

Woods Pond Watershed-Based Protection Plan



April 2013

Fiddlehead Environmental Consulting

1. Background Information

A. 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 NPS mitigation and water quality protection efforts for the Woods Pond watershed over the next ten years (2013 to 2023). Fiddlehead Environmental Consulting prepared the plan with assistance and input from Maine Department of Environmental Protection (MDEP), Lakes Environmental Association (LEA) and United States Environmental Protection Agency (EPA).

The plan was developed to satisfy national watershed planning guidelines provided by the EPA. 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 and include minimum planning elements. The Woods Pond meets these eligibility criteria, and the plan was written to include the EPA and MDEP required planning elements (sections 2 through 6 in the plan cover EPA’s five elements for alternative watershed-based plans).

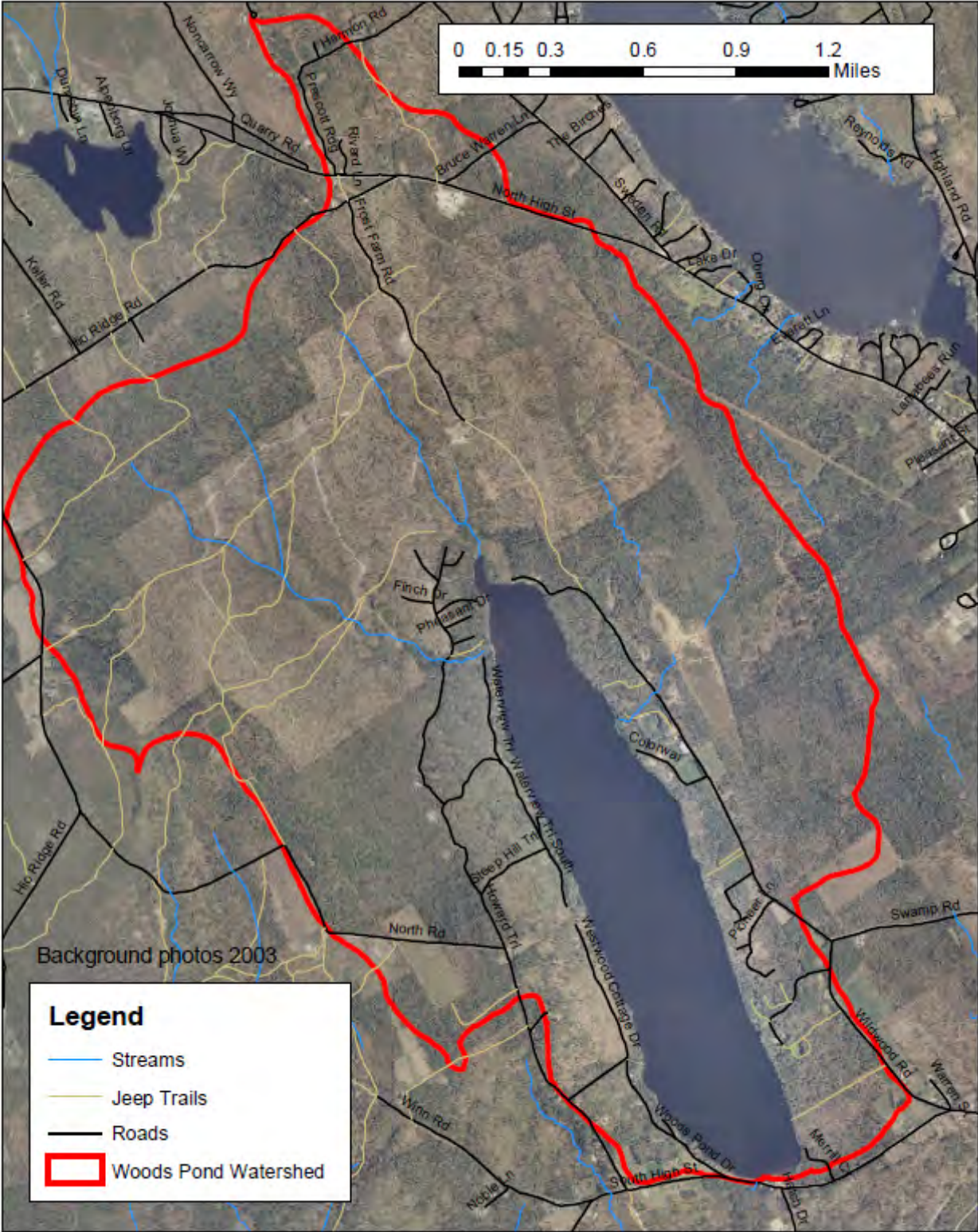
Note: Information collected during the 2012 Woods Pond watershed survey forms the basis for much of the plan. As such, the ***Woods Pond Watershed Survey Report*** is attached to the plan in Appendix A.

B. Watershed Background

Woods Pond is located in Bridgton, Maine. The pond has a surface area of 462 acres, and its 5-mile shoreline is moderately developed with 130 seasonal and year-round residences and two summer youth camps. There is a popular town beach and boat ramp at the outlet end of the pond, and an adjacent boat washing station to prevent the introduction of invasive aquatic plants to Woods Pond and neighboring lakes. The Maine Department of Inland Fisheries and Wildlife manages the pond as a warmwater fishery. Woods Pond is well known for bass fishing, but it is also periodically stocked with brown trout and landlocked salmon.

The pond’s watershed covers 5.2 square miles (Figure 1). The upper watershed is mostly forested, although there is a network of jeep trails and some scattered residential development and agriculture. Most of the watershed’s roads are located within a half mile of the lake. Almost all of the private roads have associations that raise funds to conduct some road maintenance.

Figure 1 - Woods Pond Watershed



C. Summary of Prior Watershed Work

The regional watershed stewardship group, LEA, provides several services to Woods Pond including water quality monitoring and clean-lake checkups to help residents address erosion problems on their properties. LEA identified and carried out a series of stormwater treatment and mitigation projects in the watershed between 2006 and 2010. This work, which included BMP installations at the town boat launch and both youth summer camps, was funded by phosphorus compensation fees paid by residential subdivision projects under the Maine Stormwater Law.

Although there is not an active lake association for Woods Pond, the Town of Bridgton appointed the Woods Pond Water Quality Committee in 2010 to determine lake water levels that protect the lake and reduce shoreline erosion. The committee then focused its attention on threats to water quality throughout the watershed, which led to a watershed survey project in 2012.

2. Identification of the Causes or Sources of the NPS Threat

A. Water Quality Summary

Water quality data has been collected on Woods Pond since 1976. LEA staff conducts regular monitoring with some assistance from volunteers from the Volunteer Lakes Monitoring Program. Monitoring parameters include Secchi Disk Transparency (SDT), Chlorophyll-a (Chla), phosphorus and dissolved oxygen (DO). MDEP staff also periodically conducts baseline monitoring on the pond. There are 19 years of basic chemical information in addition to SDT. DEP summarizes Woods Pond water quality as follows:

DEP considers water quality of Woods Pond to be average, based on measures of SDT, total phosphorus (TP), and Chla. The potential for nuisance algal blooms on Wood Pond is moderate. Wood Pond is a moderately colored lake (average color 31 SPU) with an average SDT of 4.7m (15.5 ft). The range of water column TP for Woods Pond is 6 - 13 parts per billion (ppb) with an average of 10 ppb, while Chla ranges from 1.3 – 10.6 ppb with an average of 3.4 ppb. Recent dissolved oxygen (DO) profiles show high DO depletion in deep areas of the lake. The potential for TP to leave the bottom sediments and become available to algae in the water column (internal loading) is low to moderate.

B. Threatened Status

Woods Pond currently meets state water quality standards. However, it is listed in Chapter 502 of the Maine Stormwater Law as “Most at Risk from New Development” and on Maine’s NPS Priority Watersheds list. Woods Pond and the other unimpaired lakes were placed on these lists because it was identified by MDEP as being particularly sensitive to eutrophication based on current water quality, potential for internal recycling of phosphorus, potential as a cold water fishery, volume or flushing rate, or projected growth rate in the watershed.

LEA conducts its own data analysis and priority ranking for the 37 lakes that they monitor. In 2012, they raised Woods Pond from a “Moderate” degree of concern to a “Moderate/High” level of concern based on water quality data over the past decade.

C. Watershed NPS Threats

Like many other lakes in Maine, Woods Pond'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 cause lake algae populations to increase and water clarity to decline. High levels can cause dense algae blooms, which can also create a biological and chemical reaction that depletes the oxygen from the bottom of the lake and results in the loss of cold water fisheries.

Phosphorus, which is typically attached to soil particles and organic matter, mostly reaches the lake in the stormwater runoff from the lake's 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. MDEP monitoring in paired watersheds found that phosphorus export from the developed watershed was up to 10 times greater than the forested one (Dennis, 1985).

The Woods Pond Water Quality Committee raised funds for and conducted a watershed survey in 2012 to identify sources of phosphorus to Woods Pond. 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 Fiddlehead Environmental Consulting, and technical support was provided by Portland Water District, LEA and MDEP staff. In April 2012, the technical leaders and 31 trained volunteers surveyed all developed portions of the watershed and documented soil erosion sites. Surveyors documented the location, nature and extent of each site's erosion and runoff problems, recommended maintenance and pollution fixes, and rated the impacts to the lake and the cost to fix. Survey findings were summarized in the **Woods Pond Watershed Survey Report** (2013), which includes maps and a spreadsheet of NPS sites (Appendix A).

In total, 79 erosion sites were identified in the watershed (Figure 2 and Table 1). The largest numbers of problems were associated with private roads (31 sites), residential properties (26 sites), driveways (8 sites) and commercial properties (7 sites). The remaining 7 sites were associated with 2 town roads, 2 paths, 1 beach, 1 state road and 1 construction site. Aside from soil erosion, no other significant sources of phosphorus were observed during the survey.

Figure 2 - Land Use and Impact of Woods Pond NPS Sites

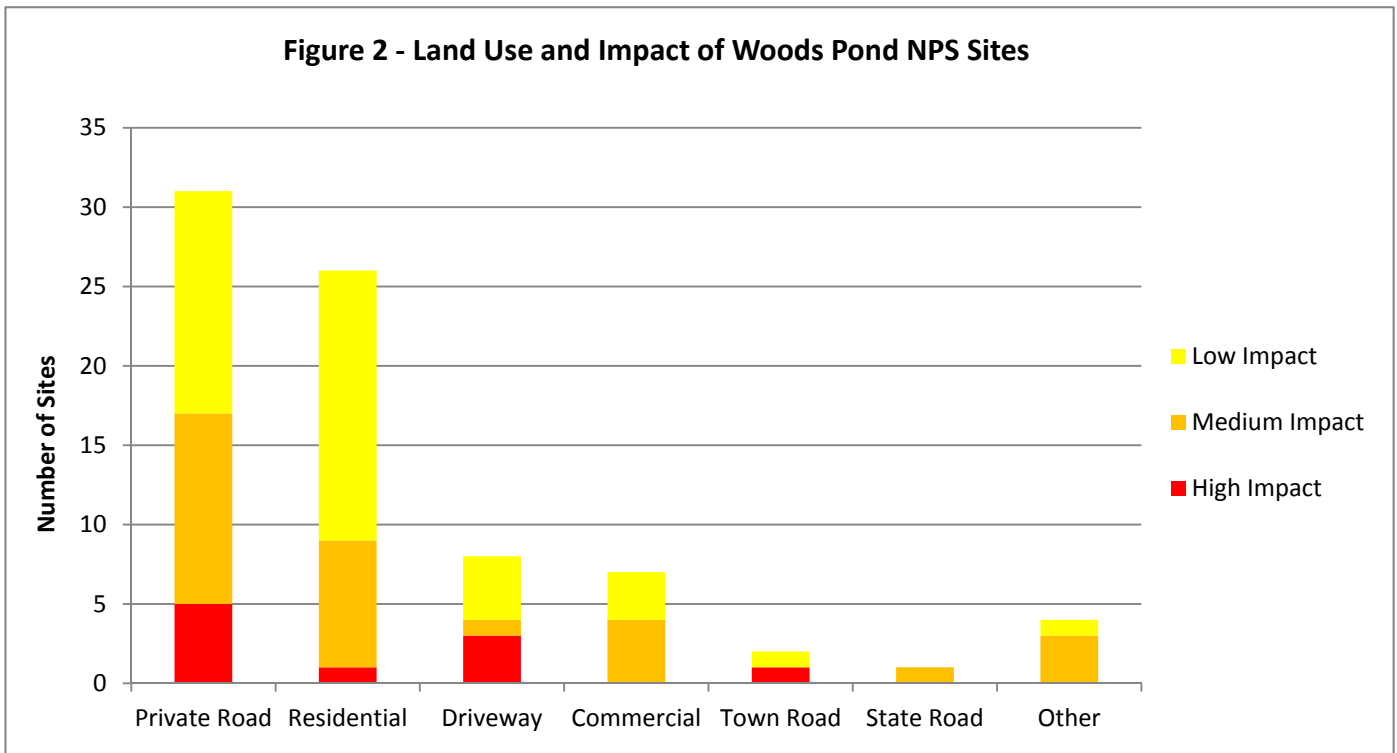


Table 1 – Land Use and Impact of Woods Pond NPS Sites

Land Use	High Impact	Medium Impact	Low Impact	Total Sites
Private Road	5	12	14	31
Residential	1	8	17	26
Driveway	3	1	4	8
Commercial	0	4	3	7
Town Road	1	0	1	2
State Road	0	1	0	1
Other	0	3	1	4
Total	10	29	40	79

