydrologically connected (Figure 11), reducing external watershed loads in the Northeast Pond subwatershed will also reduce the load entering Milton Pond and indirectly to Townhouse Pond through backflow from Milton Pond. Reducing watershed loads to Townhouse Pond or Milton Pond will also be mutually beneficial.

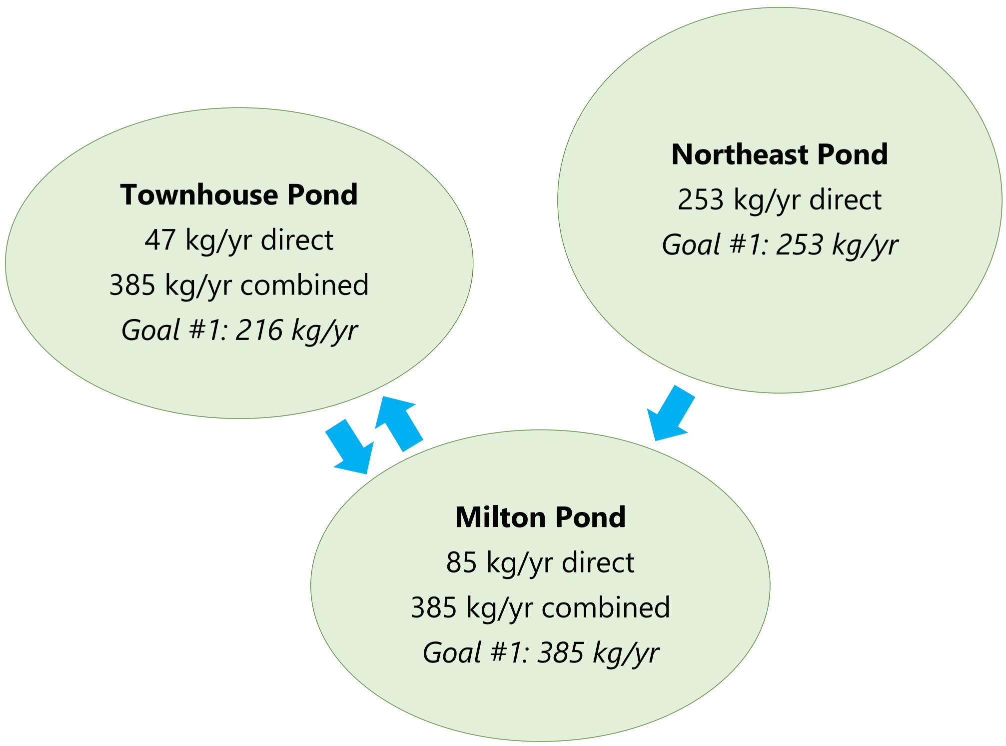

Figure 11. Conceptual diagram of external watershed load reductions by sub-watershed.

Notes: Green ovals represent the waterbody's watershed, blue arrows represent the typical flow patterns between the waterbodies. The first values ("direct") represent the external watershed load reduction from identified sources within the watershed of each pond, and the following value ("combined", Townhouse and Milton ponds only) represents the sum of watershed load reductions when accounting for hydrologic connectivity. The final value represents the load reduction needed to attain the goal for Objective 1.

Non-structural best management practices (BMPs) throughout the watershed, such as educating homeowners about septic system maintenance, fertilizer use, and residential stormwater management, may be effective at reducing phosphorus loading to three ponds beyond what had been identified in Table 8. Reality check of the water quality goal based on the identified external watershed loads. to meet and exceed the water quality goals. Preventing septic system failures, reducing residential lawn fertilizer use, and improved stormwater management at the property-scale were not relied on in the goal attainment calculations above.

Objective 2 can be met through ordinance revisions that implement low impact development strategies and encourage cluster development with open space protection and/or through conservation of key parcels of forested and/or open land.

The interim goals for each objective allow flexibility in reassessing water quality objectives following more data collection and expected increases in phosphorus loading from new development in the watershed over the next 10 or more years (Table 9). Understanding predicted water quality following watershed improvements compared to likely water quality following no action will help guide adaptive changes to interim goals (e.g., goals are on track or goals are falling short). If goals are not being met because of limited funding or resources for implementation projects, rather than because new development is adding phosphorus faster than improvements to existing development can reduce it, then the conditions for adjusting interim goals are very different. For each interim goal year, stakeholders should update the water quality data and model and assess why goals are or are not being met. Stakeholders will then decide on how to adjust the next interim goals to better reflect water quality conditions and practical limitations to implementation.

Table 9. Summary of water quality objectives for Milton Three Ponds.

Water Quality Objective	**Interim Goals/Benchmarks**		
	2027	**2030**	**2035**
1. Reduce phosphorus loading from existing development to Milton Three Ponds by 253 kg/yr for Northeast Pond, 216 kg/yr for Townhouse Pond, and 385 kg/yr for Milton Pond to improve average in-lake summer or annual total phosphorus concentration to 8.4 ppb for Northeast Pond, 7.2 ppb for Townhouse Pond, and 7.2 ppb for Milton Pond.			
	Achieve 63 kg/yr reduction in TP loading to Northeast Pond, 54 kg/yr to Townhouse Pond, and 96 kg/yr to Milton Pond	Achieve 127 kg/yr reduction in TP loading to Northeast Pond, 108 kg/yr to Townhouse Pond, and 192 kg/yr to Milton Pond; re-evaluate water quality and track progress	Achieve 253 kg/yr reduction in TP loading to Northeast Pond, 216 kg/yr to Townhouse Pond, and 385 kg/yr to Milton Pond; re-evaluate water quality and track progress
2. Mitigate (prevent or offset) phosphorus loading from future development by 72 kg/yr to the Milton Three Ponds system to maintain average summer in-lake total phosphorus concentration for Milton Pond in the next 10 years (2035).			
	Prevent or offset 18 kg/yr in TP loading from new development to Milton Three Ponds.	Prevent or offset 36 kg/yr in TP loading from new development to Milton Three Ponds; re-evaluate water quality and track progress.	Prevent or offset 72 kg/yr in TP loading from new development to Milton Three Ponds; re-evaluate water quality and track progress.

Notes: Objective 2 is represented as only Milton Pond due to the connectivity and mutual benefit. Interim goals/benchmarks are cumulative. TP refers to total phosphorus.

3 POLLUTANT SOURCE IDENTIFICATION

This section describes sources of excess phosphorus to Milton Three Ponds. Sources of phosphorus to lakes include stormwater runoff, shoreline erosion, construction activities, illicit connections, failed or improperly functioning septic systems, leaky sewer lines, fabric softeners and detergents in greywater, fertilizers, and pet, livestock, and wildlife waste. These external sources of phosphorus to lakes can then circulate within lakes and settle on lake bottoms, contributing to internal phosphorus loads over time. Additional phosphorus sources can enter the lake from atmospheric deposition but are not addressed here because of limited local management options. Wildlife is mentioned as a potential source but largely for nuisance waterfowl such as geese or ducks that may be congregating in large groups because of human-related actions such as feeding or having easy shoreline access (i.e., lawns). Environmental variability is also not a direct source but can exacerbate the impact of the other phosphorus sources identified in this section and should be considered when striving to achieve the water quality objectives.

3.1 SOURCES OF NONPOINT SOURCE POLLUTION

NPS pollution comes from many diffuse sources on the landscape and is more difficult to identify and control than point source pollution. NPS pollution can result from contaminants transported by overland runoff (e.g., agricultural runoff or runoff from suburban and rural areas), groundwater flow, or direct deposition of pollutants to receiving waters. Examples of NPS pollution that can contribute nutrients to surface waters via runoff, groundwater, and direct deposition include erosion from disturbed ground or along roads, stormwater runoff from developed areas, malfunctioning septic systems, excessive fertilizer application, unmitigated agricultural activities, pet waste, and wildlife waste.

Point Source Pollution originates from identifiable, discrete sources, such as wastewater treatment plants, industrial facilities, or discharge pipes. These sources release pollutants directly into surface waters and are typically regulated through permits that set limits on the type and amount of pollutants that can be discharged.

Nonpoint Source (NPS) Pollution comes from diffuse sources throughout a watershed, such as stormwater runoff, seepage from septic systems, and gravel road erosion. One of the major constituents of NPS pollution is sediment, which contains a mixture of nutrients (like phosphorus) and inorganic and organic material that stimulate plant and algae growth.

3.1.1 Watershed Survey

A watershed survey of the Milton Three Ponds watershed was completed by technical staff from FBE. The objective of the watershed survey was to identify and characterize sites contributing NPS pollution and/or providing opportunities to mitigate NPS pollution in the watershed. The region of the upper watershed covered by the Acton-Wakefield

Watersheds Alliance (AWWA) was excluded from the watershed survey area as other efforts have occurred in that area to document and remediate nonpoint source pollution. For each location, field staff recorded site data and photographs on tablets. Information collected included location description and GPS coordinates; NPS problem description and measurements (e.g., gully dimensions); receiving waterbody; discharge type (direct or indirect/limited); and preliminary recommendations to mitigate the NPS problem. Field staff accessed sites from public and private roads and waterfront access points.

In the Milton Three Ponds watershed, seventy-five (75) NPS sites were identified and documented by describing the problem, making recommendations for fixing the problem, rating the site's impact to water quality, logging the site's geoposition, and taking photographs. (Figure 12).

The main issues found were road and ditch erosion and shoreline buffer clearing. FBE estimated the potential pollutant removal that could be achieved by implementing recommendations. The BMP Matrix included in Appendix A summarizes the recommendations, load reduction estimates, and estimated costs for each site. The top five high priority sites (based on lowest impact-weighted cost per mass of phosphorus removed) are shown below. In addition to these specific sites, managers of both private and public roads should use best practices for road installation and maintenance for water quality protection. Despite each site causing a low impact individually, the cumulative effect results in a substantial impact. A full description of all watershed survey sites is included in the Watershed Survey Memo (FBE, 2025b).

The following recommendations were made for the top five high priority sites identified by the watershed survey.

Site 22: Route 125 near Bolan Road

Location (latitude, longitude): 43.45069, -70.98635

Impact: High

Total Phosphorous Load Reduction Estimate: 0.9 kg/yr

Cost Estimate: $10,000 – $20,000

Observations: Significant stormwater runoff from the side of Route 125 and adjacent properties has created a large, active gully extending from Bolan Road to the stream crossing at the bend. Previous BMPs installed in this area, including check dams and mulch, appear to have failed. The check dams have been overtopped or washed out, and much of the mulch has been carried downstream. At the time of the survey, the ditch was conveying murky water with high sediment loads, indicating ongoing erosion and sediment transport.

Recommendations: To mitigate further erosion and improve water quality, we recommend reshaping the affected area into a stable, grassy swale designed to convey stormwater more effectively. If high storm flows are expected, the bottom of the swale may be armored with riprap and the foreslope and backslope seeded with grass. Additionally, reinstall check dams at appropriate intervals using durable materials suited to the flow conditions. These measures will help slow runoff, reduce sediment transport, and restore the function of the ditch.



Three views of the roadside gully conveying stormwater down Route 125 from Bolan Road. Turbid water and areas of deep incision are evident.

Site 14: Milton Town Beach

Location (latitude, longitude): 43.43387, -70.98637

Impact: High

Total Phosphorous Load Reduction Estimate: 2.3 kg/yr

Cost Estimate: $25,000 – $70,000

Observations: The unpaved parking lot at Milton Town Beach exhibited pooled stormwater during the May 2025 site visit, following recent storms. A catch basin on one side of the lot collects a portion of this runoff, which is presumed to discharge directly into Townhouse Pond. While some infiltration steps have been installed near a pavilion, the area surrounding the beach is fully mowed, leaving little to no vegetative buffer. A narrow boundary separates the lawn from the sandy beach, and a small picnic area is located near the water's edge.

The entire shoreline in this area consists of exposed beach, including in front of an adjacent forested area. The road and parking lot lead directly to the water, enabling vehicle access to the beach. Signs of erosion were evident in this location. On the opposite side, an unpaved boat launch is accessible from the baseball field area. Although crushed stone has been applied to stabilize the ramp, boat traffic/stormwater is displacing stone material into the lake.

There is currently no vegetated shoreline buffer along the public beach or on the neighboring property. Additionally, many of the trees in the adjacent forested area appeared to be dead or diseased at the time of the survey.

Recommendations:

Implement erosion control measures on the hillside and other areas showing signs of soil loss. Consider using water bars to redirect stormwater from the driveway into adjacent grassy areas, or regrading the driveway to reduce direct runoff to the beach.

Regrade the parking lot to improve drainage and reduce pooling. Install a rain garden or infiltration basin near the existing catch basin to treat and infiltrate stormwater before it reaches the lake.

Restore the vegetated shoreline buffer by planting native shrubs, grasses, or trees along the lake edge, particularly in currently mowed areas. Lower growing shrubs may be used in some areas to not block the view from the picnic area. Define and limit beach access points to reduce disturbance across the entire beachfront.

Add mulch or other ground cover in the picnic area to reduce compaction and surface runoff. Biochar as a soil amendment (without compost or other nutrient amendments) can reduce soil compaction and increase vegetative growth rates. Avoid mowing areas adjacent to the shoreline and repurpose some of the maintained grass areas for stormwater best management practices (BMPs), such as bioretention features or additional buffer plantings.

1. The catch basin in the unpaved parking lot. 2. A view of the mowed lawn with the picnic area, and the beach in the background. 3. Evidence of erosion on the beach as viewed from the crushed stone boat launch. 4. View of the unvegetated shoreline from the boat launch in the other direction.

Site 2.1: Fernald Shore – Picnic Site

Location (latitude, longitude): 43.43445, -70.94936

Impact: High

Total Phosphorous Load Reduction Estimate: 1.2 kg/yr

Cost Estimate: $15,000 – $20,000

Observations: Fernald Shore in the southeastern corner of Northeast Pond lacks adequate vegetated buffers and shows signs of shoreline erosion. Bare sandy soil is present around the picnic tables on the shore, and several narrow gullies channel stormwater directly to the lake. Access points are not clearly defined, likely causing additional soil erosion, soil compaction, and trampling of seedlings that would otherwise form part of a vegetated buffer zone.

Recommendations: Reduce sedimentation into the lake by implementing erosion control measures such as mulch, native plantings, or stone riprap. Areas with exposed, bare soil should either be seeded with grass or stabilized with erosion control mulch. Establish clearly defined access points (e.g., at the beach) and restore shoreline buffers by planting native vegetation between these access areas. Incorporate stone along access paths to minimize sediment transport and slow stormwater runoff. Consider installing water bars along the unpaved road leading to the picnic area to further manage runoff. Additionally, provide trash bins and pet waste stations to reduce litter and animal waste entering the lake.




The Fernald Shore picnic area has a lack of shoreline buffer vegetation, large areas of exposed soil, and channels directing unfiltered stormwater flow directly to Northeast Pond.

Site 1: Gravel Pit and Jones Access Road

Location (latitude, longitude): Gravel Pit: 43.45253, -71.00317; Jones Access Road: 43.45544, -71.00811

Impact: High

Total Phosphorous Load Reduction Estimate: 11.0 kg/yr

Cost Estimate: $120,000 – $200,000

Observations: Jones Access Road is a long, unpaved road that extends from Route 125, passes beneath Route 16, leads to a large former gravel pit, and then runs roughly parallel to Jones Brook in the southern part of the watershed. The gravel pit is located adjacent to wetlands connected to Jones Brook. The pit was dug out and leveled, before the land was acquired by its current owner. Past the gravel pit, an access road leads to additional disturbed areas that are assumed to also be former gravel pits. Many of these disturbed areas are directly adjacent to streams and wetlands that ultimately connect to Northeast Pond. Early successional forest has established in some parts of the pits, but large parts remain barren and exposed. The land is owned by the Carol Siemon Charitable Trust.

The Jones Access Road contains several sites of road erosion, but turnouts often direct surface runoff and sediment into the forest rather than towards streams. Numerous stream crossings have large culverts which appear designed for large flow events; however, some of these are perched above the streambed which can cause bank scour downstream of outlets. Downstream wetlands along Jones Brook will help reduce some of the erosion impacts observed at this site, though sediment loading from the gravel pits and road may lead to long-term degradation of the wetland and loss of function. Furthermore, while wetlands can often retain or reduce nutrients from the water column, they may also contain channelized flow paths (not always easily visible) allowing any nutrient-rich runoff not retained or utilized to discharge from the wetland.

Recommendations: Assess the frequency, intensity and purpose of Jones Access Road use. Consider decommissioning the road or converting it to a trail for non-motorized use if access is not wanted or needed. Replace culverts that are perched or stabilize scoured banks using riprap or revegetation. To address erosion hotspots along the unpaved access road, refer to this BMP resource published by the University of New Hampshire Cooperative Extension for logging roads. Consider fully restoring and re-naturalizing the former gravel pits as habitat for plant and animal species. This should involve recontouring the land to mimic the natural topography with assistance from an environmental engineer, or at a lower cost, reseeding exposed soil with native vegetation to encourage a transition back to forested habitat. A full restoration of disturbed areas to forest is recommended, though use of nutrient enrichment (soil fertilization) should be avoided or kept to an absolute minimum. Light biochar soil amendment may help with moisture retention on fast draining sands or gravels to improve vegetative growth rates without the addition of nutrient fertilizers. Focus on introducing disturbance-specialist species tolerant of high sunlight exposure and rocky soils. Together, road erosion BMPs, stream crossing BMPs and revegetation will reduce the sediment load entering Jones Brook and ultimately Northeast Pond and moderate runoff temperatures.





The gravel pits feature leveled, barren land. The Jones Access Road near the pits runs adjacent to a wetland. Road erosion is evident along the road, though generally runoff is directed into the upland forest. Perched culverts beneath the road have caused minor bank scour.

Site 39: Downtown Wakefield

Location (latitude, longitude): 43.55390, -71.03027

Impact: High

Total Phosphorous Load Reduction Estimate: 2.0 kg/yr

Cost Estimate: $30,000 – $100,000

Observations: Downtown Wakefield is a highly impervious area with minimal green stormwater infrastructure in place. Catch basins located along the road shoulders likely discharge directly into nearby rivers, and sediment was observed in the vicinity of at least two of these catch basins. Numerous opportunities for improvement exist, particularly in areas along the road shoulder where parking is not allowed, and along paved sidewalks. The presence of many "Slow Down Wakefield" signs suggests a community interest in traffic calming.

Recommendations: Given that much of downtown has restricted or prohibited parking, there is strong potential for implementing green stormwater infrastructure, such as planter bump-outs, rain gardens, and street trees. These features can help reduce stormwater runoff, improve water quality, mitigate localized flooding, and support traffic calming, while also discouraging unauthorized parking. Sidewalks could also be replaced with pervious pavers. Engineering support is needed to produce designs that can be replicated throughout downtown Wakefield.

Several examples of high impervious cover and sediment accumulation around catch basins in downtown Wakefield.

