Lake Pennesseewassee Watershed-Based Protection Plan

2020-2029

February 2020

Lakes Association of Norway (LAON)

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Document Purpose and Scope

The purpose of this Watershed Based Plan, herein after referred to as the "plan", is to lay out a strategy and schedule for Non-Point Source (NPS) mitigation and water quality protection efforts for the Lake Pennesseewassee (Norway Lake) watershed over the next ten years (2020 to 2029). Mitigation will be achieved by applying Best Management Practices (BMP) to NPS sites. The Lakes Association of Norway (LAON) prepared the plan with assistance and input from Maine Department of Environmental Protection (MDEP) and the Oxford County Soil and Water Conservation District (SWCD) based on United States Environmental Protection Agency (EPA) guidelines. The plan is not intended to be a detailed tactical work plan. As with any watershed plan, this document should be revisited and adjusted periodically to incorporate new information.

The national watershed planning guidelines provided by the EPA requires nine-element plans for impaired watersheds but allows alternative plans in several cases including for protection of high quality or unimpaired waters. MDEP accepts alternative plans for unimpaired lakes that have completed a recent watershed survey provided that the plans follow EPA and MDEP guidance. Section V. of the Guidance for Maine Lake Watershed-based Protection Plans provides eight Required Plan Elements that incorporate the EPA's requirements for alternative watershed-based plans.

Lake Pennesseewassee is an unimpaired water body that is on the MDEP's NPS Priority Watersheds list as a "Threatened" water body and a recent watershed survey of the lake has been completed. Therefore, Lake Pennesseewassee meets the eligibility criteria for alternative plans. This plan was written to include all EPA and MDEP required planning elements.

Note: Information collected during the 2019 Lake Pennesseewassee watershed survey forms the basis for much of this plan. As such, the Lake Pennesseewassee Watershed Survey Report is attached as an Appendix.

Plan Elements

A. Background Information

1. Watershed Background

Lake Pennesseewassee is primarily located in the Town of Norway in Oxford County, Maine. The lake covers 987 acres, has a maximum depth of 48 feet (14.6 meters) and an average depth of 18 feet (5.5 meters), which is maintained by a dam on the outlet of the lake. The lake is mesotrophic (moderately productive) and supports a cold water and warm water fishery with more than 12 different species reported. *DownEast Magazine* listed Lake Pennesseewassee as one of the "12 Best Maine Lakes for Swimming."

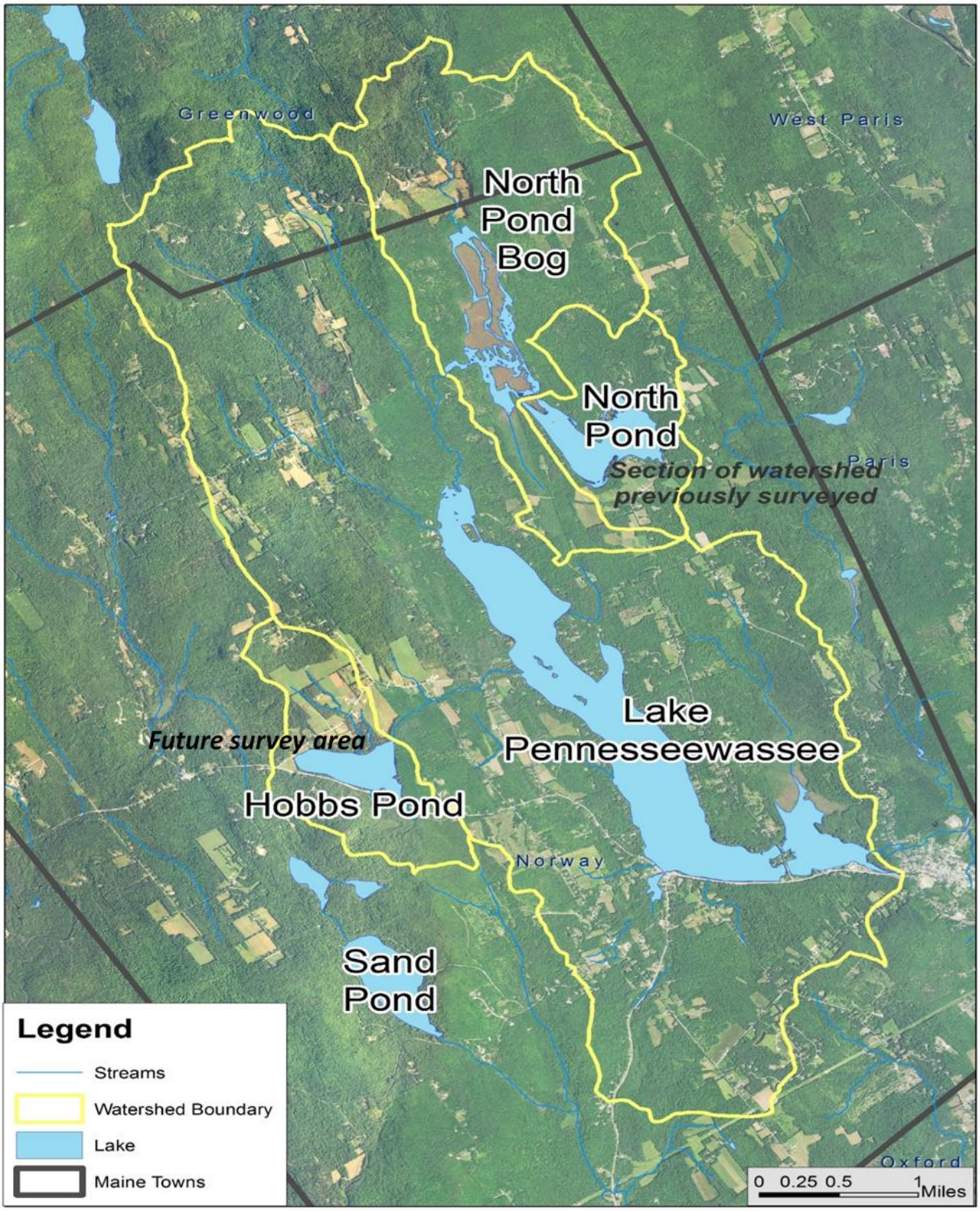
There are 1,413 properties in the Lake Pennesseewassee Watershed that were surveyed in 2019 and are the focus of this plan. (North Pond, part of the Lake Pennesseewassee Watershed, is excluded from this plan since it was previously surveyed, the focus of a separate plan and the recipient of a 319 grant.) The Lake Pennesseewassee watershed includes feeds from North Pond, North Pond Bog and Hobbs Pond, as well as a network of feeder streams, ditches and land that flows into the lake (Figure 1). There are State, Town and private roads within the watershed many of which are near the lake. Many of the private roads have associations that raise funds to conduct

varying levels of road maintenance. Watershed development includes agricultural areas and 277 shoreline year-round and seasonal homes on Lake Pennesseewassee. The watershed also contains numerous trails for walking, hiking, skiing, snowshoeing, ATVs and snowmobiles. The Western Foothills Land Trust owns several parcels of land within the watershed that are used for public access and the Town of Norway operates a town park, swimming beach and boat launch on the southern end of the lake. Two commercial marinas with private boat launches are located on the lake. State owned Rt 117/118 runs alongside Lake Pennesseewassee for over 1 ½ miles and the impact of this section on water quality is of particular concern. The watershed remains mostly forested although it is experiencing occasional new development.

The Lake Pennesseewassee drainage area covers 22.2 square miles, mostly in the town of Norway with a lesser area in the town of Greenwood. The lake flows into the Little Androscoggin River that then flows into the Androscoggin River. The flushing rate of Lake Pennesseewassee is estimated at 1.38 flushes per year.

Additional phosphorus flowing into Lake Pennesseewassee from North Pond and Hobbs Pond contributes to the phosphorus loading in Lake Pennesseewassee, which has the potential to lead to more algae growth. The lake's outlet stream flows from the southeast corner of the lake into a tributary of the Little Androscoggin River (Figure 1). Lake Pennesseewassee is a key resource to Norway and its surrounding areas because of the important recreational resources and economic benefit it provides. LAON's long range plan is to conduct surveys and develop protection plans for all our watersheds, as resources allow. Surveys have already been completed for Lake Pennesseewassee (including the North Pond Bog) and North Pond. Surveys still need to be completed for Hobbs Pond and Sand Pond.

Figure 1 – Map of Lake Pennesseewassee Watershed



2. Summary of Prior Watershed Work

The Lakes Association of Norway (LAON) was established in 1971 with a stated mission of protecting the water quality of its four lakes: Lake Pennesseewassee, North Pond, Hobbs Pond, and Sand Pond. In that capacity, LAON has developed a multi-level protection plan, that includes ***Water Quality Monitoring*** to assess the health of its lakes; ***Courtesy Boat Inspections*** to prevent the introduction of invasive species; ***Invasive Species Screening*** to determine if any invasive species have been introduced into any of Norway's lakes; ***Outreach*** to communicate best lake stewardship practices to property owners and the community in general; and most recently, ***Watershed Management*** has been added to reduce the effects of harmful storm runoff pollutants.

In the late summer/early fall of every year, professional lake scientists (Lake and Watershed Resource Management Associates) are contracted to conduct a full level 3 screening survey for invasive aquatic species on the four lakes to supplement the effort of LAON volunteers. Courtesy Boat Inspections have evolved over the years into a formal program with paid inspectors.

The Oxford County Soil and Water Conservation District working with LAON recently completed an implementation grant in the North Pond watershed, funded in part by the US EPA under Section 319 of the Clean Water Act. Previously the Androscoggin Valley Council of Governments (AVCOG) conducted several projects with USEPA Section 319 grants. AVCOG conducted town-wide watershed surveys and ditch inventories to identify road-related erosion issues in the mid-1990s. From 1997 – 2003, AVCOG carried out three USEPA 319 grant projects (#97-09, #99-16 and #2002-08) to address the problems. Although most of the AVCOG demonstration projects were conducted in other watersheds, three projects were completed in the Lake Pennesseewassee watershed.

B. Identification of the Causes or Sources of NPS Threats

1. Water Quality Summary

Several activities have taken place on Lake Pennesseewassee in recent years to assess and protect the lake's water quality.

Water Quality Monitoring – Lake Pennesseewassee has been regularly monitored since 1976 by the Maine DEP. For decades, LAON also hired contractors to do water quality testing. Since 2015 the testing has been done by LAON volunteers led by a Ph.D. aquatic biologist with the Department of Marine Sciences at the University of New England. The water quality data generated monthly during the summer includes Secchi disk transparency readings as well as color, pH, alkalinity, specific conductivity, total phosphorus and chlorophyll levels. Additionally, dissolved oxygen profiles have been monitored monthly in order to assess the degree of late summer oxygen depletion. Each year LAON contracts with Lake and Watershed Resource Management Associates to do an extensive level 3 aquatic survey to look for invasive plants.

Historically, the Secchi disk (a device used to measure water clarity) was visible to an average depth of 5.7 meters (18.7 feet), indicating moderate water clarity. Dissolved oxygen levels become depleted in the bottom half of the lake each summer. In most years the bottom 6 meters of the lake are devoid of oxygen by August, impacting aquatic life, particularly the cold-water fishery. This oxygen depletion is believed to be influenced by the continual accumulation of dead organic material on the bottom of the lake which consumes oxygen as it decomposes. The bottom contours of the lake may also make it susceptible to a certain level of "natural" oxygen loss, which may be

exacerbated by excess organic matter decomposition. Phosphorus, entering the lake via runoff, impacts this process by accelerating the growth of algae, which then dies and adds to organic material on the bottom. Total phosphorus concentrations are relatively high in Lake Pennesseewassee and recent data may suggest a slight worsening of levels in recent years, particularly in the bottom layer, as this nutrient is released from sediment. Chlorophyll concentrations, an indicator of algae growth, typically are at approximately 4.6 ppb in Lake Pennesseewassee and are considered higher than average for a Maine lake.

2. Threatened Status

Lake Pennesseewassee currently meets state water quality standards. It is listed in Chapter 502 of the Maine Stormwater Law as 'Most at Risk from New Development and on MDEP's NPS Priority Watersheds list due to being particularly sensitive to eutrophication based on current water quality and projected growth rate in the watershed.

3. Watershed NPS Threats

Like many other lakes in Maine, Lake Pennesseewassee's water quality is threatened by phosphorus enrichment. Phosphorus is the nutrient that controls the level of algae production in lakes. Small increases in phosphorus can cause lake algae populations to increase resulting in a decline of water clarity. High levels can cause dense algal blooms, which can create a biological and chemical reaction that depletes the oxygen from the bottom of the lake.

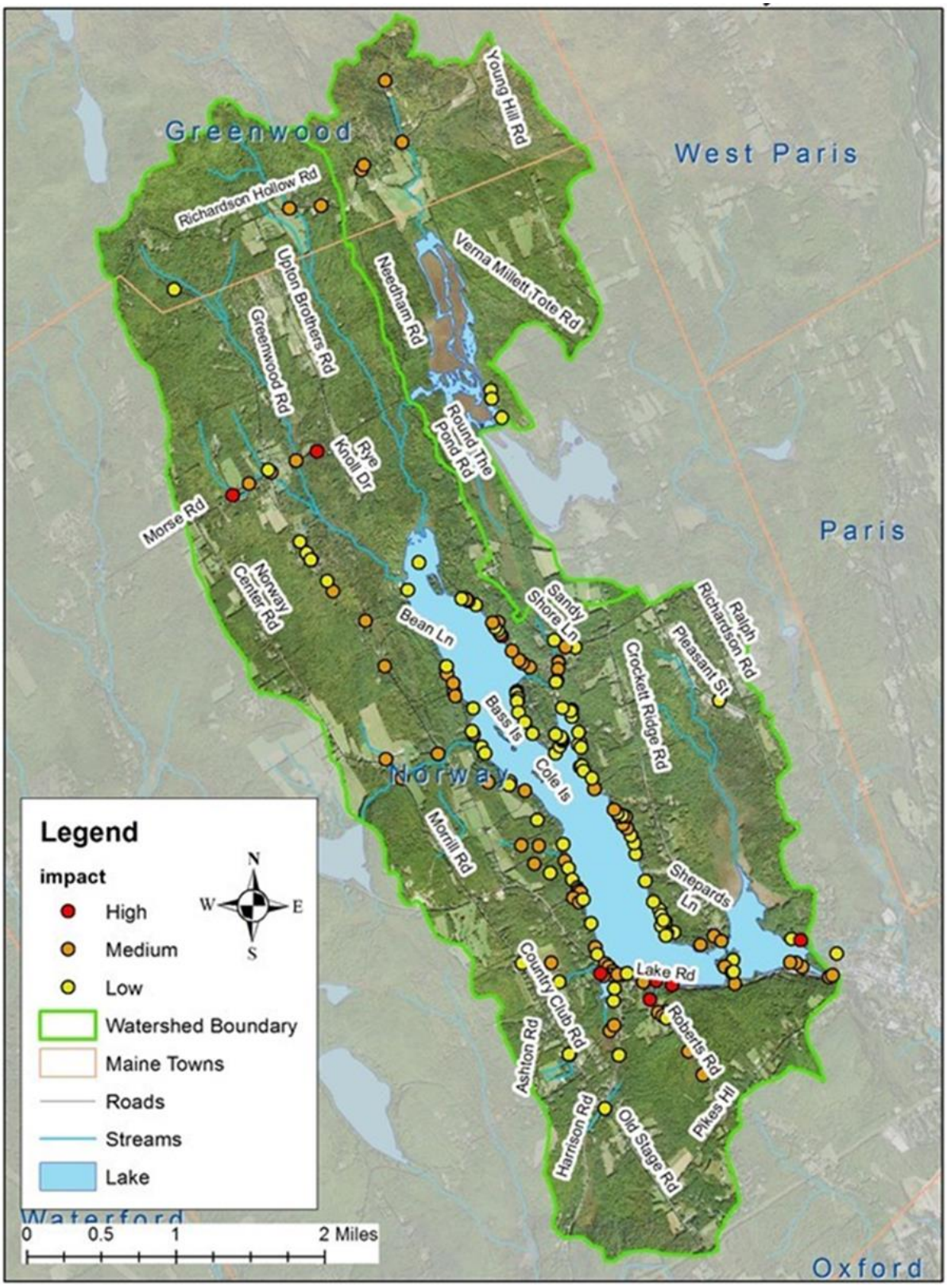
Phosphorus, which is typically attached to soil particles and organic matter, mostly reaches the lake in stormwater runoff from the watershed. Phosphorus runoff increases significantly in developed landscapes. Stormwater flows across roads, driveways, residential properties and other developed areas and picks up phosphorus in soluble form or attached to eroded soil particles. Maine DEP monitoring of impaired watersheds found that phosphorus export from a developed watershed was up to ten times greater than a forested one (Dennis, 1986)[1].

The Lakes Association of Norway (LAON) raised funds for and conducted a watershed survey in 2019 to identify sources of phosphorus to Lake Pennesseewassee. The survey followed MDEP guidance described in *Volunteer Lake Watershed Surveys: How to Conduct a Nonpoint Source Phosphorus Survey* (MDEP, 2011). The project was managed by LAON with technical support provided by MDEP staff, Oxford County Soil and Water District staff, and contracted consultants. With the permission of property owners, 19 trained volunteers with 6 technical leaders conducted a survey in 2019 of nearly 1,400 properties. Each recorded erosion site was ranked based on probable impact, the technical ability needed to fix it, and the estimated cost. Survey findings were summarized in the ***Lake Pennesseewassee Watershed Survey Report*** (2020), which includes maps and a spreadsheet of NPS sites (see Appendix).

Figure 2 shows the location of the sites identified as possible sources of phosphorous. Many are located on waterfront properties however there are also a number of sites adjacent to roads. Table 1 shows the number of NPS sites by land use and impact to the lake. The 15 sites identified as "Other" includes trails/paths (3), construction (3), commercial (3), beach access (3), municipal (2) and boat access (1). Three pie charts are presented to show land use (Figure 3); impact (Figure 4) and estimated cost of remediation (Figure 5).