3. Watershed Plan Goals and Objectives

Overall Goal: The overall plan goal is to maintain or improve Class GPA water quality standards in Woods Pond by reducing phosphorus and sediment loading to the lake. This will be achieved through the following actions over the coming ten year period (2013-2023):

- **Reduce current sources of phosphorus loading** by fixing 61 of the 79 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 NPS sites identified in the watershed survey.
- **Prevent new sources of phosphorus loading** 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, youth camps and municipal officials.
- **Build local capacity** for watershed stewardship by forming a lake association and raising funds for mitigation work.
- **Conduct ongoing assessment of lake and watershed conditions** by monitoring lake water quality and setting up and maintaining the NPS Site Tracker.

4. Schedule and Milestones to Guide Plan Implementation

A. Action Plan and Schedule

Action items, an estimated schedule and milestones were developed to prevent new NPS problems and address existing NPS sites with the highest impact and phosphorus loading to Woods Pond. The number and types of sites targeted in the plan was based on local knowledge about potential funding sources, landowner cooperation and other considerations. Other actions in the plan were included because they have proven to be cost-effective and successful in the region. The plan is designed to be implemented over a ten year period, and an estimated schedule is provided for each action (Table 1). Potential funding sources and key partners were also identified for each action (Table 2). The plan will be carried out, in large part, with local funding and resources. However, state and federal funding will also be sought to help implement some actions in the plan.

Table 1 – Implementation Schedule

2013 – 2014	<ul style="list-style-type: none">• Form Woods Pond Association.• Apply for EPA Section 319 Clean Water Act grant through MDEP.• Notify landowners about NPS sites on their properties.
2014 – 2016	<ul style="list-style-type: none">• Conduct EPA 319 project (if funded) with targeted cost sharing and matching grants for high priority sites.• Set up NPS Site Tracker.
2013 – 2023	<ul style="list-style-type: none">• LEA conducts Clean Lake Check-ups, monitoring and municipal assistance for new development projects.• Woods Pond Association conducts annual meetings, outreach, maintains NPS Site Tracker and raises funds for ongoing stewardship.• Landowners fix NPS sites independently.• Woods Pond Association uses NPS Site Tracker to identify maintenance needs and prompt ongoing road maintenance.

Table 2 – Action Items and Milestones	Schedule	Who	Potential Funding Sources
<i>Reduce current sources of P loading to the lake by addressing NPS sites identified in the watershed survey</i>			
Landowner self-funded BMP installations at NPS sites			
Driveway sites (4 sites)	2014-2019	Landowners	Private, WPA
Residential sites (12 sites)	2014-2019	Landowners	Private
Commercial Youth Camps (3 sites)	2014-2019	Youth Camps	Youth Camps
State Road site (1 site)	2014-2016	MDOT	MDOT
Provide opportunity for cost sharing assistance to install BMPs at NPS sites			
Private Roads (22 sites) & Driveways (4 sites)	2014-2023	Private	EPA (319), Private
Commercial Youth Camps (4 sites)	2014-2019	Private	EPA (319), Private
Town Road Site (1 site)	2014-2016	Town	EPA (319), Town, PWD
Residential sites (10 sites)	2014-2016	Volunteers	EPA (319), Private
Conduct clean lake check-ups for lake residents (outreach & tech assistance)	Ongoing	LEA, PWD	LEA, PWD
Notify landowners with watershed survey sites	2013-2014	WPA	WPA
<i>Prevent new sources of phosphorus loading to the lake</i>			
Construction site inspections and buffer delineation	Ongoing	LEA, Town	LEA, Town
Hold tours to highlight conservation practices	2014-2020	WPA	EPA (319)
Work with road associations and Town to prompt ongoing road maintenance	2014-2023	WPA, LEA	Town, Private
<i>Build local capacity for watershed stewardship</i>			
Apply for 319 Watershed Implementation Grant	2013	LEA	Private
Form Woods Pond Association (WPA)	2013-2014	WPWQC	Private
WPA applies for non-profit status	2013-2014	WPA	Private
Conduct WPA annual meetings	Ongoing	WPA	WPA
Raise funds to support ongoing lake stewardship work	Ongoing	WPA	Private, Town
<i>Conduct ongoing lake and watershed assessment</i>			
Conduct lake water quality monitoring	Ongoing	LEA, MDEP	LEA
Set up NPS Site Tracker and train WPA to use	2013-2014	MDEP	Private
NPS Site Tracker annual use and maintenance	Ongoing	WPA	Private

B. Plan Oversight and Partner Roles

The Woods Pond plan will initially be carried out by the Woods Pond Water Quality Committee with support from LEA. Once the Woods Pond Association is officially formed and has the organizational capacity, they will assume responsibility for plan oversight and implementation. Partners include LEA, MDEP, the Town of Bridgton, Portland Water District, MDOT, Camp Wildwood, Camp Kingswood, private road associations and landowners.

- **LEA** will support WPWQC and WPA with Plan implementation; provide technical assistance through its Clean Lakes Checkup program; conduct water quality monitoring; promote watershed stewardship through its website, newsletters and presentations; and work with the Town to provide property inspections and buffer delineation services for new development.
- **MDOT, Youth Camps, private road associations and landowners** will address NPS issues on their properties and conduct ongoing maintenance of BMPs.
- **WPWQC and WPA** will provide Plan oversight, conduct outreach activities and raise funds for stewardship work. They will also set up and use the NPS Site Tracker to identify new NPS sites and prompt ongoing maintenance.
- The **Town of Bridgton** will provide funding support for the Plan and LEA's water quality monitoring and also work to address NPS problems and conduct regular maintenance on town road sites.
- **Portland Water District (PWD)** will provide technical assistance and potentially cash match for grant projects.
- **MDEP** will conduct water quality monitoring and technical assistance and provide the opportunity for financial assistance through the NPS Grants Program.
- **EPA** may provide CWA Section 319 funds and guidance.

C. Plan Outputs and Milestones

Organizational Outputs

- Woods Pond Association formed
- WPA applies for and receives non-profit status
- LEA applies for 319 grant for Phase I project
- NPS Tracker created and local coordinator trained to use
- Contact made with all property owners and road associations with sites identified in watershed survey

NPS Mitigation Outputs

- Number of NPS sites fixed by voluntary landowner initiative
- Number of high and medium impact NPS sites fixed with cost sharing assistance
- Number of technical assistance visits
- Estimated pollutant load reductions achieved by installed BMPs

Water Quality Outcomes

- Meets lake GPA standards in MDEP's biennial 303d reports
- Stable or improved trend for lake water clarity and dissolved oxygen
- LEA level of concern for Woods Pond moved from 'High/Medium' back to 'Medium'

5. Proposed Management Measures

The *Woods Pond Watershed Survey Report* (Appendix A) 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, 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 the Woods Pond Association with support from MDEP on an ongoing basis to identify new problems and to prompt maintenance on sites fixed through the plan.

A. Residential Shoreline Development

The watershed survey identified 26 residential erosion sites. Of these, there was 1 high impact, 8 medium impact and 17 low impact residential sites. Common problems included lack of vegetated buffers, bare soil and erosion on footpaths, along roof driplines and adjacent to the lake. Based on the survey results, the most common BMPs will include:

- vegetated buffers;
- erosion control mulch;
- runoff diverters on paths; and
- infiltration trenches along roof driplines and stabilization of bare soil.

The plan aims to address 22 of the 26 residential erosion problems identified in the watershed survey. Ten sites (high and medium impact) will be fixed by providing landowners with small matching grants for plants, erosion control mulch or other materials. Since many of the low impact sites are low cost and easy to fix, another 12 sites will be fixed independently by the landowners after the problem and recommended solutions are brought to their attention through targeted outreach and/or technical assistance visits.

B. Private Roads and Driveways

The watershed survey identified 31 private road sites and 8 driveway sites. They are discussed here together since the management measures are similar for both. Impact ratings are relatively higher for

these sites compared to other problems in the watershed. For private roads, there were 5 high impact, 12 medium impact and 14 low impact sites. For driveways, there were 3 high impact, 1 medium impact and 4 low impact sites. 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 recommended in the survey included:

- reshaping (crowning) the road surface;
- removing berms that trap runoff on the road surface;
- installing waterbars to divert water off the road
- cleaning, enlarging and stabilizing ditches; and
- armoring culvert inlets and outlets.

The plan aims to address 22 private road sites and 8 driveway sites. All 5 high impact, all 12 medium impact and 4 low impact private road sites and all 3 high impact and 1 medium impact driveway sites will be addressed by providing cost sharing funds to road associations and landowners. Similar to the low impact residential sites, targeted outreach and technical assistance will be provided to landowners and road associations associated with the remaining low impact sites. It is anticipated that voluntary action will result in 16 of these problems being fixed.

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 through the NPS Site Tracker. Follow up contact will be made by the Woods Pond Association to road associations and landowners for any maintenance needs.

C. State and Town Roads

There were only 2 town road sites and 1 state road site identified in the watershed survey. One town road site was high impact, 1 town road site was low impact and the state road site was medium impact. All 3 sites will be addressed in the plan.

The high impact town road site is relatively complex and will require engineering support and coordination with the adjacent private road. The plan aims to provide cost sharing assistance and engineering oversight to help the town with a site design and construction costs. The low impact town road site involves stabilization of a ditch and will be fixed independently by the town or by providing a small amount of cost sharing for project materials.

Recommendations for the state road site, which is located just a few feet from the lake, include enhancing the buffer and shoreline riprap and stabilizing the road shoulder. The plan aims to notify Maine Department of Transportation (MDOT) about the problem and request that the recommendations be incorporated into the road maintenance schedule. The NPS Site Tracker can be used to prompt periodic inspections of the state road site and communication with MDOT about future maintenance needs.

D. Commercial Summer Youth Camps

Seven erosion sites were identified at the lake's two youth summer camps. Of these, 4 sites were rated as medium impact, and 3 were low impact sites. Problems were associated with the camp access roads (e.g., road surface and culvert inlet/outlet erosion) as well as the heavy use areas adjacent to the lake (e.g., beach erosion, inadequate buffers). Recommendations include:

- armoring culverts;
- installing plunge pools below culverts;
- crowning roads;
- installing shoreline buffers;
- defining footpaths; and
- stabilizing bare soil with erosion control mulch or vegetation.