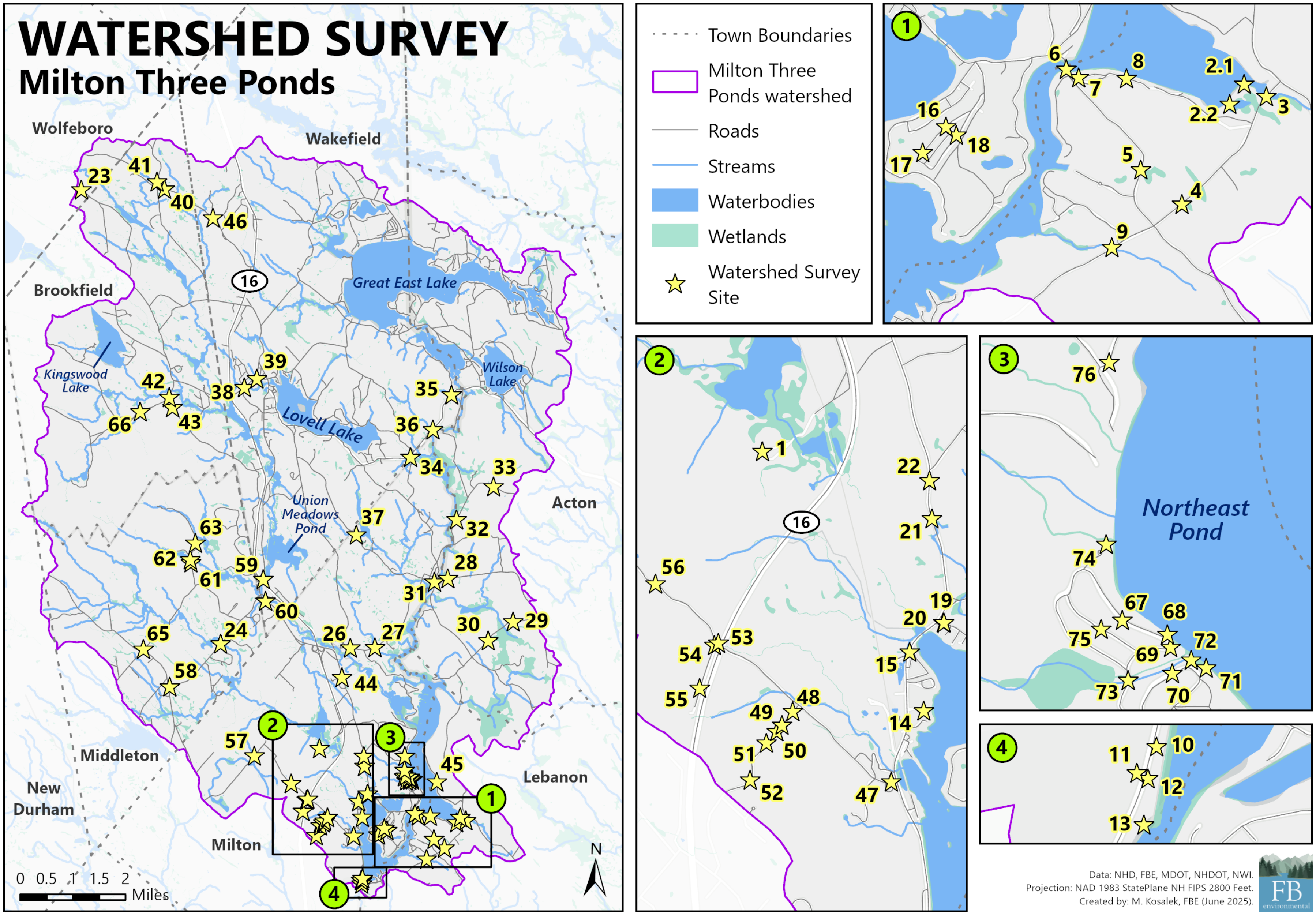

Figure 12. Location of identified nonpoint source sites and points of interest in the Milton Three Ponds watershed.

3.1.2 Shoreline Survey

A shoreline survey was completed in September 2025 by FBE technical staff and numerous TPPA volunteers who also provided boating assistance for surveying parcels with lake frontage. Technical staff documented the condition of the shoreline for each parcel using a scoring system that evaluates vegetated buffer, presence of bare soil, extent of shoreline erosion, distance of structures to the lake, and slope. These scores were summed to generate an overall "Shoreline Disturbance Score" (scores ranging from 3–12) and "Shoreline Vulnerability Score" (scores ranging from 1–6) for each parcel, with high scores indicating poor or vulnerable shoreline conditions. When evaluating the shoreline condition of each parcel, the entire length of each parcel's shoreline is considered. Because of this approach, the same shorefront home would score better on a parcel with a long shoreline that was mostly natural buffer compared to a home on a parcel with a short shoreline that consisted mostly of the developed area. Parcels with long, protected shorelines often received Shoreline Disturbance Scores of 6 or less because of a relatively small area of disturbance.

A total of 598 parcels were evaluated along the shoreline of Milton Pond, Northeast Pond, and Townhouse Pond in Milton, NH and Lebanon, ME. The average Shoreline Disturbance Score (buffer, bare soil, and shoreline erosion) for the entire study area was 6.8 (Table 10). A disturbance score of 7 or above indicates shoreline conditions that may be detrimental to lake water quality. These shoreline properties tended to have inadequate buffers, evidence of bare soil or use of lawn fertilizer, and shoreline erosion in the form of gullies. The average Shoreline Vulnerability Score (distance and slope) was 4.1 (Table 10). About 78% (or 469 parcels) scored 4 or greater (Figure 14). A vulnerability score of 4 or greater indicates that the parcel may have a home less than 150 feet from the shoreline and a moderate or steep slope to the shoreline. Parcels with a vulnerability score of 4 or greater are more prone to erosion issues whether or not adequate buffers and soil coverage are present. Most parcels have homes that are close to the lake. Specifically, 367 parcels (61%) received the maximum Distance Score of 3 for a home within 75 ft of the waterbody.

Shoreline erosion can be from or exacerbated by natural phenomena or human-related activities. Natural phenomena typically include the orientation of the parcel to prevailing winds and subsequent greater wave action, composition of the shoreline bank (whether highly erodible soil material or hardened rocky or bedrock outcroppings), winter ice damage, and the presence or absence of stabilizing shoreline vegetation. Human-related activities typically include motorboating (which generates wakes whose wave energy is dissipated by the shoreline), removal of shoreline vegetation, and shoreline development (such as retaining walls, beaches, and access points).

The pollutant loading estimates are based on the Shoreline Disturbance Scores. The 354 parcels with scores 7–11 are contributing approximately 147 kg of phosphorus annually.[9] Remediation efforts on all properties using a 50% Best Management Practices (BMP) efficiency rate could result in the annual reduction of 73.5 kg of phosphorus.

Table 10. Average Shoreline Disturbance and Shoreline Vulnerability Scores for Milton Three Ponds.

Evaluated Condition	Average Score	Average Shoreline Disturbance Score (3–11)	Average Shoreline Vulnerability Score (1–6)
Buffer (1–5)	3.3		
Bare Soil (1–4)	2.1	**6.8**	
Shoreline Erosion (1–3)	1.4		
Distance (0–3)	2.4		**4.1**
Slope (1–3)	1.8		

Notes: Lower values indicate shoreline conditions that are more effective at reducing erosion and keeping excess nutrients out of the lake. The numbers in parentheses are the range of possible scores.

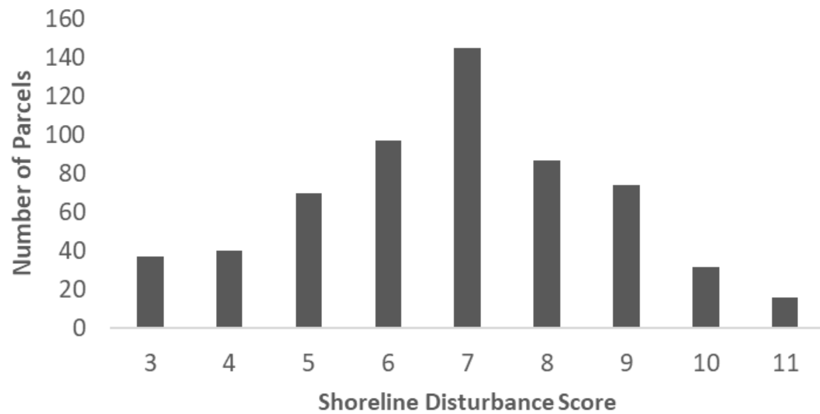

Figure 13. Histogram showing the number of parcels by Shoreline Disturbance Score.
Notes: The possible range of Shoreline Disturbance Scores is 3–12.

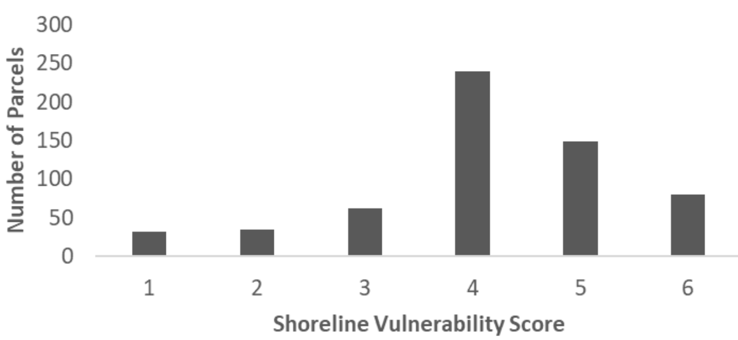

Figure 14. Histogram showing the number of parcels by Shoreline Vulnerability Score.
Notes: The possible range of Shoreline Vulnerability Scores is 1–6.

Certain site characteristics, such as slope, can cause shorelines to be naturally more vulnerable to erosion. Other site characteristics such as structure distance to the lake, are often a direct consequence of the

[9] Based on the EPA PLET model for bank stabilization with fine sandy loams, using 50 ft, 100 ft or 200 ft (length) by 3 ft (height) and moderate lateral recession rate of 0.1 ft/yr per parcel with Shoreline Disturbance Scores 7-11.

historic development on that parcel and cannot be easily changed. Shoreline buffers and amount of exposed soil are more easily changed to strengthen the resiliency of the shoreline to disturbance in the watershed.

In summary, the overall average shoreline condition of Milton Pond, Northeast Pond, and Townhouse Pond is moderate for erosion issues (average disturbance score just below 7), with 354 properties (59%) needing to address erosion or runoff issues that are impacting the lake. The shoreline parcels are also generally more prone to erosion issues because many homes are located close to shore and on steep slopes (average Vulnerability Score above 4).

Scores should be used to prioritize areas of the shoreline for remediation. Recommendations largely include improving shoreline vegetated buffers. Encouraging landowners to plant and/or maintain vegetated buffers as a BMP along their shoreline, particularly in areas of bare soil, will help mitigate erosion and reduce sediment and nutrient loading to the ponds.

3.1.3 Soil and Shoreline Erosion

Erosion can occur when ground is disturbed by digging, construction, plowing, foot or vehicle traffic, or wildlife. Rain and associated runoff are the primary pathways by which eroded soil reaches lakes and streams. Once in surface waters, nutrients are released from the soil particles into the water column, causing excess nutrient loading to surface waters or cultural eutrophication. Since development demand near lakes is high, construction activities in lake watersheds can be a large source of nutrients. Unpaved roads used by motorized vehicles near lakes and streams are especially vulnerable to erosion. Stream bank erosion can also have a rapid and severe effect on lake water quality and can be triggered or worsened by upstream impervious surfaces like buildings, parking lots, and roads which send large amounts of high velocity runoff to surface waters. Maintaining natural vegetative buffers around lakes and streams and employing strict erosion and sedimentation controls for construction can minimize these effects.

3.1.3.1 Surficial Geology

The composition of soils in the area reflect the dynamic geological processes that have shaped the landscape of New Hampshire over millions of years. Some 300 to 400 million years ago, much of the northeastern United States was covered by a shallow sea; layers of mineral deposition compressed to form sedimentary layers of shale, sandstone, and limestone (Goldthwait, 1951). Over time, the Earth's crust then folded under high heat and pressure to change the sedimentary rocks into metamorphic rocks (quartzite, schist, and gneiss parent material). This metamorphic parent material has since been modified by bursts of molten material intrusions to form igneous rock, including granite for which New Hampshire is famous for (Goldthwait, 1951). Erosion has further modified and shaped this parent material over the last 200 million years.

The current landscape formed 12,000 years ago at the end of the Great Ice Age, as the mile-thick glacier over half of North America melted and retreated, scouring bedrock and depositing glacial till to create the deeply scoured basin of the region's lakes. The retreating action also eroded mountains and left behind remnants of drumlins and eskers from ancient stream deposits. The glacier deposited a layer of glacial till more than three feet deep. Glacial till is composed of unsorted material, with particle sizes ranging from loose and sandy to compact and silty to gravely. This material laid the foundation for vegetation and streams as the depression basins throughout the region began to fill with water (Goldthwait, 1951). According to the USGS Statewide Aquifer Transmissivity data layer provided through the NH GRANIT, there are many high-yielding aquifers in the Milton Three Ponds watershed, with several underneath the three ponds.

3.1.3.2 Soils and Erosion Hazard

The soils in the Milton Three Ponds watershed are a direct result of geologic processes. Of the 70 different soil series present within the watershed (excluding soils beneath waterbodies), the most prevalent soil group in the watershed is Gloucester very stony fine sandy loam (6,974 acres, 10.6%), followed by Paxton fine sandy loam (4,173 acres, 6.4%), Henniker fine sandy loam (3,727 acres, 5.7%), and Woodstock-Bice fine sandy loams (3,502 acres, 5.3%). Gloucester and Woodstock-Bice are well to somewhat excessively drained while Paxton and Henniker are well-drained. The remaining 72% of the watershed (excluding the lake area) is a combination of 66 additional soil series ranging from 4.6% to <0.1% of the watershed.

Soil erosion hazard is dependent on a combination of factors, including land contours, climate conditions, soil texture, soil composition, permeability, and soil structure (O'Geen et al., 2006). Soil erosion hazard should be a primary factor in determining the rate and placement of development within a watershed. Soils with negligible soil erosion hazard are primarily low-lying wetland areas near abutting streams. The soil erosion hazard is determined from the associated slope and soil erosion factor K_w[10] used in the Universal Soil Loss Equation (USLE). The USLE predicts the rate of soil loss by sheet or rill erosion in units of tons per acre per year. A rating of "slight" specifies erosion is unlikely to occur under standard conditions. A rating of "moderate" specifies some erosion is likely and erosion-control measures may be required. A rating of "severe" specifies erosion is very likely and erosion-control measures and revegetation efforts are crucial. A rating of "very severe" specifies significant erosion is likely and control measures may be costly. These ratings are derived as part of the Soil Erosion Hazard Off-Road/Off-Trail for each soil series. Excluding the lake area, "severe" and "very severe" erosion hazard areas account for 40.3% of the Milton Three Ponds watershed and are mostly concentrated on the northwestern portion of the watershed. Moderate erosion hazard areas account for 39.7% of the watershed land area, and slight erosion hazard areas account for 12.5%. The remaining watershed area has soils not rated for the soil erosion factor Kw and/or located in low-lying areas with slopes less than 15%. Development should be restricted in areas with severe and very severe erosion hazards due to their inherent tendency to erode at a greater rate than what is considered tolerable soil loss. Since a highly erodible soil can have greater negative impact on water quality, more effort and investment are required to maintain its stability and

[10] *K_w = the whole soil k factor. This factor includes both fine-earth soil fraction and large rock fragments.*

function within the landscape, particularly from BMPs that protect steep slopes from development and/or prevent stormwater runoff from reaching water resources.

3.1.3.3 Shoreline Erosion

Several factors can contribute to erosion along the shoreline of lakes and ponds. Some of these factors include the removal of shoreline vegetation, wake action from recreational boating, and water level fluctuations within the water bodies. Water level fluctuations in lakes and ponds can occur on long- and short-term timescales due to naturally changing environmental conditions or as a response to human activity. The effect of lake level fluctuation on physical and environmental conditions depends on several factors including the degree of change in water level, the rate of change, seasonality, and the size and depth of the waterbody (Leira & Cantonati, 2008; Zohary & Ostrovsky, 2011). Changes in lake level can impact flora and fauna mainly by altering available habitat, impacting nesting locations, and altering available food sources. In addition to impacts to biological communities, lakes can experience physical impacts on water quality from changes in lake level. Frequent lake level fluctuations can impact the shoreline, leading to erosion and increased sedimentation in near-shore habitats, inhibiting light penetration and altering water clarity. Exposed shoreline sediment that is inundated at high water levels can release phosphorus, leading to alterations in nutrient accumulation and algae populations. High and low water levels can have detrimental effects on water systems, so finding a balance in managing water level at appropriate times throughout the year is critical to maintaining a healthy waterbody for both recreational enjoyment and aquatic life use. Management strategies become even more challenging when considering the impact of increased wake boating and extreme weather events (droughts and storms) on water level.

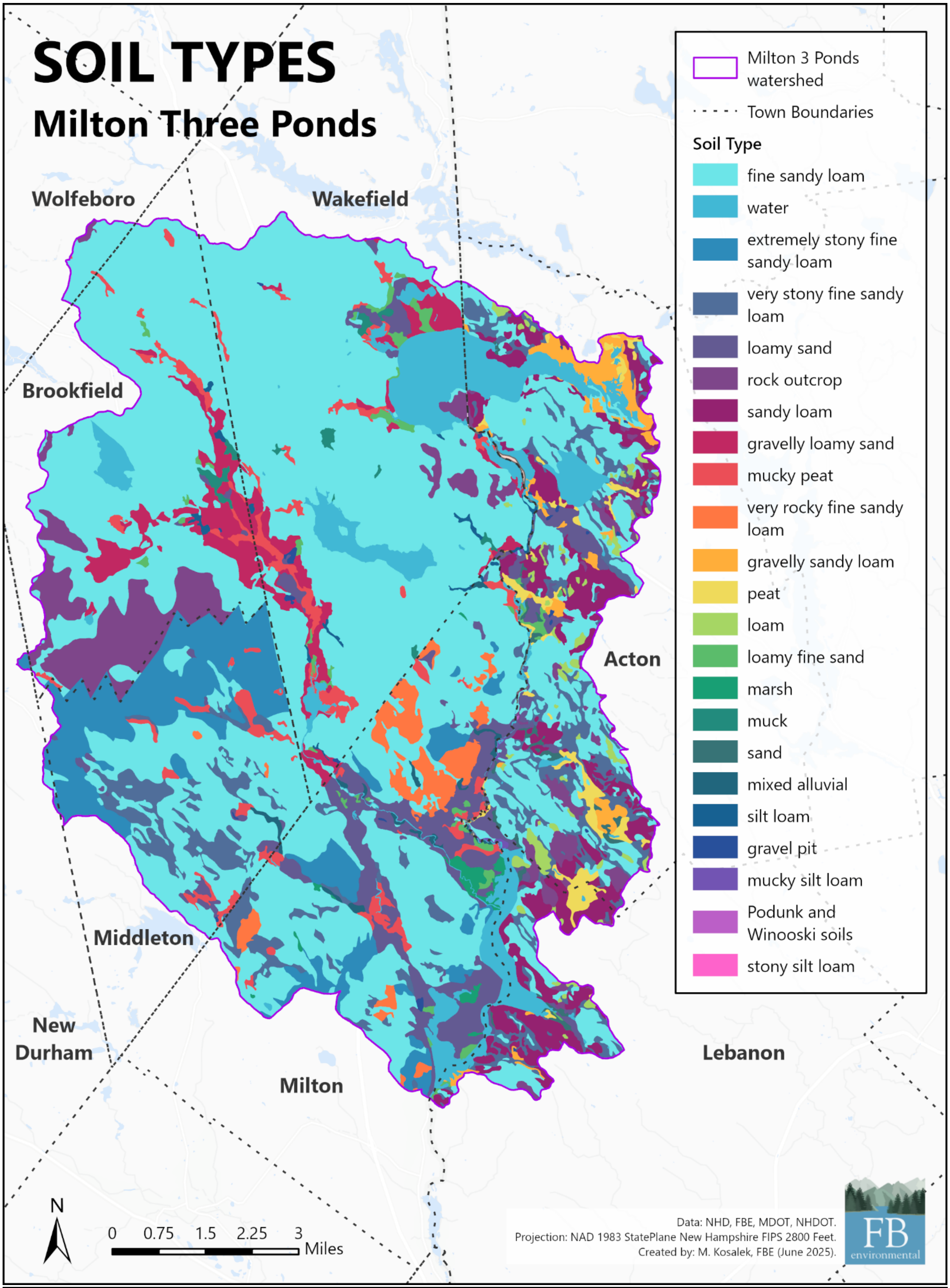

Figure 15. Milton Three Ponds soil texture map.