[1] Dennis, Jeff. 1986. "Phosphorus Export from a Low-Density Residential Watershed and an Adjacent Forested Watershed." Lake and Reservoir Management Volume II.

Figure 2 Lake Pennesseewassee Watershed Survey Sites[2]



[2] Survey site locations shown on the map are approximate. Contact LAON for more information.

Table 1. Total number of NPS sites by land use and impact to lake

Land Use	High Impact	Medium Impact	Low Impact	Total # of Sites	% of Total
Residential	1	17	56	74	41
Town Road	3	26	10	39	22
Private road	0	16	6	22	12
State Road	2	10	6	18	10
Driveway	1	6	5	12	7
Other	2	6	7	15	8
TOTAL	9	81	90	180	100%

Figure 3. Land Use of Sites

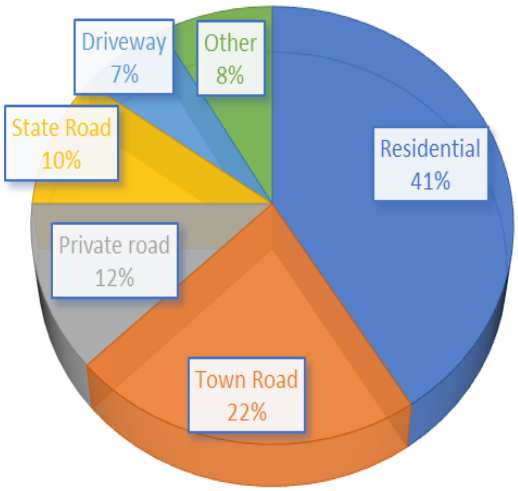


Figure 4. Impact of Site Based on Erosion, Area and Vegetation

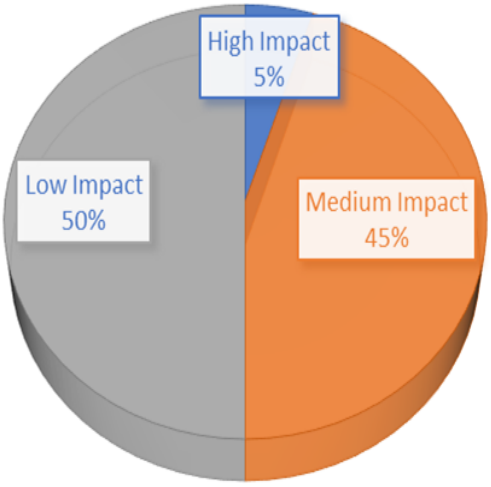
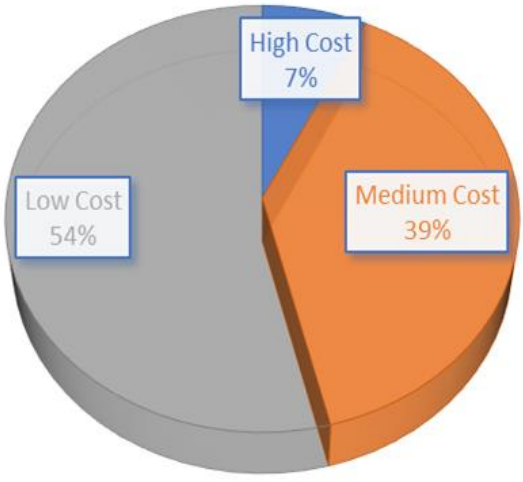


Figure 5. Estimated Cost of Remediation of Sites



C. Watershed Goal(s) and Objectives

Overall Goal: The plan goal is to maintain or improve water quality in Lake Pennesseewassee by reducing phosphorus and sediment loading to the lake. This will be achieved by applying BMPs, within the following actions over the next ten-year period (2020-2029):

- ***Reduce current sources of phosphorus loading*** by addressing the 180 sites identified in the watershed survey. This will be achieved by providing targeted outreach, technical assistance and cost-sharing assistance to install conservation practices at the NPS sites identified in the watershed survey. The success of these efforts will be dependent upon state, town and property owner cooperation and support.
- ***Prevent new sources of phosphorus loading into Lake Pennesseewassee*** by facilitating improved land use practices and ongoing maintenance activities. This objective will be met by conducting outreach and providing technical assistance to residents, road associations, and town officials.
- ***Build local capacity for watershed stewardship*** by using the Lakes Association of Norway (LAON) to raise awareness and disseminate information on best practices for property owners to employ. Explore LakeSmart program involvement to raise awareness, recognize lake-friendly properties and prompt BMP installation on residential properties.
- ***Conduct ongoing assessment of lake and watershed conditions*** by monitoring lake water quality and setting up and maintaining the NPS Site Tracker.

Note that while this plan focuses on Lake Pennesseewassee and its watershed, LAON has already completed a formal watershed survey and 319 grant remediation of North Pond. It will also be working to conduct formal watershed surveys and mitigation work on Hobbs Pond and Sand Pond in the coming years.

D. Schedule and Action Items to Guide Plan Implementation

Action Plan and Schedule

An estimated schedule, action items, and milestones were developed by the Lake Pennesseewassee Watershed Steering Committee to address existing NPS sites impacting Lake Pennesseewassee and to prevent new NPS problems. The plan aims to address all known erosion sites, and through expanded watershed stewardship be watchful for new sites that would be added to planning activities. For planning purposes, sites classified as "residential", "driveway", and "private road" are considered "*private property sites"*. Naturally, the ability to address sites on private property will be dependent upon property owner cooperation and support, and on the ability to obtain adequate funding. Considering the extensive size of the watershed, and the large number of erosion sites, the proposed plan would address the watershed in three phases. Implementation of the three phases would be over a period of from 6 to 10 years, with a desire to complete all phases in the shortest timeframe possible, depending on resources. Rather than an even distribution of sites among the phases, Phase 1 will have less sites than Phases 2 and 3 but will address a higher proportion of the most impactful sites in order to reduce NPS pollution as quickly as possible.

Work efforts for private property sites within each phase will be headed by one or more area leaders each addressing a manageable number of sites. Concurrently, a town coordinator will work with the towns of Norway and Greenwood to address the town road and other town sites allocated to each phase. Each phase will also have an overall project manager responsible for coordinating

and tracking the work on the private and public sites that are being remediated in that phase. It is possible that an individual could have multiple roles. For example, an area leader could also be the project manager. The exact size, makeup, and degree of overlap between the phases will be determined by the availability of resources and experiences gained in each. Information on state owned sites will be communicated via the Maine DEP to the Maine Department of Transportation (MDOT) for inclusion in their planning activities. The plan will be supported by local funding and resources; however, state and federal funding will also be sought to help implement some significant actions in the plan. An estimated schedule is shown on Table 2. Action items, potential funding sources and key partners are identified on Table 3. LAON will continue its existing multi-level water quality protection programs (*Water Quality Monitoring, Courtesy Boat Inspections, Invasive Species Screening, Outreach, and Watershed Management).* This combination of proactive prevention actions and inspections provides a sound approach to protecting Norway's waters.

Table 2. Implementation Schedule (LAON is the responsible organization)

2020	• Segment watershed into remediation sections to support multiple phases of remediation planning (anticipate 6 to 10 years to address all sites, utilizing multiple 319 grants). • Bring key stakeholders into remediation planning (property owners, towns of Norway and Greenwood). • Apply for the initial EPA 319 Clean Water Act grant to address Phase 1 sites. • Communicate (via Maine DEP) site information related to state roads to Maine DOT. • Continue to use LAON's outreach program to increase awareness of watershed improvement efforts, and to communicate best practices to prevent NPS pollution. • Begin to address erosion sites identified in the 2019 watershed survey. • Set up NPS Site Tracker.
2021 – 2023	• Conduct EPA 319 projects (if funded) with targeted cost sharing and matching grants for high priority sites identified in Phase 1 of the plan. • Communicate the Lake Pennesseewassee watershed improvement efforts to all property owners and advocate the application of best practices. • Continue with and expand outreach efforts. • Advocate the LakeSmart program. • Work with property owners to address NPS sites. • Identify areas where LAON and the Towns of Norway and Greenwood can increase cooperation and mutual support in prevention and the remediation of NPS sites.
2022 - 2029	• Apply for EPA 319 Clean Water Act grant to address the 2nd and 3rd phases of the plan. • Conduct EPA 319 projects (if funded) with targeted cost sharing and matching grants for high priority sites identified in Phases 2 and 3 of the plan. • Continue outreach, working with property owners and LakeSmart efforts identified in Phase 1 of the plan. • Continue working with towns of Norway and Greenwood to address NPS sites, and to incorporate BMPs into highway projects.

2020 – 2029	• Raise funds for ongoing watershed stewardship. • Landowners address NPS sites independently, with guidance/assistance from LAON, SWCD, and other technical advisors, as needed and as available. • Coordinate communication with MDOT through Maine DEP to track the status of state owned erosion sites. • Use NPS Site Tracker to record maintenance needs and prompt ongoing road maintenance. • Continue with all LAON's protection/inspection programs: Water Quality Monitoring, Courtesy Boat Inspections, Invasive Species Screening, and Outreach.

Table 3. Action Items and Milestones

Action Items	Schedule	Who	Potential Funding Sources
Reduce current sources of P loading to Lake Pennesseewassee by addressing NPS sites identified in the watershed survey			
Initial actions to support all three phases			
Divide plan into 3 phases that will address all identified sites, as follows: • 15 self-funded Residential sites • 59 Residential sites • 12 Driveway sites • 39 Town road sites • 22 Private road sites • 15 Other land use sites	2020	LAON, Steering Committee	NA
Notify NPS site property owners of watershed survey results, explaining phased approach, technical resources & possible financial support.	2020-2021	LAON, SWCD	LAON
Conduct private property site owners meeting to review types of issues and BMPs, build support, and solicit volunteers. Encourage independent efforts.	2020	LAON	LAON
Provide guidance to landowners regarding permitting.	2020-2029	LAON, SWCD	NA
Review survey findings with Towns of Norway and Greenwood to create plans to address the 42 sites on their properties over the 3 planned phases.	2020	LAON, Norway & Greenwood	NA
Identify volunteers who will help install BMPs.	Ongoing	LAON	NA
Property owners begin to address approximately 10 residential sites.	2020	Landowners	Landowners, LAON
Work with Maine DEP to have MDOT plan to address the 18 state road sites.	2020-2029	LAON, DEP, DOT	Maine DOT
Set up NPS site tracker.	Ongoing	LAON, DEP, SWCD	LAON

Address Phase 1 NPS sites			
Identify Phase 1 project manager, private property area leaders, and town coordinator. Assign up to 20 sites per area leader.	2020	LAON, Steering Committee	NA
Apply for Clean Water Act Section 319 Watershed Grant through the Maine DEP to support Phase 1.	2020	LAON, SWCD	LAON
Complete Phase 1 residential sites started in 2020.	2021-2022	Landowners	Landowners
Address the Phase 1 selected private property sites and the projects agreed upon with the towns of Norway and Greenwood. Technical assistance will be provided as needed.	2021-2022	Landowners, Town of Norway, SWCD	EPA (319), LAON, Landowners, Road Associations
Address Phases 2 and 3 NPS sites			
Begin the next phases using experiences gained from prior phases. Action items, the exact size of the remediation areas and timing for each phase will be dependent upon resources available and experiences from prior phase. These phases will address the sites remaining after Phase 1. Being cognizant of the benefits of addressing sites as soon as possible, the start of Phases 2 and 3 will depend upon the experiences gained in prior phases, and available resources.	2022-2027	LAON, Steering Committee, SWCD	LAON, EPA (319), Landowners, Road Associations

Prevent new sources of phosphorus loading to the lake			
Education and Outreach			
Post the survey report and summary, as well as, the watershed protection plan on the LAON website and Facebook. Provide updates as the plan is implemented.	Ongoing	LAON	NA
Provide updates and encourage landowners to protect Norway's lakes via LAON's annual newsletter, annual meeting, mass emails, presence and displays at local events, and articles in the local newspaper.	Ongoing	LAON	LAON
Post BMPs on website and post photos of BMPs applied in Norway.	Ongoing	LAON	NA
Conduct on-site workshops on road maintenance, and to show property owners how to survey their property, identify NPS sites, and install best practices. This could identify additional NPS sites.	2021-2029	LAON, DEP, SWCD	LAON, EPA (319)
Add best practice information to LAON's Realtor Kit.	Ongoing	LAON, SWCD	LAON
Conduct campaign to encourage property owners to protect shoreline by expanding buffer plantings.	Ongoing	LAON, DEP SWCD	LAON, EPA (319)
Provide Norway's CEO a handout to distribute to property owners with information on erosion control guidelines.	Ongoing	LAON, SWCD	LAON
Build local capacity for watershed stewardship for all 4 lakes within LAON			
Plan on how and when to advocate Lake Smart practices and evaluation. Network with other lake associations to learn from their Lake Smart experiences. Consider establishing a Lake Smart coordinator/project leader.	2020-2029	LAON, SWCD, Maine Lakes Society	LAON, Landowners
Meet with Road Associations to explain BMPs for road maintenance.	2020-2029	LAON, SWCD	LAON, EPA (319)
Work with Town of Norway to maximize the alignment of Code Enforcement including projects requiring permits (upgrades, maintenance,	Ongoing	LAON, SWCD, Town of Norway	NA

or new development) and the Highway Department with improved land use practices and BMPs.			
Work with the town of Greenwood's highway department to maximize the alignment of their Highway Department with BMPs.		LAON, SWCD, Greenwood	NA
Conduct ongoing assessment of lake and watershed conditions			
Continue with summer water quality monitoring program.	Ongoing	LAON, LSM, DEP	LAON
Formalize system to enable property owners to self-identify erosion sites.	Ongoing	LAON	LAON

E. Proposed Management Measures

The ***Lake Pennesseewassee Watershed Survey Report*** (See Appendix) lists specific management measures recommended for each of the NPS erosion problems identified during the survey. Typical problems and management measures for the most common land uses identified in the watershed survey are described in the sections below. Recommendations follow guidelines found in MDEP publications including the ***Gravel Road Maintenance Manual***, ***Conservation Practices for Homeowners*** fact sheet series, and ***Erosion and Sediment Control Manual***. The recommended BMPs accomplish the plan goal of reducing phosphorus and sediment loading to the lake by stabilizing bare soil and erosion and diverting, infiltrating or filtering polluted runoff before it reaches the lake.

In addition to structural BMPs recommended for each problem, non-structural BMPs (public education and outreach efforts) will also be needed to promote responsible stewardship and ongoing maintenance activities. The NPS Site Tracker will be created and used by LAON with support from MDEP and SWCD on an ongoing basis to identify new problems and to prompt maintenance on sites fixed through the plan.

Structural BMPS at existing NPS sites

1. Residential and Other Sites

The watershed survey identified 74 residential erosion sites and 15 other land use sites (Table 4). The "Other Land Use" category includes trails/paths (3), construction (3), commercial (3), beach access (3), municipal (2) and boat access (1). The issues found at these sites were very similar to those found on residential sites, and therefore, the recommended solutions will also be similar.

Table 4. Residential and Other Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Residential	0	0	1	8	7	2	55	1	0	74
Other Land Use	0	2	0	4	2	0	5	2	0	15

Common problems included lack of vegetated buffers, bare soil on footpaths, along roof driplines, and adjacent to the lake causing sheet surface and rill erosion. Based on the survey results, the most common BMPs will include:

- Vegetated buffers
- Erosion control mulch or stones
- Infiltration trenches along roof driplines
- Footpath stabilization and definition
- Runoff diverters
- Stabilization of bare soil

The plan aims to address all the 74 residential and 15 other erosion problems identified in the watershed survey in three phases. For each phase an estimated 20 to 30 sites will be fixed by a

combination of property owner funding, and small matching grants for plants, erosion control mulch or other materials. Additionally, each phase will address approximately 5 sites classified as other. In all phases, the emphasis will be on high impact sites. Targeted outreach and technical assistance will be provided.

2. Private Roads, Driveways and Recreational Trails

The watershed survey identified 34 private road and driveway sites (Table 5). They are discussed here together since the management measures are similar. Impact ratings are relatively higher for these sites compared to other residential problems in the watershed.

Table 5. Private Road and Driveway Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Private road	0	0	0	0	14	2	3	3	0	22
Driveways	0	0	1	1	5	0	1	4	0	12
Total	0	0	1	1	19	2	4	7	0	34

Common problems included poor shaping, moderate to severe ditch or road surface erosion, and grader/plow berms trapping surface runoff on the road surface. The most common BMPs and recommendations in the survey included:

- Add material and reshape (crowning) the road surface
- Remove berms that trap runoff on the road surface
- Install waterbars to divert water off the road
- Install turnouts and check dams
- Clean, enlarge and stabilize ditches
- Armor culvert inlets and outlets
- Install plunge pools

The plan aims to address approximately one-third of the private road and driveway sites in each phase. They will be addressed by providing cost sharing funds to road associations and landowners. Like residential sites, targeted outreach and technical assistance will be provided to landowners and road associations. It is anticipated that some of these problems will be fixed by property owner funded solutions, but further discussions with property owners are necessary for a better understanding of the extent of this option.

Ongoing maintenance (e.g., grading, removing accumulated sediment from sediment basins and turnouts) is critical to long term performance of these BMPs and prevention of new NPS problems. As a result, the plan calls for periodic inspections of implemented BMPs. Follow up contact will be made by LAON to road associations and landowners for any maintenance needs.

3. Town Roads

Table 6 shows that there were 39 town road sites identified in the watershed survey. Thirty-two were in the Town of Norway and 7 in the Town of Greenwood.