The plan aims to fix all 7 commercial sites. Both camps have year-round maintenance staff, equipment and expertise to implement recommendations. Four of the projects will be completed independently by the camp staff. Cost sharing for materials will be provided to help purchase materials needed for the remaining 4 sites.

6. Pollutant Load Reductions

Pollutant load reductions will be estimated for many NPS sites to help demonstrate the value of BMPs to reduce the amount of sediment and phosphorus entering the pond. Pollutant load reductions will be estimated and reported to MDEP for any work funded by 319 grants. Pollutant load reduction will be made using methods approved and recommended by the MDEP and EPA. Preliminary estimates were already made during the watershed survey process of the pollutant loading prior to watershed mitigation efforts (Appendix B). These estimates can be used to further prioritize projects in the watershed.

7. 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. LEA will continue to monitor Woods Pond twice 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 Woods Pond 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.

Woods Pond Watershed Survey



**Woods Pond Water Quality Committee
Fiddlehead Environmental Consulting
Lakes Environmental Association**

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*Cover photo of Woods Pond by Jeff Stern
Printed on recycled paper*



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Introduction

Is there a water quality problem in the Woods Pond Watershed?

Woods Pond in Bridgton is 454 feet above sea level, and has a surface area of 462 acres. With a **watershed** covering 3,329 acres (see box and Figure 1), Woods Pond is vital to the economy and quality of life in Bridgton. It is the setting for a growing number of seasonal and year-round residences and two summer youth camps, with a popular town beach at the outlet end. Woods Pond provides recreational opportunities for fishing, boating, and swimming, as well as valuable wildlife habitat.

Lakes Environmental Association (LEA) has tested water quality in Woods Pond since 1976. Water quality in the lake is generally good, but like many lakes and ponds in southwestern Maine, there is growing concern about lower water clarity, as well as increased nutrients (such as phosphorus) and algae growth. These conditions accelerated during the previous decade, prompting LEA in 2012 to raise Woods Pond from a “Moderate” degree of concern to a “Moderate/High” level.

Watershed

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

The Woods Pond Watershed is 3,329 acres (Figure 1).

Over the past decade, Woods Pond has experienced significant soil runoff from the surrounding land during storm events. This storm water runoff is a type of **nonpoint source pollution** (see box). Rain and snowmelt sweep over the watershed, moving debris and soil into the lake from the surrounding land and streams.

NONPOINT SOURCE POLLUTION

Also called NPS or polluted runoff. Pollution that can not be traced back to a discharge from a particular direct source (e.g., an industrial outfall pipe).

One way to visualize NPS pollution is to think of rain and snow melt as a giant broom that sweeps over the watershed, moving debris and soil into the lake from the surrounding land and streams.

In an undeveloped, forested watershed, storm water runoff (rain and snowmelt) is slowed by trees and shrubs. It is then filtered through the soil and soaks into the uneven forest floor. In this way, nonpoint source pollution is trapped on land so it doesn't flow into the lake. But in *developing* watersheds, the velocity of storm water runoff increases on impervious surfaces like rooftops, compacted and bare soil, gravel roads and pavement. Storm water runoff does not receive the filtering treatment the forest once provided.

Soil particles carry **phosphorus** (a plant nutrient) as a “hitch hiker”. If eroding soil carries too much phosphorus into a lake, it upsets the natural balance, and algae in the lake gorge on it like junk food. Algae growth explodes and the lake can become covered with slimy green plant matter, which ruins swimming, boating, fishing and the quality of wildlife habitat.

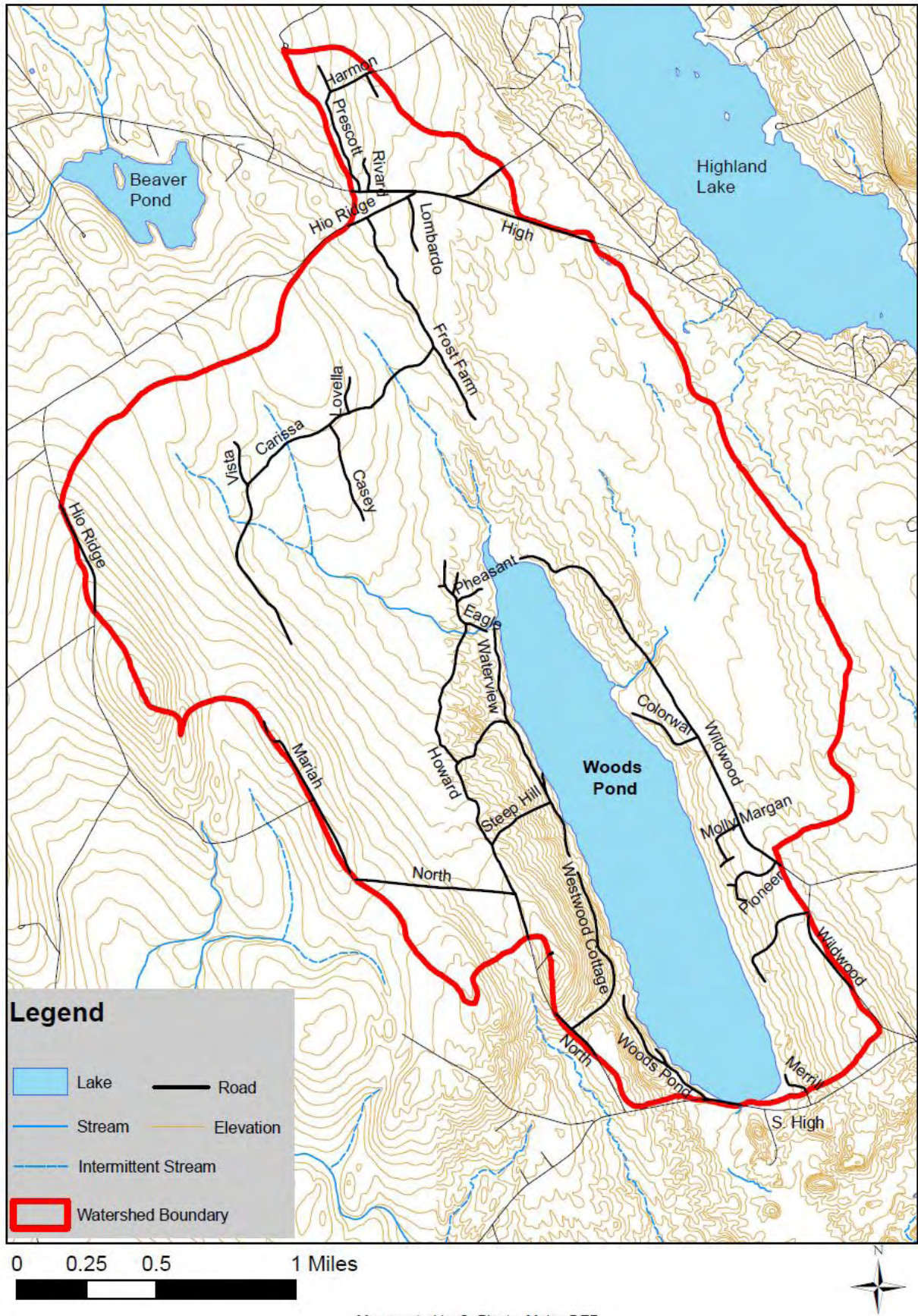


Excess phosphorus can “fertilize” a lake and lead to nuisance algal blooms.

(continued on page 3)

Figure 1

Woods Pond Watershed



INTRODUCTION (continued from page 1)

Algae “blooms” like this have already occurred in lakes around Lewiston and Augusta. Once these blooms occur, they are enormously expensive to fix. Restoring a lake’s clarity may take decades. That’s why minimizing soil erosion is so important; we want to keep Woods Pond clear and healthy for the enjoyment of all. Prevention is the key.

But in order to fix erosion problems we first need to find out where they are. This is what the survey is all about. We not only look for erosion at the lakeshore, but also in the surrounding watershed which can flow downhill to Woods Pond via streams and surface runoff.



In 2012, the Woods Pond Water Quality Committee (WPWQC) and volunteers surveyed the watershed for soil erosion “hotspots”. Survey results are contained in this report. The survey was funded 100% by contributions; watershed residents and businesses donated generously, as did the Town of Bridgton and Portland Water District. LEA and the Maine Department of Environmental Protection contributed valuable staff time and technical expertise to the project.

Purpose of the Watershed Survey

The primary purpose of the watershed survey is to identify and prioritize existing sources of polluted runoff, particularly soil erosion sites, in the Woods Pond Watershed. However, the following goals are also important:

- Raise public awareness of the connection between land use and water quality, and the impact of polluted runoff.
- Inspire people to become active stewards of the watershed.
- Use the information gathered as a component of a long term lake protection strategy.
- Make general recommendations to landowners for fixing erosion problems on their properties.

Local citizen participation was essential in completing the watershed survey and will be even more important in coming years. Through the leadership of the Woods Pond Water Quality Committee and watershed residents, and with assistance from groups and agencies concerned with lake water quality, the opportunities for stewardship are limitless! We hope that you will find this report interesting and informative.



*Several lakeshore properties were observed to have little or no **vegetated buffer** at the water's edge. It is important to note that buffers of shrubs and trees do a much more effective job than bare ground or grass at keeping NPS pollution from entering lakes. Deep shrub and tree roots also help hold the shoreline.*

(Bear Pond, Hartford, Maine)

Buffers can be installed inexpensively. You can either stop mowing , stop raking to the water's edge and let plants grow up naturally (as in the picture on the right). Or you can plant the area with native trees and shrubs.

Buffers enhance the appearance of shore-front property, increase privacy, and attract birds and other wildlife without ruining the landowner's view.

(MDEP file photo)



Why is it important to protect Woods Pond from polluted runoff?

- Woods Pond provides recreational opportunities to watershed residents and visitors. It is an important contributor to the local economy.
 - Woods Pond provides valuable habitat for fish, birds and other wildlife.
 - 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! Declining property values affect individual landowners as well as the tax revenue of the entire community.
 - Once water quality problems occur in a lake, they can be difficult or impossible to fix.
-

What is being done to protect Woods Pond?

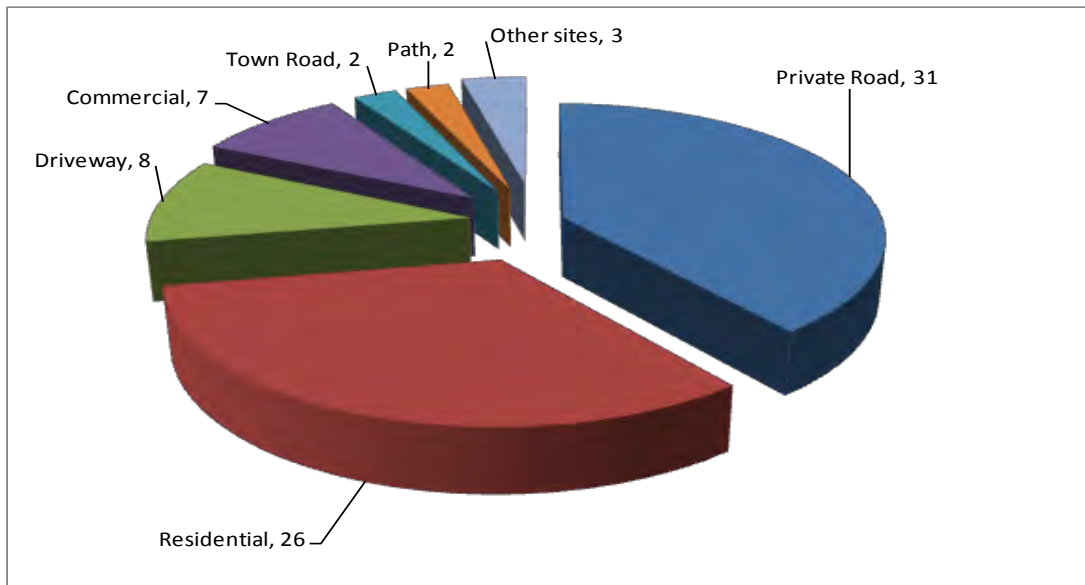
LEA and volunteers have tested water quality in Woods Pond since 1976. Water quality data are shared with the Maine Department of Environmental Protection.