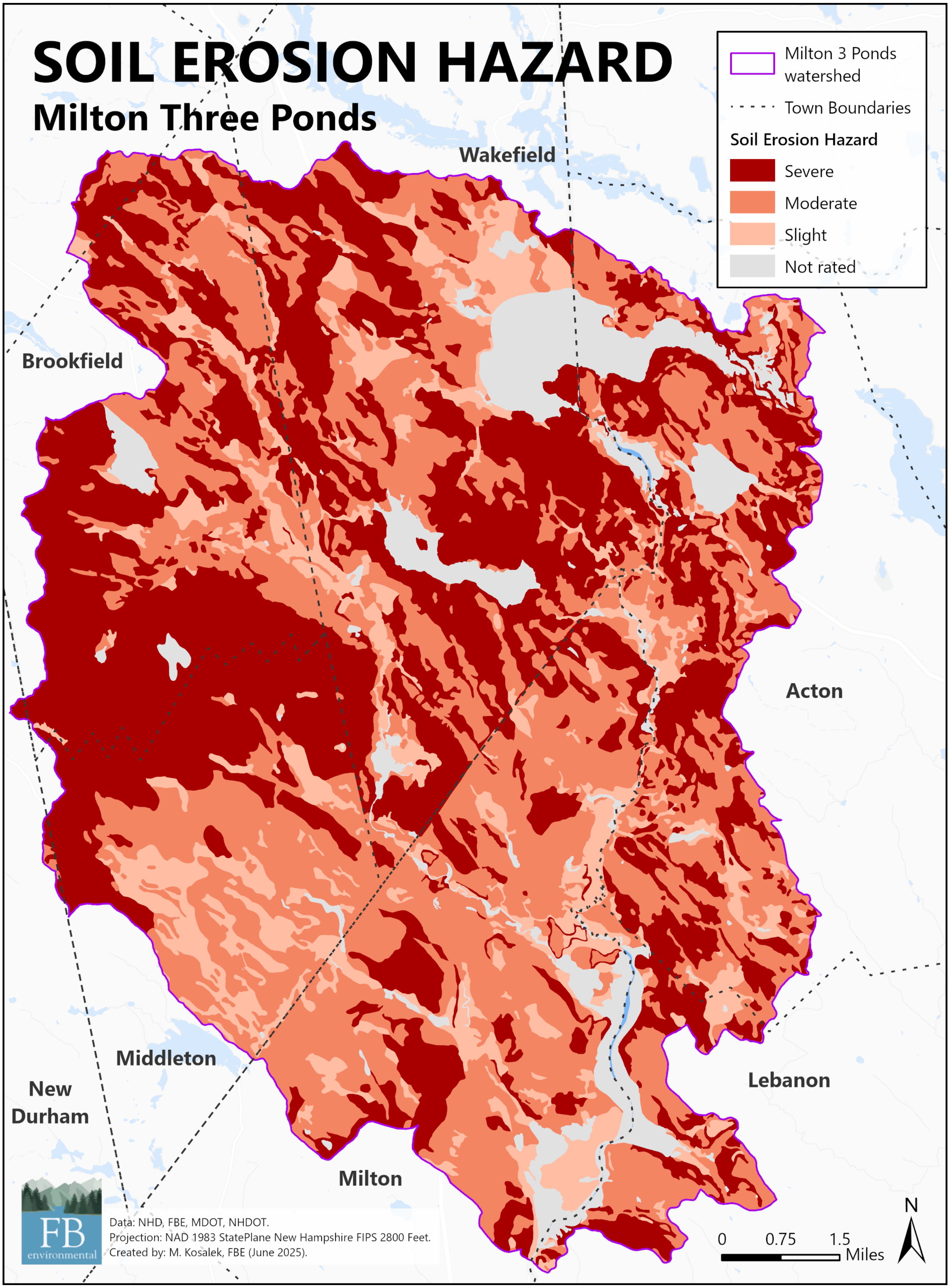

Figure 16. Milton Three Ponds soil erosion hazard map.

3.1.4 Wastewater

3.1.4.1 Septic Systems

Untreated discharges of sewage (domestic wastewater) are prohibited regardless of source. An example of an NPS discharge of untreated wastewater is from insufficient or malfunctioning subsurface sewage treatment and disposal systems, commonly referred to as septic systems, but which also include holding tanks and cesspools. When properly designed, installed, operated, and maintained, septic systems can reduce phosphorus concentrations in sewage within a zone close to the system (depending on the development and maintenance of an effective biomat, the adsorption capacity of the underlying native soils, and proximity to a restrictive layer or groundwater). Age, overloading, or poor maintenance can result in system failure and the release of nutrients and other pollutants into surface waters (EPA, 2016). Nutrients from failing or underperforming septic systems can enter surface waters through surface overflow or breakout, stormwater runoff, or groundwater. Cesspools are buried concrete structures that allow solid sludge to sink to the bottom and surface scum to rise to the top and eventually leak out into surrounding soils through holes at the top of the structure. Holding tanks are completely enclosed structures that must be pumped regularly to prevent effluent back-up into the home.

SRPC and TTPA drafted and distributed a septic system survey to homeowners of shoreline properties on the three ponds. The primary objective of this survey was to determine the number of septic systems along the shoreline in addition to their age and usage. Additional questions in the survey related to homeowners' perceptions of water quality over time. There were 119 responses to the survey, for which important metrics about septic system age and usage were extrapolated to 550 total systems within 250 feet of the three ponds (239 for Milton Pond, 159 for Northeast Pond, and 152 for Townhouse Pond). Septic systems were broken into four occupancy categories (1-3 months, 4-6 months, 7-9 months, and 10-12 months) and two age categories (<25 years and >25 years). For each category, the average number of occupants was determined, and used in the LLRM (see Section 2.3.1) to calculate the amount of wastewater being generated within 250 feet of the shoreline. Holding tanks or seasonal portable restrooms were removed from the septic system loading calculations assuming all wastewater generated is removed from the site.

The average home within 250 feet of the shoreline has 2.6 bedrooms, 2.1 occupants, and 90% of responses showed seasonal usage of the property. Most respondents showed favorable perceptions of water quality, with 46% perceiving water quality as "very good" or "good" and 40% responding "neutral." The remaining 14% of respondents either perceived water quality poorly (13%) or did not respond (1%). Despite the general perception of "good" or "neutral" water quality, 35% of respondents felt that water quality has worsened in the past 10 years. Only 8% of respondents felt that water quality has improved, whereas the other respondents felt water quality was stable (33%) or were unsure (23%).

FBE estimated the pollutant loading from shoreline septic systems using default literature values for daily water usage, phosphorus concentration output per person, and system phosphorus attenuation factors. The number of people using shoreline septic systems was calculated by multiplying the number of "old" (>25 years) and "new" (≤ 25 years) shoreline septic systems used seasonally or year-round by the average number of occupants for each occupancy category. As detailed in the *Milton Three Ponds Lake Loading Response Model Report* (FBE, 2025a), shoreline septic systems contribute 24.2 kg/yr of total phosphorus loading to Northeast Pond, 23.4 kg/yr to Townhouse Pond, and 36.1 kg/yr to Milton Pond, comprising about 1-2% of the total phosphorus load from all sources to each pond. The septic system load estimate is only for those systems directly along the shoreline and potentially short-circuiting minimally treated effluent to the ponds. The load from septic systems throughout the rest of the watershed was not explicitly quantified and is instead inherent to coefficients used throughout the modeling.

3.1.5 Fertilizers

When lawn and garden fertilizers are applied in excessive amounts, in the wrong season, or just before heavy precipitation, they can be transported by rain or snowmelt runoff to lakes and other surface waters where they can promote cultural eutrophication and impair the recreational and aquatic life uses of the waterbody. Many states and local communities are beginning to set restrictions on the use of fertilizers by prohibiting their use altogether or requiring soil tests to demonstrate a need for any phosphate application to lawns.

3.1.6 Pets

In residential areas, fecal matter from pets can be a significant contributor of nutrients to surface waters. Each dog is estimated to produce 200 grams of feces per day, which contain concentrated amounts of phosphorus (CWP, 1999). If pet feces are not properly disposed, these nutrients can be washed off the land and transported to surface waters by stormwater runoff. Pet feces can also enter by direct deposition of fecal matter from pets standing or swimming in surface waters.

3.1.7 Agriculture

Agricultural activities, including dairy/cattle farming, raising livestock and poultry, growing crops, and keeping horses and other animals for pleasure or profit, involve managing nutrients. Agricultural activities are closely linked to water quality due to the potential for nutrient/pollutant runoff and soil erosion from farmland. Nonpoint pollution from agriculture, particularly surface runoff from farms, is a leading cause of water impairment in watersheds across the U.S. (Adler, 2013). Practices such as plowing, fertilizer/manure application, livestock grazing, and poor storage of nutrients can result in significant pollution if not managed carefully. Studies have shown that excessive or poorly timed application of fertilizers, can lead to the runoff of nutrients into nearby water bodies, contributing to problems like algal blooms and eutrophication leading to low dissolved oxygen (EPA, 2004). The key to nutrient application is to apply the right amount of nutrients at the right time. When appropriately applied to soil, synthetic fertilizers or animal manure can fertilize crops and restore nutrients to the land. When improperly managed, pollutants in manure can enter surface waters through several pathways, including surface runoff and erosion, direct discharges to surface water, spills and other dry-weather discharges, and leaching into soil and groundwater. For agricultural land use management strategies and resources, please see Section 4.2.8.

3.1.8 Future Development

Understanding population growth, and ultimately development patterns, provides critical insight to watershed management, particularly as it pertains to lake water quality. According to the US Census Bureau, all towns substantially in the Milton Three Ponds watershed (Milton, Middleton, Brookfield, and Wakefield, NH and Acton and Lebanon, ME) have experienced steady population growth since 2020 (Figure 17). Lebanon has experienced the largest increase of approximately 1,500 people from 2000 to 2020, while the other towns have increased by approximately 1,000 people or less. The proximity of Milton Three Ponds to the desirable greater Lakes Region/Lake Winnipesaukee area as a recreational destination will likely stimulate continued population growth in the future. Growth figures and estimates suggest that towns should continue to consider the effects of current municipal land-use regulations on local water resources. As the region's watersheds are developed, erosion from disturbed areas increases the potential for water quality decline.

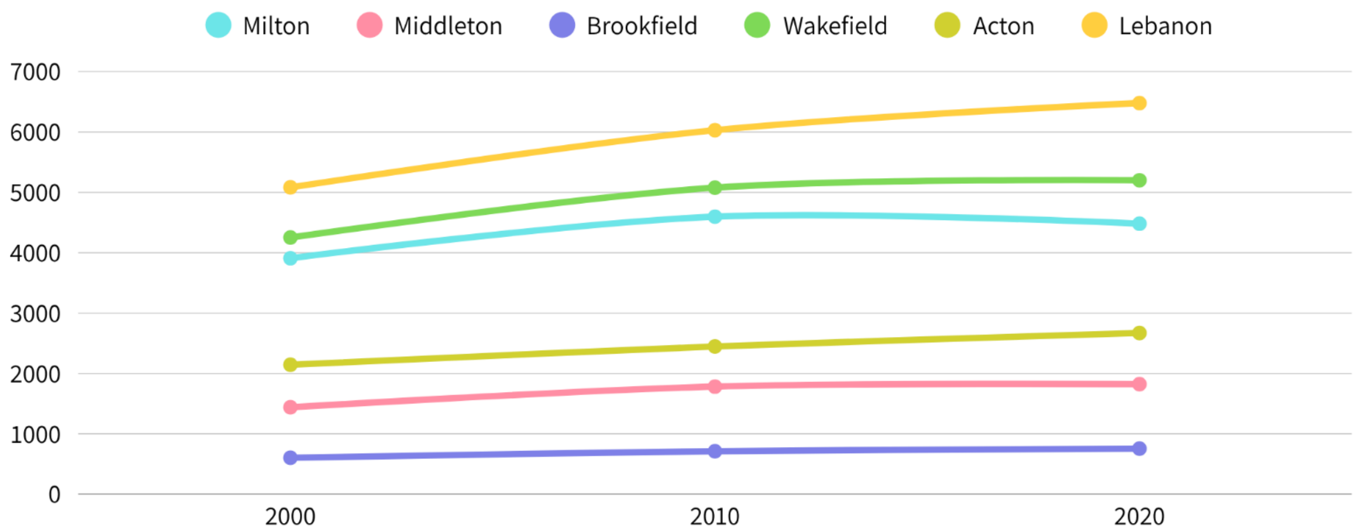

Figure 17. Population from 2000-2020 for all towns substantially in the Milton Three Ponds watershed.

Notes: Data from the U.S. Census.

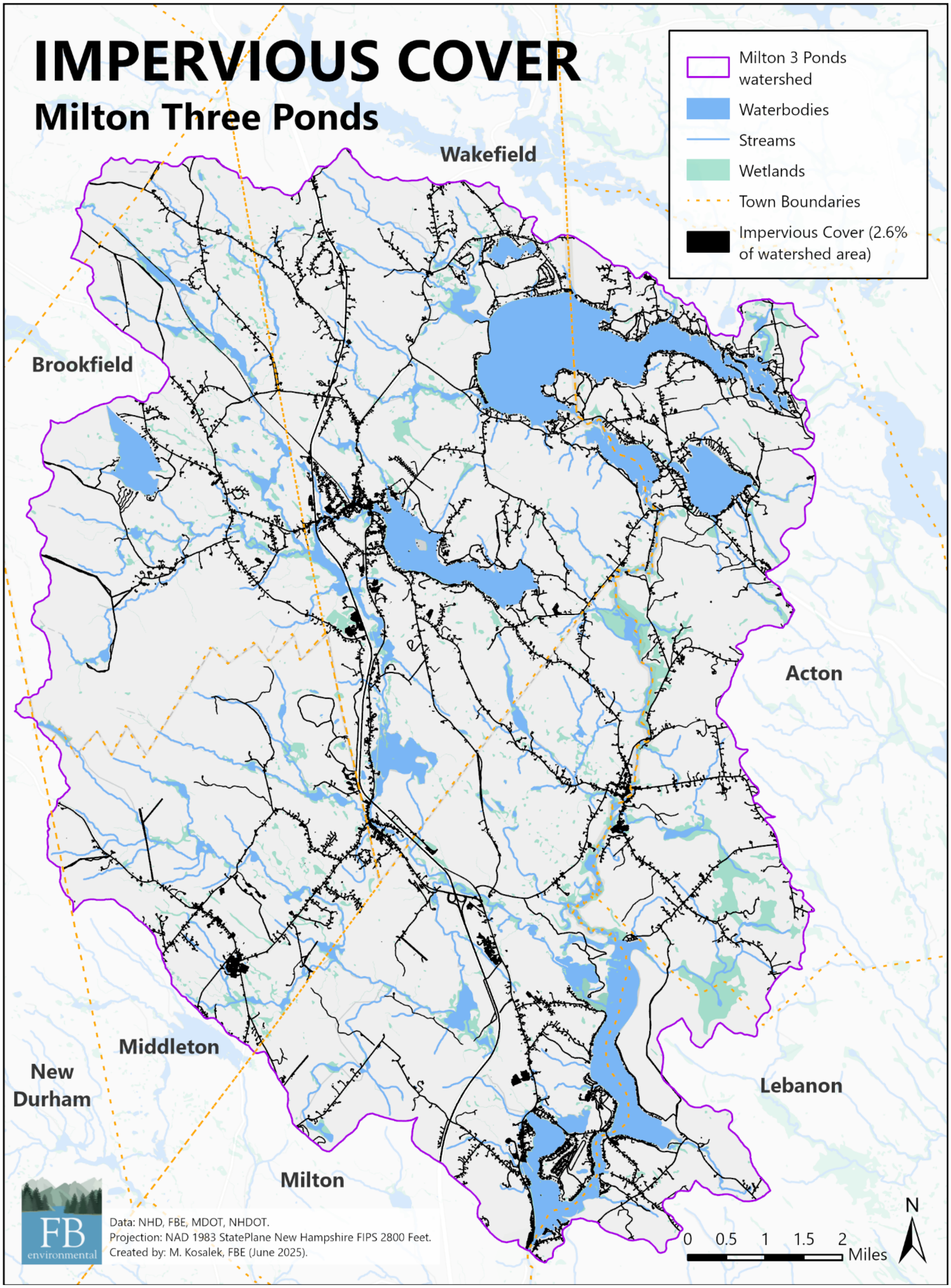

Figure 18. Impervious cover in the Milton Three Ponds watershed.

3.2 POTENTIAL CONTAMINATION SOURCES

Point source (PS) pollution can be traced back to a specific source such as a discharge pipe from an industrial facility, municipal treatment plant, permitted stormwater outfall, or a regulated animal feeding operation, making this type of pollution relatively easy to identify. Section 402 of the CWA requires all such discharges to be regulated under the National Pollutant Discharge Elimination System (NPDES) program to control the type and quantity of pollutants discharged. NPDES is the national program for regulating point sources through issuance of permit limitations specifying monitoring, reporting, and other requirements under Sections 307, 318, 402, and 405 of the CWA.

Both NHDES and MEDEP operate and maintain databases which house data on Potential Contamination Sources (PCS) in each state, OneStop and Environmental and Geographic Analysis Database (EGAD), respectively. Identifying the types and locations of PCS within the watershed may help identify sources of pollution and areas to target for restoration efforts.

In August 2025, FBE downloaded datasets for above ground storage tanks, underground storage tanks, brownfield sites, hazardous waste generators, and remediation sites in the Milton Three Ponds watershed Figure 19.

3.2.1 Remediation Sites

There are 37 remediation sites in New Hampshire within the Milton Three Ponds watershed which contribute various discharges to the watershed. One site is in Brookfield, 21 are in Milton, and 15 are in Wakefield.

3.2.2 Underground and Aboveground Storage Tanks

There are 47 underground storage tanks in New Hampshire with one in Brookfield, one in Middleton, 14 in Milton, and 31 in Wakefield. In Maine there are three underground storage tanks, all of which are in Acton. There are ten aboveground storage tanks, all of which are in New Hampshire. Three tanks are in Brookfield, three in Middleton, two in Milton, and two in Wakefield.

3.2.3 Hazardous Waste Generator

There are 19 hazardous waste generators located within the watershed, with 17 inactive and two active. Of the inactive sites, two are in Middleton, three in Milton, and 12 in Wakefield. The active sites are in Middleton and Milton. All sites are either regulated by the state or the Resource Conservation and Recovery Act (RCRA). The two active sites qualify as "NH Small Quantity Generator," producing no more than 220 pounds of non-acute hazardous waste per year.

3.2.4 Brownfield Sites

There are four Brownfield sites in the watershed, all of which are in Milton. The closest Brownfields site to Milton Three Ponds is Lockhart Field, located at 899 White Mountain Highway. The site is the location of a former unlined municipal landfill, which ceased operation in 1978. The site is monitored on a regular basis in accordance with NHDES Groundwater Management Permit GWP-199202008-M-001, dated June 19, 2023 (revised April 14, 2025). Monitoring includes evaluation of groundwater and surface water conditions between Lockhart Field and Townhouse Pond. Recent groundwater monitoring results indicated concentrations of dissolved arsenic and certain per- and poly- fluoroalkyl substances [PFAS] compounds above the New Hampshire Ambient Groundwater Quality Standards (AGQS) in some locations. Surface water discharging from the Lockhart Field site is monitored for arsenic and barium. Recent results identified arsenic in surface water at concentrations below the New Hampshire Surface Water Quality Standard (SWQS).[11]

[11] *Data Submittal, Lockhart Field (aka Old Milton Dump), 899 White Mountain Highway, Milton, NH 03851*; NHDES Site No. 199202008, prepared by Credere Associates, LLC, dated July 14, 2025.

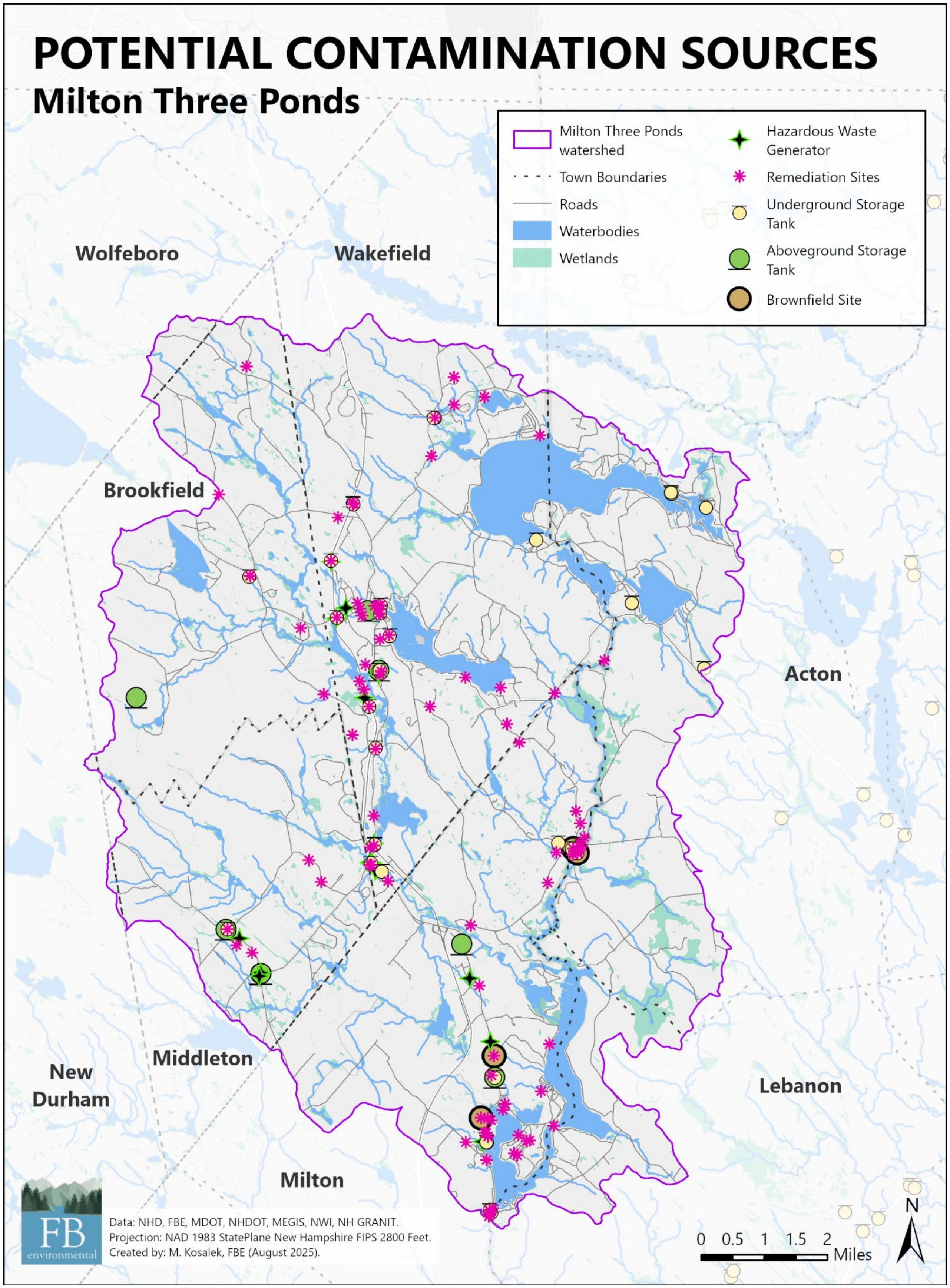

Figure 19. Map of potential point sources of pollution within the Milton Three Ponds Watershed.