Table 6. Town Road Sites Impact and Cost

	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Norway	0	2	1	5	11	4	6	3	0	32
Greenwood	0	0	0	1	5	0	1	0	0	7
Total	0	2	1	6	16	4	7	3	0	39

Following the Lake Pennesseewassee Watershed Survey, the Town of Norway was informed of overall findings and will be involved with remediation planning. The Town Highway Department has performed road improvements in some of the site areas. These areas will be resurveyed in the spring of 2020 to see if any sites have been addressed, or if any additional action is needed. The NPS Site Tracker can be used to prompt periodic inspections of the town road sites and communication with the Town of Norway about future maintenance needs. Similar discussions will be held with the Town of Greenwood in the spring of 2020.

Common problems included erosion around culverts, moderate to severe ditch erosion, and grader/plow berms. The most common BMPs and recommendations in the survey included:

- Remove berms that trap runoff on the road surface
- Install waterbars to divert water off the road
- Install turnouts and check dams
- Clean, enlarge and stabilize ditches
- Armor culvert inlets and outlets
- Install plunge pools

4. State Roads

The Lake Pennesseewassee Watershed Survey identified 18 sites located on State of Maine roads. (Table 7).

Table 7. State Road Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
State Road	0	0	2	1	9	0	6	0	0	18

Preliminary discussions were held with representatives of the Maine DEP regarding the state sites. They indicated that they work directly with the Maine DOT to address these sites. We will continue to work with MDEP about the remediation of these sites. These areas will be resurveyed in the spring of 2020 to see if any sites have been addressed, or if any additional action is needed. The NPS Site Tracker can be used to prompt periodic inspections of the state road site and communication with the State DEP and DOT about future maintenance needs.

Non-Structural BMPs

In addition to the actions to mitigate existing NPS sites, the plan includes a proactive strategy to prevent and identify emerging NPS sites. These actions include the use of the NPS Site Tracker to monitor existing and newly identified NPS sites and communication through LAON outreach efforts including annual meetings, mass-email messages, the LAON website, Facebook, workshops, and the utilization of local media to communicate BMP information.

F. Plan Ownership and Partner Roles

The Lake Pennesseewassee plan will be carried out by the **Lakes Association of Norway** (LAON) in association with Oxford County Soil and Water Conservation District (SWCD). LAON will have responsibility for plan oversight and implementation. Partners include: MDEP, the Town of Norway, private road associations and landowners.

- **LAON** will provide Plan oversight, conduct outreach activities to promote watershed stewardship, and raise funds for stewardship work. Through the SWCD, they will offer information on current BMPs applicable to road maintenance and building sites to the Town of Norway Highway Department and Code Enforcement. LAON will also set up and use the NPS Site Tracker to identify new NPS sites and prompt ongoing maintenance.
- **Oxford County Soil and Water District Conservation District** (SWCD) will provide project management for 319 grants (if awarded). Oxford County SWCD will provide technical assistance to identify and remediate NPS problems, support LakeSmart program activities and assist outreach efforts and training for appropriate departments within the Town of Norway.
- **Private road associations and landowners** will address NPS issues on their properties and conduct ongoing maintenance of BMPs.
- The **Town of Norway** will continue providing funding support for LAON's water quality monitoring, courtesy boat inspection and efforts to address NPS problems and conduct regular maintenance on town road sites.
- **MDEP** will conduct water quality monitoring and provide technical assistance and support through the NPS Grants Program.
- **EPA** may provide CWA Section 319 funds and guidance.

G. Water Quality Results Monitoring and Tracking Project Success

1. Water Quality Results Monitoring

Maine water quality criteria require that lakes and ponds have a stable or improving trophic state and be free of culturally induced algal blooms. LAON will continue to monitor Lake Pennesseewassee once a month from May through September for parameters including Secchi disk transparency, temperature, Chlorophyll-a, dissolved oxygen and total phosphorus. MDEP also conducts baseline monitoring on Lake Pennesseewassee about every five years for these and other parameters.

MDEP conducts Secchi disk trend analysis every two years as part of their Integrated Water Quality Monitoring and Assessment report. Trend reporting (positive, negative or stable) will assist in determining whether the plan meets its goal of having stable or improving water quality over time.

2. Pollutant Load Reductions

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

3. Plan Outputs and Milestones

It is anticipated that the plan will generate the following Plan Outputs and Milestones

Organizational Outputs (LAON)

- Lake Pennesseewassee Watershed Steering Committee formed under the existing non-profit Lakes Association of Norway (LAON) applies for 319 grant for Phase 1 project
- Creates NPS Tracker and local coordinator trained to use
- Contacts property owners and road associations associated with NPS sites identified in the watershed survey
- Completes multiple Outreach projects

NPS Mitigation Outputs

- Number of NPS sites fixed by voluntary landowner initiative (15)
- Number of NPS sites fixed with cost sharing assistance (147)
- Number of technical assistance visits (60)
- Estimated pollutant load reductions achieved by installed BMPs

Water Quality Outcomes

- Stable or improved trend for lake water clarity, total phosphorus, and dissolved oxygen
- Meet lake GPA standards in MDEP's biennial 303d reports

APPENDIX: Lake Pennesseewassee Watershed Survey Report

LAKE PENNESSEEWASSEE WATERSHED SURVEY REPORT

JANUARY 2020

PREPARED BY:

Lakes Association of Norway

ACKNOWLEGEMENTS

The Lake Pennesseewassee Watershed Survey Project was organized and conducted on behalf of The Lakes Association of Norway (LAON). The project was planned by a steering committee and carried out by 19 volunteers with support from six technical leaders. The draft report was prepared by a steering committee subcommittee and then finalized by the full steering committee.

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The Lake Pennesseewassee Watershed Survey was made possible by the members of the Lakes Association of Norway through their generous contributions. Thanks to Lake Stewards of Maine for a grant towards survey expenses and to the Maine DEP for ongoing guidance. Meeting space was generously provided by the Town of Norway.

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EXECUTIVE SUMMARY

What is a watershed? Why is this important?

A watershed is all the land that drains into a lake through streams, over the ground surface, or through ground water. On undeveloped forested land, runoff is filtered by plants, tree roots, and natural debris. In developed areas, roads, rooftops, and compacted soil concentrate and speed up runoff, turning it into a destructive erosive force that transports naturally occurring phosphorous and sediment. When excess phosphorus enters a lake, algae growth increases. That can cause choking blooms and changes in water quality that can, over time, become difficult and prohibitively expensive to restore.

Lake Pennesseewassee Watershed Survey

Lake Pennesseewassee is included on the Maine Department of Environmental Protection's Priority Watersheds List as a "threatened" lake due to its sensitivity to additional phosphorus inputs. With the permission of property owners, 19 trained volunteers with 6 technical leaders conducted a survey in 2019 of nearly 1,400 properties and found 180 erosion sites. Each problem was ranked based on probable impact, the technical ability needed to fix it, and the estimated cost. Virtually all erosion sites simply evolve over time without anyone doing anything wrong and many can be fixed at low cost. Without identifying the owners, the problems we found are listed in this Report.

What can be done?

For each problem, there is a recommended solution. We can reseed bare soil, define footpaths, or plant a buffer of native plants at the shoreline. We can repair or reposition gutters. Where water flows down off driveways, we can install diverters or reshape and strengthen ditches. Roads can be reshaped to reduce surface erosion. The banks surrounding culvert openings can be reinforced. This is only a very small sampling of what we can do to reduce harmful runoff.

Next steps

Our aim is to protect Lake Pennesseewassee's excellent water quality by addressing sources of phosphorus within the lake's watershed. We will develop a watershed-based protection plan, communicate with property owners, and help them develop specific remediation plans. We will also seek funding to assist with repairs, provide information on best practices, offer technical assistance to homeowners and town officials, and conduct more watershed surveys as soon as resources permit.

INTRODUCTION

This report was specifically designed for landowners and municipal officials in the Lake Pennesseewassee watershed. It provides the results and analysis of a watershed survey conducted during the summer of 2019. The survey was conducted in response to a desire to develop proactive approaches for maintaining Lake Pennesseewassee's water quality and a desire to improve and preserve the lake for the enjoyment of future generations. Lake Pennesseewassee is the largest of the lakes covered by The Lakes Association of Norway (LAON), which was established in 1971 with a mission of protecting the water quality of its four lakes: North Pond, Lake Pennesseewassee, Hobbs Pond, and Sand Pond.

LAKE PENNESSEEWASSEE AND ITS WATER QUALITY

Lake Pennesseewassee is located in the Town of Norway in Oxford County, Maine. The lake covers 987 acres, has a maximum depth of 48 feet (14.6 meters) and an average depth of 18 feet (5.5 meters), which is maintained by a dam on the outlet of the lake. The lake is mesotrophic (moderately productive) and supports a cold water and warm water fishery with more than 12 different species reported. Lake Pennesseewassee Park is operated by the Town of Norway and contains a beach, playground and boat ramp. *DownEast Magazine* listed Lake Pennesseewassee as one of the "12 Best Maine Lakes for Swimming."

Lake Pennesseewassee water quality data has been collected regularly by the Maine Department of Environmental Protection (DEP), and LAON contractors and volunteers. Historically, the Secchi disk (a device used to measure water clarity) was visible to an average depth of 5.7 meters (18.7 feet), indicating moderate water clarity.

NPS Priority Watersheds

Maine DEP maintains a list of watersheds where water quality is impaired or considered particularly threatened by polluted runoff.

Lake Pennesseewassee is on this NPS Priority Watersheds list, which makes the pond eligible for 319 grant funding under the Clean Water Act.

Dissolved oxygen levels become depleted in the bottom half of the lake each summer. In most years the bottom 6 meters of the lake are devoid of oxygen by August, impacting aquatic life, particularly the cold-water fishery. This oxygen depletion is believed to be influenced by the continual accumulation of dead organic material on the bottom of the lake which consumes oxygen as it decomposes. The subsurface topographic contour of the lake may also make it susceptible to a certain level of "natural" oxygen loss, which may be exacerbated by excess organic matter decomposition. Phosphorus, entering the lake via runoff, impacts this process by accelerating the growth of algae, which then dies and adds to organic material on the bottom. Total phosphorus concentrations are relatively high in Lake Pennesseewassee and recent data may suggest a slight worsening of levels in recent years, particularly in the bottom layer as this nutrient is released from sediment. Chlorophyll concentrations, an indicator of algae growth, typically are at approximately 4.6 ppb in Lake Pennesseewassee and are considered higher than average for a Maine lake.

As a result of the moderately high algae levels and depletion of oxygen, Lake Pennesseewassee is listed on the DEP's list of lakes "Most at Risk from New Development" under the Maine Stormwater Law. Lake Pennesseewassee is also on the Maine DEP list of Nonpoint Source Priority Watersheds.

WHY IS LAKE PENNESSEEWASSEE'S WATER QUALITY AT RISK?

The biggest pollution threat to Lake Pennesseewassee and other Maine lakes is polluted runoff from watershed development and roads. Storm water runoff can wash soil and nutrients from the surrounding landscape into lakes and streams during and after rainstorms and snowmelt.

In undeveloped, forested areas of the watershed, stormwater runoff is slowed and filtered by tree roots, understory plants, leaves, and other natural debris on the forest floor. It is further filtered as the water percolates through the soil profile. Impervious surfaces, such as rooftops, compacted soil, lawns and gravel or paved roads, are common in developed areas and can increase the volume and velocity of runoff resulting in increased erosion and delivery of sediment and pollutants into the lake.

POLLUTED RUNOFF

Soil, fertilizers and other pollutants from diffuse sources across the landscape that are carried into the lake by runoff from rain or snowmelt. This increases phosphorus levels, which increases algae growth.

Large volumes of sediment can settle out in the lake, creating an ideal substrate for nuisance and invasive aquatic plants such as variable-leaved water milfoil. Phosphorous, which is a naturally present element in soils and is also found in septic waste, animal manure and fertilizers, can easily be carried to the lake by runoff. This nutrient is an essential food for all plants and it is the primary factor influencing the growth of algae. In natural conditions, the low level of phosphorus in a lake limits algae growth, however, when a lake receives extra phosphorus from the watershed, algae growth increases dramatically. Sometimes this growth causes choking blooms, but more often it results in small, insidious changes in water quality that, over time, damage the ecology, aesthetics and economy of lakes. In recent years, increased amounts of algae have been reported on Lake Pennesseewassee. Runoff from roads and existing and new development needs to be managed in order to prevent the transport of pollutants such as phosphorous into the lake. This is especially important in areas where proximity of roads and sources of erosion result in the direct entry of runoff into the water.

High phosphorus levels result in an increase in organic matter in the bottom of the lake and diminished dissolved oxygen during the summer months. In turn, oxygen loss may contribute to a geochemical process whereby phosphorus that has accumulated in the bottom sediments becomes biologically available to the algae in the overlying water, increasing its growth. This cycle could result in a rapid decline of water quality. The chemical makeup of the sediments in Lake Pennesseewassee, however, could reduce the probability for significant sediment release of phosphorous in the absence of dissolved oxygen.

WHY SHOULD WE PROTECT LAKE PENNESSEEWASSEE FROM POLLUTED RUNOFF?

- Lake Pennesseewassee is the largest and most extensively used lake in Norway, which provides major recreational and economic resources for the entire Norway area.
- The lake contains valuable habitat for fish, birds and other wildlife.
- Lake Pennesseewassee has a moderate potential for nuisance algal blooms and for internal loading problems which can impact recreational opportunities as well as decrease the biodiversity of life in the lake.
- Once a lake has declined, it can be difficult and prohibitively expensive to restore.
- A 1996 University of Maine study demonstrated that lake water quality affects property values. For every meter (3 ft.) decline in water clarity, shorefront property values can decline as much as 10 to 20 percent. This can affect individual landowners as well as the entire community.

LAKE PENNESSEEWASSEE'S WATERSHED

WATERSHED

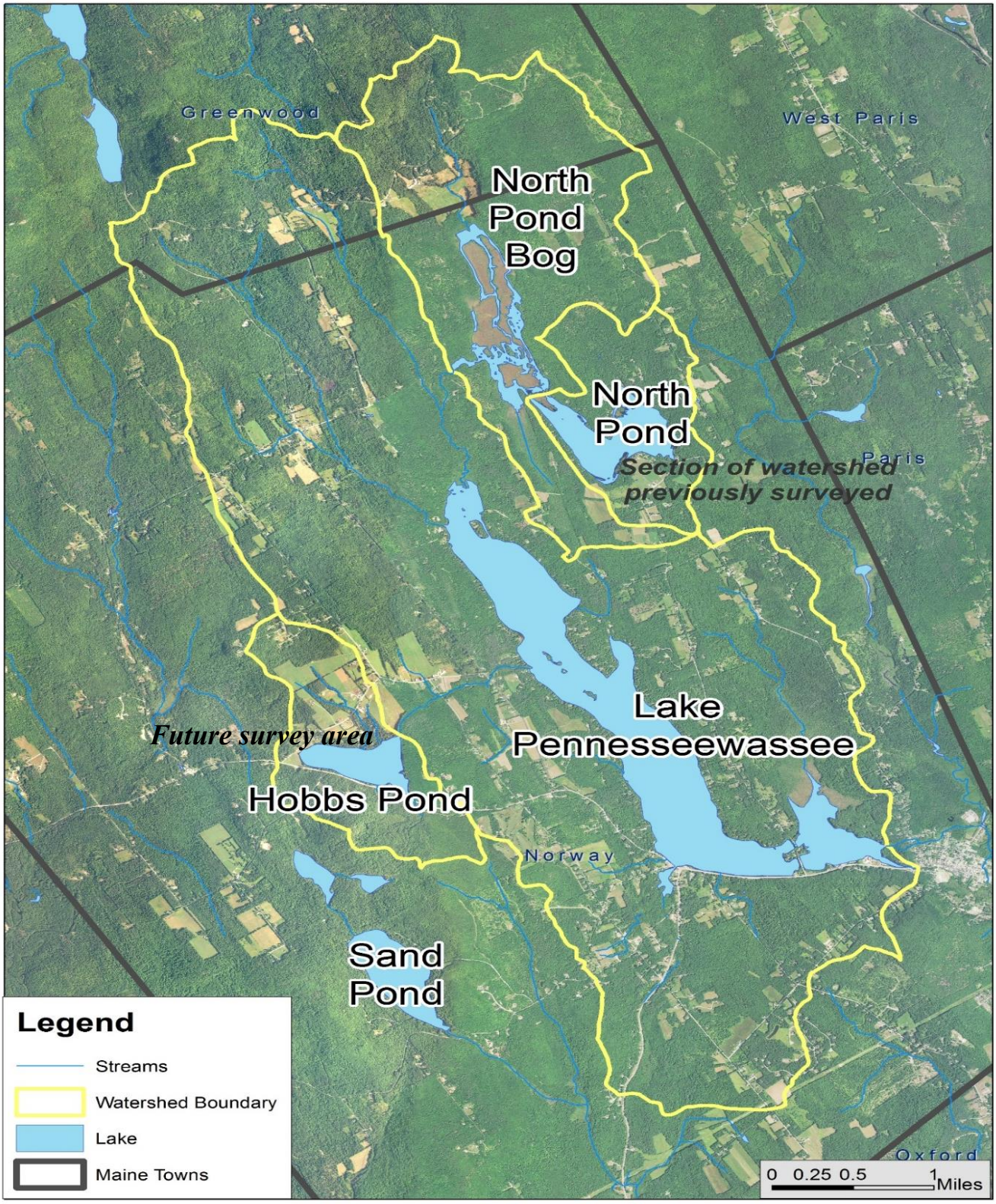
All the land that surrounds a lake that drains or sheds its water into the lake through streams, ditches, directly over the ground surface or through ground water.