In 2003, Woods Pond became the first lake in the Lakes Region to have a milfoil boat wash station. This station was designed and funded by watershed residents, the Town of Bridgton, and LEA. The Woods Pond Water Quality Committee (WPWQC) was appointed by the town in 2010 to determine proper water level settings that protect the lake and reduce shoreline erosion. WPWQC then examined erosion issues and threats to water quality *throughout* the watershed, culminating in this watershed survey.

Volunteer watershed surveys are one of the most effective ways to protect lake water quality because they get citizens involved in identifying existing and potential sources of polluted runoff. During the course of the watershed survey in the spring and summer of 2012, it was observed that many residents had already installed erosion control measures, such as rubber razor bars and open-top culverts across driveways, to reduce erosion into Woods Pond. Road associations maintain nearly all of the private roads in the watershed.

Woods Pond Watershed Survey Findings

Volunteers and technical staff identified **79 sites** that may have an impact on Woods Pond.



By the numbers

Sites by Land Use:

Private Road	31	(39%)
Residential	26	(33%)
Driveway	8	(10%)
Commercial	7	(9%)
Town Road	2	(3%)
Path	2	(3%)
Beach	1	(1%)
State Road	1	(1%)
Construction Site	1	(1%)
TOTAL	79	(100%)

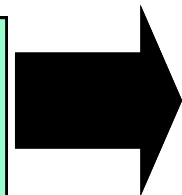
Sites by Sector:

Sector 1:	13
Sector 2:	11
Sector 3:	1
Sector 4:	17
Sector 5:	21
Sector 6:	16
TOTAL	79

Sites by Impact:

High	10
Medium	29
Low	40
TOTAL	79

A total of 9 land uses were associated with the identified sites in the survey. Detailed descriptions of **private road, driveway, residential, commercial and town roads** sites are on the following pages.



Private Roads & Driveways

31 private road and 8 driveway sites were found. Conservation practices are often similar for private roads and driveways.

Common Problems Identified:

- Poor shaping
- Moderate to severe surface erosion.
- Sediment flowing directly to stream or lake.
- Grader berms trap flows on road.

Recommended solutions:

- Reshape road (crown), and remove grader berms, allowing the road to shed water
- Install water bars, open-top culverts or rubber razor bars to divert flow off road.
- Clean, reshape and armor ditches with angular stone rip rap, or plant grass.

Below are examples of private road problems identified on Woods Pond in this survey.



Problems:

- Poor shaping (no crown and two tracks have developed).
- Ditch backslope erosion.
- Water flows over road causing erosion.

Solutions:

- Properly crown the road to remove the tracks.
- Improve the ditch backslope to reduce erosion and armor.
- Enlarge ditch capacity so it contains water and keeps it from flowing over the road.

Problems:

- Sediment delta has formed in the stream which will wash into Woods Pond.
- Road slumping over culvert.

Solutions:

- Install rock armor around the culvert outlet.
- Properly shape shoulder and build up road.
- Install plunge pool at culvert outlet.



Residential

26 Residential sites were found. Many are low impact, and will be inexpensive to fix.

Common Problems Identified:

- Slight or moderate surface erosion.
- Bare soil.
- Inadequate vegetation along the shoreline.
- Direct flow of sediment into Woods Pond.
- Roof runoff erosion.
- Inadequate erosion control at construction sites.

Recommended Solutions:

- Seed and mulch bare soil.
- Establish or enhance shoreline buffer.
- Limit foot traffic in eroding areas, place mulch or stone on heavily used paths.
- Install waterbar, open-top culvert, rubber razor or other runoff diverters.
- Use dripline trench to catch roof runoff.

Below is an example of residential problems identified on Woods Pond in this survey.



Problems:

- Roof runoff causes erosion.
- Bare soil is exposed to the erosive force of snow and rain.
- Exposed roots indicate heavy foot traffic that increases erosion.

Solutions:

- Install an infiltration trench beneath the roof dripline.
- Apply erosion control mulch on bare areas or plant with grass and shrubs in sunny spots.
- Define and narrow the foot path to reduce erosion.

Residential areas were associated with 33% of the identified sources of polluted runoff to Woods Pond. Their cumulative effect pose a significant threat to water quality. Fortunately, most can be easily corrected.

Commercial

Summer youth camps are an important part of the Woods Pond Watershed. They contribute to the local economy and protect large swaths of land from high density development . 7 commercial sites were found.

Common Problems Identified:

- Slight road erosion.
- Sparse buffers in places.
- Beach erosion.
- Inadequate armoring of culvert inlets and outlets.

Recommended Solutions:

- Armor culvert inlets and outlets.
- Install plunge pools below culverts to hold runoff and catch sediment before it enters streams or Woods Pond.
- Properly shape the road.
- Reduce beach erosion and plant buffers

Below are examples of commercial sites identified on Woods Pond in this survey.



Problems:

- Inadequate buffer where erosion washes into lake.
- Eroded material flows to lake.

Solutions:

- Apply additional erosion control mulch to bare areas.
- Enhance buffer.

Problems:

- Berm traps storm water on the road which causes erosion.
- Rut in road indicates that the road is not crowned.



Solutions:

- Remove berm to allow runoff to enter the ditch.
- Properly crown the road.

Town Road

2 town road sites were found. One will be easy to fix, but the other one is a major contributor to erosion and fixing it will be complicated.

Common Problems Identified:

- Moderate to severe shoulder erosion.
- Severe ditch erosion.
- Direct flow of sediment to streams or Woods Pond.
- Unstable culvert inlet and outlet.
- Winter sand build-up.
- Poor shaping and inappropriate surface material.

Recommended Solutions:

- Clean, reshape and armor ditches with stone or plant grass.
- Armor culvert inlets and outlets.
- Install plunge pools below culverts to hold runoff and catch sediment before it enters streams or Woods Pond.
- Properly size and align culverts.
- Properly shape road and install appropriate surface material.

This is a particularly problematic erosion site where Wildwood Road crosses Sucker Brook. The town and private road association will need to work together to solve this problem.



Problems:

- Deteriorating road above the culvert creates a direct path for eroding material to enter the brook.
- Berm traps water on the shoulder and has created a channel to the brook.

Solutions:

- Remove berm so storm water runoff flows into the forest buffer.
- Build up road over the culvert.
- Elongate culvert and add rip-rap over the extension to catch and trap sediment before it enters the brook.
- Coordinate with the private road association to minimize erosion on the unpaved part of the road that is used as a turnaround for town snowplows.

Important Points!

- A full summary of all erosion sites identified in the survey is contained in a spread sheet in the appendix. Sites are grouped in order by survey sector. Each listing shows the map site number, the type of problem(s) encountered, location, size or area, and recommended solutions.
- In addition to the surveyed sites, numerous lakeshore properties were observed to have little or no vegetated buffer at the water's edge. Since the primary purpose of this survey was to document erosion, not all of these sites were included in the survey results because some weren't actively eroding. However, it is important to note buffers of shrubs and trees do a much more effective job than bare ground or grass to keep NPS pollution from entering lakes.
- During the survey, we found that many landowners in the Woods Pond Watershed have already taken steps to protect water quality. Surveyors found numerous open top culverts and waterbars across driveways, as well as dripline trenches under roof edges. These simple conservation measures do an effective job of minimizing, and in some cases eliminating, soil erosion. Landowners' concern for protecting Woods Pond bodes well for future efforts to continue the great erosion control work.

Site Rankings

Sites in the spreadsheet were ranked according to these criteria:

- Impact was assigned by considering factors such as the size of disturbed area, slope, soil type, amount of soil that's eroding, proximity to water, and size of buffer. **Low** impact eroding sites are those with limited transport off-site. At **medium** impact sites, sediment is transported off-site, but the erosion does not reach a high magnitude. Large sites where there is significant erosion that flows directly into the lake, a stream, or ditch, were rated **high** impact.
- Cost is an important factor in planning for restoration. **Low** cost sites were estimated to cost less than \$500 to fix. An estimate of \$500 to \$2,500 was rated **medium**. If the estimated cost to fix a site exceeded \$2,500, a **high** rating was assigned.

With a few exceptions, virtually all of the sites identified in the survey are significant to one degree or another. The cumulative effect of many "low" and "medium" impact sites can exceed that of any one "high" impact site. This should be considered when a strategy is developed to address problems in the watershed.

Recommendations

Fixing the erosion sites identified in this survey will require efforts by the entire community. Below are some suggestions for individuals and groups.

Individual Citizens

- Prevent runoff from washing sediment into Woods Pond. Detain runoff in depressions or divert flow to vegetated areas. Call LEA or Maine Department of Environmental Protection (MDEP) for free technical assistance.
- Minimize the amount of cleared land and road surfaces.
- Stop mowing and raking, and let lawn and raked areas revert back to natural plants. Deep shrub and tree roots help hold the shoreline.
- Avoid exposing bare soil. Seed and mulch bare areas. Use erosion control mulch around construction projects which involve excavation.
- Do not bring in sand or rebuild beaches. Call LEA, Fiddlehead Environmental Consulting or MDEP for technical assistance with beach or shoreline erosion.
- Call the town code enforcement officer before cutting vegetation within 250 feet of the shoreline. The Bridgton town office phone number is 207-647-8786.
- Join the efforts of the Woods Pond Water Quality Committee and LEA. LEA conducts water testing and provides erosion control assistance to landowners and the town.

Woods Pond Water Quality Committee

- Develop an active membership, provide educational materials and guidance to members of the Woods Pond Watershed community and to town officials.
- Organize workshops and volunteer “work parties” to start fixing identified erosion problems and teach citizens how to fix similar problems on their own properties.
- Educate municipal officials and the watershed community about lake issues and work cooperatively to find solutions.
- Use this watershed survey to keep track of fixed sites and new problems.

Private Road Associations

- Minimize road runoff by doing regular, comprehensive maintenance.
- Decrease water velocity in steep ditches by installing check dams.
- Get a copy of “*Gravel Road Maintenance Manual – A Guide for Landowners.*” This reference is a must for anyone managing a gravel road. (Visit the MDEP website www.maine.gov/dep/blwq/docwatershed/roads/gravel_road_manual.pdf.)
- Use hard packing road material and regularly grade gravel roads to allow water to drain into ditches and adjacent vegetation.
- For more extensive problems, seek technical help. Contact LEA, Fiddlehead Environmental Consulting or MDEP to request technical assistance. Contact information is at the end of this report.

Municipal Officials

- Enforce shoreland zoning standards to assure full protection of Woods Pond.
- Conduct regular maintenance on town roads in the watershed, and fix town road problems identified in this survey.
- Participate in and support long term watershed management projects.
- Promote training in erosion control for road crews, planning boards and conservation commissions.

Next Steps

With publication of this report, the watershed community has taken a major step forward by completing the survey of erosion sites. We now have the information needed for planning purposes, and for fundraising, as well.

What happens next? The Woods Pond Water Quality Committee and LEA are already preparing a grant proposal to the MDEP Section 319 Program that, if awarded, will allow us to share the costs of controlling erosion with the town, summer youth camps, private road associations, and property owners. This grant proposal is due in late spring, 2013. If awarded, it will start in January, 2014 and run for two years. Additional action items in the coming years can include:

2013:

- Create a formal lake association that encompasses representatives from the ad hoc Woods Pond Water Quality Committee, private road associations, summer youth camps, and watershed residents/landowners. Coalescing into a formal lake association will facilitate protection efforts in the coming years.
- Apply for nonprofit status once the lake association is formed. This will allow the association to directly submit proposals for grants (most funders require nonprofit status), as opposed to the current situation where we must rely on another organization to be our grant sponsor.