3.3 WILDLIFE

Fecal matter from wildlife such as geese, gulls, other birds, and beaver may be a significant source of nutrients in some watersheds. This is particularly true when human activities, including the direct and indirect feeding of wildlife and habitat modification, result in the congregation of wildlife (CWP, 1999). Congregations of geese, gulls, and ducks are of concern because they often deposit their fecal matter next to or directly into surface waters. Examples include large mowed fields adjacent to lakes and streams where geese and other waterfowl gather, as well as the underside of bridges with pipes or joists directly over the water that attract large numbers of pigeons or other birds. Studies show that geese inhabiting **riparian** areas increase soil nitrogen availability (Choi et al., 2020) and gulls along shorelines increase phosphorus concentration in beach sand pore water that then enters lakes through groundwater transport and wave action (Staley et al. 2018). When submerged in water, the geese and gull droppings quickly release nitrogen and phosphorus into the water column, contributing to eutrophication in freshwater ecosystems (Mariash et al., 2019). On a global scale, fluxes of nitrogen and phosphorus from seabird populations have been estimated at 591 Gg N per year and 99 Gg P per year, respectively (with the highest values derived from arctic and southern shorelines) (Otero et al., 2018). Additional studies show greater concentrations of nitrogen, ammonia, and dissolved organic carbon downstream of beaver impoundments compared to similar streams with no beaver activity in New England (Bledzki et al., 2010).

3.4 ENVIRONMENTAL VARIABILITY

Environmental variability has important implications for water quality that should be incorporated into WMPs. In the last century, New England has already experienced significant changes in stream flow and air temperature. Out of 28 stream flow stations throughout New England, 25 showed increased flows over the record, likely due to the increase in frequency of extreme precipitation and total annual precipitation in the region. In 79 years of recorded flooding in the Oyster River in Durham, NH, three of the four highest floods occurred in the past 10 years (Ballestero et al., 2017). Average annual air temperature in New England has risen by 1°C to 2.3 °C since 1895 with greater increases in winter air temperature (IPCC, 2013). Lake ice-out dates are occurring earlier as warmer winter air temperature melts the snowpack and lake ice; earlier ice-out allows a longer growing season and increases the duration of anoxia in bottom waters. Increasing storm frequencies flush more nutrients to surface waters for algae to feed on and flourish under warmer air temperatures. These trends will likely continue to impact both water quality and quantity. Models predict a 10-40% increase in stormwater runoff by 2050, particularly in winter and spring and an increase in both flood and drought periods as seasonal precipitation patterns shift. Adding to this stress is population growth and corresponding development in New Hampshire and Maine. The build-out analysis for the watershed showed up to 8,346 new buildings could be added to the watershed at full build-out based on current zoning standards. Milton Three Ponds is at serious risk for sustained water quality degradation with the possibility for new development in the watershed unless climate resiliency and **low impact development** (LID) strategies are incorporated to existing zoning standards.

4 MANAGEMENT STRATEGIES

The following section details management strategies for achieving the water quality goal and objectives using a combination of structural and non-structural restoration techniques, as well as outreach and education and an adaptive management approach. A key component of these strategies is the idea that existing and future development can be remediated or conducted in a manner that sustains environmental values. All stakeholder groups have the capacity to be responsible watershed stewards, including citizens, businesses, the government, and others. Specific action items are provided in the Action Plan (Section 5).

4.1 STRUCTURAL NONPOINT SOURCE (NPS) RESTORATION

Structural NPS restoration techniques are engineered infrastructure designed to intercept stormwater runoff, often allowing it to soak into the ground, be taken up by plants, harvested for reuse, or released slowly over time to minimize flooding and downstream erosion. These BMPs often incorporate some mechanism for pollutant removal, such as sediment settling basins, oil separators, filtration, or microbial breakdown. They can also consist of removing or disconnecting impervious surfaces, which in turn reduces the volume of polluted runoff generated, minimizing adverse impacts to receiving waters.

4.1.1 Watershed and Shoreline BMPs

Seventy-five (75) NPS sites identified during the 2025 watershed survey and 354 high/medium impact rated shoreline properties from the 2024 shoreline survey were documented to have some impact to water quality through the delivery of phosphorus-laden sediment (refer to Section 3.1.1-3.1.2). As such, structural BMPs to reduce the external watershed phosphorus load are a necessary and important component for the protection of water quality in the watershed.

The following series of BMP implementation action items are recommended for achieving Objective 1:

- Address the top nineteen priority sites (and the remaining 35 lower priority sites as opportunities arise) identified during the 2025 watershed survey. The sites were ranked based on phosphorus load reduction, estimated implementation cos, and waterbody proximity. The full prioritization matrix with recommended improvements is provided in Appendix A.
- Coordinate with other watershed groups within the Milton Three Ponds Watershed to address sites needing structural control measures identified in other watershed management plans such as the 2010 Salmon Falls Headwater Lakes WMP, and the 2022 Great East Lake Watershed-Based Project Plan.
- Provide technical assistance and/or implementation cost sharing to the sixteen high impact shoreline properties identified during the 2024 shoreline survey. Encourage landowners to

implement stormwater and erosion controls on the 106 medium impact shoreline properties identified during the 2024 shoreline survey. Workshops and tours of demonstration sites can help encourage landowners to utilize BMPs on their own property. Conduct regular shoreline surveys to continue prioritizing properties for technical follow-up.

For the proper installation of structural BMPs in the watershed, TPPA and other stakeholders should work with experienced professionals on sites that require a high level of technical knowledge (engineering). Whenever possible, pollutant load reductions should be estimated for each BMP installed. More specific and additional recommendations are included in Section 5. For helpful tips on implementing BMPs, see Additional Resources.

4.2 NON-STRUCTURAL NONPOINT SOURCE (NPS) RESTORATION

Non-structural NPS restoration techniques refer to a broad range of behavioral practices, activities, and operational measures that contribute to pollutant prevention and reduction. The following section highlights important restoration techniques for several key areas, including pollutant reduction best practices, zoning and ordinance updates, land conservation, septic system regulation, sanitary sewer system inspections, fertilizer use prohibition, pet waste management, agricultural practices, nuisance wildlife controls, and in-lake treatment.

4.2.1 Pollutant Reduction Best Practices

Pollutant reduction best practices include recommendations and strategies for improving road management and municipal operations for the protection of water quality. Following standard best practices for road maintenance and drainage management protects both infrastructure and water quality through the reduction of sediment and other pollutant transport. Refer to the *New Hampshire Stormwater Manual* (UNH Stormwater Center et al., 2025) for standard road design and maintenance best practices.

Milton, NH is required to comply with the six minimum control measures under the New Hampshire Small MS4 General Permit. Other watershed towns could consider instituting the permit's key measures, such as street sweeping, catch basin cleaning, and road/ditch maintenance, if not already in place. The MS4 permit also covers illicit discharge detection and elimination plans (and ordinance inclusion), source control and pollution/spill prevention protocols, and education/outreach and/or training for residents, municipal staff, and stormwater operators, all of which are aimed at minimizing polluted runoff to surface waters.

4.2.2 Zoning and Ordinance Updates

Regulations through municipal zoning and ordinances such as LID strategies that prevent polluted runoff from new and re-development projects in the watershed are equally important as implementing structural BMPs on existing development. In fact, local land use planning and zoning ordinances can be the most critical components of watershed protection. A review of these ordinances is strongly encouraged for specific recommendations to improving ordinances and regulations related to natural resource protection. The town should also consider its staffing capacity to enforce existing and proposed regulations.

Local land use planning and zoning ordinances should consider incorporating environmental resiliency strategies for protecting water quality and improving infrastructure based on temperature, precipitation, water levels, wind loads, storm surges, wave heights, soil moisture, and groundwater levels (Ballestero et al., 2017). There are nine strategies which can aid in minimizing the adverse effects associated with environmental variability and include the following (McCormick and Dorworth, 2019).

1. **Installing Green Infrastructure and Nature-Based Solutions:** Planning for greener infrastructure requires that we think about creating a network of interconnected natural areas and open spaces needed for groundwater recharge, pollution mitigation, reduced runoff and erosion, and improved air quality. Examples of green infrastructure include forest, wetlands, natural areas, riparian (banks of a water course) buffers, and floodplains; all of which already exist to various extents in the watershed and have minimized the damage created by intense storms. As future development occurs, these natural barriers must be maintained or even increased to reduce runoff of pollutants into freshwaters. See also Section 4.2.3: Land Conservation.
2. **Using LID Strategies:** Use of LID strategies requires replacing traditional approaches to stormwater management using curbs, pipes, storm drains, gutters, and retention ponds with innovative approaches such as bioretention, vegetated swales, and permeable paving.
3. **Minimizing Impervious Surfaces:** Impervious surfaces such as roads, buildings, and parking lots should be minimized by creating new ordinances and building construction design requirements which reduce the imperviousness of new development. Property owners can increase the permeability for their lots by incorporating permeable driveways and walkways.
4. **Encouraging Riparian Buffers and Maintaining Floodplains:** Municipal ordinances should forbid construction in floodplains, and in some instances, floodplains should be expanded to increase the land area to accommodate larger rainfall events. Riparian (vegetated) buffers and filter strips along waterways should be preserved and/or created to slow runoff and filter pollutants.
5. **Protecting and Re-establishing Wetlands:** Wetlands are increasingly important for preservation because wetlands hold water, recharge groundwater, and mitigate water pollution.
6. **Encouraging Tree Planting:** Trees help manage stormwater by reducing runoff and mitigating erosion along surface waters. Trees also provide critical shading and cooling to streams and land surfaces.
7. **Promoting Landscaping Using Native Vegetation:** Landowners should promote the use of native vegetation in landscaping, and landscapers should become familiar with techniques which minimize runoff and the discharge of nutrients into waterbodies (Chase-Rowell et al., 2012).
8. **Slowing Down the Flow of Stormwater:** To slow and infiltrate stormwater runoff, roadside ditches can be armored or vegetated and equipped with turnouts, settling basins, check dams, or

infiltration catch basins. Rain gardens can retain stormwater, while water bars can divert water into vegetated areas for infiltration. Water running off roofs can be channeled into infiltration fields and drainage trenches.

9. **Coordinating Infrastructure, Housing, and Transportation Planning**: Coordinate planning for infrastructure, housing, and transportation to minimize impacts on natural resources. Critical resources including groundwater must be conserved and remain free of pollutants especially as future droughts may deplete groundwater supplies.

4.2.3 Land Conservation

Land conservation is essential to the health of a region, particularly for the protection of water resources, enhancement of recreation opportunities, vitality of local economies, and preservation of wildlife habitat. Land conservation is one of many tools for protecting water quality for future generations. The Maine portion of the watershed has two privately conserved areas amounting to approximately 348 acres. The New Hampshire portion of the watershed has municipal (1,083 acres), federal (408 acres), state (2,137 acres), and private (8,072 acres) land. In total, 17.6% of the watershed is conserved (Figure 20). As land conservation is essential to the future of this region, local groups should continue to pursue opportunities for land conservation in the Milton Three Ponds watershed based on the highest valued habitat identified by the New Hampshire Fish & Game (NHFG) and Maine DEP. NHFG ranks habitat based on value to the State, biological region (areas with similar climate, geology, and other factors that influence biology), and supporting landscape. These habitat rankings are published in the State's 2015 Wildlife Action Plan (with updated statistics and data layers released in January 2020), which serves as a blueprint for prioritizing conservation actions to protect Species of Greatest Conservation Need in New Hampshire (NHFG, 2015). Approximately 12,351 acres (18%) of the watershed are considered Highest Ranked Habitat in New Hampshire, and 6,626 acres (9.7%) is classified as the highest ranked habitat in the biological region. Throughout the whole watershed, there are 7,771 acres of wildlife corridor, and in the Maine portion of the watershed, there are 681 acres of inland waterfowl and wading bird habitat (Figure 21). The Milton Three Ponds watershed is located within the Sebago-Ossipee Hills and Plains ecoregion for both the Maine and New Hampshire portions.

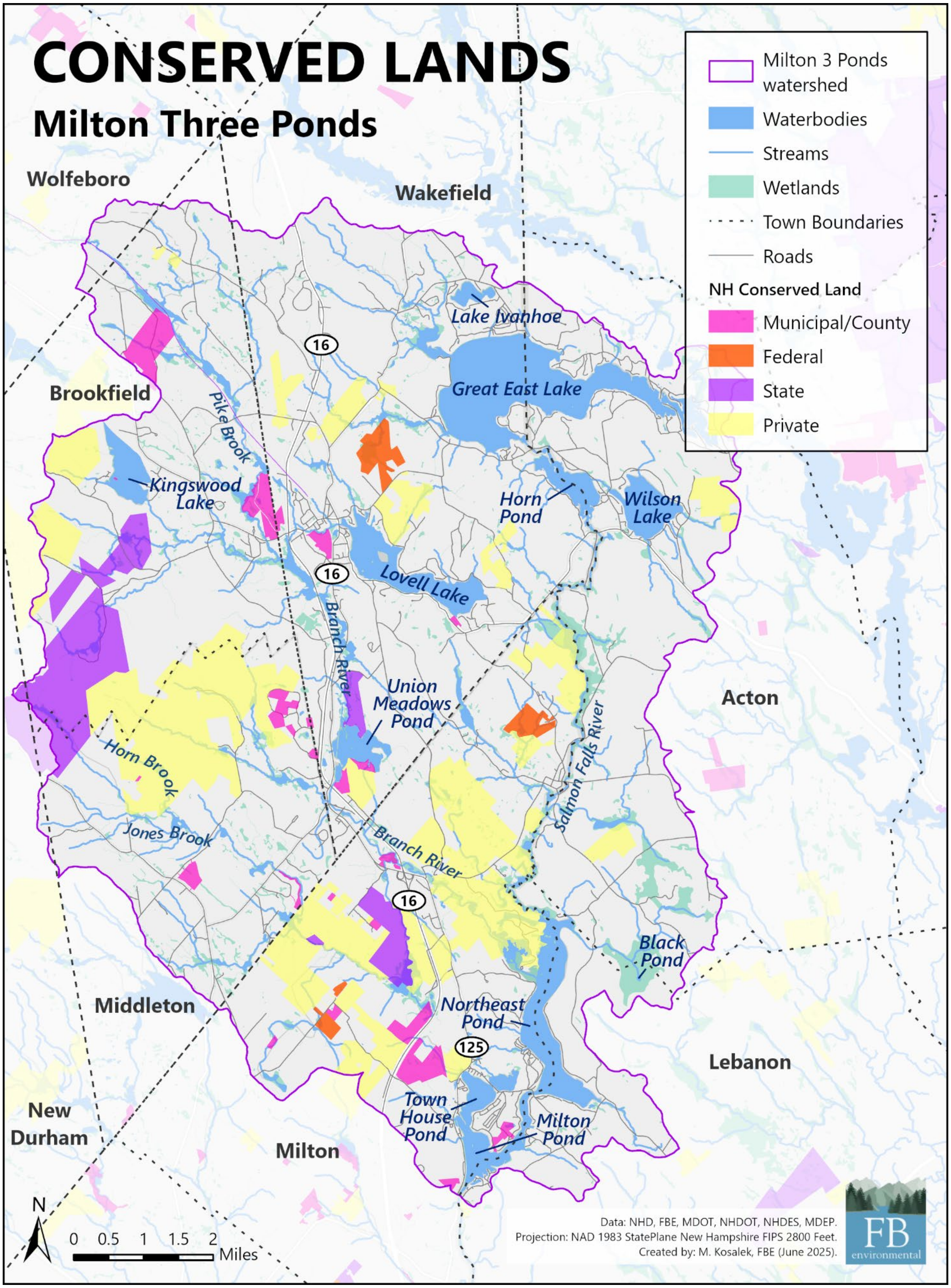

Figure 20. Conserved land in the Milton Three Ponds watershed.

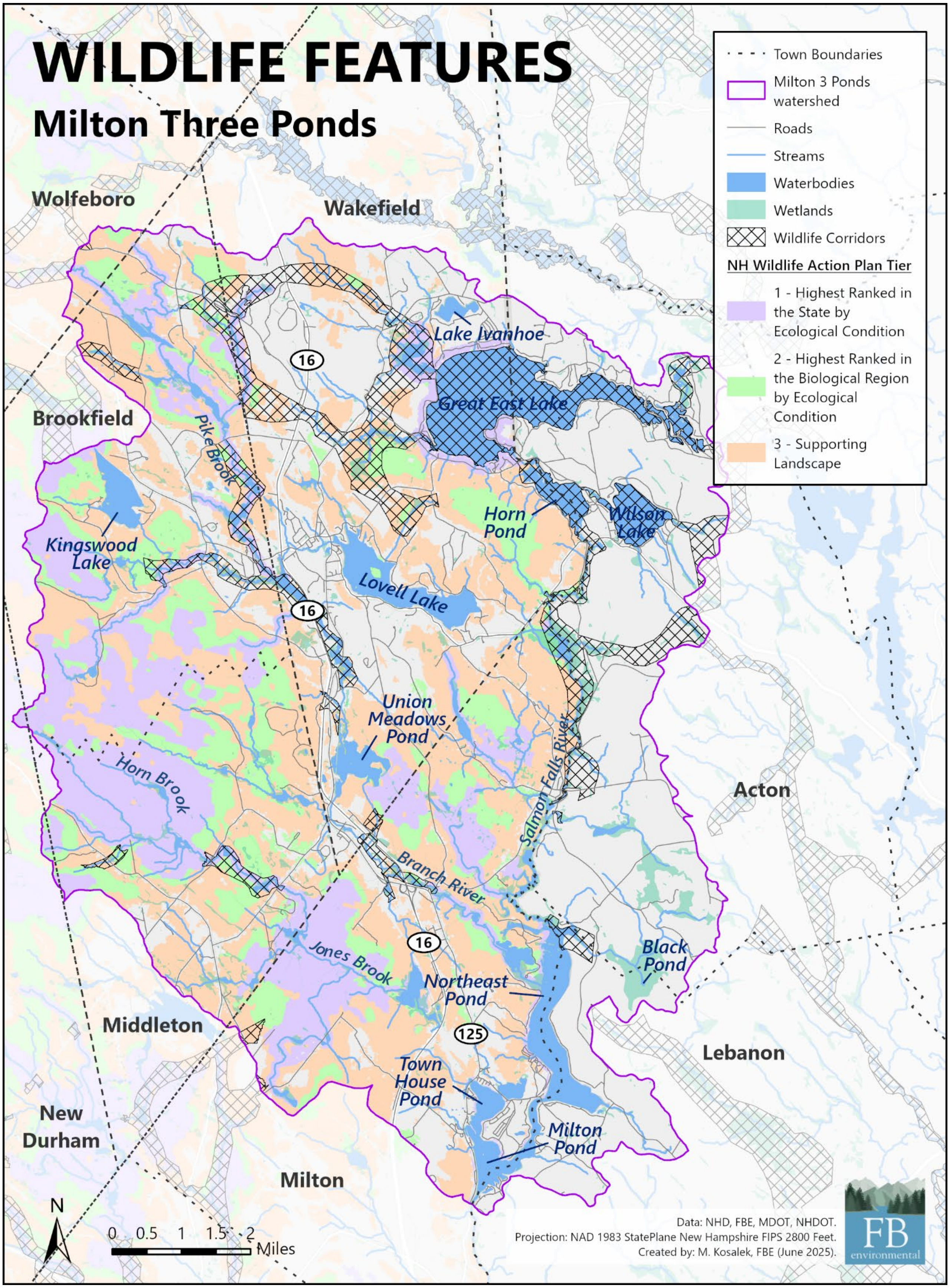

Figure 21. Wildlife features in the Milton Three Ponds watershed.