The Lake Pennesseewassee watershed includes feeds from North Pond, North Pond Bog and Hobbs Pond, as well as a network of feeder streams, ditches and land that flows into the lake (Figure 1). There are both public and private roads within the watershed, and many of them are in close proximity to the lake. Many of the private roads have associations that raise funds to conduct varying levels of road maintenance. Watershed development includes agricultural areas and 277 shoreline year-round and seasonal homes on Lake Pennesseewassee. The watershed also contains numerous trails for walking, hiking, skiing, snowshoeing, ATVs and snowmobiles. The Western Foothill Land Trust owns several parcels of land within the watershed that are used for public access and the Town of Norway operates a town park and boat launch on the southern end of the lake. Two commercial marinas with private boat launches are located on the lake. State owned Rt 117/118 runs alongside Lake Pennesseewassee for over 1 ½ miles and the impact of this section on water quality is of particular concern. The watershed remains mostly forested although it is experiencing occasional new development.

The Lake Pennesseewassee drainage area covers 22.2 square miles, mostly in the town of Norway with a lesser area in the town of Greenwood. The lake flows into the Little Androscoggin River that then flows into the Androscoggin River. The flushing rate of Lake Pennesseewassee is estimated at 1.38 flushes per year.

Additional phosphorus flowing into Lake Pennesseewassee from North Pond and Hobbs Pond contributes to the phosphorus loading in Lake Pennesseewassee, which has the potential to lead to more algae growth.

Figure 5. Map of Lake Pennesseewassee Watershed



WHAT IS BEING DONE TO PROTECT LAKE PENNESSEEWASSEE?

Several activities have taken place on Lake Pennesseewassee in recent years to assess and protect the lake's water quality.

Water Quality Monitoring – Lake Pennesseewassee has been regularly monitored since 1976 by the Maine DEP. For decades, LAON also hired contractors to do water quality testing. Since 2015 the testing has been done by LAON volunteers led by a Ph.D. aquatic biologist with the Department of Marine Sciences at the University of New England. The water quality data generated monthly during the summer includes Secchi disk transparency readings as well as color, pH, alkalinity, specific conductivity, total phosphorus and chlorophyll levels. Additionally, dissolved oxygen profiles have been monitored monthly in order to assess the degree of late summer oxygen depletion. Each year LAON contracts with Lake and Watershed Resource Management Associates to do an extensive level 3 aquatic survey to look for invasive plants.

Watershed Planning Efforts – In the mid-1990s, the Androscoggin Valley Council of Governments (AVCOG) conducted town-wide watershed surveys and ditch inventories to identify erosion issues. From 1997-2003, the Phase I, Phase II and Phase III Norway Lakes Improvement Projects helped fix numerous erosion sites and provided technical assistance to landowners while raising awareness through demonstration projects and public awareness workshops. The purpose of the project was to reduce sediment and phosphorus loading to the four major lakes in Norway. Although many of the project sites were located in other watersheds, the Phase I project addressed three private roads sites and the Phase III project addressed one town road site in the Lake Pennesseewassee watershed.

Watershed Survey - Watershed surveys have been found to be one of the most effective ways to protect lake water quality since they identify existing and potential sources of polluted runoff. In 2015, LAON approached DEP to discuss strategies for protecting Norway's lakes, and watershed surveys were identified as an important first step. North Pond was targeted as the first watershed survey for the town, and the survey was conducted in the summer of 2016. A North Pond Watershed Plan was approved and led to the successful application and receipt of a grant for North Pond funded in part by USEPA under section 319 of the Clean Water Act. The North Pond remediation efforts have been very successful in meeting the goals identified in the grant application, including the prevention of over 35 tons of soil loss per year.

In 2019 with the North Pond remediation efforts nearing completion the Lakes Association of Norway (LAON) planned and implemented a survey of the Lake Pennesseewassee Watershed.

PURPOSE OF THE WATERSHED SURVEY

The primary goals of the Lake Pennesseewassee watershed survey were to:

- Identify and prioritize existing sources of polluted runoff, particularly soil erosion sites, on residential, town and state properties.
- Inform watershed residents and stakeholders that bare eroding soil is a primary source of water pollution.
- Raise awareness about the connection between land use and water quality, and the impact of polluted runoff.
- Make general recommendations to landowners for fixing erosion problems on their properties.
- Use the information gathered to develop a lake watershed-based protection plan that will help guide long-term lake protection efforts and open the door for possible funding through the 319-grant program.

Many activities and land uses can coexist with water quality protection and safe drinking water. The purpose of the survey was to provide grounds at the local level for balancing protection of a beautiful and valuable water resource and public health with other activities and uses of the resource and surrounding land. Pointing fingers at landowners with problem spots was NOT an objective of the survey, nor was it to seek enforcement action against landowners not in compliance with ordinances. While it is important to be accountable for the problems that arise, there is no individual or single entity responsible for the water quality issues of Lake Pennesseewassee. Rather it is the accumulation of all inputs, past and present that are responsible for water quality degradation. It is the hope that through future projects, landowners will work on their own or with the town, LAON and technical staff to solve erosion problems on their properties.

THE SURVEY METHOD

A Lake Pennesseewassee Watershed Survey Steering Committee was formed in early fall 2018. The Lake Pennesseewassee Watershed consists of 1,533 properties. Of these, 156 had been surveyed in the 2016 North Pond Survey and were the target of the North Pond 319 remediation grant. These properties were not included in the present survey. The remaining 1,377 properties, including 116 properties in the North Pond Bog watershed, were included in the Lake Pennesseewassee watershed survey of which 1,297 are in the Town of Norway and 80 are in the Town of Greenwood. The 1,377 properties are owned by 1,065 different property owners. Letters were mailed to all the watershed property owners prior to the survey to inform them about the planned effort and give them the opportunity to "opt-out" their property. Only nine property owners requested their property not be included in the survey. The 1,377 properties in the watershed were initially divided into ten sectors. An additional sector was subsequently added to include the five islands in the Lake.

Technical staff from the Maine DEP, Oxford County Soil & Water Conservation District, Lakes Environmental Association (LEA) and Fiddlehead Environmental Consulting led teams of volunteers across the sectors to document erosion on the roads, properties, and driveways. Survey 123 for ArcGIS, an electronic tool, was used to record standardized field data. On May 21, 2019 two teams of trained volunteers and technical staff refined the survey techniques in the North Pond Bog and two of the sectors and tested the use of Survey 123. On June 1, 2019 all volunteers received Maine DEP training and then the major survey effort was completed by six teams of volunteers and technical staff. Although most of the watershed was surveyed over two days, additional days were required to complete the survey due to the size of the watershed.

The data collected using Survey 123 was downloaded into a spreadsheet and imported into a database. The documented erosion sites were plotted on maps. Identified sites were broken out into categories (such as residential and private roads) and ranked based on their probable impact on the lake, along with an assessment of the technical ability and estimated costs required to address the problem. A summary of sites and associated rankings are discussed in the next section of this report.

SUMMARY OF WATERSHED SURVEY FINDINGS

The following figures and tables summarize the survey results across 180 identified erosion sites. Residential properties had the highest number of documented sites followed by town, private and state roads, and then driveways. Other land uses made up less than 8% of the total sites and included beach or boat access, public and commercial areas, construction sites and trails. All sites received an impact score based on the type of erosion present, the size of the area involved and the type and density of vegetation present which could mitigate an issue. Ninety of the 180 sites received a compiled score that resulted in them being identified as having a low impact on the lake. Eighty-one were identified with a medium impact and nine with a high impact. Figure 6 is an overview map

Figure 2. Land Use of Sites

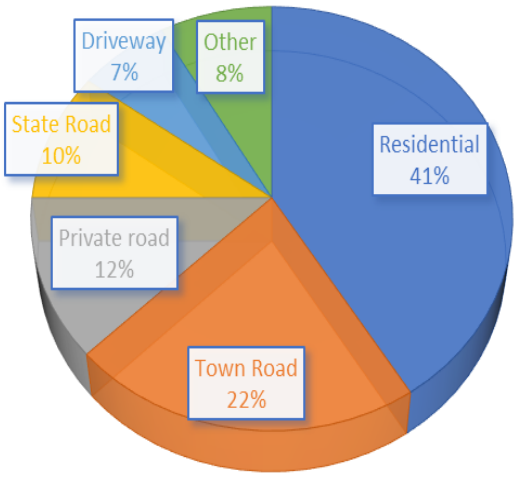
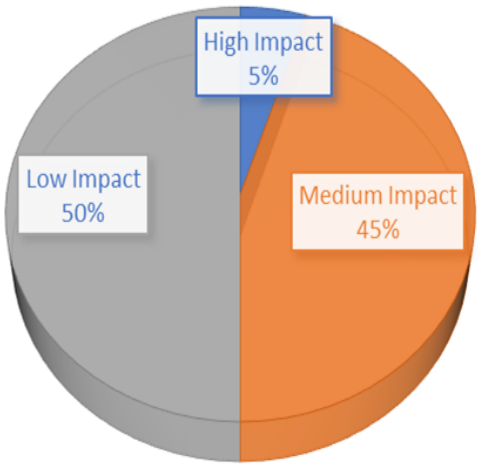


Figure 3. Impact of Site Based on Erosion, Area and Vegetation



of the Watershed Survey Erosion Sites. Appendixes A-1 through A-6 provide maps with more detail.

Once field data describing the physical characteristics of each site was collected, a solution was recommended by the team technical lead and trained volunteers. An estimate of the projected cost and the technical skill level required to complete remediation was then made. Based on DEP recommendations, sites expected to cost more than $2500 to remediate were classified as high cost sites. Those expected to cost between $500 and $2500 were classified medium and those expected to cost less than $500 were low cost sites. A high technical level site might require an engineering design, a medium site would require a site visit by a technical person and a low complexity solution could be implemented by a property owner with reference materials. Figures 4 and 5 show the estimated ranges of cost and complexity of the 180 sites.

Table 8. Total number of NPS sites by land use and impact to lake

Land Use	High Impact	Medium Impact	Low Impact	Total # of Sites	% of Total
Residential	1	17	56	74	41
Town Road	3	26	10	39	22
Private road	0	16	6	22	12
State Road	2	10	6	18	10
Driveway	1	6	5	12	7
Other	2	6	7	15	8
TOTAL	9	81	90	180	100%

Figure 4. Estimated Cost of Remediation of Sites

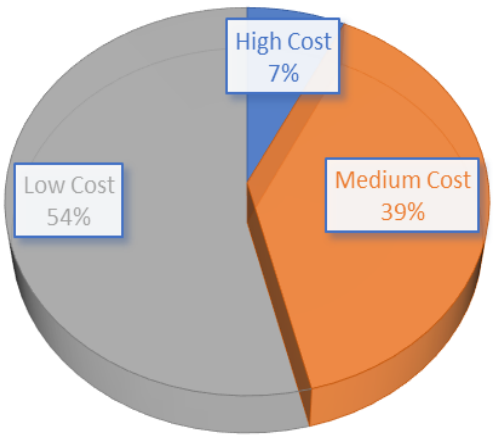


Figure 5. Estimated Technical Skill Required for Site Remediation

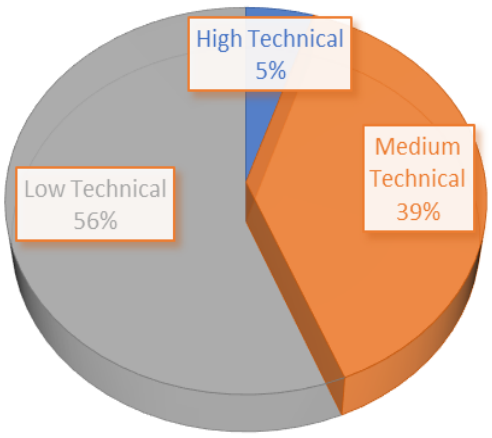
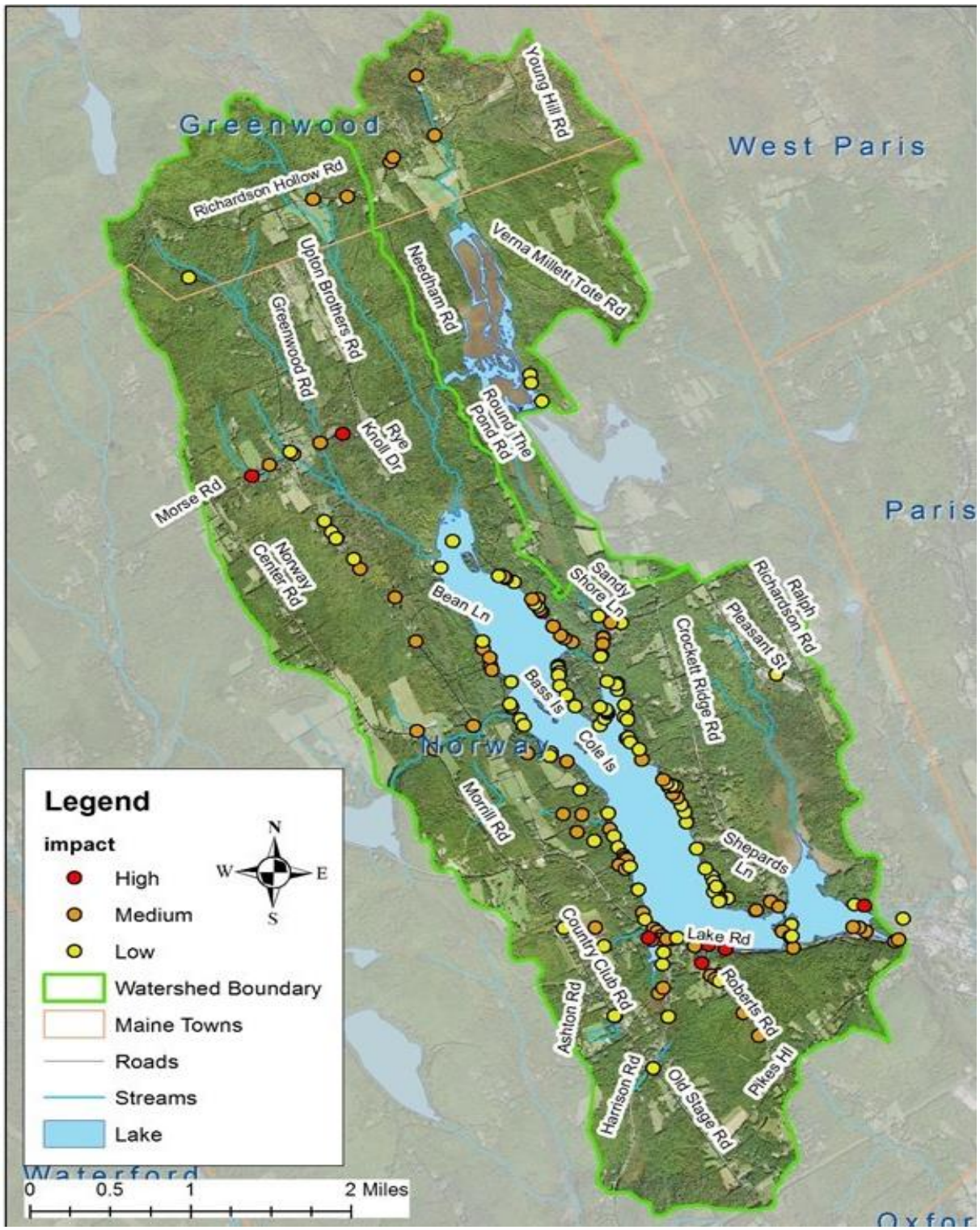


Figure 6. Map of Watershed Survey Erosion Sites[1]



[1] Survey site locations shown on the map are approximate. Contact LAON for more information about specific locations.

RESIDENTIAL AREAS

Residential areas accounted for almost half (41%) of identified erosion sites in the watershed.

Table 9. Residential Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Residential	0	0	1	8	7	2	55	1	0	74

The most frequent problem on residential properties in the watershed was sheet erosion, often with bare soil, flowing directly into the lake. Rill erosion (i.e., with observable small channels carved into the soil) was another common problem along with inadequate shoreline vegetation, and unstable shoreline access. Depicted below are some examples of the most common problems found on residential sites and general recommendations to prevent erosion.

Figure 7. Heavy foot traffic, lack of vegetation and raking of pine needles make residential shoreline areas very susceptible to erosion

General Recommendations for Residential Improvements:

- Install runoff diverters/rubber razors.
- Define and stabilize footpath.
- Build infiltration steps.
- Avoid raking pine needles. Add mulch / erosion control mix to paths and trails.
- Reseed any bare soil and thinning grass, especially along shoreline.
- Establish buffer and add to buffer along shoreline.
- Build infiltration trench at roof dripline.

PRIVATE ROADS, TOWN ROADS AND STATE ROADS

Private, town and state roads accounted for 44% of identified sources of polluted runoff. Of that total, 49% were town, 28% were private roads and 23% were state roads.

Table 10. Town, Private, and State Road Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Town Road	0	2	1	6	16	4	7	3	0	39
Private road	0	0	0	0	14	2	3	3	0	22
State Road	0	0	2	1	9	0	6	0	0	18
Total	0	2	3	7	39	6	16	6	0	79

The most common observations related to roads were: sand and bare soil that would be washed into waterways (47 times); shoulder erosion (48 times); culverts that were clogged, crushed, or broken or had unstable inlets or outlets (43 times); surface erosion (18 times); and ditch erosion (24 times). There were also a few instances of roadside plow/ grader berm, especially on town roads. Examples of the most common problems and general recommendations are shown and described below.

Figure 8. Erosion on the surface of this private road washed into a ditch then into a stream that feeds Lake Pennesseewassee

Figure 9. Severe erosion at a culvert

General Recommendations for Private Road Improvements:

- Replace failing or undersized culverts. Armor both ends of culvert with stone.
- Remove plow and grader berms that prevent runoff from getting off roads.
- Install runoff diverters (open top culvert, rubber razor or water bar).
- Stabilize road shoulders with gravel or stone.
- Stabilize road surface with hard-packing gravel and grade/crown to shed water.
- Reshape ditches and armor with stone.
- Employ Maine DEP certified contractors for road work.
- Utilize Maine DEP's guidance documents for forming a road association and conducting road maintenance.

DRIVEWAYS

Driveway sites accounted for 7% of sites identified as sources of polluted surveyed in the Lake Pennesseewassee watershed.