2014 -2016:

- Implement the MDEP erosion control grant, assuming it is awarded. Given the realities of current restrictions in funds, it is likely this grant will only be the first phase in fixing a large chunk, but not all, of erosion sites that were found in the watershed survey. Therefore, the lake association should seek subsequent phases, as needed, from the MDEP Section 319 Program, as well as other erosion control grants.

“Evergreen” action items (Those that can begin right now and are ongoing):

- Remain vigilant about keeping milfoil out of Woods Pond.
- Keep an eye out for new erosion sites that have emerged after the watershed survey was completed.
- Continue monitoring lake water levels and make recommendations to the Town of Bridgton about water level management with an eye toward reducing shoreline erosion.
- Continue education efforts about erosion control in the watershed. It has been noted elsewhere in this report that volunteers and technical staff identified numerous places around the lake where landowners have already installed erosion control measures. This is a great sign, but we need to educate all users – especially young people who are the next generation of lake stewards - about the link between erosion and diminishing water quality.
- Encourage participation in LEA’s “Clean Lakes Check-Up” Program to identify and minimize erosion hot spots.

Appendix

- **Site Location Maps**
- **Glossary of Erosion Control Terms**
- **Spreadsheet**
- **Conservation Practices for Homeowners**
- **Permitting ABCs**
- **Where To Go For More Information**

Map Key:

BA = Beach Access
C = Commercial
CS = Construction Site
D = Driveway
P = Path/Trail
PR = Private Road
R = Residential
SR = State Road
TR = Town Road

Glossary of Erosion Control Terms

Armor: Reinforcement of ditches, lake shore, culvert inlets or outlets, or embankments with angular rocks to resist erosion.

Berm: As used in this report, “berm” refers to the build-up of road gravel, winter sand or other material on the sides of a road that prevents storm water from flowing off the road into a ditch or the forest. Berms can be formed during road grading or plowing.

Check Dam: A small dam made of small angular stones placed in steep ditches for the purposes of reducing water velocity in the ditch and trapping eroded material.

Crown: Creating a high point that runs lengthwise along the center of a road. Either side of this high point is sloped gently away from the center toward the outer edge of the road. Crowning is the quickest way to get water off the road to prevent erosion and development of potholes.

Culvert: A closed pipe or other conduit, other than a bridge, that allows water to pass under a road.

Ditch: A small, artificial channel for conveying water along the side of a road.

Erosion: The wearing away of natural (earth) and human-made (ditch, road, embankment) surfaces by the action of external forces such as water and wind.

Infiltration: Passage of water through the soil surface into the ground.

Mulch: A natural protective covering over the land surface that conserves moisture, holds soil in place, aids in establishing vegetation, and reduces temperature fluctuations. **Erosion Control Mulch** prevents erosion from steep slopes.

Plunge Pool: Also known as a **Sediment Basin**, a plunge pool is a drainage structure that collects water before it flows into a stream or lake. Plunge pools are usually located at the lowest end of a ditch. They slow runoff so that storm water flowing down a ditch has a chance to drop out its sediment before entering a stream or lake.

Turnout: Turnouts are used to direct ditch water away from the road into a vegetated buffer area or sediment basin. A turnout should have a flared end section that is level and lined with rock to spread out the flow.

Vegetated Buffer: A natural or planted area of trees, shrubs, or other vegetated ground cover located between developed areas (such as roads, driveways, or residences) and a lake or stream. These are excellent at removing sediment and nutrients from storm water runoff. A **Rain Garden** is a type of buffer that collects storm water runoff in a low area and traps contaminants.

Water Bar: Water bars can be used on roads and driveways to divert water off the surface during a storm. A water bar is a ridge (like a speed bump) that runs diagonally off the road or driveway, typically at a 30° angle. It stops water from running down the road and diverts it to the side. Common types of water bar seen on roads and driveways around Woods Pond include **Rubber Razors** and **Open-top Culverts**.

Conservation Practices for Homeowners

After reading this report, you probably have a general idea about how to make your property more lake-friendly. However, making the leap from concept to construction may be challenging.

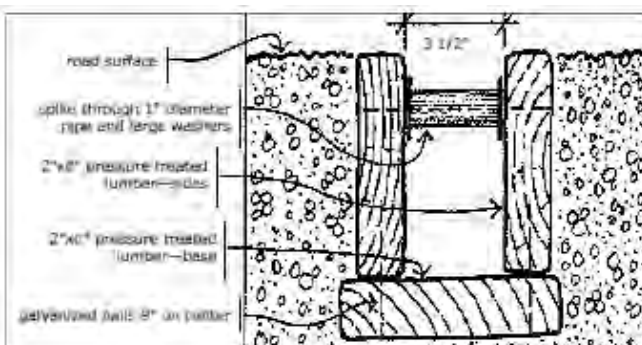
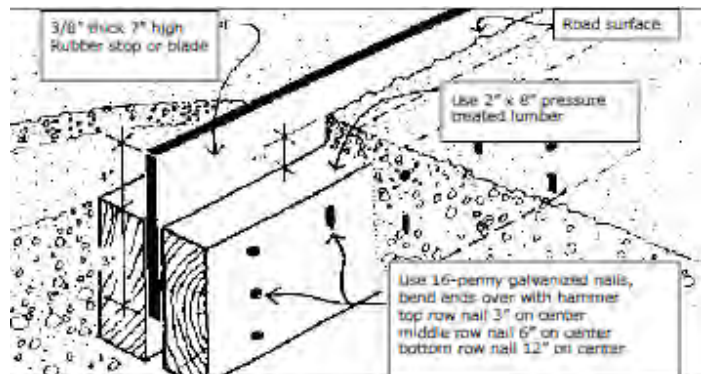
The MDEP and Portland Water District completed a series of fact sheets that answer many common how-to questions. The fact sheets profile common conservation practices and include detailed instructions, diagrams and color photos about installation and maintenance.

The series also includes six native plant lists. Each one is tailored to different site conditions (e.g., full sun and dry soils). The lists include plant descriptions from the MDEP's *Buffer Handbook* and small color photos of each plant to make plant selection easier.



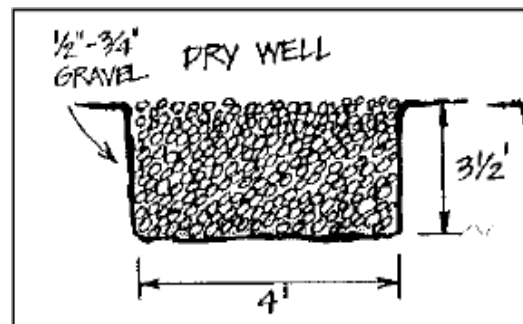
Fact sheets are available to help you install conservation practices on your property. Download at <http://www.maine.gov/dep/land/watershed/materials.html>

Rubber Razor—Use this structure in a gravel driveway or camp road. It can be plowed over only if the plow operator is aware of its presence and lifts the plow blade slightly. Place it at a 30 degree angle to the road edge and direct the outlet toward a stable vegetated area.



Open Top Culvert— Use this structure in a gravel driveway or camp road that does not get plowed in the winter. Place it at a 30 degree angle to the road edge and point the outlet into stable vegetation. Remove leaves and debris as needed.

Drywell—Use a drywell to collect runoff from roof gutter downspouts. Drywells can be covered with sod or left exposed for easy access and cleanout. Drywells and infiltration trenches work best in sandy or gravelly soils.



Permitting ABCs

Protection of Maine's watersheds is primarily ensured through laws and ordinances created and enforced by the State of Maine and local municipalities, as well as through the goodwill of lake residents. The following laws and ordinances require permits for activities adjacent to wetlands and water bodies.

Shoreland Zoning Law—

Construction, clearing of vegetation and soil movement within 250 feet of lakes, ponds, and many wetlands, and within 75 feet of most streams, falls under the Shoreland Zoning Act, which is administered by the Town through the Code Enforcement Officer and the Planning Boards.

Natural Resources Protection Act (NRPA)—

Soil disturbance & other activities within 75 feet of the lakeshore or tributary stream also falls under the NRPA, which is administered by the MDEP. Contact MDEP and the Town Code Enforcement Officer if you have any plans to construct, expand or relocate a structure, clear vegetation, create a new path or driveway, stabilize a shoreline or otherwise disturb the soil on your property. Even if projects are planned with the intent of enhancing the environment, contact the MDEP and town to be sure.

How to apply for a Permit by Rule with MDEP—

To ensure that permits for small projects are processed swiftly, the MDEP has established a streamlined permit process called **Permit by Rule**. These one page forms (shown here) are simple to fill out and allow the MDEP to quickly review the project.

- Fill out a notification form before starting any work. Forms are available from the town code enforcement officer, MDEP offices, or online at <http://www.maine.gov/dep/land/nrpa/pbrform.pdf>
- The permit will be reviewed by MDEP within 14 days. If you do not hear from MDEP in 14 days, you can assume your permit is approved and you can proceed with work on the project.
- Follow all standards required for the specific permitted activities to keep soil erosion to a minimum. It is important that you obtain a copy of the standards so you will be familiar with the law's requirements.

11/01/2012 DEPARTMENT OF ENVIRONMENTAL PROTECTION
PERMIT BY RULE NOTIFICATION FORM
(For use with DEP Regulation, Chapter 305)

PLEASE TYPE OR PRINT IN BLACK INK ONLY

Name of Applicant: (owner)	Jane Waters	Name of Agent:	
Applicant Mailing Address:	18 Watershed Ave.	Agent Phone # (include area code):	
Town/City:	Waterford	PROJECT Information Name of Town/City:	Waterford
State and Zip code:	ME 04002	Name of Wetland or Waterbody:	Big Pond
Daytime Phone # (include area code):	(207) 222-2222	Map #:	Lot #:
Detailed Directions to Site: Head north on Route 26 and take a right on Watershed Ave.			
18 Watershed Ave. is 5 houses down on the left.			
UTM Northing: (if known)		UTM Easting: (if known)	
Description of Project:	Installation of a rain garden and infiltration steps to allow infiltration of runoff.		
Bare soil will be stabilized with Erosion Control Mulch.			
Part of a larger project? (check one) →	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	After the Fact? (check one) →	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Check one → This project <input type="checkbox"/> does (or) <input type="checkbox"/> does not involve work below mean low water (average low water).			

PERMIT BY RULE (PBR) SECTIONS: (Check at least one)

I am filing notice of my intent to carry out work which meets the requirements for Permit by Rule (PBR) under DEP Rules, Chapter 305. I and my agents, if any, **have read** and will comply with all of the standards in the Sections checked below.

<input checked="" type="checkbox"/> Sec. (2) Act. Adj. to Protected Natural Res.	<input type="checkbox"/> Sec. (10) Stream Crossing	<input type="checkbox"/> Sec. (17) Transfers/Permit Extension
<input type="checkbox"/> Sec. (3) Intake Pipes	<input type="checkbox"/> Sec. (11) State Transportation Facil.	<input type="checkbox"/> Sec. (18) Maintenance Dredging
<input type="checkbox"/> Sec. (4) Replacement of Structures	<input type="checkbox"/> Sec. (12) Restoration of Natural Areas	<input type="checkbox"/> Sec. (19) Activities in/on/over significant vernal pool habitat
<input type="checkbox"/> Sec. (5) REPEALED	<input type="checkbox"/> Sec. (13) F&W Creation/Enhance/Water Quality Improvement	<input type="checkbox"/> Sec. (20) Activities in existing dev. areas located in/on/over high or moderate value inland waterfowl & wading bird habitat or shorebird nesting, feeding & staging areas
<input type="checkbox"/> Sec. (6) Movement of Rocks or Vegetation	<input type="checkbox"/> Sec. (14) REPEALED	
<input type="checkbox"/> Sec. (7) Outfall Pipes	<input type="checkbox"/> Sec. (15) Public Boat Ramps	
<input type="checkbox"/> Sec. (8) Shoreline stabilization	<input type="checkbox"/> Sec. (16) Coastal Sand Dune Projects	
<input type="checkbox"/> Sec. (9) Utility Crossing		

I have attached the following required submittals. **NOTIFICATION FORMS CANNOT BE ACCEPTED WITHOUT THE NECESSARY ATTACHMENTS:**

- Attach a check for \$70 made payable to: "Treasurer, State of Maine".
- Attach a U.S.G.S. topo map or Maine Atlas & Gazetteer map with the project site clearly marked.
- Attach Proof of Legal Name. If applicant is not an individual or municipality, provide a copy of Secretary of State's registration information (available at <http://licsrs.inform.org/nel-sps-icsr/ICRS?MainPage=x>)
- Attach photos of the proposed site where activity will take place as outlined in PBR Sections checked above.
- Attach all other required submissions as outlined in the PBR Sections checked above.