4.2.4 Septic System Regulation

When properly designed, installed, operated, and maintained, septic systems can treat residential wastewater and reduce the impact of excess pollutants in ground and surface waters. It is important to note, however, that traditional septic systems are designed for pathogen removal from wastewater and not specifically for other pollutants such as nutrients. The phosphorus in wastewater is "removed" only by binding with soil particles or recycled in plant growth but is not removed entirely from the watershed system. Nutrient removal can only be achieved through more expensive, alternative septic systems. Proper design, installation, operation, maintenance, and replacement considerations include the following:

1. Proper **design** includes adequate evaluation of soil conditions, seasonal high groundwater or impermeable materials, proximity of sensitive resources (e.g., drinking water wells, surface waters, wetlands, etc.);
2. Proper siting and **installation** mean that the system is installed in conformance with the approved design and siting requirements (e.g., setbacks from waterways);
3. Proper **operation** includes how the property owner uses the system. While most systems excel at treating normal domestic sewage, disposing of some materials, such as toxic chemicals, paints, personal hygiene products, oils and grease in large volumes, and garbage, can adversely affect the function and design life of the system, resulting in treatment failure and potential health threats; proper operation also includes how the property owner protects the system; allowing vegetation with extensive roots to grow above the system will clog the system; driving large vehicles over the system may crush or compact piping or leaching structures;
4. Proper **maintenance** means having the septic tank pumped at regular intervals to eliminate accumulations of solids and grease in the tank; it may also mean regular cleaning of effluent filters, if installed. The frequency of septic pumping is dependent on the use and total volume entering the system. A typical 3-bedroom, 1,000 gallon tank should be pumped every 3-4 years;
5. Proper **replacement** of failed systems, which may include programs or regulations to encourage upgrades of conventional systems (or cesspools and holding tanks) to more innovative alternative technologies.

Management strategies for reducing water quality impacts from septic systems (as well as cesspools and holding tanks) start with education and outreach to property owners so that they are better informed to properly operate and maintain their systems. Other management strategies include setting local regulations for enforcing proper maintenance and inspection of septic systems and establishing funding mechanisms to support replacement of failing systems (with priority for cesspools and holding tanks).

4.2.5 Fertilizer Use Prohibition

Management strategies for reducing water quality impacts from residential, commercial, and municipal fertilizer application start with education and outreach to property owners. Both New Hampshire and Maine law prohibit the use of residential fertilizers within 25 feet of a surface water. Outside of 25 feet, property owners can get their soil tested before considering the application of fertilizers to their lawns and gardens to determine whether nutrients are needed and if so in what quantity or ratio. A soil test kit can be obtained through the UNH Cooperative Extension. Many New England communities are starting to adopt local regulations prohibiting the use of both fertilizers and pesticides, especially near critical waterbodies. Milton and Lebanon should consider a similar prohibition, at the very least for a watershed zoning overlay of major lakes and ponds as nearly all shoreline properties are privately owned.

4.2.6 Pet Waste Management

Pet waste collection as a pollutant source control involves a combination of educational outreach and enforcement to encourage residents to clean up after their pets. Public education programs for pet waste management are often incorporated into a larger message of reducing pollutants to improve water quality. Signs, posters, brochures, and newsletters describing the proper techniques to dispose of pet waste can be used to educate the public and create a cause-and-effect link between pet waste and water quality (USEPA, 2005). Adopting simple habits, such as carrying a plastic bag on walks and properly disposing of pet waste in dumpsters or other refuse containers, can make a difference. It is recommended that pet owners do not put dog and cat feces in a compost pile because it may contain parasites, bacteria, pathogens, and viruses that are harmful to humans and may or may not be destroyed by composting. “Pooper-scooper” ordinances are often used to regulate pet waste disposal. These ordinances generally require the removal of pet waste from public areas, other people’s properties, and occasionally from personal property, before leaving the area. Fines are typically the enforcement method used to encourage compliance with these ordinances.

4.2.7 Nuisance Wildlife Controls

Human development has altered the natural habitat of many wildlife species, restricting wildlife access to surface waters in some areas and promoting access in others. Minimizing the impact of wildlife on water quality generally requires either reducing the concentration of wildlife in an area or reducing their proximity to a waterbody. In areas where wildlife is observed to be a large source of nutrient contamination, such as large and regular congregations of waterfowl, a program of repelling wildlife from surface waters (also called harassment programs) may be implemented. These programs often involve the use of scarecrows, kites, a daily human presence, or modification of habitat to reduce attractiveness of an at-risk area. Providing closed trash cans near waterbodies, as well as discouraging wildlife from entering surface waters by installing fences, pruning trees, or making other changes to landscaping, can reduce impacts to water quality. Public education and outreach on prohibiting waterfowl or other wildlife feeding is an important step to reducing the impact of nuisance wildlife on the lake.

4.2.8 Agricultural Practices

Manure and fertilizer management and planning are the primary tools for controlling nutrient runoff from agricultural areas. Direct outreach and education should be conducted for small hobby farms and any larger-scale operations in the watershed.

Best management practices (BMPs) aim to reduce nutrient, sediment, and bacteria load into water bodies while ensuring agricultural productivity; however, the selection of practices should consider local conditions – such as climate, soil type, hydrology, land use, funding, and other factors – to maximize effectiveness (EPA, 2004). In the Milton Three Ponds watershed, agricultural activities such as hay farming, livestock grazing, and cropland cover 902 acres (2% of the watershed not including the lake area). This may pose a threat to water quality through increased nutrient and sediment loads.

The NRCS is a key resource for farmers and landowners in implementing BMPs to improve water quality. Through various programs, the NRCS provides both financial and technical assistance for projects aimed at reducing runoff and improving soil health (Levey, 2023). In New Hampshire, the most implemented practices (by acre application) between 2005 and 2023 were cover cropping (31.8%) and conservation crop rotation (29%), which continue to be the most two popular practices to date (USDA, 2023a). Larger-scale agricultural operations can work with the NRCS to complete a Comprehensive Nutrient Management Plan (CNMP). These plans address soil erosion and water quality concerns of agricultural operations through setting proper nutrient budgets, identifying the types and amount of nutrients necessary for crop production (by conducting soil tests and determining proper calibration of nutrient application equipment), and ensuring the appropriate storage and handling of manure. Manure should be stored or applied to fields properly to limit runoff of solids containing high concentrations of nutrients. Manure and fertilizer management involve managing the source, rate, form, timing, and placement of nutrients. Writing a plan is an ongoing process because it is a working document that changes over time. The Environmental Quality Incentives Programs (EQIP) through NRCS is one of their flagship programs with the highest rates of BMP implementation in 2023 (64%). Other notable programs include the Conservation Program and Conservation Technical Assistance (USDA, 2023b).

NRCS Resources

To access the technical and financial support offered through these programs, it is recommended that farmers and landowners contact their local NRCS office.

In the state of NH, there are seven (7) NRCS field offices, each serving a different area (see coverage areas here (NH) and here (ME)). Milton Three Ponds watershed towns are served by either the Concord Field Office which covers Belknap County, the Epping Field Office which covers Strafford County, or the Scarborough Field Office which covers York County.

Information on agricultural BMPs have been published in section 1 of the NRCS Field Office Technical Guide (FOTG) for NH, under the NH Ag BMPS" section. In this document, agricultural BMPs are sorted into three main sections: manure, agricultural compost, and chemical fertilizer (Figure 22). These classifications support the initial identification of appropriate BMPs for each farm, field, or site, depending on local needs. Once the relevant BMPs are identified, producers can better understand which NRCS practices will support BMP implementation. A full list of NRCS practices are available in Section 4 of the **FOTG**, with practices relevant to water quality highlighted in Table 11.

These programs offered by the NRCS can serve as an essential resource for farmers, particularly in addressing environmental concerns in agricultural watersheds (USDA NRCS, 2024). The NRCS has developed a "*Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire*, which can be found here: **https://www.agriculture.nh.gov/publications-forms/documents/bmp-manual.pdf**. Through continued collaboration with the NRCS and other stakeholders, farmers in the watershed can play a pivotal role in in enhancing water quality while maintaining agricultural productivity – supporting two essential natural resources for community wellbeing in the region.

Many of the programs offered by the NRCS are implemented confidentially on private lands, and no public information was available regarding practices within the Milton Three Ponds watershed. Because of this confidentiality, there may be established agricultural BMPs and/or current projects underway within the region. Nutrient load reductions from agricultural BMPs were not calculated as part of the Watershed Survey and therefore not factored into the loads needed to reach the Water Quality Goal. Any load reductions made on agricultural lands will therefore be a bonus to help the community reach their Water Quality Goal.

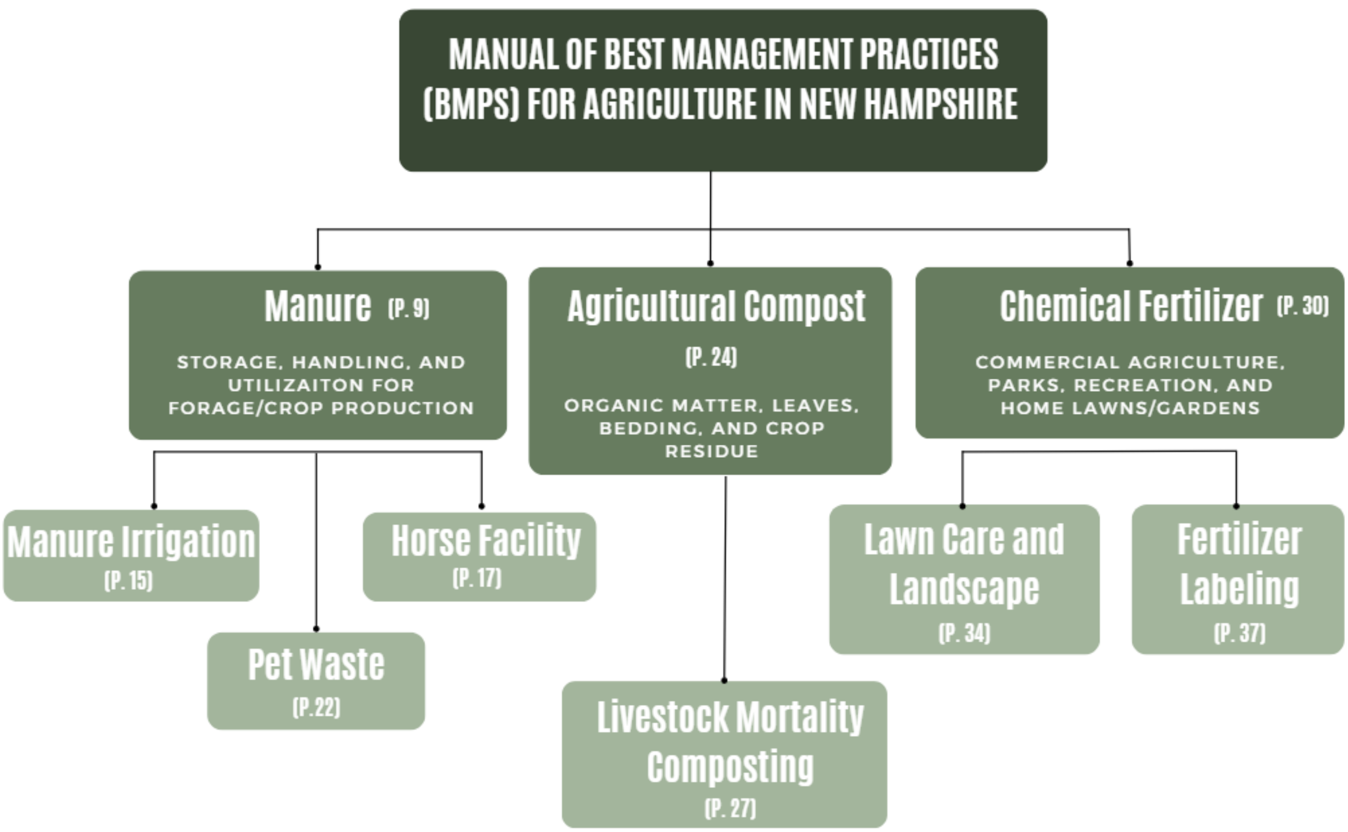

Figure 22. Overview of the major topics covered in the "Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire."

Table 11. Adapted from the "USDA Conservation Choices; Water Quality Practices" table adjusted to meet current NH NRCS practices (USDA NRCS, n.d).

Conservation Practice	Descriptions	N	P	Sediment	NRCS Practice #
Cover Crop	Crops, including grasses, legumes, and forbs for seasonal cover, conservation, and soil health.	X	X	X	340, 328,
Drainage Water Management	Water control structure to keep water in the root zone to support excess nutrient uptake before draining.	X	X	X	587
Filter Strip	Strip of vegetation near water to remove pollutants from runoff and wastewater.	X	X	X	393, 327, 386, 390,
Manure Management	Manure storage until conditions are appropriate for field application.	X	X		318, 313
No-Till/Strip-Till	Reducing soil tillage to support soil health.	X	X	X	329, 345, 346
Nutrient Management	Managing the amount, source, placement, and timing of plant nutrients and soil amendments.	X	X		590
Prescribed Grazing	Managing the harvest of vegetation by rotating grazing animals.	X	X	X	528
Riparian Forest Buffer	Vegetation planted along stream or river to reduce nutrients/pollutants in surface runoff.	X	X	X	342, 391, 612,
Wetlands	Marshy area with saturated soils to filter out nutrients/pollutants, sediments.	X	X	X	659, 657

4.3 OUTREACH AND EDUCATION

Awareness through education and outreach is a critical tool to protect and restore water quality. Most people want to be responsible watershed stewards and not cause harm to water quality, but many are unaware of best practices to reduce or eliminate contaminants from entering surface waters. TPPA is the primary entity for education and outreach campaigns in the watershed and for development and implementation of the plan. However, it is important to note that endorsement and outreach on the municipal level is critical in building community buy-in. TPPA and local municipalities should continue all aspects of their education and outreach strategies and consider developing new ones, improving existing ones, and collaborating with other watershed groups within their greater Milton Three Ponds watershed to reach more watershed residents. Refer to Section 5: Action Plan. Examples include providing educational materials to existing and new property owners, as well as renters, by distributing them at various locations and through a variety of means, such as websites, newsletters, social media, community events, or community gathering locations. Additionally, TPPA and local municipalities should continue to engage with local stakeholders such as conservation commissions, land trusts, businesses, and landowners. Educational campaigns should include raising awareness of water quality, septic system maintenance, fertilizer and pesticide use, pet waste disposal, waterfowl feeding, invasive aquatic species, boat pollution, shoreline buffer improvements, gravel road maintenance, and stormwater runoff controls.

4.4 ADAPTIVE MANAGEMENT APPROACH

An adaptive management approach, to be employed by the TPPA or similar watershed management plan committee, is highly recommended for protecting Milton Three Ponds. Adaptive management enables stakeholders to conduct restoration actions in an iterative manner. Through this management process, restoration actions are taken based on the best available information. Assessment of the outcomes following restoration action, through continued watershed and water quality monitoring, allows stakeholders to evaluate the effectiveness of one set of restoration actions and either adopt or modify them before implementing effective measures in the next round of restoration actions. This process enables efficient utilization of available resources through the combination of BMP performance testing and watershed monitoring activities. Adaptive management features establishing an ongoing program that provides adequate funding, stakeholder guidance, and efficient coordination of restoration actions. Implementation of this approach ensures that restoration actions are implemented and that surface waters are monitored to document restoration over an extended time. The adaptive management components for implementation efforts should include:

- **Maintaining an Organizational Structure for Implementation.** Communication and a centralized organizational structure are imperative to successfully implementing the actions outlined in this plan. A diverse group of stakeholders through TPPA and the watershed towns should be assembled to coordinate watershed management actions. This group can include representatives from state and federal agencies or organizations, municipalities, local businesses, and other interested groups or private landowners. Refer to Section 6.1: Plan Oversight.
- **Establishing a Funding Mechanism.** A long-term funding mechanism should be established to provide financial resources for management actions. In addition to initial implementation costs, consideration should also be given to the type and extent of technical assistance needed to inspect and maintain structural BMPs. Funding is a key element of sustaining the management process, and once it is established, the plan can be fully vetted and restoration actions can move forward. A combination of grant funding, private donations, and municipal funding should be used to ensure implementation of the plan. Refer to Section 6.3 for a list of potential funding sources.
- **Determining Management Actions.** This plan provides a unified watershed management strategy with prioritized recommendations for restoration using a variety of methods. The proposed actions in this plan should be used as a starting point for grant proposals. Once a funding mechanism is established, designs for priority restoration actions on a project-area basis can be completed and their implementation scheduled. Refer to Section 5: Action Plan.
- **Continuing and Expanding the Community Participation Process.** Plan development has included active involvement of a diversity of watershed stakeholders. Plan implementation will require continued and ongoing participation of stakeholders, as well as additional outreach

efforts to expand the circle of participation. Long-term community support and engagement is vital to successfully implement this plan. Continued public awareness and outreach campaigns will aid in securing this engagement. Refer to Section 4.3: Outreach & Education.

- **Continuing the Long-Term Monitoring Program.** A water quality monitoring program is necessary to track the health of surface waters in the watershed. Information from the monitoring program will provide feedback on the effectiveness of management practices. Refer to Section 6.4: Monitoring Plan.
- **Establishing Measurable Milestones.** A restoration schedule that includes milestones for measuring restoration actions and monitoring activities in the watershed is critical to the success of the plan. In addition to monitoring, several environmental, social, and programmatic indicators have been identified to measure plan progress. Refer to Section 6.5: Indicators to Measure Progress for interim milestones.

5 ACTION PLAN

5.1 ACTION PLAN

Top Priorities

Based on feedback from the Steering Committee, the top priority Action Items to address pollution to Milton Three Ponds are these BMPs. Below, the full table of Action Items allows stakeholders to adjust priorities based on conditions and opportunities.

Top Priority Action Items

Action Item 2.a., Site 14: Milton Town Beach. Secure funding and municipal support for design and implementation of erosion control measures, regrading, vegetation buffer, and structural BMPs.

Action Item 2.a., Site 2.1: Fernald Shores. Implement erosion control practices, establish clearly defined access points, and restore vegetated buffers to reduce runoff into Northeast Pond.

Action Item 2.a., Site 22: Route 125 at Bolan Road. Work with New Hampshire DOT and other down-gradient property owners to design and implement erosion control measures including drainage swale reconstruction and check dams.

Action Plan Details [following pages]

The Action Plan (Table 12) outlines responsible parties, approximate costs[12], an implementation schedule, and potential funding sources for each recommendation within the following major categories: (1) Watershed BMPs; (2) Shoreline BMPs; (3) Road and

[12] Cost estimates for each recommendation will need to be adjusted based on further research and site design considerations.

Driveway Management; (4) Municipal Operations; (5) Municipal Land Use Planning & Zoning; (6) Land Conservation; (7) Septic System Management; (8) Agricultural Practices; and (9) Education and Outreach. The plan is designed to be implemented from 2025-2035 and is flexible to allow for new priorities throughout the 10-year implementation period as additional data are acquired.

Table 12. Action plan for the Milton Three Ponds watershed.