- **Table 11. Driveway Sites Impact and Cost**

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Driveways	0	0	1	1	5	0	1	4	0	12

The most common Driveway problems and recommended solutions are shown and described below.

Figure 10. Runoff concentrates on these driveways then the eroded material washes into the lake

General Recommendations for Driveway Improvements:

- Add new surface material, such as gravel.
- Reshape and crown driveway surface.
- Install runoff diverters (open top culvert, rubber razor or water bar).
- Define parking area and vegetate temporary driveways.
- Build a rain garden and establish vegetated buffer.
- Install gutters and drywell for roof runoff.
- Armor inlet/ outlet of culvert and install a plunge pool.
- Reshape ditches and armor with stone.

OTHER LAND USE (COMMERCIAL, CONSTRUCTION, TRAILS, PUBLIC ACCESS SITES & TOWN PROPERTIES)

Fifteen other sites that have a potential impact on the water quality of Lake Pennesseewassee were identified during the watershed survey.

Table 12. Other Sites Impact and Cost

Land Use	High Impact			Medium Impact			Low Impact			Total # of Sites
	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost	High Cost	
Other Land Use	0	2	0	4	2	0	5	2	0	15

Surface erosion was observed at 12 of the sites. One site showed bank failure and another showed shoulder erosion. Sand and bare soil was observed at 10 of the sites. Roof runoff was observed at two sites. Seven of the sites had shoreline problems.

Figure 11. Lack of a vegetation buffer has resulted in shoreline erosion in this picnic area

Figure 12. A construction project with inadequate protection of a ditch that leads to the lake

General Recommendations:

- Don't utilize unprotected areas close to waterbodies, near ditches that can carry pollution into a waterbody.
- Armor heavily used areas to prevent erosion.
- Use silt fence or berm to contain erosion on construction sites.
- Apply Erosion Control Mulch.
- Establish shoreline buffers.

WHERE DO WE GO FROM HERE?

LAON intends to utilize the information from the survey report to develop a lake watershed-based protection plan. The plan will be developed in partnership with other Lake Pennesseewassee stakeholders and submitted for approval to Maine DEP. This plan will include action steps towards:

- Organizing a long-term group effort to provide input and develop a watershed-based plan and oversee plan implementation.
- Fundraising for remediation projects.
- Applying for federal 319 grant funding under the Clean Water Act to help carry out the plan.
- Continuous monitoring and updating a database of survey sites.
- Expanding outreach and education efforts.
- Working with the Towns of Norway and Greenwood to promote and upgrade watershed protection.
- Working with the Maine DEP to communicate to the state Department of Transportation information about erosion sites found on state roads.

WHERE DO I GET MORE INFORMATION

Lakes Association of Norway
PO Box 505
Norway ME 04268
norwaylaon@gmail.com
http://norwaylakes.org/

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Scott Williams
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stewards@lakestewardsme.org

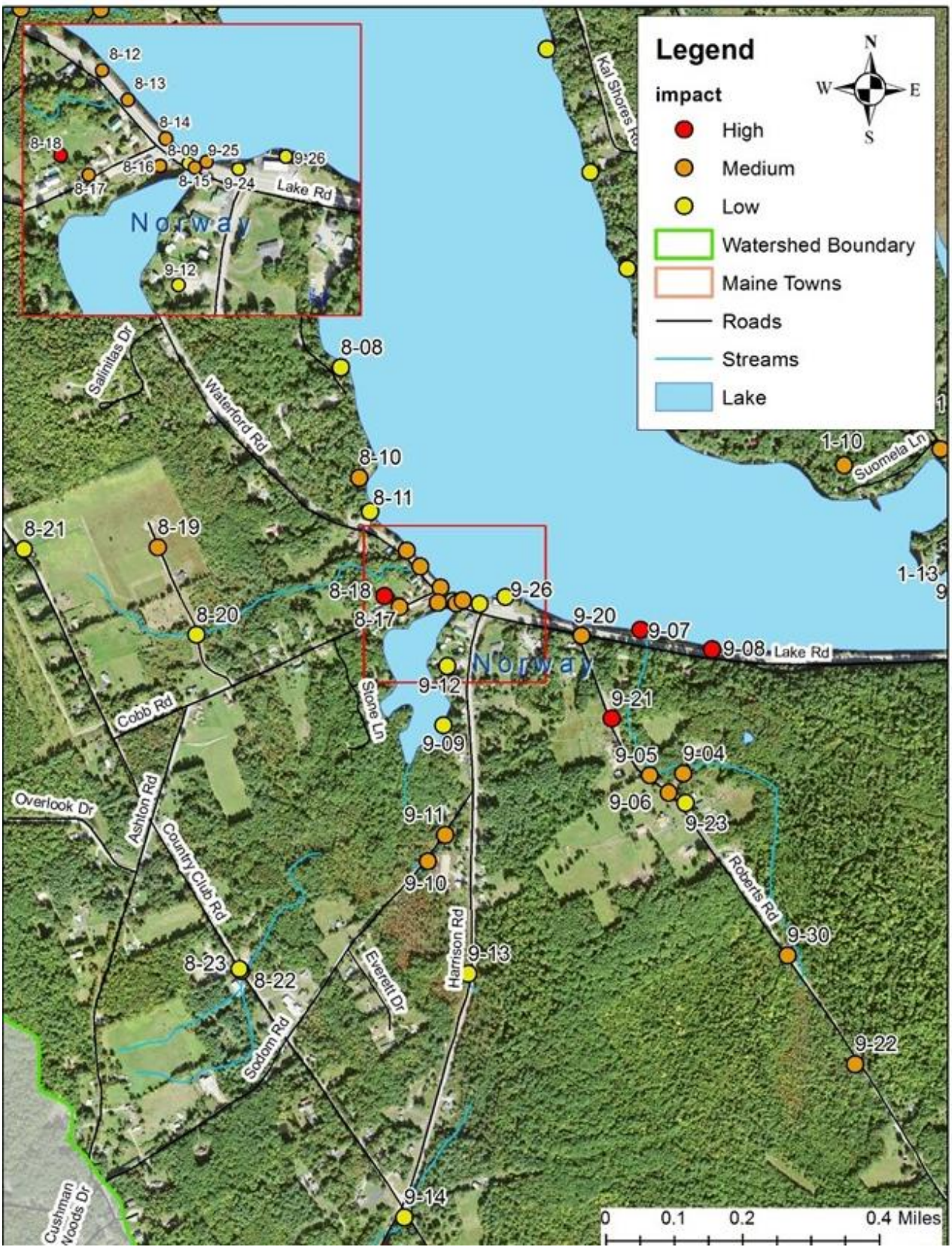
PUBLICATIONS

Conservation Practices for Homeowners Factsheets
www.maine.gov/dep/land/watershed/materials.html

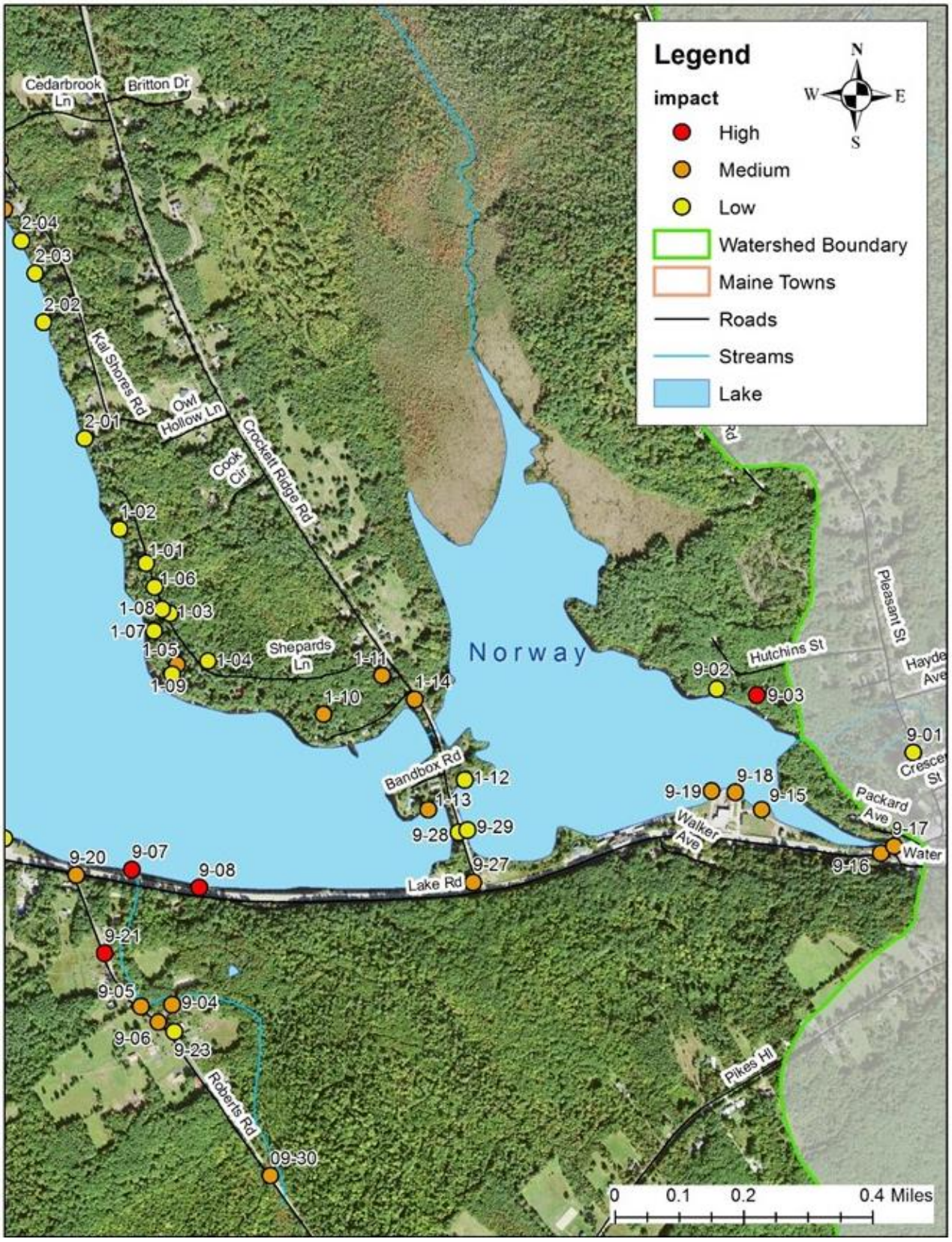
Gravel Road Maintenance Manual
www.maine.gov/dep/land/watershed/camp/road/gravel_road_manual.pdf

Norway Lakes Improvement Project, Phase III #2002-08
http://www.gulfofmaine.org/kb/uploads/14119/2002-08%20Norway%20Lakes.pdf

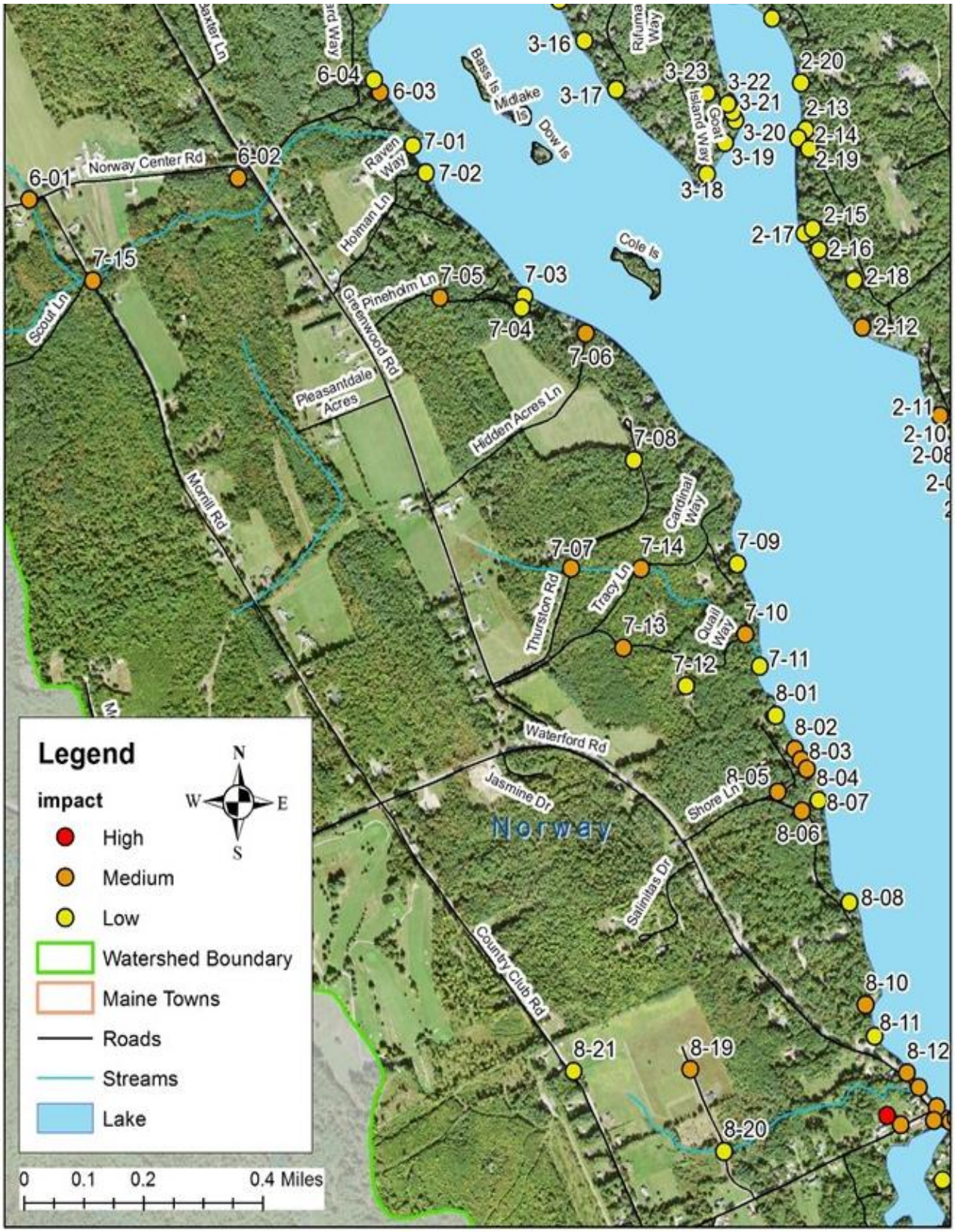
APPENDIX A-1 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES SOUTH



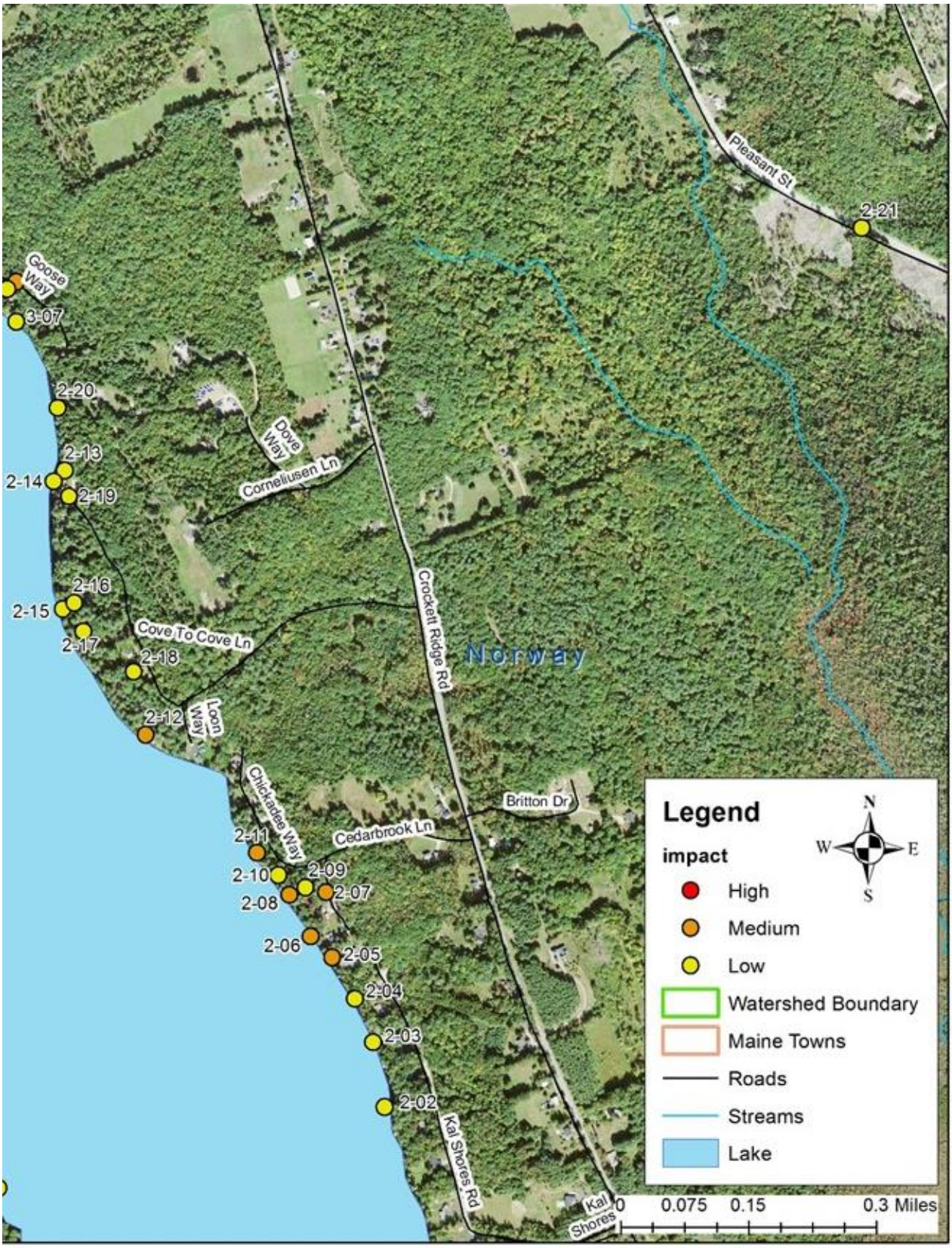
APPENDIX A-2 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES SOUTH EAST