I authorize staff of the Departments of Environmental Protection, Inland Fisheries & Wildlife, and Marine Resources to access the project site for the purpose of determining compliance with the rules. I also understand that **this permit is not valid until approved by the Department or 14 days after receipt by the Department, whichever is less.**

By signing this Notification Form, I represent that the project meets all applicability requirements and standards in the rule and that the applicant has sufficient title, right, or interest in the property where the activity takes place.

Signature of Agent or Applicant:	<i>Jane Waters</i>	Date:	1/2/13
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Keep a copy as a record of permit. Send the form with attachments via certified mail or hand deliver to the Maine Dept. of Environmental Protection at the appropriate regional office listed below. The DEP will send a copy to the Town Office as evidence of the DEP's receipt of notification. No further authorization by DEP will be issued after receipt of notice. Permits are valid for two years. Work carried out in violation of any standard is subject to enforcement action.

AUGUSTA DEP 17 STATE HOUSE STATION AUGUSTA, ME 04333-0017 (207)287-3901	PORTLAND DEP 312 CANCO ROAD PORTLAND, ME 04103 (207)822-6300	BANGOR DEP 106 HOGAN ROAD BANGOR, ME 04401 (207)941-4570	PRESQUE ISLE DEP 1235 CENTRAL DRIVE PRESQUE ISLE, ME 04769 (207)764-0477
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OFFICE USE ONLY	Ck.#	Staff	Staff
PBR #	FP	Acc. Date	Def. Date
			After Photos

DEPLW0309-N2012

Where To Go For More Information

Lakes Environmental Association

230 Main Street
Bridgton, ME 04009
207-647-8580

Colin Holme, Assistant Director
colin@leamaine.org
www.mainelakes.org

LEA is a non-profit, membership organization. Programs include water testing on 37 lakes and ponds, technical assistance to landowners and contractors in preventing erosion, watershed education programs, invasive plant prevention, and GIS mapping for town comprehensive planning.

Fiddlehead Environmental Consulting

P.O. Box 783
Harrison, ME 04040
207-627-3126

Jeff Stern, Watershed Specialist
sternjm@hotmail.com

Fiddlehead Environmental Consulting assists property owners, lake and river protection associations, and towns, with watershed planning and survey work, reports, water quality testing, environmental education, training, and grant writing.

Maine Department of Environmental Protection

312 Canco Road
Portland, ME 04103
207-615-2451
1-888-769-1036 (toll free)

Wendy Garland, Watershed Manager
Wendy.Garland@maine.gov
www.maine.gov/dep

MDEP provides technical assistance, reference materials, permitting, environmental education, project funding opportunities, and stewardship activities for streams, lakes and marine waters.

Portland Water District

1 White Rock Road
Standish, ME 04084
207-523-5405

Brie Holme, Water Resources Specialist
bholme@pwd.org
www.pwd.org

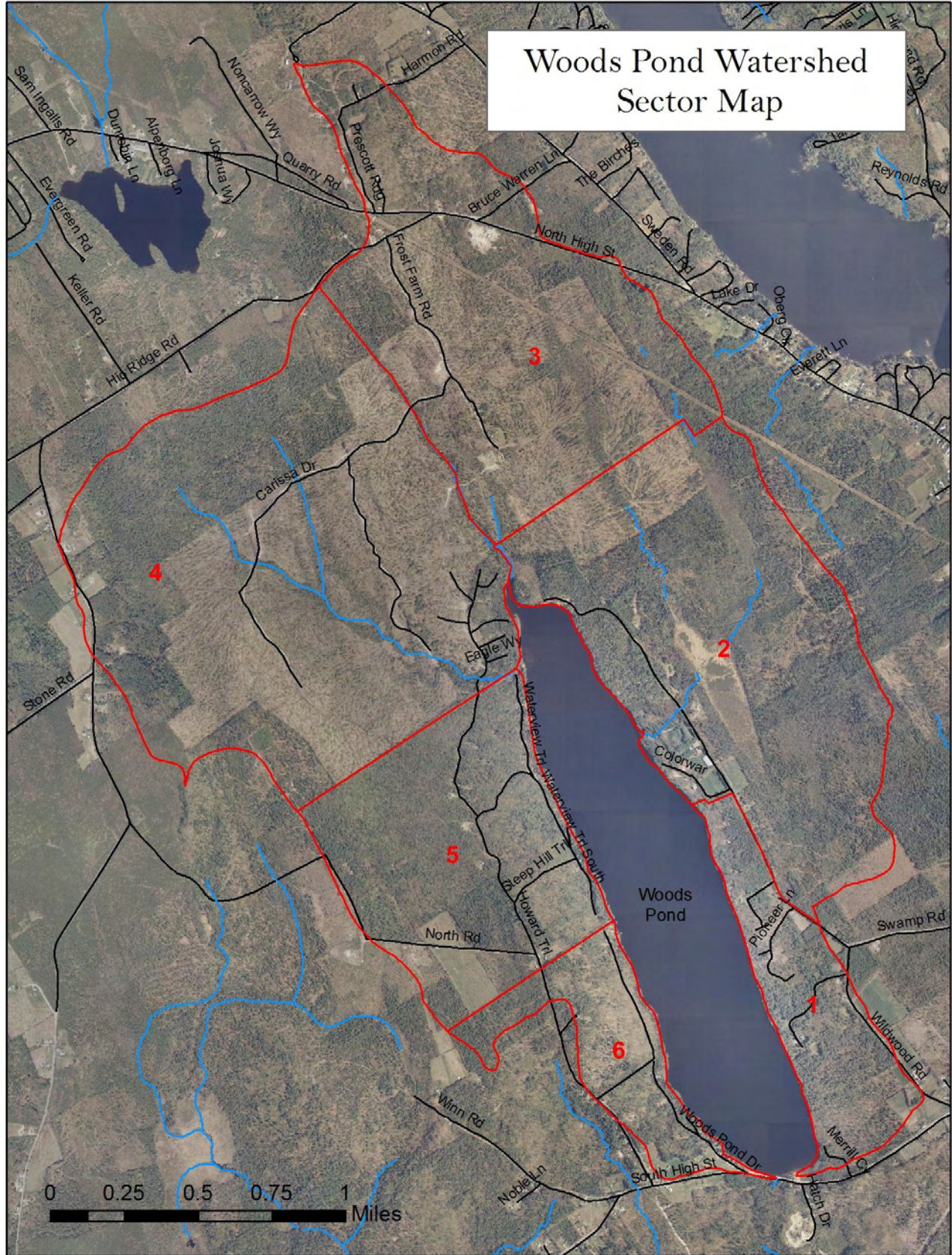
The Portland Water District provides drinking water from Sebago Lake to more than 200,000 people in southern Maine. PWD supports surveys and erosion control activities in areas that supply Sebago Lake, which includes the Woods Pond Watershed.

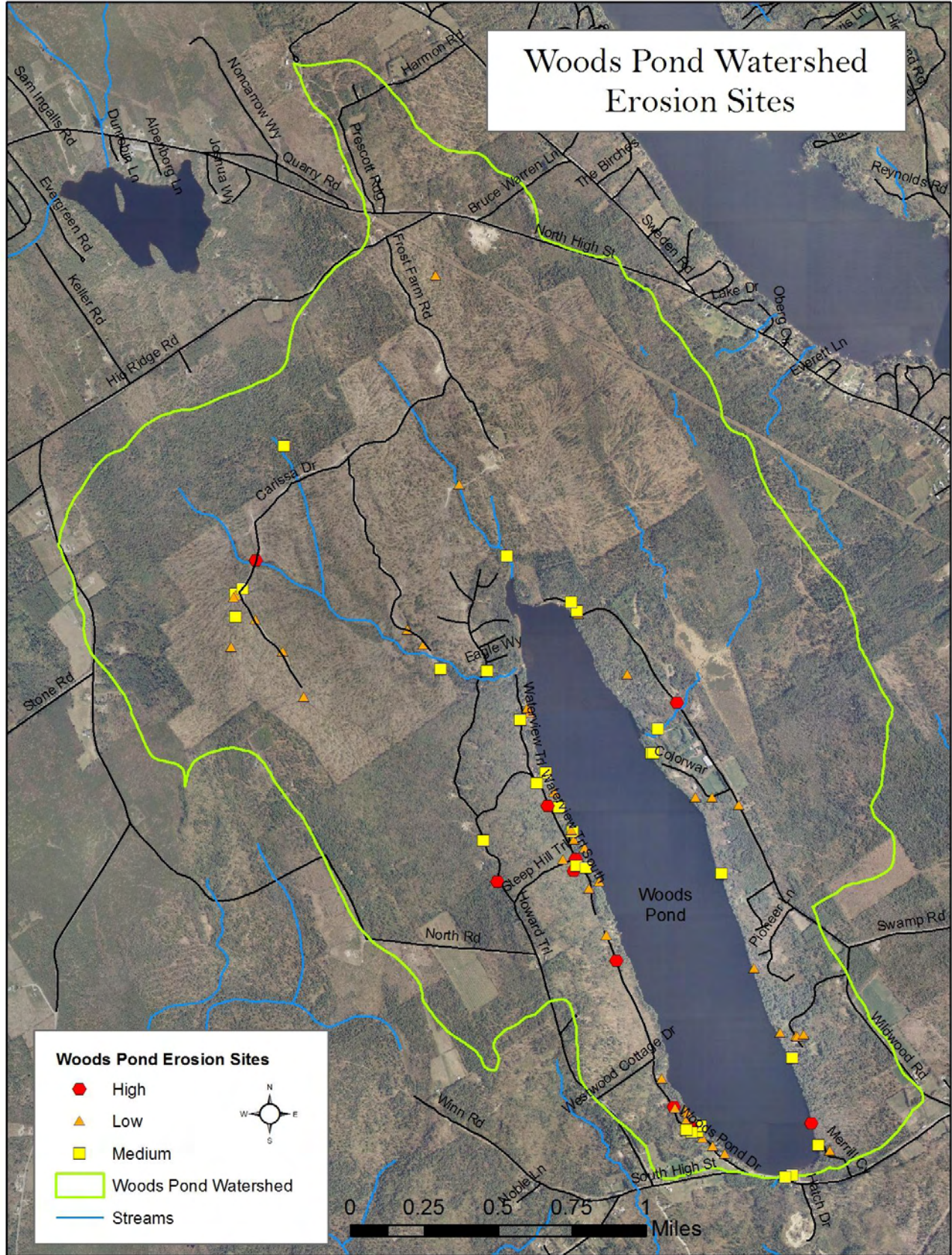
Maine Nonpoint Source Training and Resource Center