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
1.a. Establish a committee to regularly meet to monitor and track action item implementation and progress.	TPPA	NA 2025	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners
1.b. Explore grant opportunities to mitigate surface runoff into the Ponds by the 72 sites identified in the report.	TPPA, Municipalities	$2,000-$5,000	Municipalities, private landowners
2. Watershed BMPs	Watershed BMPs	Watershed BMPs	Watershed BMPs
2.a. Complete design and construction of mitigation measures at the top 19 priority sites identified in the watershed survey (refer to Appendix A for complete list). **Achieves a total reduction of 30.9 kg/yr P (25.3 kg/yr P for Northeast Pond, 2.3 kg/yr P for Townhouse Pond, and 3.3 kg/yr P for Milton Pond individually).**	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$465k-980k 2025-2030	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners
2.b. Complete design and construction of mitigation measures at the next 18 priority sites identified in the watershed survey as opportunities arise (refer to Appendix A for complete list). **Achieves a total reduction of 5.3 kg/yr P (3.7 kg/yr P for Northeast Pond, 0.2 kg/yr P for Townhouse Pond, and 1.4 kg/yr P for Milton Pond individually).**	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$170k-355k 2025-2035	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners
2.c. Complete design and construction of mitigation measures at 35 low priority sites identified in the watershed survey as opportunities arise (refer to Appendix A for complete list). **Achieves a total reduction of 4.5 kg/yr P**	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$328k-635k 2025-2035	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
(2.8 kg/yr P for Northeast Pond, 0.4 kg/yr P for Townhouse Pond, and 1.3 kg/yr P for Milton Pond individually).			
2.d. Coordinate with the Acton Wakefield Watersheds Alliance to track, design, and construct measures at the watershed sites identified in 491 sites identified in the 2010 Salmon Falls Headwater Lakes WMP. **Achieves a total reduction of 36.8 kg/yr P**.[13]	TPPA, SRPC, SCCD, YCCD, Acton Wakefield Watersheds Alliance, Municipalities, private landowners	The 2010 Salmon Falls Headwater Lakes WMP estimated $75,000 for BMPs on private roads, $200,000 for BMPs on public roads and $50,000 for residential BMPs in 2010. 2025-2035	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners
2.e. Coordinate with the Acton Wakefield Watersheds Alliance and the Great East Lake Improvement Association to track, design, and construct measures at the 221 sites identified in the 2022 Great East Lake Watershed-Based Protection Plan. **Achieves a total reduction of 120.4 kg/yr P**.[14]	TPPA, SRPC, SCCD, YCCD, Acton Wakefield Watersheds Alliance, Great East Lake Improvement Association, Municipalities, private landowners	The 2022 Great East Lake Watershed-Based Protection Plan estimated this to cost a total of $869,000. 2025-2035	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners

[13] A 40% attenuation factor was applied to the original load reduction value of 92 kg/yr to account for retention within the lakes.
[14] A 40% attenuation factor was applied to the original load reduction value of 301 kg/yr to account for retention within the lake.

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
2.f. Complete design and construction measures with load reduction calculations at the watershed sites identified in 136 sites identified in the 2022 Lovell Lake Watershed Survey Report.	TPPA, SRPC, SCCD, YCCD, Acton Wakefield Watersheds Alliance, Lovell Lake Association, Municipalities, private landowners	Estimated over $300,000 if "low" sites were to cost <$1,000, "medium" sites between $1,000 and $3,000, and "high" sites >$3,000 according to the 2022 report. 2025-2035	CWSRF, Grants (319, Moose Plate, NFWF 5-Star, ILFP), Municipalities, private landowners
3. Shoreline BMPs			
3.a. Promote the LakeSmart program evaluations and certifications through NH Lakes to educate property owners about lake-friendly practices such as revegetating shoreline buffers with native plants, avoiding large grassy areas, and increasing mower blade heights to 4 inches. Coordinate with NHDES Soak Up the Rain NH program for workshops and trainings. Cost assumes coordination and materials for up to 10 workshops.	TPPA, SRPC, SCCD, YCCD, NH Lakes, NHDES Soak Up the Rain NH, Municipalities	$30K 2025-2035	NH Lakes, NHDES Soak Up the Rain NH, Grants (319, Moose plate), CWSRF, Municipalities
3.b. Provide technical assistance and/or implementation cost sharing to watershed/shoreline property owners to install stormwater and/or erosion controls such as rain gardens and buffer plantings. Prioritize high impact properties identified during the shoreline survey. Cost assumes technical assistance and implementation cost sharing provided to the 16 high impact shoreline properties. With a 50% BMP removal efficiency rate this would amount to **an annual reduction of 2.3 kg/yr P** for all three ponds combined. See Table (Table 8. Reality check of the water quality goal based on the identified external watershed loads.) for a breakout by pond.	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$160k 2025-2030	Grants (319, Moose plate), CWSRF, private landowners

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
3.c. Provide technical assistance and/or implementation cost sharing to watershed/shoreline property owners to install stormwater and/or erosion controls such as rain gardens and buffer plantings. Prioritize medium impact properties identified during the shoreline survey as opportunities allow. Cost assumes technical assistance and implementation cost sharing provided to the 106 medium impact shoreline properties. With a 50% BMP removal efficiency rate this would amount to **an annual reduction of 30.7 kg/yr P** for all three ponds combined. See Table (Table 8. Reality check of the water quality goal based on the identified external watershed loads.) for a breakout by pond.	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$742k 2030-2035	Grants (319, Moose plate), CWSRF, private landowners
3.d. Provide technical assistance and/or implementation cost sharing to watershed/shoreline property owners to install stormwater and/or erosion controls such as rain gardens and buffer plantings. Address low impact properties identified during the shoreline survey as opportunities allow. Cost assumes technical assistance and implementation cost sharing provided to the 233 low impact shoreline properties. With a 50% BMP removal efficiency rate this would amount to **an annual reduction of 134.7 kg/yr P** for all three ponds combined. See Table (Table 8. Reality check of the water quality goal based on the identified external watershed loads.) for a breakout by pond.	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$699k 2030-2035	Grants (319, Moose plate), CWSRF, private landowners
3.e. Repeat the shoreline survey in 10 years when updating the WMP. Use the results to target education and technical assistance for high impact sites. Cost assumes hired consultant for survey and summation of shoreline survey results.	TPPA, Municipalities	$20K 2035	Municipalities, Grants (Moose plate), CWSRF

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
4. Road and Driveway Management			
4.a. Review practices for road and drainage maintenance currently used by public and private entities/groups and determine areas for improvement.	Municipalities, TPPA, SRPC, SCCD, YCCD	$10K 2026	CWSRF, Municipalities, Grants (Moose Plate, NFWF 5-Star)
4.b. Provide education and training to contractors and municipal staff on protocols for road maintenance best practices. Assumes one workshop. Consider holding joint workshop with all towns for cost sharing savings.	Municipalities, TPPA, SRPC, SCCD, YCCD	$15K 2026	CWSRF, Municipalities, Grants (Moose Plate, NFWF 5-Star)
4.c. Develop and/or update a written protocol for road maintenance best practices.	Municipalities, TPPA, SRPC, SCCD, YCCD	$20K 2027	CWSRF, Municipalities, Grants (Moose Plate, NFWF 5-Star)
4.d. Incorporate water quality considerations and strategies into roadway evaluations and action plans.	Municipalities, TPPA, SRPC, SCCD, YCCD	N/A 2027-2035	Municipalities
4.e. Establish inspection and maintenance agreements for private unpaved roads. Cost does not include the implementation of proper road maintenance by private landowners and assumes that municipalities can accommodate this additional effort in current budgets.	Municipalities, private landowners	N/A 2025-2030	Municipalities, private landowners
4.f. Hold informational workshops on proper road management and winter maintenance and provide educational materials for homeowners about winter maintenance and sand/salt application for driveways and walkways. Cost assumes up to five workshops.	TPPA, SRPC, SCCD, YCCD, Municipalities, private landowners	$10K 2025-2035	CWSRF, Municipalities, Grants (Moose Plate, NFWF 5-Star), private landowners
5. Municipal Operations			
5.a. Review and optimize MS4 compliance for towns (regardless of MS4 designation), including infrastructure mapping, erosion and sediment controls, illicit discharge programs, regular catch basin cleaning, and good	Municipalities (Public Works/Highway)	TBD 2028-2035	Municipalities

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
housekeeping practices. Sweep municipal paved roads and parking lots two times per year (spring and fall).			
5.b. Participate in the Municipal Green SnowPro Program. Complete training to become Green SnowPro Certified.	Municipalities (Public Works/Highway)	Est. $150-$250/person 2025-2035	Municipalities
5.c. Review and update winter operations procedures to be consistent with Green SnowPro best management practices for winter road, parking lot, and sidewalk maintenance.	Municipalities (Public Works/Highway)	N/A 2026-2028	Municipalities
5.d. In both Milton and Lebanon, adopt policies to either eliminate fertilizer applications on town properties or implement best practices for fertilizer management (to minimize application and transport of phosphorus). Consider extending these regulations to private properties as well.	Municipalities (Public Works/Highway)	N/A 2026-2028	Municipalities
5.e. Develop best practice design standards for stormwater control measures, including deep sump catch basins.	Municipalities (Public Works/Highway)	N/A 2026-2028	Municipalities
6. Municipal Land Use Planning & Zoning			
6.a. Present WMP recommendations to Select Boards/City Council and Planning Boards in Milton and Lebanon. Cost assumes presentations conducted by SRPC or lake association volunteers.	TPPA, SRPC	$2,000 2025-2026	TPPA
6.b. Meet with municipal staff to review recommendations to improve or develop ordinances addressing setbacks, buffers, lot coverage, low impact development, and open space.	TPPA, SRPC, Municipalities	$2,000 2026	TPPA, Municipalities
6.c. Incorporate WMP recommendations into municipal master plans and encourage regular review of the WMP action plan.	Municipalities	N/A 2026-2035	Municipalities
6.d. Adopt/strengthen zoning ordinance provisions and enforcement mechanisms:	Municipalities	N/A 2026-2035	Municipalities

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
1) to promote low impact development practices, particularly impervious cover limits that incorporate Effective Impervious Cover regulations);			
2) to require stormwater regulations that align with MS4 Permit requirements;			
3) to promote or require vegetative buffers around lake shore and tributary streams;			
4) to require shorefront "tear down and replace" home construction to be no more non-conforming than existing structures;			
5) to require shorefront seasonal to year-round conversions of homes to demonstrate no additional negative impacts to lake water quality;			
6) to establish a lake protection overlay zoning ordinance that prohibits erosion from sites in sensitive areas (e.g., lake shorefront, along lake tributaries, steep slopes); and			
7) to enhance performance standards for unpaved roads to prevent erosion and protect lake water quality.			
6.e. Increase municipal staff capacity for inspections and enforcement of stormwater regulations on public and private lands.	Municipalities	TBD 2026-2035	Municipalities
7. Land Conservation			
7.a. Create a Natural Resource Inventory (NRI) for Milton and Lebanon first before working with towns higher in the watershed to create or update NRIs.	Municipalities, Conservation Commissions	$20-30K per municipality 2028-2031	Municipalities, Grants (NFWF NEFRG), CWSRF
7.b. Create a priority list of watershed areas that need protection based on NRIs once written. Refer to Section 4.2.4 to understand current conservation	TPPA, Municipalities, Conservation	$4-8K 2031-2033	Grants (NFWF NEFRG, NAWCA), CWSRF, Municipalities

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
lands and valuable habitats and wildlife in the watershed that can be used to help identify potential areas to target conservation.	Commissions, Local land trusts		
7.c. Identify potential conservation buyers and property owners interested in easements within the watershed. Use available funding mechanisms, such as the Regional Conservation Partnership Program (RCPP) and the Land and Community Heritage Investment Program (LCHIP), to provide conservation assistance to landowners.	SRPC, TPPA, Municipalities, Conservation Commissions, Local land trusts	$5,000 2027-2035	Grants (Moose Plate, LCHIP, RCCP, NAWCA, LWCF, ACEP, CSP, EQIP)
7.d. Maximize conservation of intact forest and other ecologically important properties through education, zoning, and public or private conservation.	Municipalities, Conservation Commissions, Local land trusts, private landowners	TBD 2025-2035	Grants (Moose Plate, LCHIP, RCCP, NAWCA, LWCF, ACEP, CSP, EQIP, NFWF NEFRG), Municipalities, private landowners
8. Septic System Management			
8.a. Distribute educational materials to property owners about septic system function and maintenance. Ensure wide distribution while targeting first all shoreline properties, before expanding to all properties within the shoreland zone (250 feet from the water's edge).	Municipalities, TPPA	$5K 2026, 2030, 2035	Municipalities, Grant (319), CWSRF
8.b. Look into whether any septic pumping companies would give a quantity discount or a discount to members to incentivize septic system pumping.	TPPA	N/A 2026-2027	TPPA
8.c. Evaluate locations of older and/or noncompliant septic systems (including cesspools or holding tanks) to identify clusters where conversion to community septic systems might be desirable.	TPPA, Municipalities	TBD 2026	CWSRF, Municipalities
8.d. Institute a minimum pump-out/inspection interval for shorefront septic systems (e.g., once every 3-5 years). Pump-outs (~$250 per system) are the responsibility of the owner.	Municipalities	N/A 2026-2027	Municipalities, private landowners

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
8.e. Require (ME) and enforce (NH) inspection for all home conversions (from seasonal to permanent residences) and property sales to ensure systems are sized and designed properly. Require upgrades if needed. Prioritize shorefront properties.	State Agencies (ME and NH), Municipalities	N/A 2026-2035	Municipalities
8.f. Develop and maintain a septic system database for the watershed to facilitate code enforcement of any septic system ordinances.	Municipalities	$5-10K 2026-2035	Municipalities, CWSRF
8.g. Undertake a feasibility study to provide cost/benefit analysis of extending the existing municipal sewer system in Milton New Hampshire to allow waterfront homes currently on private septic to connect to municipal system.	Town of Milton, Sewer Department	TBD 2026	Town of Milton, CWSRF
9. Agricultural Practices			
9.a. Work with NRCS to implement soil conservation practices such as cover crops, no-till methods, and others which reduce erosion and nutrient pollution to surface waters from agricultural fields.	NRCS, farm owners	TBD 2028-2035	Grants, NRCS
10. Education and Outreach			
10.a. Encourage participation of shore owners in the Lake Smart Program.	TPPA, Municipalities	N/A 2026	TPPA, Municipalities
10.b. Secure Lake Host participation at the Milton Town Beach. Lake Host program currently operates at the New Bridge Marina, providing boat inspection and education on invasive plant species. Work with the Town to provide similar services at Milton Town Beach.	TPPA, private landowners	N/A 2026	TPPA, Municipalities, private landowners
10.c. Partner or collaborate with watershed associations within the Milton Three Ponds watershed (Acton Wakefield Watersheds Alliance, Great East Lake Improvement Association, and Lovell Lake Association) on Action Items related to education and outreach, municipal planning, advocacy issues, or	TPPA	N/A 2025-035	TPPA, other lake associations

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
relevant outreach to leverage greater collective power and cost share, if applicable.			
10.d. Share additional/dynamic information on the Three Ponds Protective Association website, such as water quality data, loon activity, weather conditions, and webcam, to generate more traffic to the website.	TPPA	TBD 2025-2035	Grants
10.e. Create flyers/brochures or other educational materials through printed or online mediums, regarding topics such as stormwater controls, road maintenance, buffer improvements, fertilizer and pesticide use, pet waste disposal, boat pollution, invasive aquatic species, waterfowl feeding, and septic system maintenance. Consider creating a "watershed homeowner" packet that covers these topics and is distributed (mailed separately or in tax bills or posted at community gathering locations or events) to existing and new property owners, as well as renters. Hold 1-2 informational workshops per year to update the public on restoration progress and ways that individuals can help. Cost is highly variable.	Municipalities, TPPA, SRPC, SCCD, YCCD_	$20K-$60K 2025-2035	Municipalities, Grants (319), CWSRF
10.f. Educate managers of private boat launches about invasive species management, in addition to the existing lake host program that operates at public boat launches.	TPPA	$10K 2025, 2030, 2035	Grants (NHDES AIPC)
10.g. Offer workshops for landowners with 10 acres or more for NRCS assistance with land conservation. Cost assumes up to two workshops.	TPPA, NRCS	$5K 2030-2035	Grants (RCCP, ACEP, CSP, EQIP)
10.h. Encourage private property owners to hire Green SnowPro certified commercial salt applicators.	TPPA, CCCD, Municipalities	N/A 2025-2035	TPPA, CCCD, Municipalities
10.i. Educate contractors and municipal staff about erosion and sediment control (ESC) practices required on plans. Work with municipalities to ensure that there are sufficient resources to enforce permitting conditions.	Municipalities, TPPA, SRPC, SCCD, YCCD_	$6K 2025-27	Municipalities, Grants (319), CWSRF

Action Item	Responsible Party	Estimated Cost / Schedule	Potential Funding Sources
10.j. Collaborate with NH Lakes on legislative or advocacy issues such as boat speed limits.	TPPA, NH Lakes	N/A 2025-2035	Grants

5.2 POLLUTANT LOAD REDUCTIONS

To meet the water quality goal, Objective 1 set a target phosphorus load reduction of 253 kg/yr for Northeast Pond, 216 kg/yr for Townhouse Pond, and 385 kg/yr for Milton Pond to achieve an in-lake summer total phosphorus concentration of 8.4 ppb, 7.2 ppb, and 7.2 ppb, respectively. This would reduce the risk of cyanobacteria blooms in Northeast Pond and meet the NH state water quality standards for oligotrophic waterbodies for Townhouse Pond and Milton Pond. The following opportunities for phosphorus load reductions to achieve Objective 1 were identified in the watershed based on field and desktop analyses:

- Remediating the 72 watershed survey sites could prevent up to **40.7 kg/yr** of phosphorus load from entering Milton Three Ponds.
- Remediating the 848 watershed survey sites from existing WMPs and watershed surveys could prevent over **157.2 kg/yr** of phosphorus load from entering Milton Three Ponds.
- Treating shoreline sites could reduce the phosphorus load to Milton Three Ponds by **2.3 kg/yr** for the 16 high impact site (disturbance score 11+), **30.7 kg/yr** for the 106 medium impact sites (disturbance score between 9-10), and **134.7 kg/yr** for the 233 low impact sites (disturbance score between 7-8) identified from the shoreline survey.
- Upgrading the 190 (approximate) shorefront septic systems older than 25 years is estimated to reduce the phosphorus load to Milton Three Ponds by **19 kg/yr**.

Addressing these field-identified phosphorus load reduction opportunities coming from the external watershed load (i.e., watershed and shoreline sites and shorefront septic systems) could reduce the phosphorus load to Milton Three Ponds by 385 kg/yr, which meets 100% of the needed reductions to achieve Objective 1 for Milton Three Ponds and Northeast Pond, and overactive the objective 1 goal for Townhouse Pond (178% of this goal) (Table 13).

Objective 2 (preventing or offsetting additional phosphorus loading from anticipated new development) can be met through ordinance revisions that implement LID strategies and encourage cluster development with open space protection and/or through conservation of key parcels of forested and/or open land.

It is important to note that, while the focus of the objectives for this plan is phosphorus, the treatment of stormwater and sediment erosion will result in the reduction of many other kinds of pollutants that may impact water quality. These pollutants would likely include other nutrients (e.g., nitrogen), petroleum products, bacteria, road salt/sand, and heavy metals (cadmium, nickel, zinc, etc.). Without a monitoring program in place to measure these other pollutants, it will be difficult to track the success of efforts that reduce these other pollutants. However, there are various spreadsheet models available that can estimate reductions in these pollutants depending on the types of BMPs installed. These reductions can be tracked to help assess long-term response.

Table 13. Breakdown of phosphorus load sources and modeled water quality for current and target conditions.

Parameter	Unit	Current Condition	WQ Goal & Estimated Reduction Needed Target Condition	*(includes all field-identified reduction opportunities)* Reduction (Amount, % change)
Northeast Pond				
Total P Load (All Sources)3	kg/yr	2,005.5	1,752.5	-253 (13%)
(A) Background P Load1	kg/yr	651.5	651.5	0 (0%)
(B) Disturbed (Human) P Load2	kg/yr	1,354.0	1,101.0	-253 (19%)
(C) Developed Land Use P Load	kg/yr	1,319.5	1,060.2	-259.3 (20%)
(D) Septic System P Load	kg/yr	24.2	30.5	6.3 (-26%)
(E) Internal P Load	kg/yr	10.3	10.3	0 (0%)
In-Lake TP*	ppb	11.6	10.1	-1.46 (13%)
In-Lake Chl-a*	ppb	3.8	3.2	-0.6 (16%)
In-Lake SDT*	meters	3.5	3.9	0.4 (-11%)
In-Lake Bloom Probability*	days	15.0	7.0	-15 (53%)
Townhouse Pond				
Total P Load (All Sources)[3]	kg/yr	1,655.8	1,439.8	-216 (13%)
(A) Background P Load[1]	kg/yr	544.8	544.8	0 (0%)
(B) Disturbed (Human) P Load[2]	kg/yr	1,111.0	895.0	-216 (19%)
(C) Developed Land Use P Load	kg/yr	1,078.4	867.1	-211.3 (20%)
(D) Septic System P Load	kg/yr	23.4	18.7	-4.7 (20%)
(E) Internal P Load	kg/yr	9.1	9.1	0 (0%)
(F) Northeast Pond Land/Septic P Load	kg/yr	1,949.5	1,696.5	-253 (13%)
(G) Milton Pond Land/Septic P Load	kg/yr	1,822.4	1,437.4	-385 (21%)
In-Lake TP*	ppb	9.9	8.6	-1.26 (13%)
In-Lake Chl-a*	ppb	3.1	2.6	-0.5 (16%)
In-Lake SDT*	meters	4.0	4.4	0.4 (-10%)
In-Lake Bloom Probability*	days	6.0	2.0	-6 (67%)

Continued on the next page.