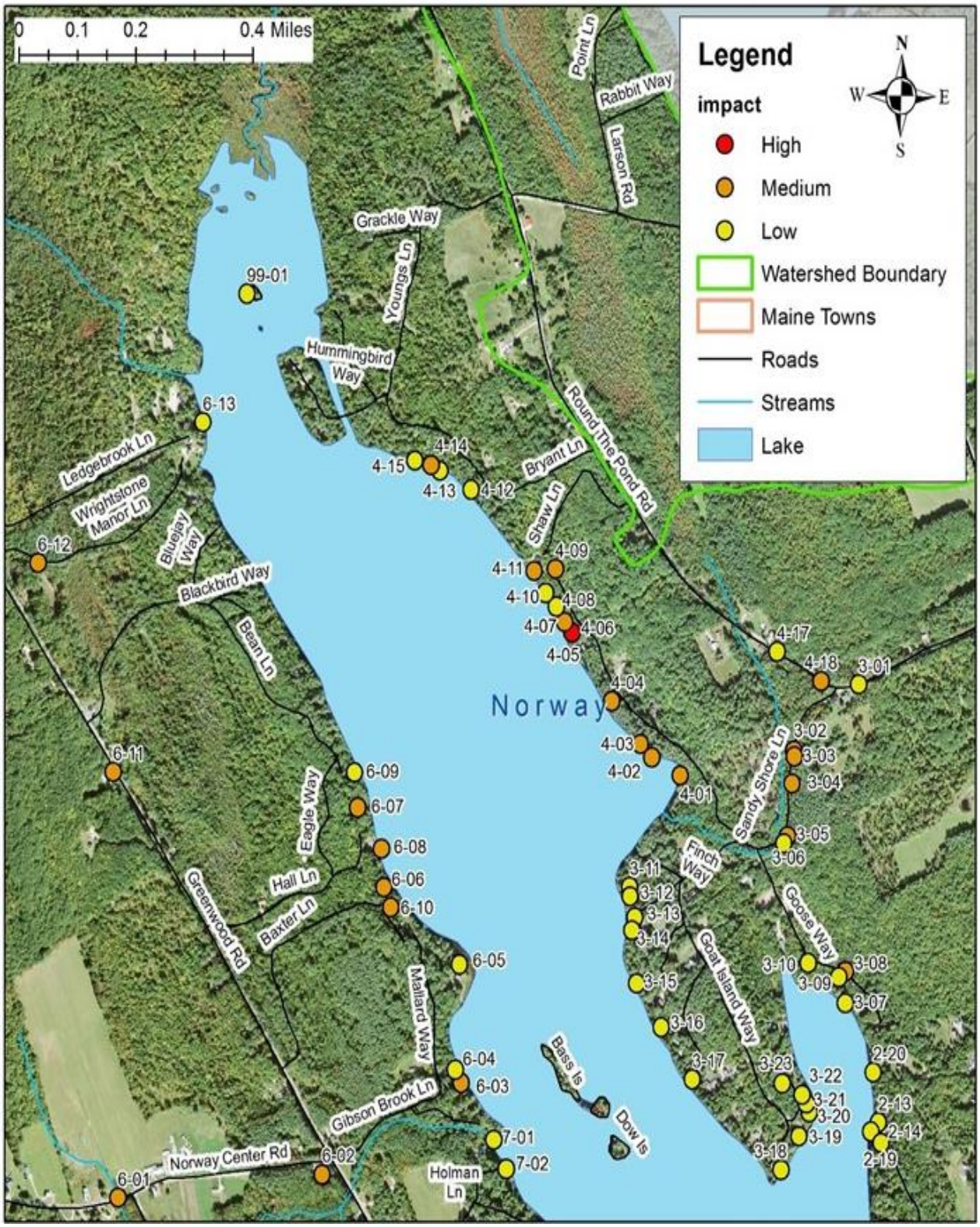
APPENDIX A-3 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES WEST



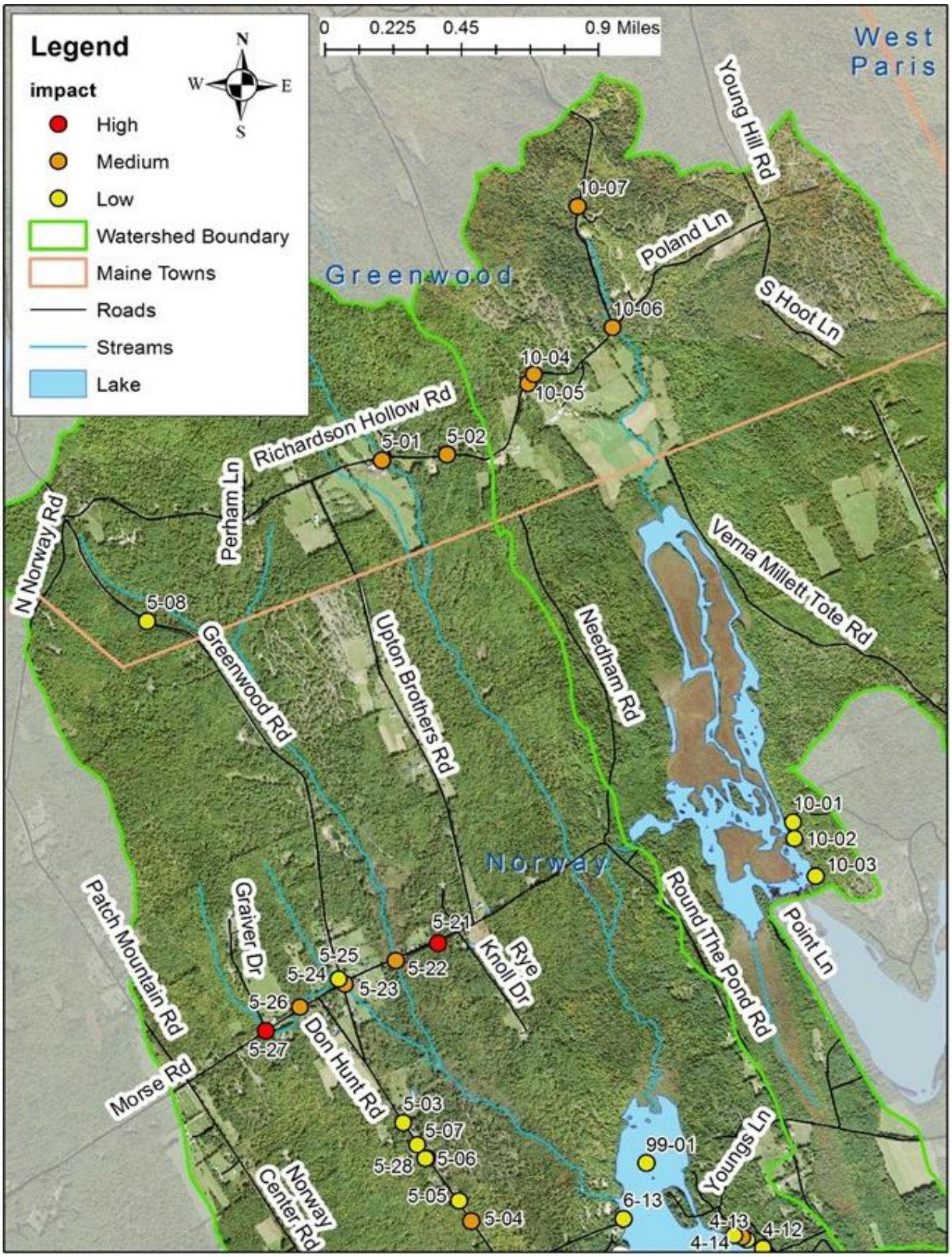
APPENDIX A-4 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES EAST



APPENDIX A-5 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES MID



APPENDIX A-6 –MAP OF LAKE PENNESSEEWASSEE EROSION SITES NORTH



APPENDIX B – LAKE PENNESSEEWASSEE EROSION SITES

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
01-01	Residential	Surface Erosion Slight; Soil bare;	Shepard's Lane	40x10	Path & Trail Recommendations: define, diverter; Other Recommendations: garden, water bar, mulch mix; Vegetation Recommendations: no raking; Other Suggestions: Maybe a rain garden to help as well;	Low	Low
01-02	Residential	Surface Erosion Slight; Roadside Plow/Grader Berm no; Shoreline erosion;	Shepard Lane	20x5	Path & Trail Recommendations: define, diverter; Vegetation Recommendations: no raking;	Low	Low
01-03	Residential	Surface Erosion Slight;	Shepard's Lane	3x30 (2 sides)	Roof Runoff Recommendations: trench; Vegetation Recommendations: no raking; Other Suggestions: Create diverter away from lake into woods on either side;	Low	Low
01-04	Residential	Surface Erosion Slight; Soil bare;	Shepard's Lane	6x15	Path & Trail Recommendations: infiltration step; Other Recommendations: swales, mulch mix; Vegetation Recommendations: no raking, add buffer; Other Suggestions: Steps to dock and replace rotting log;	Low	Low
01-05	Residential	Surface Erosion Slight; Soil bare; Shoreline lacks shore vegetation; Retaining wall is failing (see pic 2) which increases cost and technical assistance	Shepard's Lane	200'x8'	Vegetation Recommendations: buffer; Other Suggestions: Buffer before the shoreline retaining wall;	Medium	High
01-06	Residential	Surface Erosion Slight; Soil bare; Shoreline erosion;	Shepard's Lane	30x6	Path & Trail Recommendations: define, infiltration step; Other Recommendations: mulch mix; Vegetation Recommendations: no raking; Other Suggestions: Put steps by dock and define path above the infiltration steps;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
01-07	Residential	Surface Erosion Slight; Soil bare; Shoreline lacks shore vegetation;	Shepards Lane	20x4	Path & Trail Recommendations: diverter; Other Recommendations: water bar, garden; Vegetation Recommendations: buffer;	Low	Low
01-08	Residential	Surface Erosion Slight;	Shepard Lane	60x4	Path & Trail Recommendations: infiltration step, define; Other Recommendations: mulch mix;	Low	Low
01-09	Residential	Surface Erosion Slight; Soil bare;	Shepard's Lane	150'x3'	Path & Trail Recommendations: define, diverter; Other Recommendations: mulch mix; Other Suggestions: Note that they did put grass seed but erosion control will be better to absorb runoff;	Low	Low
01-10	Residential	Surface Erosion Slight; Soil bare; Shoreline inadequate shore vegetation, undercut;	Suomela Lane	36'x 4'	Other Suggestions: Riprap or stone to build it up;	Medium	Low
01-11	Town Road	Surface Erosion Moderate; Ditch severe erosion;	Crockett Ridge, north of causeway	400 x 4	Ditch Recommendations: reshape, armor, dam, sedimentation pools;	Medium	High
01-12	Residential	Surface Erosion Slight; Shoreline lacks shore vegetation;	Bandbox Road	15' x 3'	Other Recommendations: swales;	Low	Low
01-13	Residential	Surface Erosion Slight; Shoreline inadequate shore vegetation; Need more riprap	Bandbox road	60'x 8'	Other Recommendations: water bar, infiltration trench; Vegetation Recommendations: add buffer; Other Suggestions: More rip rap;	Medium	Medium
01-14	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion gully; Roadside Plow/Grader Berm no; Soil sand;	Crocket Ridge - boat culvert	40x30	Culvert Recommendations: armoring; Road/Driveway Recommendations: stabilize shoulder;	Medium	Medium
02-01	Residential	Surface Erosion rill; Soil bare; Shoreline undercut, erosion;	Kal Shore Rd	15 x 15	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
02-02	Residential	Surface Erosion rill; Shoreline undercut, lacks shore vegetation;	Kal Shore Rd	20 x 5	Vegetation Recommendations: add buffer; Other Suggestions: Rip rap;	Low	Medium
02-03	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation;	Kal Shore Rd	10 x 30	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed; Other Suggestions: Fix or improve water bar;	Low	Low
02-04	Residential	Surface Erosion sheet; Shoreline lacks shore vegetation, erosion;	Kal Shore Rd	15 x 30	Other Recommendations: mulch mix; Vegetation Recommendations: no raking, add buffer, reseed;	Low	Low
02-05	Residential	Surface Erosion rill; Soil bare; Shoreline inadequate shore vegetation;	Kal Shore Rd	10 x 40	Other Recommendations: mulch mix; Vegetation Recommendations: reseed, add buffer; Other Suggestions: Build up rock wall by steps;	Medium	Medium
02-06	Residential	Surface Erosion rill; Soil bare; Shoreline inadequate shore vegetation, erosion;	Cedar Brook La	15 x 21	Other Recommendations: infiltration trench, mulch mix; Vegetation Recommendations: buffer, add buffer; Other Suggestions: Sediment pool at pipe outlet, add more rock to eroding sides of wide steps;	Medium	Medium
02-07	Town Road	Surface Erosion gully; Culvert unstable inlet-outlet, clogged;	Cedarbrook Rd near pole 8061 1, across from no trespassing sign	5 x 12	Culvert Recommendations: remove clog, armoring, lengthen, enlarge; Ditch Recommendations: sedimentation pools;	Medium	High
02-08	Driveway	Surface Erosion rill;	Cedarbrook	50 x 100	Road/Driveway Recommendations: diverter/razor, diverter bar;	Medium	Low
02-09	Residential	Surface Erosion rill; Soil bare; Roof Runoff Erosion yes;	Cedarbrook	5 x 100	Roof Runoff Recommendations: drywell, barrel;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
02-10	Residential	Surface Erosion sheet; Soil bare; Shoreline erosion;	Chickadee Way	3 x 40	Path & Trail Recommendations: diverter; Other Recommendations: water bar, mulch mix; Other Suggestions: Clean out existing water bars, add berm at shoreline, minimize bare area near shoreline;	Low	Low
02-11	Driveway	Surface Erosion rill; Roadside Plow/Grader Berm no; Soil bare;	Chickadee	15 x 100	Road/Driveway Recommendations: diverter/razor, diverter bar; Other Recommendations: water bar; Other Suggestions: Clean out existing diverter, reshape;	Medium	Medium
02-12	Residential	Surface Erosion rill; Soil bare; Shoreline inadequate shore vegetation, erosion, lacks shore vegetation;	Cove to Cove Lane	20 x 60	Path & Trail Recommendations: define, diverter; Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed; Other Suggestions: Two affected areas, on either side of docks;	Medium	Medium
02-13	Residential	Surface Erosion gully; Ditch severe erosion; Soil bare; Shoreline inadequate shore vegetation, erosion; Drainage ditch erosion	Cove to Cove Lane	8 x 30	Ditch Recommendations: armor; Vegetation Recommendations: add buffer;	Low	Low
02-14	Residential	Surface Erosion rill; Roadside Plow/Grader Berm no; Soil bare; Shoreline erosion; Pipe sticking up is of unknown function but could be adding to issue	Cove to Cove Lane	20x20	Other Recommendations: mulch mix; Vegetation Recommendations: no raking, reseed;	Low	Low
02-15	Residential	Surface Erosion sheet; Roadside Plow/Grader Berm no; Soil bare;	Cove to Cove Lane	20 x 20	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, no raking, reseed;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
		Shoreline inadequate shore vegetation;					
02-16	Driveway	Surface Erosion sheet; Culvert clogged; Soil bare; Runoff from Driveway entering small ditch that flows to lake.	Cove to Cove Lane		Culvert Recommendations: remove clog; Ditch Recommendations: sedimentation pools; Road/Driveway Recommendations: reshape, diverter bar, catch basin; Other Recommendations: infiltration trench;	Low	Medium
02-17	Residential	Surface Erosion rill; Soil bare; Roof Runoff Erosion yes;	Cove to Cove Lane	8x 50	Roof Runoff Recommendations: drywell;	Low	Low
02-18	Driveway	Soil bare; Runoff goes straight down Driveway	Cove to Cove Lane	15x 100	Road/Driveway Recommendations: reshape, diverter dip;	Low	Medium
02-19	Private Road	Ditch severe erosion; Strong seasonal flow	Cove to Cove Lane	10x 20	Ditch Recommendations: sedimentation pools, remove debris, armor;	Low	Medium
02-20	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation;	Dove Way	20x30	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, no raking, reseed;	Low	Low
02-21	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion rill; Soil sand;	utility pole 18 on Pleasant St	40 x 100	Culvert Recommendations: armoring; Road/Driveway Recommendations: detention basin;	Low	Medium
03-01	Town Road	Culvert unstable inlet-outlet; Ditch moderate erosion; Road Shoulder Erosion gully; Roadside Plow/Grader Berm no; Soil sand;	Round the Pond Rd utility pole 5 just before turn to Sandy Shore both sides of road. Ditched up steam and down	300 x 50 '	Culvert Recommendations: armoring; Ditch Recommendations: remove debris, reshape, vegetate; Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: Remove winter sand;	Low	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
03-02	Private Road	Surface Erosion rill; Ditch moderate erosion;	Sandy Shore Rd Over Crest of First Hill Near Utility Pole	300 x 15	Ditch Recommendations: remove debris, sedimentation pools; Road/Driveway Recommendations: reshape; Other Suggestions: Improve existing turnout	Medium	Medium
03-03	Private Road	Culvert clogged, unstable inlet-outlet, broken; Ditch undersize;	Sandy Shore Rd Near Pole 3	50 x 100'	Culvert Recommendations: plunge pool, armoring, remove clog, replace; Ditch Recommendations: reshape, remove debris	Medium	Medium
03-04	Private Road	Surface Erosion rill; Culvert unstable inlet-outlet; Road Shoulder Erosion rill;	Pole 4 Sandy Shores Rd	50 x 50'	Culvert Recommendations: armoring; Road/Driveway Recommendations: stabilize shoulder; Other Suggestions: Lower culvert;	Medium	Medium
03-05	Private Road	Road Shoulder Erosion sheet; Roadside Plow/Grader Berm no; Soil bare;	Sandy Shore Rd Pole 6	10 x 50'	Road/Driveway Recommendations: detention basin; Other Suggestions: Maybe move basin	Medium	Medium
03-06	Private Road	Culvert unstable inlet-outlet, broken;	Sandy Shore Rd Pole 6	5 x 50'	Culvert Recommendations: armoring, replace;	Low	Medium
03-07	Residential	Ditch moderate erosion; Runoff from artesian well	021-001 Goose Way,	125x3'	Ditch Recommendations: armor; Other Suggestions: Install PVC pipe to divert flow;	Low	Low
03-08	Private Road	Culvert unstable inlet-outlet, clogged;	Pole 6 Across from Red A Frame on Goose Way 2 Culverts Mo	100 x 30'	Culvert Recommendations: remove clog, armoring; Ditch Recommendations: remove debris;	Medium	Medium
03-09	Private Road	Culvert unstable inlet-outlet;	Goose Way Before Pole 5 Between Camps	50 x 5'	Culvert Recommendations: armoring; Other Suggestions: Repair inlet armoring. ;	Low	Low
03-10	Private Road	Culvert unstable inlet-outlet, broken; Road Shoulder Erosion sheet; Culvert rusted	Goat Island Way Just Past Sandy Shore Intersection	10 x 50	Culvert Recommendations: armoring, replace, lengthen; Other Suggestions: Armor road shoulder near culvert	Low	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
03-11	Driveway	Surface Erosion sheet; Flow from Driveway causing sheet erosion through yard	Sparrow Way	200 x 20'	Road/Driveway Recommendations: build, add gravel; Other Suggestions: Reinforce Low spot with stone to prevent gully forming. stabilize path	Low	Medium
03-12	Residential	Surface Erosion sheet; Soil bare;	Sparrow Way	150 x 20'	Roof Runoff Recommendations: trench; Vegetation Recommendations: no raking, reseed, buffer;	Low	Low
03-13	Residential	Surface Erosion sheet; Soil bare;	Sparrow	150 x 20	Roof Runoff Recommendations: trench; Vegetation Recommendations: buffer, no raking, reseed;	Low	Low
03-14	Residential	Surface Erosion sheet;	Sparrow	125 x 100	Vegetation Recommendations: add buffer, no raking, reseed;	Low	Low
03-15	Residential	Surface Erosion sheet; Soil bare;	Dinsmore	50 x 75	Other Recommendations: mulch mix; Vegetation Recommendations: buffer, no raking;	Low	Low
03-16	Residential	Surface Erosion sheet; Soil bare;	Rifuma Way	15 x 150	Path & Trail Recommendations: define, stabilize; Other Recommendations: mulch mix, water bar; Other Suggestions: Could install log or stone berm, leave buffer	Low	Low
03-17	Residential	Surface Erosion sheet; Soil bare;	Rifuma Way	100 x 150	Other Recommendations: mulch mix; Vegetation Recommendations: no raking;	Low	Low
03-18	Residential	Surface Erosion sheet; Soil bare; Shoreline erosion;	Goat Island Way	40'x12'	Other Recommendations: mulch mix; Vegetation Recommendations: no raking, reseed;	Low	Low
03-19	Residential	Surface Erosion sheet; Soil bare; Shoreline erosion, lacks shore vegetation;	Goat Island Way	20'x30'	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, no raking, buffer;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
03-20	Residential	Surface Erosion sheet; Soil bare; Roof Runoff Erosion yes; Shoreline erosion;	Boulder Way	50'x30'	Roof Runoff Recommendations: trench; Other Recommendations: mulch mix, water bar; Vegetation Recommendations: no raking;	Low	Low
03-21	Residential	Surface Erosion rill; Road Shoulder Erosion rill;	Boulder Way	50'x5'	Road/Driveway Recommendations: add gravel; Other Recommendations: mulch mix;	Low	Low
03-22	Residential	Surface Erosion rill; Soil bare;	Boulder Way		Other Recommendations: mulch mix, infiltration trench, garden;	Low	Low
03-23	Private Road	Surface Erosion sheet; Road Shoulder Erosion sheet; Worn rubber razors. Sediment turnout	Boulder Road,	100'x20'	Road/Driveway Recommendations: diverter/razor; Other Recommendations: water bar; Other Suggestions: Clean out run off area;	Low	Low
04-01	Commercial	Surface Erosion rill; Soil uncovered pile;	Sandy shore ln	10x10	Vegetation Recommendations: reseed; Other Suggestions: Relocate compost pile;	Medium	Medium
04-02	Trail/Path	Surface Erosion sheet; Roof Runoff Erosion yes;	sandy shore lane	10x70	Path & Trail Recommendations: define, stabilize, diverter; Other Recommendations: mulch mix;	Medium	Medium
04-03	Residential	Surface Erosion sheet; Shoreline lacks shore vegetation, undercut, erosion;	Sandy Shore Ln	20x30	Path & Trail Recommendations: define; Vegetation Recommendations: buffer; Other Suggestions: All space has been turned into recreational;	Medium	Medium
04-04	Residential	Surface Erosion rill; Roof Runoff Erosion yes;	Sandy shore ln	4x150	Roof Runoff Recommendations: trench;	Medium	High
04-05	Residential	Surface Erosion sheet; Soil bare; Steps filled with dirt	Sandy Shore Ln	10x100	Path & Trail Recommendations: stabilize, define, infiltration step; Vegetation Recommendations: buffer;	High	High
04-06	Driveway	Surface Erosion gully; Soil bare;	Sandy Shore Ln	20x50	Road/Driveway Recommendations: build, add asphalt, reshape, diverter/razor;	High	High