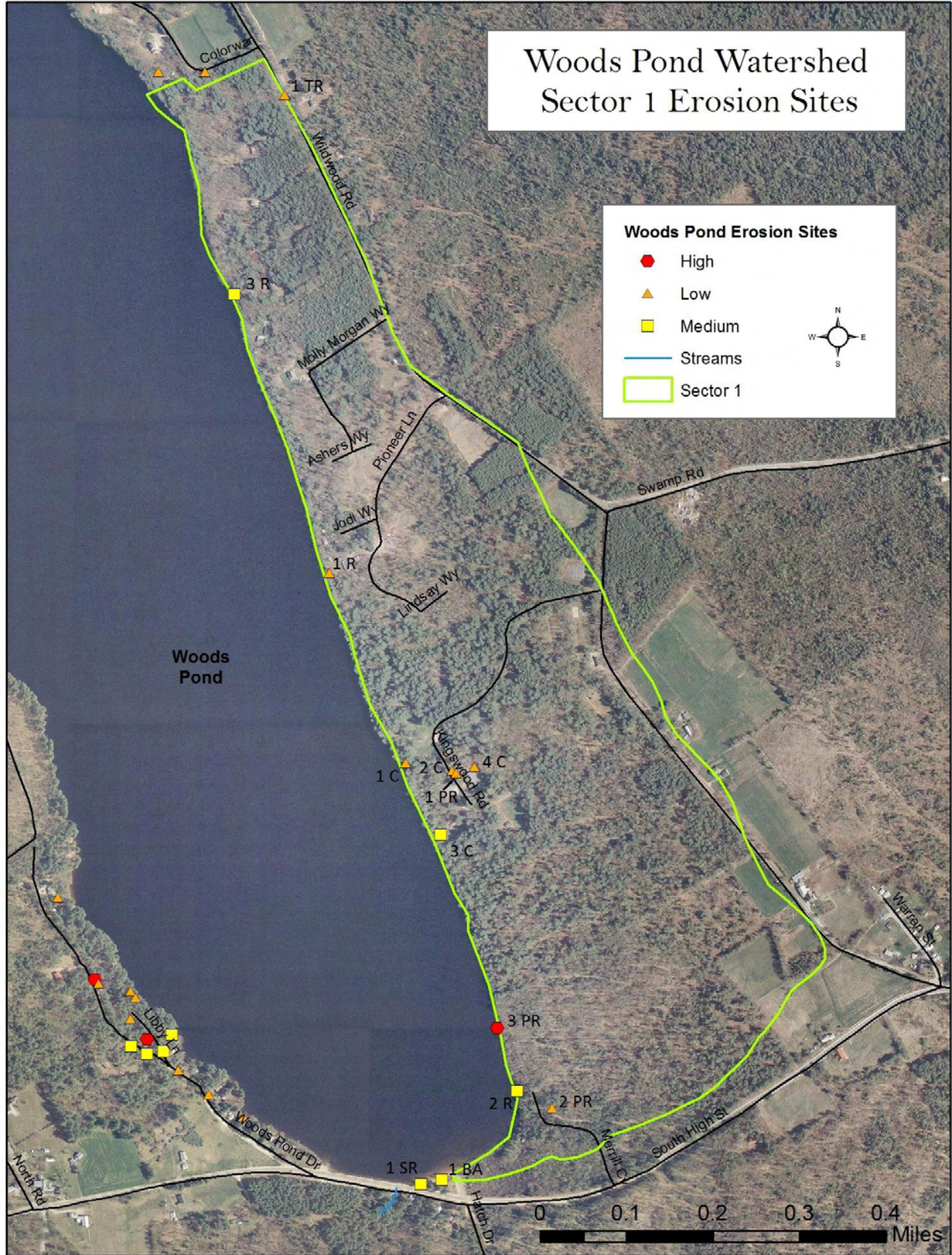
17 State House Station
Augusta, ME 04333
207-287-7726

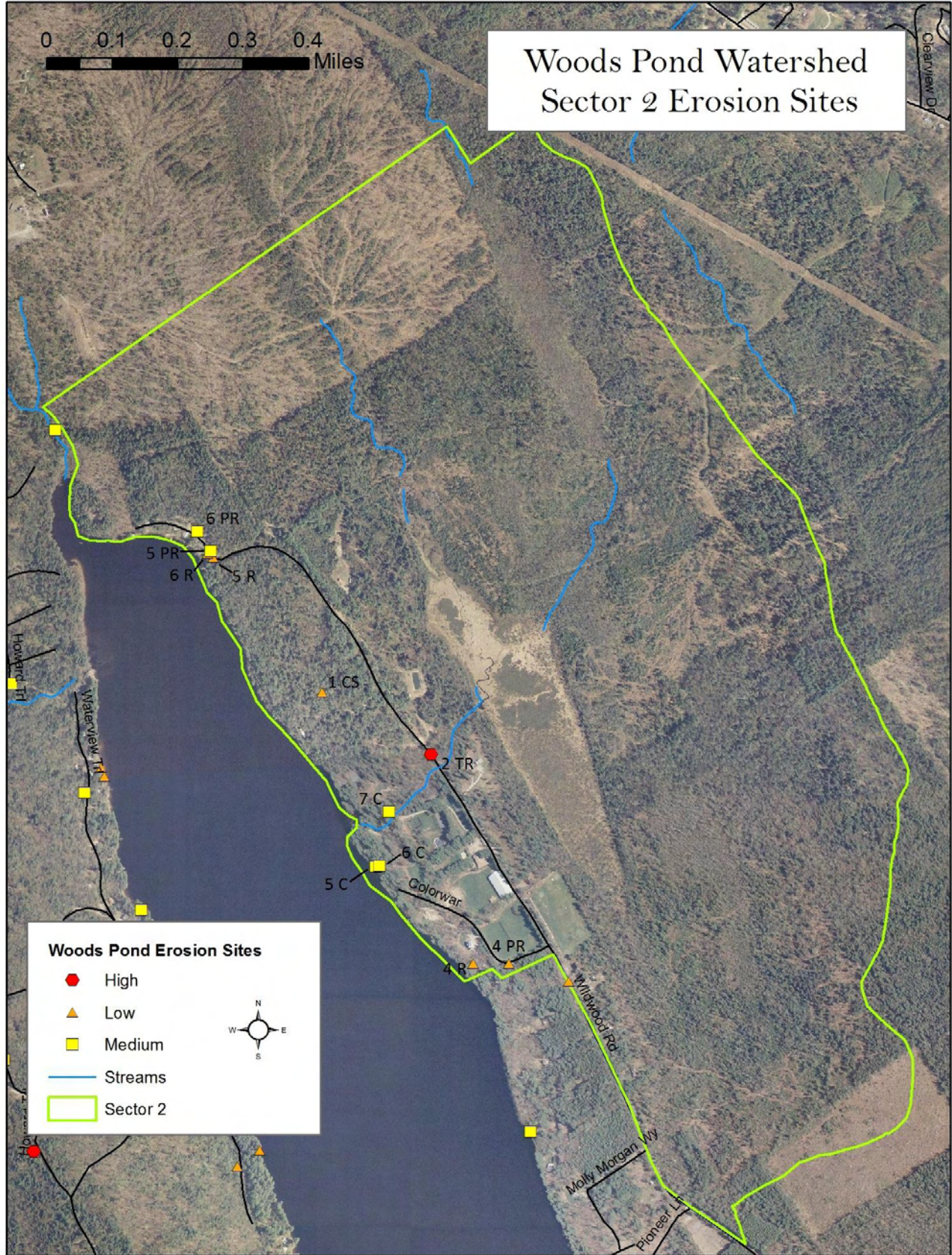
Bill Laflamme
william.n.laflamme@maine.gov
www.maine.gov/dep/land/training

Offers courses in erosion control for contractors, including a primer and exam for Certified Professional in Erosion and Sediment Control, camp road maintenance, and storm water management.