Parameter	Unit	Current Condition	WQ Goal & Estimated Reduction Needed: Target Condition	*(includes all field-identified reduction opportunities)* Reduction (Amount, % change)
Milton Pond				
Total P Load (All Sources)[3]	kg/yr	1,852.8	1,467.8	-385 (21%)
(A) Background P Load[1]	kg/yr	558.7	558.7	0 (0%)
(B) Disturbed (Human) P Load[2]	kg/yr	1,294.1	909.1	-385 (30%)
(C) Developed Land Use P Load	kg/yr	1,247.1	870.1	-377 (30%)
(D) Septic System P Load	kg/yr	36.1	28.1	-8 (22%)
(E) Internal P Load	kg/yr	10.9	10.9	0 (0%)
(F) Northeast Pond Land/Septic P Load	kg/yr	1,949.5	1,696.5	-253 (13%)
(G) Townhouse Pond Land/Septic P Load	kg/yr	1,637.6	1,421.6	-216 (13%)
In-Lake TP*	ppb	10.9	8.6	-2.26 (21%)
In-Lake Chl-a*	ppb	3.5	2.6	-0.9 (26%)
In-Lake SDT*	meters	3.7	4.4	0.7 (-19%)
In-Lake Bloom Probability*	days	11.0	2.0	-11 (82%)

Notes: water quality conditions designed to meet the water quality goal (Objective 1), and reflect all field identified reduction opportunities in the watershed. Reduction percentages are based out of the current condition value for each parameter.

[1] Sum of forested/water/natural land use load, waterfowl load, and atmospheric load

[2] Sum of developed land use load, shorefront septic system load, and internal load (B = C+D+E)

[3] Total P Load (All Sources) = A + B

** Water quality parameters were sourced from the model (full-year conditions)*

*** Accounts for attenuation from Northeast Pond and Milton Pond to Townhouse Pond*

**** Accounts for attenuation from Northeast Pond and Townhouse Pond to Milton Pond*

6 IMPLEMENTATION AND EVALUATION

The following section details the oversight and estimated costs (with funding strategy) needed to implement the action items recommended in the Action Plan (Section 5), as well as the monitoring plan and indicators to measure progress of plan implementation over time.

6.1 PLAN OVERSIGHT

The recommendations of this plan will be carried out largely by TPPA with assistance from a diverse stakeholder group, including representatives from the municipalities (e.g., select boards, planning boards), conservation commissions, state and federal agencies or organizations, nonprofits, land trusts, schools and community groups, local business leaders, and landowners. TPPA and an established committee will need to meet regularly and work hard to coordinate resources across stakeholder groups to fund and implement the management actions. The Action Plan (Section 5) will need to be updated periodically (typically every 2, 5, and 10 years) to ensure progress and to incorporate any changes in watershed activities. Measurable milestones (e.g., number of BMP sites, volunteers, funding received, etc.) should be tracked by TPPA.

The Action Plan (Section 5) identifies the stakeholder groups responsible for each action item. Generally, the following responsibilities are noted for each key stakeholder:

- **TPPA** will be responsible for plan oversight and implementation. TPPA will conduct water quality monitoring, facilitate outreach activities and watershed stewardship, and raise funds for stewardship work.
- **Municipalities** will work to address NPS problems identified in the watershed, including conducting regular best practices maintenance on roads, adopting ordinances for water quality protection, and addressing other recommended actions specified in the Action Plan. TPPA and other local groups can work with each municipality to provide support in reviewing and tailoring the recommendations to fit the specific needs of each community.
- **Conservation Commissions** will work with municipal staff and boards to facilitate the implementation of the recommended actions specified in the Action Plan.
- **The SCCD** can provide administrative capacity and can help acquire grant funding for BMP implementation projects and education/outreach to watershed residents and municipalities.
- **NHDES** can provide technical assistance, permit approval, and the opportunity for financial assistance through the 319 Watershed Assistance Grant Program and other funding programs.
- **Private Landowners** will seek opportunities for increased awareness of water quality protection issues and initiatives and conduct activities in a manner that minimizes pollutant impact to surface waters.

The success of this plan is dependent on the continued effort of volunteers and a strong and diverse committee that meets regularly to coordinate resources for implementation, review progress, and make any necessary adjustments to the plan to maintain relevant action items and interim milestones. A reduction in nutrient loading is no easy task, and because there are many diffuse sources of phosphorus reaching the rivers, lakes, and ponds from existing development, roads, septic systems, and other land uses in the watershed, it will require an integrated and adaptive approach across many different parts of the watershed community to be successful.

6.2 ESTIMATED COSTS

The strategy for reducing pollutant loading to Milton Three Ponds to meet the water quality goal and objectives set in Section 2.4 will be dependent on available funding and labor resources but will include approaches that address sources of phosphorus loading, as well as water quality monitoring and education and outreach. Additional significant but difficult to quantify strategies for reducing phosphorus loading to the lake are revising local ordinances such as setting LID requirements on new construction, identifying and replacing malfunctioning septic systems, performing proper road maintenance, and improving agricultural practices (refer to Section 5: Action Plan for more details). With a dedicated stakeholder group in place and with the help of grant or local funding, it is possible to achieve the target phosphorus reductions and meet the established water quality goal for Milton Three Ponds in the next 10 years. **The cost of successfully implementing the plan is estimated to be at least $4.39–$5.63 million over the next 10 or more** years (Table 14). However, many costs are still unknown or were roughly estimated and should be updated as information becomes available. In addition, costs to private landowners (e.g., septic system upgrades, private road maintenance, etc.) are not reflected in the estimate.

Table 14. Estimated total phosphorous (TP) reduction and costs for implementation of the Action Plan

Planning Action	TP Reduction (kg/yr)	Estimated Total Cost	Estimated Annual Cost
Watershed BMPs	**197.9**	$2,457,000 - $3,564,000	$245,700 - $356,400
Shoreline BMPs	**167.7**	$1,651,000	$165,100
Road Management	TBD	$55,000	$5,500
Municipal Operations[1]	TBD	$1,250 – 2,500 +	$125 – 250 +
Municipal Land Use Planning & Zoning	**(72)***	$4,000	$400
Land Conservation	Included in land use planning & zoning	$169,000 – $253,000	$16,900 - $25,300
Septic System Management[2]	**19**	$10,000 – $15,000	1,000 – 15,000
Agricultural Practices	TBD	TBD	TBD

Planning Action	TP Reduction (kg/yr)	Estimated Total Cost	Estimated Annual Cost
Education & Outreach	TBD	$41,000 - $81,000	$4,100 – $8,100
Total	**384.6**	**$4,388,250 – $5,625,500**	**$438,825 – $562,550**

Notes: The light gray shaded planning actions are necessary to achieve the water quality goal. Other planning actions are important but difficult to quantify for TP reduction and costs, the latter of which were roughly estimated here as general placeholders.

** Estimated increase in phosphorus load from new development in the next 10 years. Not included in the total load reduction.*

[1] The cost of municipal operations as a planning action only reflects the cost of the Green SnowPro Program course for employees, not other items shown in the Action Plan.

[2] Septic system management only reflects shoreline septic systems, and does not include the cost of inspecting, repairing, or replacing, private septic systems.

6.3 FUNDING STRATEGY

It is important that TPPA and local municipalities develop a strategy to collect the funds necessary to implement the recommendations listed in the Action Plan (Section 5). Funding to cover ordinance revisions and third-party review could be supported by municipalities through tax collection (as approved by majority vote by town residents). Monitoring and assessment funding could come from a variety of sources, including state and federal grants, municipalities, or donations. Funding to improve septic systems, roads, and shoreland zone buffers would likely come from property owners. As the plan evolves into the future, the establishment of a funding subcommittee will be a key part in how funds are raised, tracked, and spent to implement and support the plan. Listed below are state and federal funding sources that could assist TPPA with future water quality and watershed work for Milton Three Ponds.

Funding Options

- **EPA/NHDES/MEDEP 319 Grants (Watershed Assistance Grants)** – This NPS grant is designed to support local initiatives to restore impaired waters (priorities identified in the NPS Management Program Plan, updated 2014) and protect high quality waters. 319 grants are available for the implementation of watershed-based plans and typically fund $50,000 to $150,000 projects over the course of two years.

  New Hampshire: https://www.des.nh.gov/business-and-community/loans-and-grants/watershed-assistance

  Maine: http://www.maine.gov/dep/water/grants/319.html

- **NH State Conservation Committee (SCC) Grant Program (Moose Plate Grants)** – County Conservation Districts, municipalities (including commissions engaged in conservation programs), and qualified nonprofit organizations are eligible to apply for the SCC grant program. Projects must qualify in one of the following categories: Water Quality and Quantity; Wildlife Habitat; Soil Conservation and Flooding; Best Management Practices; Conservation Planning; and Land Conservation. The total SCC grant request per application cannot exceed $24,000. https://www.mooseplate.com/grants/

- **Land and Community Heritage Investment Program (LCHIP)** – This grant provides matching funds to help municipalities and nonprofits protect the state's natural, historical, and cultural resources. https://www.lchip.org/index.php/for-applicants/general-overview-schedule-eligibility-and-application-process
- **Aquatic Resource Mitigation Fund (ARM)** – This grant provides funds for projects that protect, restore, or enhance wetlands and streams to compensate for impacted aquatic resources. The fund is managed by the NHDES Wetlands Bureau that oversees the state In-Lieu Fee (ILF) compensatory mitigation program. A permittee can make a payment to NHDES to mitigate or offset losses to natural resources because of a project's impact to the environment. https://www.des.nh.gov/climate-and-sustainability/conservation-mitigation-and-restoration/wetlands-mitigation
- **New England Forest and River Grant (NFWF NEFRG)**– This grant awards $50,000 to $200,000 to projects that restore and sustain healthy forests and rivers through habitat restoration, fish barrier removal, and stream connectivity such as culvert upgrades. https://www.nfwf.org/newengland/Pages/home.aspx
- **Aquatic Invasive Plant Control, Prevention and Research Grants (NHDES AIPC)** – Funds are available each year for projects that prevent new infestations of exotic plants, including outreach, education, Lake Host Programs, and other activities. https://www.des.nh.gov/business-and-community/loans-and-grants/rivers-and-lakes
- **Clean Water State Revolving Fund (CWSRF)** – This fund is available in both Maine and New Hampshire and provides low-interest loans to communities, nonprofits, and other local government entities to improve and replace wastewater collection systems with the goal of protecting public health and improving water quality. A portion of the CWSRF program is used to fund NPS pollution prevention, watershed protection and restoration, and estuary management projects that help improve and protect water quality in ME and NH.

  New Hampshire: https://www.des.nh.gov/business-and-community/loans-and-grants/clean-water-state-revolving-fund

  Maine: https://www.maine.gov/dep/water/grants/srfparag.html
- **Regional Conservation Partnership Program (RCCP) -** This NRCS grant provides conservation assistance to producers and landowners for projects carried out on agricultural land or non-industrial private forest land to achieve conservation benefits and address natural resource challenges. Eligible activities include land management restoration practices, entity-held

easements, and public works/watershed conservation activities. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/rcpp/

- **Agricultural Conservation Easement Program (ACEP) -** This NRCS grant protects the agricultural viability and related conservation values of eligible land by limiting nonagricultural uses which negatively affect agricultural uses and conservation values, protect grazing uses and related conservation values by restoring or conserving eligible grazing land, and protecting, restoring, and enhancing wetlands on eligible land. Eligible applicants include private landowners of agricultural land, cropland, rangeland, grassland, pastureland, and non-industrial private forestland. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/acep/
- **Conservation Stewardship Program (CSP) -** This NRCS grant helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resource concerns. Eligible lands include private agricultural lands, non-industrial private forestland, farmstead, and associated agricultural lands, and public land that is under control of the applicant. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/
- **Environmental Quality Incentives Program (EQIP) -** This NRCS grant provides financial and technical assistance to agricultural producers and non-industrial forest managers to address natural resource concerns and deliver environmental benefits. Eligible applicants include agricultural producers, owners of non-industrial private forestland, water management entities, etc. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/
- **National Fish and Wildlife Federation (NFWF) Five Star and Urban Waters Restoration Grants (NFWF 5-Star) -** Grants seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. Eligible projects include wetland, riparian, in-stream and/or coastal habitat restoration; design and construction of green infrastructure BMPs; water quality monitoring/assessment; outreach and education. https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program
- **North American Wetlands Conservation Act (NAWCA) Grants -** The U.S. Standard Grants Program is a competitive, matching grants program that supports public-private partnerships carrying out projects in the United States that further the goals of the North American Wetlands Conservation Act (NAWCA). These projects must involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetlands-associated migratory birds. https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-standard
- **National Park Service - Land and Water Conservation Fund Grant Program (LWCF) -** Eligible projects include acquisition of parkland or conservation land; creation of new parks; renovations to existing parks; and development of trails. Municipalities must have an up-to-date Open Space and Recreation Plan. Trails constructed using grant funds must be ADA-compliant. https://www.nhstateparks.org/about-us/community-recreation/land-water-conservation-fund-grant

6.4 MONITORING PLAN

A long-term water quality monitoring plan is critical to evaluate the effectiveness of implementation efforts over time. Given the available historic data summarized in this report, the following monitoring efforts are recommended to be conducted by TPPA and the UNH LLMP as feasible to enhance understanding of water quality in the three ponds and track changes in water quality over time as implementation of the watershed management plan progresses.

NHDES and MEDEP require **dissolved oxygen** samples to meet stringent requirements in order to be included in State assessment. These requirements are intended to ensure that dissolved oxygen data is consistent and represents the highest stress periods of the year and time of day (June 1 to September 30 and between 10am and 2pm). Samples also must be collected from the epilimnion (defined as the surface to the first 1 or more ˚C change in temperature). To meet Class B standards, no more than two or 10% of samples (whichever is greater) that meet these requirements can have a dissolved oxygen concentration less than 5 mg/L.

- If volunteers have access to a dissolved oxygen and temperature meter, we recommend that profiles are collected at the deep spots biweekly from June 1 to September 30 between the hours of 10am and 2pm.
    - For lake assessment purposes, NHDES requires the following criteria for dissolved oxygen: no more than two or 10% of samples (whichever is greater), collected from the epilimnion (defined from the surface to the first one or more °C change in temperature) between the days of June 1 and September 30 and the hours of 10am and 2pm in the last 10 years, can be less than 5 mg/L for a Class B waterbody such as the Milton Three Ponds.
    - Consider a meter with a conductivity sensor to include in profile readings.
- Collect Secchi disk transparency with each profile or total phosphorus sample or at a biweekly frequency throughout the summer.
- Continue routine LLMP monitoring for key parameters. If additional funding is available, we also recommend the following to better characterize the contribution of phosphorus from internal loading:
    - Collect discrete grab samples for total phosphorus every 2 meters from the surface (1 meter) to the bottom (up to 15 meters) at the deep spot in the three ponds, for a total of 2-3 times in August through September.
    - Collect sediment samples (top 4 inches) from multiple locations in the three ponds to analyze elemental ratios of phosphorus, aluminum, and iron and characterize biologically labile fractions of phosphorus.

- Consider collaborating with UNH Center for Freshwater Biology on continuing research on cyanotoxins in Milton Three Ponds.
    - Research indicates that cyanobacteria toxins may accumulate in lakes even in the absence of cyanobacteria blooms. Factors such as higher nitrogen concentrations and higher amounts of sunlight reaching the lake bottom have been correlated with higher levels of microcystins (Haney & Ikawa, 2001, a survey of 50 New Hampshire lakes that included Milton Three Ponds). While other research indicates that microcystins generally correlate with lake productivity (trophic status), there are notable exceptions in which lakes with low productivity and no cyanobacteria blooms still show high microcystins (Johnson, 1999). For this reason, monitoring of microcystins may be warranted.

6.5 INDICATORS TO MEASURE PROGRESS

The following environmental, programmatic, and social indicators and associated numeric targets (milestones) will help to quantitatively measure the progress of this plan in meeting the established goal and objectives for the Milton Three Ponds watershed (Table 15). These benchmarks represent short-term (2027), mid-term (2030), and long-term (2035) targets derived directly from actions identified in the Action Plan (Section 5). Setting milestones allows for periodic updates to the plan, maintains and sustains the action items, and makes the plan relevant to ongoing activities. TPPA should review the milestones for each indicator on an ongoing basis to determine if progress is being made and then determine if the plan needs to be revised because the targets are not being met.

Environmental Indicators are a direct measure of environmental conditions. They are measurable quantities used to evaluate the relationship between pollutant sources and environmental conditions. They assume that recommendations outlined in the Action Plan (Section 5) will be implemented accordingly and will result in an improvement in water quality. **Programmatic indicators** are indirect measures of watershed protection and restoration activities. Rather than indicating that water quality reductions are being met, these programmatic measurements list actions intended to meet the water quality goal. **Social Indicators** measure changes in social or cultural practices and behaviors that lead to the implementation of management measures and water quality improvement.

Table 15. Environmental, programmatic, and social indicators for the Milton Three Ponds WMP.

Indicators	Milestones*		
	2027	**2030**	**2035**
ENVIRONMENTAL INDICATORS			
Achieve an average summer epilimnion total phosphorus concentration of 8.4 ppb at the deep spot station in Northeast Pond	<10.9 ppb	<9.0 ppb	<8.4 ppb
Achieve an average summer epilimnion total phosphorus concentration of 7.2 ppb at the deep spot station in Townhouse Pond	<9.3 ppb	<8.5 ppb	<7.2 ppb
Achieve an average summer epilimnion total phosphorus concentration of 7.2 ppb at the deep spot station in Milton Pond	<9.8 ppb	<8.8 ppb	<7.2 ppb
Achieve an average summer epilimnion chlorophyll-a concentration of 3.2 ppb at the deep spot station in Northeast Pond	<3.35 ppb	<3.3 ppb	<3.2 ppb
Achieve an average summer epilimnion chlorophyll-a concentration of 3.0 ppb at the deep spot station in Townhouse Pond	<4.0 ppb	<3.5 ppb	<3.0 ppb
Achieve an average summer epilimnion chlorophyll-a concentration of 3.0 ppb at the deep spot station in Milton Pond	<3.5 ppb	<3.3 ppb	<3.0 ppb
Eliminate the occurrence of cyanobacteria or algal blooms in Northeast Pond (milestones based on model results)	12 days/yr	8 days/yr	0 days/yr
Eliminate the occurrence of cyanobacteria or algal blooms in Townhouse Pond (milestones based on model results)	5 days/yr	3 days/yr	0 days/yr
Eliminate the occurrence of cyanobacteria or algal blooms in Milton Pond (milestones based on model results)	9 days/yr	5 days/yr	0 days/yr
Achieve an average summer water clarity of 6 m or deeper at the deep spot station in Northeast Pond	3.2 m+	3.5 m+	3.9 m+
Achieve an average summer water clarity of 6 m or deeper at the deep spot station in Townhouse Pond	4.0 m+	4.4 m+	4.9 m+
Achieve an average summer water clarity of 6 m or deeper at the deep spot station in Milton Pond	3.7 m+	4.0 m+	4.4 m+
Prevent and/or control the introduction and/or proliferation of invasive aquatic species all waterbodies	Absence of invasives	Absence of invasives	Absence of invasives
PROGRAMMATIC INDICATORS			
Amount of funding secured from municipal/private work, fundraisers, donations, and grants	>$500,000	>$2,000,000	>$4,500,000

Indicators	Milestones*		
	2027	**2030**	**2035**
Number of NPS sites remediated (75 identified in the Milton Three Ponds WMP)	20	40	75
Number of NPS sites remediated in other WMPs within the Milton Three Ponds watershed.	100	400	848
Linear feet of buffers improved in the shoreland zone	7,100	17,750	35,500
Percentage of shorefront properties with LakeSmart certification	20%	40%	75%
Number of watershed/shoreline properties receiving technical assistance for implementation cost sharing	16	40	75
Number of workshops and trainings for stormwater improvements to residential properties (e.g., NHDES Soak Up the Rain NH program)	2	5	10
Number of updated or new ordinances that target water quality protection	2	6	10
Number of new municipal staff for inspections and enforcement of regulations	2	5	8
Number of voluntary or required septic system inspections (seasonal conversion and property transfer)	25	50	100
Number of septic system upgrades	25	50	100
Number of informational workshops and/or trainings for landowners, municipal staff, and/or developers/landscapers on local ordinances, watershed goals, and/or best practices for road management and winter maintenance	2	5	10
Number of parcels with new conservation easements or number of parcels put into permanent conservation	3	6	12
Number of copies of watershed-based educational materials distributed or articles published	500	1,000	2,000
Number of new best practices for road management and winter maintenance implemented on public and private roads by the municipalities	5	10	20
Number of municipalities fully implementing key aspects of the MS4 program	2	4	6
Number of meetings and/or presentations to municipal staff and/or boards related to the WMP	3	6	12
Number of CNMPs completed or NRCS technical assistance provided for farms in the watershed	2	5	10
SOCIAL INDICATORS			
Number of new association members	20	50	80

Indicators	Milestones*		
	2027	2030	2035
Number of volunteers participating in educational campaigns	10	30	60
Number of people participating in informational meetings, workshops, trainings, BMP demonstrations, or group septic system pumping	50	75	100
Number of watershed residents installing conservation practices on their property and/or participating in LakeSmart	50	150	300
Number of municipal DPW staff receiving Green SnowPro training	5	15	30
Number of groups or individuals contributing funds for plan implementation	25	75	150
Number of newly trained water quality and invasive species monitors	5	10	20
Percentage of residents making voluntary upgrades or maintenance to their septic systems (with or without free technical assistance), particularly those identified as needing upgrades or maintenance	10%	25%	50%
Number of farmers working with NRCS	5	10	20
Number of daily visitors to the TPPA website	50	100	150

**Milestones are cumulative starting at year 1, 2025.*

ADDITIONAL RESOURCES

Buffers for wetlands and surface waters: a guidebook for New Hampshire municipalities. Chase, et al. 1997. NH Audubon Society.