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
04-07	Residential	Surface Erosion rill; Soil bare; Roof Runoff Erosion yes; Roof runoff	sandy shore ln	100x4	Path & Trail Recommendations: stabilize; Roof Runoff Recommendations: trench;	Medium	Medium
04-08	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation;	sandy shore ln	30x30	Path & Trail Recommendations: define; Other Recommendations: mulch mix; Vegetation Recommendations: buffer;	Low	Low
04-09	Residential	Surface Erosion rill; Soil bare; Road runoff into stream	sandy shore ln		Other Suggestions: Close road and vegetate;	Medium	Low
04-10	Residential	Surface Erosion sheet; Soil bare;	sandy shore ln		Path & Trail Recommendations: define, stabilize; Other Recommendations: mulch mix;	Low	Low
04-11	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation; Recent fire	Shaw Ln	100x100	Vegetation Recommendations: reseed, add buffer;	Medium	Medium
04-12	Residential	Surface Erosion sheet;	young's ln	10x50	Other Recommendations: mulch mix; Vegetation Recommendations: buffer;	Low	Low
04-13	Residential	Shoreline undercut;	young's ln	20x5	Vegetation Recommendations: buffer, add buffer; Other Suggestions: Rip rap on shoreline where undercut;	Low	Low
04-14	Residential	Surface Erosion sheet; Roof Runoff Erosion yes;	young's ln	10x40	Roof Runoff Recommendations: barrel; Other Recommendations: mulch mix;	Medium	Low
04-15	Residential	Surface Erosion sheet; Soil bare;	young's ln	25x10	Path & Trail Recommendations: stabilize; Other Recommendations: mulch mix; Vegetation Recommendations: buffer;	Low	Low
04-17	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion rill; Soil sand;	Round the Pond Road, pole# 10	18'x6'	Culvert Recommendations: armoring;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
04-18	Town Road	Surface Erosion gully; Culvert unstable inlet-outlet, clogged, broken; Soil sand; Possible replacement. Unclog	Round the Pond Road, pole 7	20'x30'	Culvert Recommendations: armoring, remove clog, replace;	Medium	Medium
05-01	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion severe; Soil sand; Flow into lake via stream	Richardson Hollow Road	150' both sides	Culvert Recommendations: armoring; Other Recommendations: water bar; Other Suggestions: Berm;	Medium	Medium
05-02	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion severe; Soil sand; Flow into lake via stream	End of Richardson Hollow Road	30'x10'	Culvert Recommendations: armoring; Other Suggestions: Berm along road;	Medium	Medium
05-03	State Road	Culvert unstable inlet-outlet;	South of pole 65 - both sides of road	10'x10' (both sides)	Culvert Recommendations: armoring; Other Suggestions: Reinforce;	Low	Low
05-04	State Road	Culvert unstable inlet-outlet; Ditch bank failure, moderate erosion; Road Shoulder Erosion severe; Soil bare, sand;	Near pole# 57	50'x10'	Culvert Recommendations: armoring; Ditch Recommendations: vegetate, armor; Road/Driveway Recommendations: remove berm;	Medium	Medium
05-05	State Road	Ditch bank failure;	North of pole 58 Greenwood Road	30'x5'	Ditch Recommendations: vegetate;	Low	Low
05-06	State Road	Culvert unstable inlet-outlet; Road Shoulder Erosion severe; Soil sand;	North of pole# 61.5 Greenwood Road	150'x5'	Culvert Recommendations: armoring; Road/Driveway Recommendations: remove berm; Other Suggestions: Both sides knock down berm;	Low	Low
05-07	State Road	Culvert unstable inlet-outlet;	South of pole#63, Greenwood road	6'x5'	Culvert Recommendations: armoring;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
05-08	Town Road	Culvert unstable inlet-outlet;	South of pole 9, Greenwood Road, east side of road	6'x15'	Culvert Recommendations: armoring;	Low	Low
05-21	Town Road	Surface Erosion Slight; Culvert clogged; Ditch slight erosion; Road Shoulder Erosion severe; Soil sand;	Road next to gray trailer	6x300'	Culvert Recommendations: remove clog; Ditch Recommendations: dam, armor; Road/Driveway Recommendations: remove berm;	High	Medium
05-22	Town Road	Road Shoulder Erosion severe; Roadside Plow/Grader Berm no; Soil sand;	Round the Pond Rd Culvert	30x30'	Road/Driveway Recommendations: catch basin, add gravel, detention basin; Other Suggestions: Rip rap, stabilize shoulder;	Medium	Medium
05-23	Town Road	Road Shoulder Erosion severe; Soil sand, bare;	Intersection of Round the Pond and Greenwood Rd	6x16'	Road/Driveway Recommendations: build, add gravel; Other Suggestions: stabilize shoulder;	Medium	Low
05-24	Town Road	Road Shoulder Erosion severe; Roadside Plow/Grader Berm no; Soil sand;	Intersection of Greenwood and Round the Pond Roads both sides	20x12'	Road/Driveway Recommendations: build, add gravel; Other Suggestions: Stabilize shoulder;	Medium	Medium
05-25	Town Road	Road Shoulder Erosion slight; Roadside Plow/Grader Berm no; Soil sand;	Fire pond & W3 hydrant	20x6'	Road/Driveway Recommendations: build, catch basin; Other Recommendations: infiltration trench; Vegetation Recommendations: add buffer;	Low	Low
05-26	Town Road	Ditch slight erosion; Road Shoulder Erosion severe; Roadside Plow/Grader Berm no; Soil sand;	Morse Rd road shoulders and culverts both sides of road	40x10' and 12x6'	Culvert Recommendations: armoring; Ditch Recommendations: dam, reshape;	Medium	Medium
05-27	Town Road	Culvert clogged, unstable inlet-outlet; Ditch moderate erosion;	Utility pole 10.01 at Gravier Rd	30 x 100'	Culvert Recommendations: armoring, remove clog; Ditch Recommendations: dam, armor; Road/Driveway Recommendations: vegetate	High	High