Conserving your land: *options for NH landowners.* Lind, B. 2005. Center for Land Conservation Assistance / Society for the Protection of N.H. Forests.

Gravel road maintenance manual: a guide for landowners on camp and other gravel roads. Maine Department of Environmental Protection, Bureau of Land and Water Quality. April 2010.

Gravel roads: maintenance and design manual. U.S. Department of Transportation, Federal Highway Program. November 2000. South Dakota Local Transportation Assistance Program (SD LTAP).

Innovative land use techniques handbook. New Hampshire Department of Environmental Services. 2008.

Landscaping at the water's edge: an ecological approach. University of New Hampshire, Cooperative Extension. 2007.

New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home. New Hampshire Department of Environmental Services, Soak Up the Rain NH. Revised November 2019.

NRCS ***Field Office Technical Guide (FOTG)*** for NH to provide information regarding agricultural BMPs

Protecting water resources and managing stormwater. University of New Hampshire, Cooperative Extension & Stormwater Center. March 2010.

Stormwater Manual, Volumes 1-3. New Hampshire Department of Environmental Services. 2008.

University of New Hampshire Stormwater Center 2009 Biannual Report. University of New Hampshire, Stormwater Center. 2009.

Information for Homeowners and Renters. Maine Department of Environmental Protection.

Lakeside Living: Caring For Your Septic System. Maine Lakes Program.

Manuals and Guides to Reduce Water Pollution (Includes Vegetated Buffer Handbook and Planting List). Maine Department of Environmental Protection.

NHDES Fact Sheets

Cyanobacteria in New Hampshire Waters. WD-WMB-10, 2023.

Erosion Control for Construction within the Protected Shoreland. SP-1, 2020.

Lake Eutrophication. WD-BB-3, 2019.

Lawn Care within the Protected Shoreland. SP-2, 2020.

New Hampshire Fish Consumption Guidelines. ARD-EHP-25, 2021.

Phosphorus: Too much of a good thing. WD-BB-20, 2019.

Variable Milfoil. WB-BB-23, 2019.

Why Watersheds Are Important to Protect. WMB-19, 2020.

You and Your Septic System, a Homeowner's Guide to Septic System Maintenance. SSB-13 2020.

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APPENDIX A: BMP MATRIX

Table B-1. Site ID, location description, water quality impact, estimated load reduction, and implementation costs for the 75 nonpoint source sites identified in the Milton Three Ponds watershed; sites 48-51 are listed together, making a total of 72 sites. Pollutant load reduction and cost estimates are preliminary and are for planning purposes only. Cost estimates are based on pre-COVID19 ranges (adjusted for 2025 inflation), and thus actual construction costs could be highly variable at this time. Sites are priority ranked from lowest to highest cost per pound of phosphorus load (using average cost reduced with remediation).

				LOAD REDUCTION			**ESTIMATED COST**				**RANK**
SITE	**LOCATION**	**IMPACT**	**Town**	TP (kg/yr)	TN (kg/yr)	TSS (metric tons/yr)	Low	High	Average	*Per kg P reduction*	**RANK**
22	Route 125 near Bolan Road	High	Milton	0.9	2.3	3.4	$10,000	$20,000	$15,000	$16,702	1
14	Milton Town Beach	High	Milton	2.3	6.8	7.6	$25,000	$70,000	$47,500	$20,986	2
2.1	Fernald Shore – Picnic Site	High	Lebanon	1.2	3.2	4.7	$15,000	$20,000	$17,500	$14,289	3
1	Gravel Pit and Jones Access Road	High	Milton	11.0	14.1	1.5	$120,000	$200,000	$160,000	$14,567	4
39	Downtown Wakefield	High	Wakefield	2.0	13.2	1.1	$30,000	$100,000	$65,000	$32,130	5
76	234 Bolan Road	High	Milton	0.8	4.3	0.4	$10,000	$20,000	$15,000	$18,372	6
6	New Bridge Marina Boat Launch	High	Lebanon	0.6	0.4	0.8	$10,000	$20,000	$15,000	$23,288	7
73	Yogi Bear Jellystone – Stream Crossing	High	Milton	0.8	4.4	0.4	$10,000	$30,000	$20,000	$24,911	8
2.2	Fernald Shore - Beach & Road Crossing	High	Lebanon	0.5	1.4	2.0	$5,000	$25,000	$15,000	$28,264	9
56	Teneriffe Road (Unpaved Section)	High	Milton	2.1	5.4	7.9	$40,000	$80,000	$60,000	$29,008	10
31	Milton Mills Downtown	High	Milton	2.1	11.3	1.0	$30,000	$100,000	$65,000	$30,950	11
45	Sewall Shores Road	High	Lebanon	0.8	2.0	3.0	$15,000	$40,000	$27,500	$34,843	12
60	Main Street, Downtown Union	Medium	Wakefield	2.2	14.5	1.1	$30,000	$50,000	$40,000	$18,565	13
38	Route 109 Branch River Crossing	High	Wakefield	0.2	0.5	0.8	$5,000	$10,000	$7,500	$38,453	14
75	Yogi Bear Jellystone – Miscellaneous	High	Milton	0.8	5.0	0.4	$30,000	$40,000	$35,000	$41,485	15
16	Pineland Park #1	Medium	Milton	0.6	3.0	0.6	$10,000	$20,000	$15,000	$24,679	16
71	Yogi Bear Jellystone – Southern Beach	High	Milton	0.3	0.8	1.2	$10,000	$20,000	$15,000	$49,357	17
33	Hopper Road Shoulder	Medium	Acton	0.4	1.2	1.7	$10,000	$15,000	$12,500	$27,836	18
30	Country Road #2	High	Acton	1.3	3.5	5.1	$50,000	$100,000	$75,000	$56,240	19
41	Tibbett's Hill Road	Medium	Brookfield	0.4	0.0	0.2	$5,000	$20,000	$12,500	$30,964	20

SITE	LOCATION	IMPACT	Town	LOAD REDUCTION TP (kg/yr)	TN (kg/yr)	TSS (metric tons/yr)	ESTIMATED COST Low	High	Average	*Per kg P reduction*	RANK
29	Country Road #1	Medium	Acton	0.4	1.0	1.5	$10,000	$15,000	$12,500	$31,316	21
17	Pineland Park #2	Medium	Milton	0.3	0.9	0.1	$5,000	$15,000	$10,000	$34,994	22
43	Governors Road #2	Medium	Brookfield	0.4	1.4	1.3	$10,000	$20,000	$15,000	$35,180	23
7	Dolby Road Catch Basin	Medium	Lebanon	0.5	2.3	0.6	$10,000	$25,000	$17,500	$36,744	24
36	Lovell Lake Road Stream Crossing #2	Medium	Wakefield	0.3	0.7	0.3	$5,000	$20,000	$12,500	$40,526	25
68	Yogi Bear Jellystone – Northern Beach	Medium	Milton	0.5	1.4	2.1	$15,000	$30,000	$22,500	$41,684	26
10	Route 125 Parking Lot	Medium	Milton	0.3	1.9	0.1	$10,000	$20,000	$15,000	$44,688	27
15	Route 125 near Townhouse Pond Bridge	High	Milton	0.1	0.4	0.0	$5,000	$10,000	$7,500	$97,263	28
24	Route 153	Medium	Middleton	0.4	2.1	0.1	$15,000	$25,000	$20,000	$51,270	29
69	Yogi Bear Jellystone – Road above Beach	High	Milton	0.1	0.2	0.3	$5,000	$10,000	$7,500	$110,231	30
70	Yogi Bear Jellystone – Near Campsite 229	Low	Milton	0.3	1.8	0.1	$10,000	$15,000	$12,500	$38,275	31
28	Milton Mills Road	Medium	Acton	0.2	0.4	0.6	$5,000	$15,000	$10,000	$61,240	32
11	Shopping Center Parking Lot along Route 125	Medium	Milton	0.3	2.0	0.1	$15,000	$30,000	$22,500	$64,421	33
66	Moose Mountain Road – Hanson Brook Crossing	Medium	Brookfield	0.2	0.5	0.7	$10,000	$15,000	$12,500	$67,214	34
13	Marina Plaza Parking Lot	Medium	Milton	0.3	2.1	0.1	$15,000	$30,000	$22,500	$69,865	35
12	Route 125 near Milton Pond Outlet	Medium	Milton	0.2	0.7	0.0	$10,000	$20,000	$15,000	$70,360	36
19	Townhouse Road and Route 125	High	Milton	0.1	0.3	0.4	$10,000	$20,000	$15,000	$143,780	37
34	Berry Road Stream Crossing	Low	Milton	0.2	1.0	0.1	$8,000	$10,000	$9,000	$48,394	38
65	Ridge Road near Middleton Fire Dept.	Low	Middleton	0.4	2.4	0.2	$20,000	$25,000	$22,500	$50,105	39
46	Stoneham Road #2	Low	Wakefield	0.5	1.2	1.8	$20,000	$30,000	$25,000	$52,491	40
37	Willey Road	Low	Milton	0.3	0.9	1.3	$15,000	$20,000	$17,500	$52,851	41
52	Ford Farm Road #5	Low	Milton	0.1	0.4	0.5	$5,000	$10,000	$7,500	$53,338	42
8	Dolby Road Excavated Area	Low	Lebanon	0.3	0.7	1.1	$10,000	$20,000	$15,000	$55,116	43
72	Yogi Bear Jellystone – Campsite 224	Medium	Milton	0.1	0.2	0.2	$5,000	$5,000	$5,000	$84,793	44
59	Irving Oil Catch Basin	Low	Wakefield	0.1	0.8	0.0	$5,000	$5,000	$5,000	$58,016	45
55	Ellis Drive (Upper)	Low	Milton	0.4	1.0	1.4	$20,000	$25,000	$22,500	$61,240	46
18	Pineland Park #3	Low	Milton	0.2	0.4	0.1	$5,000	$15,000	$10,000	$61,240	47
74	Yogi Bear Jellystone – Boat Ramp	Low	Milton	0.1	0.4	0.0	$5,000	$5,000	$5,000	$64,842	48
44	Route 125 near Industrial Way	High	Milton	0.1	0.2	0.3	$10,000	$20,000	$15,000	$194,526	49

SITE	LOCATION	IMPACT	Town	LOAD REDUCTION TP (kg/yr)	TN (kg/yr)	TSS (metric tons/yr)	ESTIMATED COST Low	High	Average	*Per kg P reduction*	RANK
54	Ellis Drive (Lower)	Medium	Milton	0.1	0.2	0.3	$5,000	$10,000	$7,500	$110,231	50
26	Applebee Road Stream Crossing #1	Low	Milton	0.1	0.3	0.5	$5,000	$15,000	$10,000	$76,022	51
58	Route 153 at Diprizio Sawmill	Medium	Middleton	0.1	0.2	0.3	$5,000	$15,000	$10,000	$122,479	52
40	Stoneham Road #1	Low	Brookfield	0.1	0.2	0.3	$5,000	$10,000	$7,500	$82,673	53
9	TM Wentworth Crossing @ Rocky Cove Rd	Low	Lebanon	0.1	0.4	0.6	$10,000	$15,000	$12,500	$83,509	54
47	Teneriffe Road near Route 125	Medium	Milton	0.1	0.3	0.4	$10,000	$15,000	$12,500	$125,263	55
62	New Portsmouth Road #2	Medium	Middleton	0.1	0.3	0.4	$10,000	$15,000	$12,500	$125,263	56
48-51	Ford Farm Road #1-4	Medium	Milton	0.2	0.4	0.7	$15,000	$40,000	$27,500	$159,884	57
4	TM Wentworth Road	Low	Lebanon	0.1	0.3	0.4	$10,000	$15,000	$12,500	$110,231	58
61	New Portsmouth Road #1	Medium	Middleton	0.0	0.1	0.2	$5,000	$10,000	$7,500	$165,347	59
20	Route 125 above Townhouse Road	Medium	Milton	0.4	2.3	0.2	$40,000	$120,000	$80,000	$185,653	60
35	Lovell Lake Road Stream Crossing #1	Low	Wakefield	0.1	0.3	0.1	$10,000	$20,000	$15,000	$127,212	61
53	Teneriffe Road above Route 16 Bridge	Medium	Milton	0.0	0.0	0.1	$5,000	$5,000	$5,000	$275,578	62
23	Cotton Valley Road	Low	Wolfeboro	0.0	0.1	0.1	$5,000	$10,000	$7,500	$206,684	63
63	New Portsmouth Road #3	Low	Middleton	0.1	0.2	0.2	$10,000	$20,000	$15,000	$254,380	64
32	Hopper Road River Access	Low	Acton	0.1	0.2	0.3	$10,000	$30,000	$20,000	$259,368	65
3	South Inlet to Northeast Pond	Low	Lebanon	0.0	0.1	0.1	$5,000	$10,000	$7,500	$275,578	66
67	Yogi Bear Jellystone – Walkway	Medium	Milton	0.0	0.0	0.1	$5,000	$10,000	$7,500	$413,367	67
57	Mason Road Near Hart Brook	Low	Milton	0.0	0.1	0.1	$5,000	$10,000	$7,500	$330,694	68
27	Applebee Road Stream Crossing #2	Low	Milton	0.0	0.1	0.2	$10,000	$25,000	$17,500	$385,809	69
21	Route 125 Road Shoulder Ditch	Low	Milton	0.0	0.0	0.0	$5,000	$5,000	$5,000	N/A	70
42	Governors Road #1	Low	Brookfield	0.0	0.0	0.0	$5,000	$10,000	$7,500	N/A	71
5	New Bridge Road Culvert	Low	Lebanon	0.0	0.0	0.0	$5,000	$10,000	$7,500	N/A	72
			TOTAL	**41.0**	**133.3**	**66.2**	**$963,000**	**$1,970,000**	**$1,466,500**	**$35,770**	

APPENDIX B: BUILDOUT ANALYSIS

Milton Three Ponds Buildout

Revised 8/7/25

Calculation

	Brookfield, Middleton, Milton, Wakefield, and Wolfeboro* **New Hampshire**	Acton and Lebanon **Maine**	Study Communities **Total**
Total Existing Structures	10,144	5,503	15,647
Total Existing Structures (Watershed **only)**	5,589	1,506	7,095
Percent current units in watershed	55.1%	27.4%	45.3%
Projected full buildout added units on developable land	9,007	15,863	24,870
Projected full buildout added units on **watershed** developable land	5,623	2,723	8,346
Estimated units per year study towns	51	45	96
Potential units per year within watershed	28	12	44
Units at full buildout (above) / Potential units per year = **Years to full buildout**	200	221	192
Year of full buildout (from 2024)	2224	2245	2216

*Only the portion of Wolfeboro included in the Watershed was included.

Projected Buildout by Subwatershed

Subwatershed	NH	ME	Existing	**To Full Buildout**
Upper Branch River			1,336	1,559
Lower Branch River			963	1,468
Great East Lake			1,576	1,331
Lower Salmon Falls River			349	777
Upper Salmon Falls River			369	639
Wilson Lake			245	592
Northeast Pond direct drainage			299	497
Lovell Lake			826	318

Milton Pond direct drainage			420	273
Black Pond			70	193
Fernald Shore/Northeast Pond			18	157
Horn Pond			157	143
“Rt6Rivr”			13	112
Dawn Point			71	104
Townhouse Pond direct drainage			293	87
Cove			18	53
Kingswood Lake			72	43
Total			7,095	8,346

GIS Layers Used

“In-House” SRPC layers

Piscataqua region steep slopes	constrsleepslopes
Assessing (excl. Maine, Town of Wolfeboro)	exisitngbuildnh_subtr
Roads	Roadssrpc_roads
Zoning*** (Brookfield, Middleton, Wakefield)	AllZoningV4 Zoning_SRPC_2023
Milton Three Ponds watershed	Milton3Ponds_Subwatershed_FIN_20250505
Surface water	constr_new_water
Conservation lands	constr_conslandnh constra_conslandsall1

***This layer is representative of these three towns’ 2021 zoning, despite the name of the layer. Milton and Wolfeboro’s zoning is up to date in 2025 to SRPC’s knowledge.

Town of Milton

Zoning	AllZoningV4 Zoning miltonclip2 Milton_Zoning_2021
Assessing	Parcels_Assessing_Milton
Conservation lands	constr_conslandnh constra_conslandsall1
Priority wetlands	constrmilPriorityWetlands
Waterfront buffer	constrmilWaterfrontBuffer constrmilPriorityWetlandsftBuffer
Protected shoreland buffer	constrmilProtectedShorelineBuffer
Priority wetland setback	constrmilPriorityWetlandsftSetback
Natural woodland buffer	constrmilNaturalWoodlandBuffer

Southern Maine Planning & Development Commission

Zoning	AllZoningV4

Assessing (Lebanon)	Parcels_Assessing_Lebanon

State of Maine

E911 addressed roads	RoadsMaine_E911_NG_ROADS.shp
E911 building points	existingbuildmeMaine_E911_NG_ADDRESSES
Wetlands	constrmilPriorityWetlands
Surface water	constr_new_water
Conservation lands	constr_conslandme constra_conslandsall1

State of New Hampshire

Parcels (Wolfeboro)	existingbuildnh_pts

National Hydrography Dataset

Surface water	constr_new_water
Wetlands	constr_wetlands

Steps

1. Load existing structures from parcel and assessing data and local roads.
2. Merge assorted zoning layers.
3. Load zoning and development attributes (attached).
    a. Note: SRPC and its Lakes Region counterpart do not possess Wolfeboro's zoning GIS data. The portion of the M3P watershed in Wolfeboro falls within one zoning district, and only this portion was included in the analysis.
    b. Note: The portion of the M3P watershed in the Town of New Durham is entirely on state or conservation land and was not included in the analysis.
    c. Note: The Town of Lebanon is one zoning district.
    d. Note: Overlay districts were not included and SRPC only analyzed residential uses allowed by right in the seven municipalities.
4. The following characteristics were "subtracted out" as constraints:
    a. Steep slopes
    b. Wetlands
    c. Surface water
    d. Conservation land**
    e. Special buffers and setbacks as requested by the Town of Milton
5. Perform development calculations producing figures above.
    a. Establish existing structures across six municipalities and the watershed area of Wolfeboro from various sources (=15,647)
    b. Calculate existing structures within M3P watershed only (=7,095)
    c. Calculate percentage of development existing within M3P watershed (=45.3%)
    d. Run buildout analysis using constraints listed above.

        i. **Note: An error was discovered in the Maine conservation lands data at this stage. This will need re-examining.
e. Projected number units that would need to be added to be considered "full buildout" under current zoning = 29,364 units for the six municipalities and the watershed area of Wolfeboro.
f. Projected number of units that would need to be added to be considered "full buildout" within watershed only = 13,315.
g. Estimate building rates.
    i. New Hampshire communities[1] = 51 permits/year
    ii. Maine communities[2] = 45/year
h. Adjust building rate to the watershed.
    i. 44/year
i. Divide projected buildout added units by current rate of growth to produce years to full buildout (=303)
j. Add to the current year for buildout year (=year 2327)

Contact Info

Questions? Reach out to Mark.
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[1] SRPC Regional Housing Needs Assessment: https://straffordrpcnh.gov/uploads/documents/plans/rpc/rhna_2023_appendixc_datasnapshot.pdf

[2] Towns of Acton and Lebanon annual reports.