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
		Road Shoulder Erosion severe; Soil sand;			shoulder, catch basin; Other Recommendations: garden;		
05-28	State Road	Ditch bank failure;	Greenwood Rd pole 62	10 x 10	Ditch Recommendations: armor;	Low	Low
06-01	Town Road	Road Shoulder Erosion severe;	Pole #10	100x40	Ditch Recommendations: ditch, sedimentation pools, vegetate; Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: Ditch needed on north side with sediment pools;	Medium	Medium
06-02	Private Road	Surface Erosion Slight; No shoulder so Road runoff goes into steam.	Along Gibson Road brook	400 x 20	Ditch Recommendations: vegetate, sedimentation pools, remove debris, ditch, turnout; Road/Driveway Recommendations: reshape, vegetate shoulder, diverter/razor; Vegetation Recommendations: buffer;	Medium	High
06-03	Residential	Surface Erosion Moderate;	Mallard Way	100 x 20	Path & Trail Recommendations: diverter; Vegetation Recommendations: add buffer;	Medium	Low
06-04	Residential	Surface Erosion Slight; Soil bare; Shoreline inadequate shore vegetation;	Mallard Way	100 x 50	Vegetation Recommendations: reseed, buffer;	Low	Low
06-05	Residential	Surface Erosion Moderate; Soil uncovered pile, bare; Roof Runoff Erosion yes;	Mallard Way	100 x 30	Path & Trail Recommendations: stabilize; Roof Runoff Recommendations: barrel, drywell;	Low	Low
06-06	Driveway	Surface Erosion Moderate; Soil bare; Roof Runoff Erosion yes;	Hall Lane	200 x 75	Road/Driveway Recommendations: vegetate shoulder; Roof Runoff Recommendations: trench; Other Recommendations: mulch mix; Other Suggestions: Build up Driveway to define it and then vegetate outer area of Driveway once defined;	Medium	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
06-07	Driveway	Surface Erosion Moderate; Driveway is sand rather than gravel	Eagle Way	200x75	Road/Driveway Recommendations: add gravel, diverter dip, diverter, culvert, diverter/razor, diverter bar, build; Other Suggestions: Build up berm at end of Driveway to mitigate run off to lake;	Medium	Medium
06-08	Private Road	Surface Erosion Moderate; Ditch moderate erosion;	Hall Lane	300x30	Culvert Recommendations: enlarge, armoring, plunge pool, install; Ditch Recommendations: ditch, armor; Other Recommendations: garden, water bar; Other Suggestions: Plunge pool needs to be expanded;	Medium	High
06-09	Residential	Surface Erosion Slight; Soil bare;	Eagle Way	75’x20’	Other Recommendations: mulch mix, water bar; Vegetation Recommendations: no raking;	Low	Low
06-10	Residential	Surface Erosion Slight; Soil bare;	Eagle Way	55’x15’	Path & Trail Recommendations: define, diverter; Roof Runoff Recommendations: barrel; Other Recommendations: mulch mix;	Medium	Low
06-11	State Road	Culvert unstable inlet-outlet; Ditch moderate erosion; Road Shoulder Erosion moderate; Soil sand;	Pole 46,5. Greenwood Road	150 x 40	Culvert Recommendations: armoring; Ditch Recommendations: vegetate; Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: Remove winter sand;	Medium	Medium
06-12	Private Road	Road Shoulder Erosion rill; Roadside Plow/Grader Berm yes; Agriculture manure; Turn out damaged	This location is in sector 6 and not sector 8 as the pictures show	300 'x20'	Ditch Recommendations: reshape; Road/Driveway Recommendations: remove berm; Other Suggestions: Repair current turnout;	Medium	Medium
06-13	Residential	Surface Erosion sheet; Soil bare;	Ledgebrook Lane. This location is in sector 6 and not sector 8 as the pictures show.	15'x6'	Other Recommendations: mulch mix;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
07-01	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation;	Raven Way	30 x 100	Vegetation Recommendations: add buffer, no raking, reseed;	Low	Low
07-02	Residential	Surface Erosion sheet; Soil bare; Roof Runoff Erosion yes; Shoreline inadequate shore vegetation;	Raven Way	20 x 50	Path & Trail Recommendations: infiltration step; Vegetation Recommendations: add buffer, no raking, reseed;	Low	Low
07-03	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation, erosion;	Robin Way	30 x 75	Road/Driveway Recommendations: add gravel; Other Recommendations: mulch mix; Vegetation Recommendations: no raking; Other Suggestions: Erosion control mulch;	Low	Low
07-04	Residential	Culvert unstable inlet-outlet; Clean upstream check dams	Robin Way		Culvert Recommendations: armoring, plunge pool; Other Suggestions: Remove hay bale;	Low	Low
07-05	Private Road	Culvert unstable inlet-outlet, undersized;	Pine Holm Lane		Culvert Recommendations: armoring, lengthen; Ditch Recommendations: turnout; Road/Driveway Recommendations: remove berm;	Medium	Medium
07-06	Driveway	Surface Erosion rill;	Hidden Acres	200 x 20	Road/Driveway Recommendations: remove berm, diverter dip; Other Suggestions: Dry well at bottom of Driveway;	Medium	Medium
07-07	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion gully; Soil sand;	Pole number 505 Thurston Lane	10 x 15	Culvert Recommendations: armoring; Other Suggestions: Divert energy with rip rap under outlet;	Medium	Low
07-08	Town Road	Culvert unstable inlet-outlet; Soil sand;	Thurston La pole 511	8 x 20	Culvert Recommendations: armoring;	Low	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
07-09	Residential	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation, erosion;	Tracy La	10 x 25	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, no raking;	Low	Low
07-10	Private Road	Surface Erosion gully; Culvert clogged; Roadside Plow/Grader Berm yes; Muddy Road	Quail; pole 12	30x10	Culvert Recommendations: remove clog; Road/Driveway Recommendations: remove berm, build, add gravel, reshape; Other Recommendations: water bar; Other Suggestions: Could be prop 005-002-00A;	Medium	Medium
07-11	Trail/Path	Surface Erosion sheet; Soil bare;	Quail	30x10	Path & Trail Recommendations: diverter; Other Recommendations: mulch mix;	Low	Low
07-12	Residential	Surface Erosion sheet; Soil bare;	Lark	15x10	Vegetation Recommendations: buffer;	Low	Low
07-13	Private Road	Ditch bank failure; Roadside Plow/Grader Berm yes; Soil sand;	Lark at Tracy Lane	200x10	Ditch Recommendations: vegetate, armor, reshape, turnout, remove debris, dam, sedimentation pools;	Medium	Medium
07-14	Private Road	Ditch bank failure; Flow Direct into stream both inlet and outlet	Tracy Lane Culvert at Stream	75x6	Ditch Recommendations: armor, vegetate, sedimentation pools; Other Suggestions: Erosion Control Mat;	Medium	Medium
07-15	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion gully; Roadside Plow/Grader Berm yes; Soil sand;	Morrill Road at Scout Lane	100x5	Culvert Recommendations: armoring; Road/Driveway Recommendations: remove berm; Other Suggestions: Roadside Grading;	Medium	Low
08-01	Residential	Surface Erosion sheet; Soil bare;	Wood Duck Way	5'x10'	Other Recommendations: mulch mix; Vegetation Recommendations: reseed; Other Suggestions: Add to buffer;	Low	Low
08-02	Residential	Surface Erosion sheet; Soil bare; Shoreline undercut, inadequate shore vegetation;	Wood Duck Way	both sides of dock 5'x10'	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed; Other Suggestions: stabilize shoreline;	Medium	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
08-03	Residential	Surface Erosion sheet; Soil bare;	Wood Duck Way	30'x10'	Other Recommendations: mulch mix; Vegetation Recommendations: reseed; Other Suggestions: This is a dock storage area where they pull up their dock to the shore;	Medium	Low
08-04	Residential	Surface Erosion sheet; Soil bare;	Wood Duck Way	100'x30'	Path & Trail Recommendations: define; Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed; Other Suggestions: Pulling up dock causes consistent erosion every year;	Medium	Low
08-05	Private Road	Surface Erosion rill; Roadside Plow/Grader Berm yes;	Private Road -Wood Duck Way - near fork with Shore Lane	300'x15'	Ditch Recommendations: turnout; Road/Driveway Recommendations: remove berm, reshape, add gravel, diverter/razor;	Medium	Medium
08-06	Private Road	Surface Erosion rill; Ditch moderate erosion;	Shore Lane from corner of Wood Duck Lane	300'x15'	Road/Driveway Recommendations: add gravel, reshape;	Medium	Medium
08-07	Driveway	Surface Erosion rill;	Shore Lane	100'x15'	Road/Driveway Recommendations: diverter/razor; Vegetation Recommendations: add buffer;	Low	Low
08-08	Residential	Surface Erosion sheet;	Shore Lane	20'x20'	Other Recommendations: mulch mix;	Low	Low
08-09	Town of Norv	Surface Erosion sheet;	Norway Park, near town Beach Area	50'x10'	Other Recommendations: mulch mix;	Low	Low
08-10	Beach Access	Surface Erosion rill;	Town Beach Area - Norway Beach	100'x20'	Other Recommendations: mulch mix; Other Suggestions: Improve existing berm;	Medium	Low
08-11	Beach Access	Surface Erosion sheet;	Below Little Red School House and parking area, Norway Beach	100'x30'	Road/Driveway Recommendations: diverter bar; Other Recommendations: mulch mix;	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
08-12	State Road	Surface Erosion rill;	Near pole J78S, Waterford Road	15'x3'	Other Suggestions: stabilize with rip rap;	Medium	Low
08-13	State Road	Culvert unstable inlet-outlet; Road Shoulder Erosion rill; Road shoulder erosion is on the yellow house side of road	Waterford Road - Culvert across from	20'x5'	Other Suggestions: Stabilize shoulder and culvert outlet area;	Medium	Medium
08-14	State Road	Surface Erosion gully; Road Shoulder Erosion gully; Shoreline erosion, unstable access;	Waterford Road across from Lake Store near dry hydrant W6	40'x8'	Vegetation Recommendations: add buffer; Other Suggestions: Stabilize shoreline;	Medium	Medium
08-15	State Road	Road Shoulder Erosion gully;	Waterford Road, near pole 72. Culvert by Lake Store. Both sides of road	10'x3'	Other Suggestions: stabilize shoulder;	Medium	Medium
08-16	Commercial	Surface Erosion rill; Shoreline erosion, lacks shore vegetation; Contaminants from run off of parking lot	parking lot and shoreline	100'x7'	Road/Driveway Recommendations: diverter bar; Vegetation Recommendations: add buffer; Other Suggestions: Define parking area. Stabilize access points. Add ashtray can.	Medium	Low
08-17	Town Road	Road Shoulder Erosion gully;	Ashton Road culvert/shoulder	5'x4'	Road/Driveway Recommendations: stabilize shoulder; Other Suggestions: stabilize shoulder and culvert;	Medium	Low
08-18	Construction	Ditch bank failure; Soil bare, delta; Dug trenches for run off into stream. Collapsed natural ditch	Ashton Road, across from pole J3	200'x100'	Ditch Recommendations: remove debris; Construction Site Recommendations: fence/berm; Other Suggestions: Remove dirt from ditch;	High	Medium
08-19	Private Road	Surface Erosion gully; Culvert clogged, unstable inlet-outlet; Ditch undersize; No vegetation.	Front of End property on road	300'x15'	Culvert Recommendations: armoring, remove clog; Ditch Recommendations: vegetate, reshape; Vegetation Recommendations: reseed;	Medium	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
		Wrong material used for drainage pipe from house.					
08-20	Private Road	Culvert unstable inlet-outlet; Road Shoulder Erosion rill; Soil sand;	Elizabeth Road, second utility pole	15'x8'	Culvert Recommendations: armoring; Road/Driveway Recommendations: add gravel;	Low	Low
08-21	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion rill; Soil sand;	Country Club Road	12'x6'	Culvert Recommendations: armoring; Other Suggestions: Replace rocks under culvert outlet;	Low	Low
08-22	Driveway	Surface Erosion rill; Soil bare, sand; Sand flows into ditch	Country Club Road, pole#16	50'x30'	Road/Driveway Recommendations: build, reshape, add gravel, diverter dip;	Medium	Medium
08-23	Town Road	Road Shoulder Erosion gully; Soil sand;	Country Club Road between poles 15 and 16	75'x20'	Road/Driveway Recommendations: remove berm, build;	Low	Low
09-01	Residential	Surface Erosion sheet; Soil bare; Roof Runoff Erosion yes; Shoreline unstable access;	Hutchins	12x5	Roof Runoff Recommendations: trench; Other Recommendations: mulch mix; Vegetation Recommendations: no raking;	Low	Low
09-02	Residential	Surface Erosion sheet; Soil bare; Shoreline unstable access;	Hutchins	25x6	Path & Trail Recommendations: stabilize; Other Recommendations: mulch mix; Vegetation Recommendations: no raking;	Low	Low
09-03	Construction	Surface Erosion gully; Soil bare, uncovered pile; Shoreline unstable access; entire yard needs veg	Hutchins	30x30	Construction Site Recommendations: fence/berm, mulch; Path & Trail Recommendations: define, stabilize; Other Recommendations: mulch mix, garden; Vegetation Recommendations: no raking; Other Suggestions: cover piles, divert Driveway runoff to vegetate;	High	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
09-04	Private Road	Surface Erosion sheet; Culvert unstable inlet-outlet; Ditch severe erosion; Road Shoulder Erosion sheet; Soil sand, delta;	Roberts Road	100x15	Culvert Recommendations: armoring; Ditch Recommendations: armor, sedimentation pools; Road/Driveway Recommendations: add gravel, reshape, diverter dip;	Medium	Medium
09-05	Town Road	Road Shoulder Erosion sheet; Roadside Plow/Grader Berm no; Soil delta, sand;	Roberts Road	100x8	Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: erosion control mulch berms along shoulder;	Medium	Medium
09-06	Town Road	Culvert unstable inlet-outlet; Ditch severe erosion; Road Shoulder Erosion rill; Roadside Plow/Grader Berm no; Soil bare, sand;	Roberts Road	60x5	Culvert Recommendations: armoring, plunge pool; Ditch Recommendations: armor, dam;	Medium	High
09-07	State Road	Culvert unstable inlet-outlet; Road Shoulder Erosion gully; Soil delta, sand;	Lake Road (Rte. 118)	10x20x2	Culvert Recommendations: armoring, replace, enlarge; Ditch Recommendations: dam;	High	High
09-08	State Road	Road Shoulder Erosion gully; Soil bare, sand; Shoreline erosion, inadequate shore vegetation;	Lake Rd	2500x15	Road/Driveway Recommendations: vegetate shoulder; Other Recommendations: mulch mix; Vegetation Recommendations: add buffer; Other Suggestions: stabilize Shoulders;	High	High
09-09	Residential	Surface Erosion sheet; Shoreline lacks shore vegetation;	Harrison	39x10	Other Recommendations: water bar, mulch mix; Vegetation Recommendations: add buffer;	Low	Low
09-10	Town Road	Culvert unstable inlet-outlet; Soil sand, uncovered pile;	Sodom Road Large Culvert near Pole 509	6x2	Culvert Recommendations: armoring; Other Suggestions: Remove sand pile;	Medium	Low
09-11	Town Road	Ditch bank failure; Road Shoulder Erosion sheet; Soil sand;	Sodom Road Ditch Opposite Pole 510 to intersection Harrison	500x5	Other Suggestions: stabilize shoulder;	Medium	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
09-12	Residential	Surface Erosion rill;	Harrison	60x20	Road/Driveway Recommendations: build, add gravel, reshape; Vegetation Recommendations: buffer; Other Suggestions: Buffer at end Driveway;	Low	Low
09-13	State Road	Culvert unstable inlet-outlet; Soil bare; Shoreline lacks shore vegetation;	Harrison Road Culvert Near Pole 19	25x15	Vegetation Recommendations: reseed, buffer;	Low	Low
09-14	Town Road	Road Shoulder Erosion rill; Roadside Plow/Grader Berm no; Soil bare, sand;	Old Stage int Harrison Pole 32	80x10	Road/Driveway Recommendations: vegetate shoulder, remove berm; Vegetation Recommendations: buffer, reseed; Other Suggestions: Reshape Shoulder;	Low	Low
09-15	State Road	Culvert clogged; Bank erosion at inlet near road, sediment build up outlet, long culvert 150 plus feet	Cummings Landing	250 x 12	Culvert Recommendations: remove clog, plunge pool; Ditch Recommendations: remove debris, sedimentation pools; Road/Driveway Recommendations: stabilize shoulder; Vegetation Recommendations: add buffer;	Mediu m	Medium
09-16	State Road	Road Shoulder Erosion gully; Roadside Plow/Grader Berm no; Soil bare; Shoreline erosion;	Rt 118 opposite Water Street	20x20	Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: rip-rap;	Medium	Medium
09-17	State Road	Culvert broken; Soil bare; Shoreline inadequate shore vegetation;	Route 118 Half Culvert north if bridge	20x2	Culvert Recommendations: replace; Road/Driveway Recommendations: vegetate shoulder;	Medium	Medium
09-18	Boat Access	Soil bare, sand; Shoreline erosion, unstable access, lacks shore vegetation;	Lake Boat Ramp	25x25	Path & Trail Recommendations: stabilize; Other Suggestions: stabilize slope to informal boat ramp;	Medium	Low
09-19	Other	Surface Erosion gully; Soil bare; Shoreline undercut, lacks shore	Lake	25x12	Path & Trail Recommendations: stabilize; Other Suggestions: stabilize slope to lake;	Medium	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
		vegetation, unstable access, erosion;					
09-20	Town Road	Culvert clogged, unstable inlet-outlet; Ditch moderate erosion; Soil sand;	Roberts at Lake Road West Side	300x20	Culvert Recommendations: armoring, plunge pool; Ditch Recommendations: vegetate, armor, reshape, dam, remove debris; Road/Driveway Recommendations: vegetate shoulder; Other Suggestions: Use less winter sand; problem will occur if Lake Road Culvert cleaned out;	Medium	Medium
09-21	Town Road	Ditch undersize; Road Shoulder Erosion gully; Soil bare, sand; Shoulder eroded ditch	Pole1 to 4 West Side Roberts Road	1000x12	Ditch Recommendations: vegetate, reshape, turnout, ditch, dam;	High	Medium
09-22	Town Road	Surface Erosion rill; Road Shoulder Erosion gully; Roadside Plow/Grader Berm yes; Soil sand;	Roberts Road Hill before Pikes	1000x30	Ditch Recommendations: remove debris, dam; Road/Driveway Recommendations: remove berm, reshape, stabilize shoulder;	Medium	High
09-23	Town Road	Culvert unstable inlet-outlet; Roadside Plow/Grader Berm no; Soil bare, sand;	Roberts Road at Farm both sides including Driveway	40x2	Culvert Recommendations: armoring;	Low	Low
09-24	Driveway	Road runoff thru paved parking lot to Lake	Lake Road	20x10	Other Recommendations: mulch mix, infiltration trench, swales; Vegetation Recommendations: add buffer; Other Suggestions: Reduce pavement and vegetate;	Low	Medium
09-25	State Road	Road Shoulder Erosion sheet; Roadside Plow/Grader Berm no; Soil bare, sand; Shoreline lacks shore vegetation, inadequate shore vegetation, unstable access; Both sides bridge need work have sink holes	Parking Lot to Bridge	100x10	Road/Driveway Recommendations: vegetate shoulder; Path & Trail Recommendations: define; Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed; Other Suggestions: Dock?	Medium	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
09-26	Commercial	Soil bare, sand; Roof Runoff Erosion yes; Shoreline lacks shore vegetation, inadequate shore vegetation, erosion; Too much pavement and gully next to retaining wall	Lake Road	150x10	Roof Runoff Recommendations: trench, barrel; Other Recommendations: mulch mix; Vegetation Recommendations: buffer, add buffer;	Low	Medium
09-27	Town Road	Culvert unstable inlet-outlet; Ditch bank failure; Road Shoulder Erosion gully; Roadside Plow/Grader Berm no; Soil sand;	Crockett Ridge at Stop Sign towards lake	50x10	Culvert Recommendations: plunge pool; Road/Driveway Recommendations: stabilize shoulder; Other Recommendations: infiltration trench;	Medium	Medium
09-28	Trail/Path	Surface Erosion rill; Road Shoulder Erosion sheet; Soil sand, bare; Shoreline unstable access, lacks shore vegetation;	three ramps near canoe launch, two opposite, one same side	30x15	Path & Trail Recommendations: infiltration step, stabilize; Vegetation Recommendations: add buffer; Other Suggestions: rip-rap slope;	Low	Low
09-29	Town of Norv	Surface Erosion sheet; Soil bare; Shoreline inadequate shore vegetation; people	Canoe Launch	20x10	Other Recommendations: mulch mix; Vegetation Recommendations: reseed, add buffer;	Low	Low
09-30	Town Road	Road Shoulder Erosion gully; Soil bare, sand;	Roberts Road Beg Stream at Culvert to where diverts from Road	100	Road/Driveway Recommendations: vegetate shoulder, stabilize shoulder; Vegetation Recommendations: buffer; Other Suggestions: Consider moving stream away from road; stabilize Shoulder and buffer stream;	Medium	Medium
10-01	Construction	Surface Erosion Severe; Soil uncovered pile, bare; Flow into lake via minimal vegetation	Beaver Way	500'x200'	Construction Site Recommendations: mulch, seed/hay, fence/berm; Other Recommendations: water bar; Vegetation Recommendations: add buffer;	Low	Medium

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
10-02	Residential	Surface Erosion Slight; Soil bare; Shoreline lacks shore vegetation; Flow into lake via directly into lake	Beaver way	20'x50'	Other Recommendations: mulch mix; Vegetation Recommendations: add buffer, reseed;	Low	Low
10-03	Residential	Surface Erosion Slight; Soil bare; Flow into lake via directly into lake	Jackson	100'x20'	Path & Trail Recommendations: define, stabilize, diverter; Other Recommendations: water bar; Other Suggestions: Install possible diverter on the road above the camp;	Low	Low
10-04	Town Road	Culvert unstable inlet-outlet; Road Shoulder Erosion moderate; Soil sand; Flow into lake via stream	Richardson Hollow Road, pole#17	100'x30'	Culvert Recommendations: armoring; Ditch Recommendations: remove debris, dam; Other Suggestions: Stabilize shoulder, Rip Wrap;	Medium	Medium
10-05	Town Road	Road Shoulder Erosion severe; Soil sand; Flow into lake via stream	Between pole 17-18, Richardson Hallow Road	125'x10'	Road/Driveway Recommendations: remove berm; Other Suggestions: Stabilize shoulder, remove berm to divert to existing turnout;	Medium	Medium
10-06	Town Road	Ditch moderate erosion; Road Shoulder Erosion moderate; Soil bare, sand; Flow into lake via stream	Corner of Bronson and Richardson Hollow Roads, across from pole #26	125'x10'	Culvert Recommendations: armoring; Ditch Recommendations: vegetate, armor, reshape, dam; Other Suggestions: Inlet undermined by water. Fix sink hole above culvert, road material washes across main road;	Medium	Medium
10-07	Town Road	Surface Erosion Moderate; Road Shoulder Erosion moderate; Soil sand;	Richardson Hollow both sides (near Bronson Lane Pole # 35	20'x10'	Culvert Recommendations: armoring; Vegetation Recommendations: buffer;	Medium	Low
99-01	Residential	Surface Erosion sheet; Roadside Plow/Grader Berm no; Soil bare; Roof Runoff Erosion yes; Shoreline undercut;	Birch island	15x20	Path & Trail Recommendations: define, infiltration step; Other Recommendations: mulch mix; Vegetation Recommendations: no	Low	Low

Lake Pennesseewassee Watershed Remediation Sites							
Sector & Site	**Land Use**	**Problems**	**Location**	**Area**	**Recommendations**	**Impact**	**Cost**
					raking; Other Suggestions: Drip line trench not practical, place stones under drip edge;		