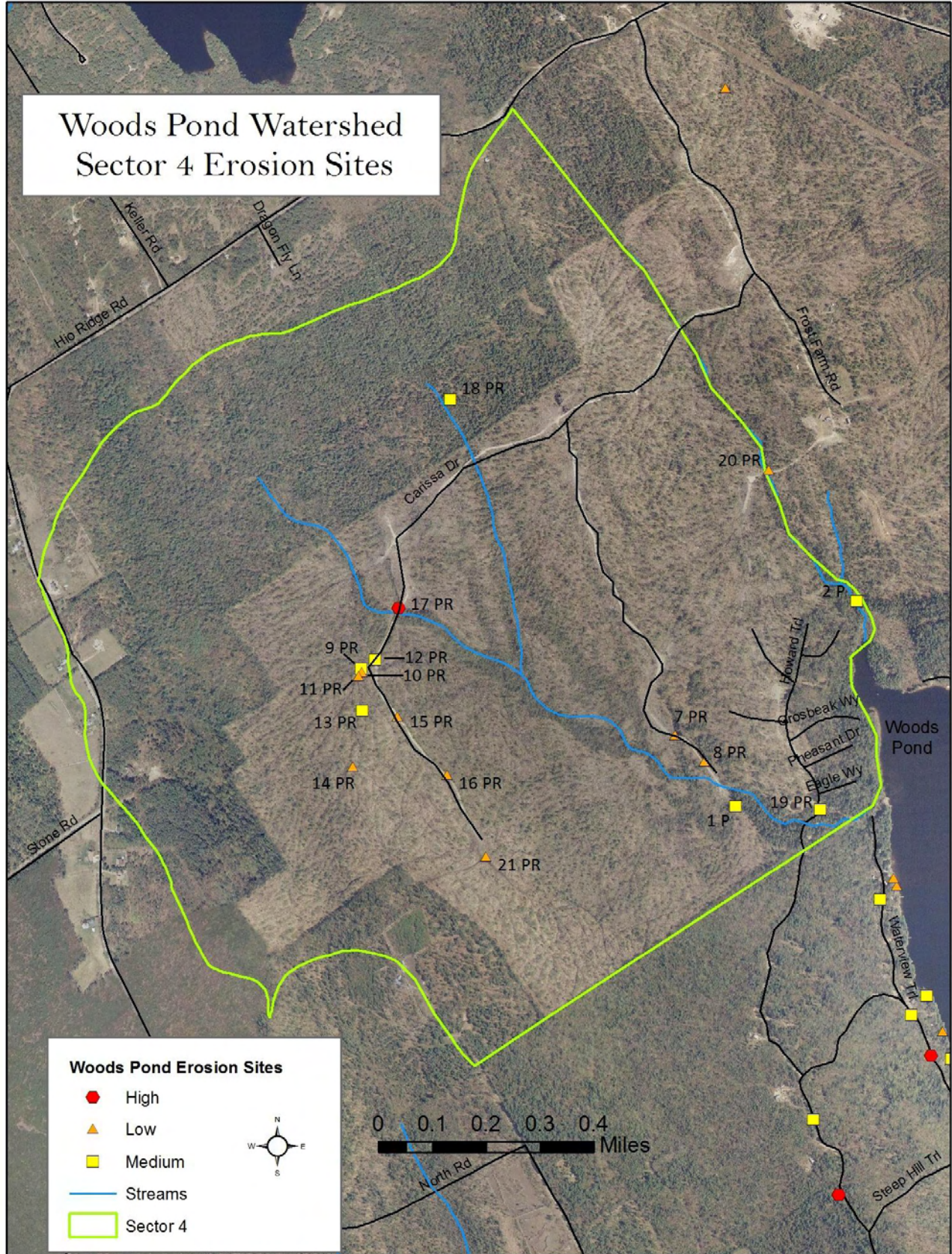


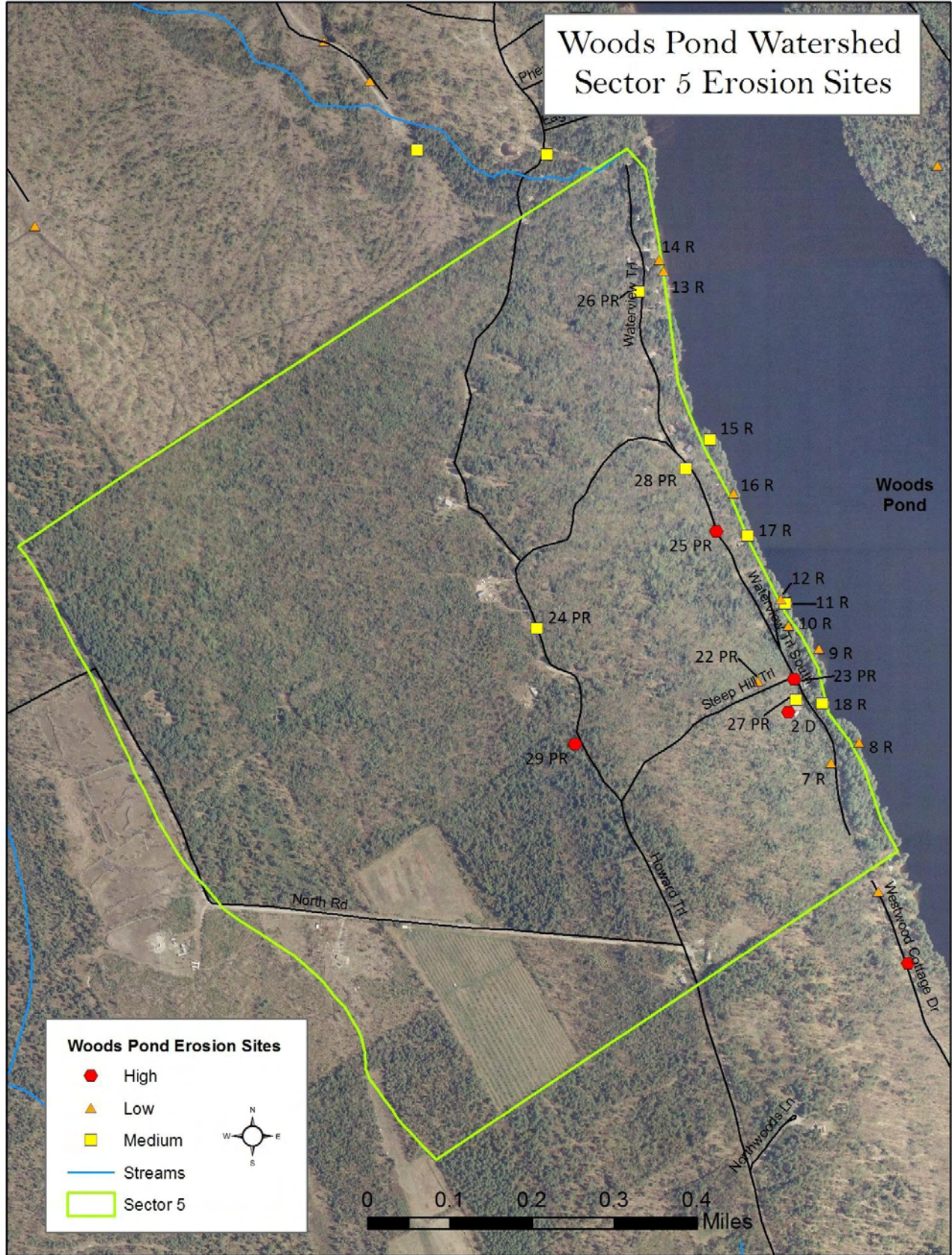


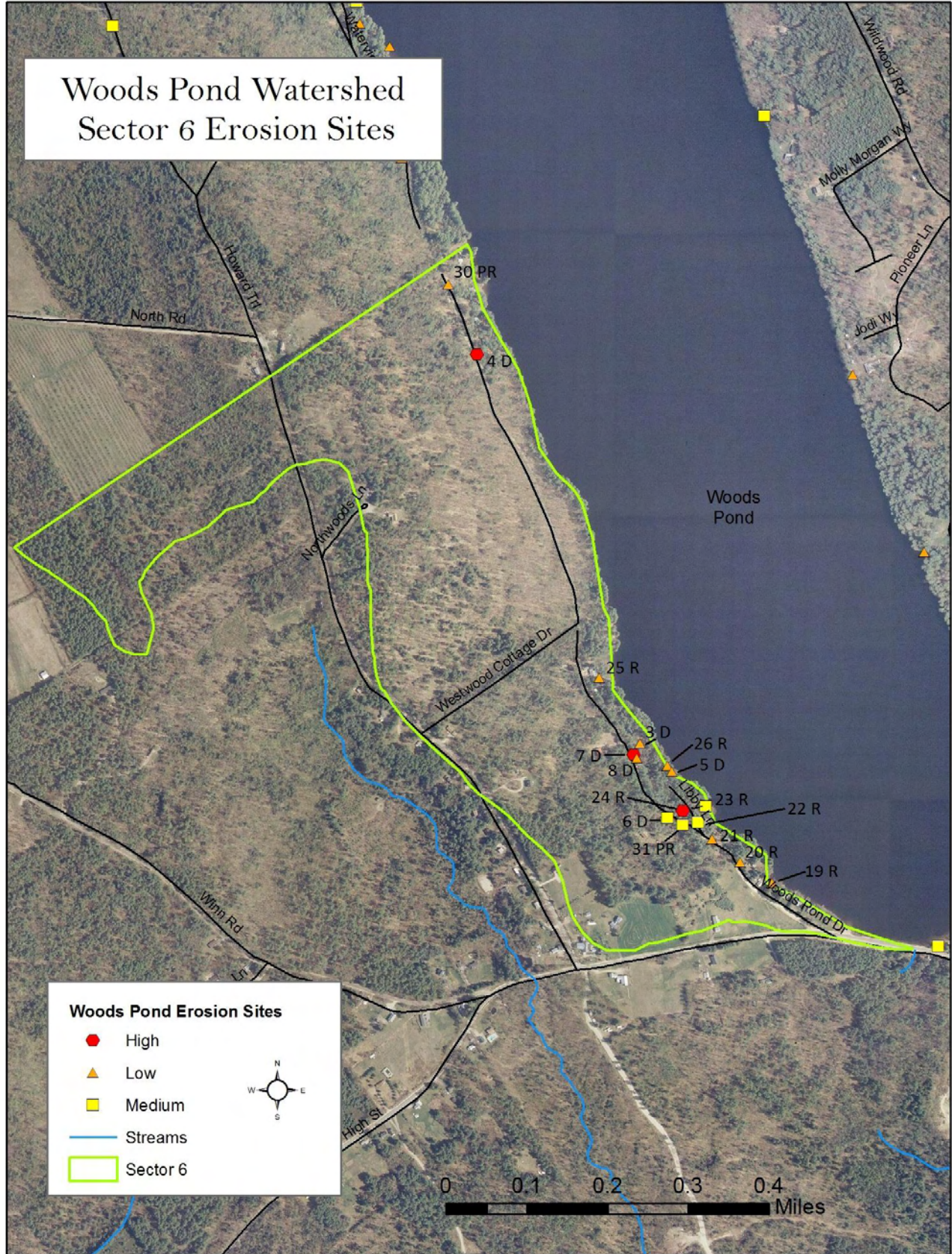












Woods Pond Watershed Survey

Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
1 R	1	Residential	Bare soil, lack of shoreline vegetation, inadequate shoreline vegetation, unstable access, direct flow to lake.	Sanctuary Cove – Pioneer Lane in front of clubhouse 0361401 4876594	12' x 60'	Apply mulch/erosion control mix to bare areas, reseed thinning grass, add to buffer.	Low	Low
1 C	1	Commercial	Slight surface erosion, inadequate shoreline vegetation, shoreline erosion, direct flow to lake.	Kingswood Camp @ beach, by north side steps 0361543 4876241	4' x 4'	Add to buffer, reseed bare soil and thinning grass.	Low	Low
1 PR	1	Private Road	Slight surface erosion by culvert outlet, unstable culvert outlet, direct flow to stream.	Kingswood Camp – road leading south from beach, near basketball court 0361629 4876226	3' x 7'	Armor culvert outlet, build up road.	Low	Low
2 C	1	Commercial	Moderate surface erosion, direct flow to stream.	Kingswood Camp – left side of road leading south 0361636 4876222	8' x 30'	Define foot path, install runoff diverter (water bar), apply mulch/erosion control mix.	Low	Low
3 C	1	Commercial	Moderate surface erosion, undercut shoreline, shoreline erosion, inadequate shoreline vegetation, exposed roots, direct flow to lake.	Kingswood Camp – shore near “MACK Shack” & fire pit 0361608 4876108	10' x 100'	Armor shoreline, establish & add to buffer, apply erosion control mix on bare areas by campfire ring.	Medium	Medium

Appendix A

Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
4 C	1	Commercial	Moderate surface erosion, direct flow to stream.	Kingswood Camp – bridge over stream next to big building 0361671 4876233		Define foot path, install runoff diverter (water bar), apply mulch/erosion control mix, add to buffer.	Low	Low
2 R	1	Residential	Slight surface erosion, bare soil, shoreline erosion, exposed roots, direct flow to lake.	End of Merrill Cove Rd, brown house w/ green trim 0361750 4875632	30' x 20'	Define & stabilize foot path, install runoff diverters, apply mulch/erosion control mix.	Medium	Low
2 PR	1	Private Road	Slight surface erosion, moderate ditch erosion.	Merrill Cove Rd toward end @ turnoff to brown house with green & white trim 0361815 4875599	10' x 100'	Reshape ditch, install turnouts.	Low	Low
1 TR	1	Town Road	Severe ditch erosion.	Wildwood Rd from Kingswood to Lot C (turnoff to Colorwar Lane) 0361318 4877482	5' x 2,600'	Armor ditch w/ stone, reshape ditch.	Low	Medium
3 PR	1	Private Road	Severe surface erosion, surface water and springs from woods run down the road to the lake, direct flow to lake.	41 Wildwood Rd, old woods road down to lakeshore & dock 0361713 4875749	6' x 400'	Install plunge pools, install runoff diverters, intercept flow where it pops out of woods and divert from the road.	High	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
1 BA	1	Beach Access	Severe surface erosion, bare soil, direct flow to lake.	Town beach on Rte. 117 @ picnic table 0361610 4875467	6' x 15'	Establish buffer at upper end of cut, reseed bare soil & thinning grass.	Medium	Low
1 SR	1	State Road	Winter sand, slight shoulder erosion, delta in lake, direct flow to lake.	Route 117 shoulder across from 688 S. High Street between town beach & dam 0361571 4875458	20' x 400'	Establish buffer, add to rip-rap put down by WPWQC in August, 2012, stabilize shoulders.	Medium	Medium
3 R	1	Residential	Moderate surface erosion, bare soil, roof runoff, exposed roots, direct flow to lake.	Fire Lane 172 off Wildwood Rd, house & shed red w/ white trim 0361224 4877112	12' x 20'	Install runoff diverters on path from main house, install infiltration trench at shed, apply mulch/erosion control mix, add to buffer.	Medium	Low
4 PR	2	Private Road	Severe surface and shoulder erosion, berm.	Colorwar Lane by soccer field 0361170 4877525	6' x 90'	Reshape (crown) road, remove berm that prevents runoff from entering ditch.	Low	Low
4 R	2	Residential	Slight surface erosion, bare areas, unstable access, direct flow to lake.	Tax Map 9, Lot 3-B @ end of Colorwar Lane 0361083 4877525	40' x 40'	Apply erosion control mix to bare areas, install a rain garden @ drainage pipe outlet, install steps @ shore.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
2 TR	2	Town Road (Note: there is also a Private Road component to this site. Public & private are combined into 1 site.)	Unstable culvert inlet and outlet, severe surface erosion, moderate road shoulder erosion, shoulder slumping over inlet/outlet of culvert, direct flow to stream.	Wildwood Rd @ crossing of Sucker Brook 0360979 4878041	20' x 500'	Lengthen culvert, armor inlet & outlet, reshape ditch, install ditch, clean out existing turnout & install new ones, install sediment basins, remove grader/plow berms, add new surface material, reshape (crown) road.	High	High
5 R	2	Residential	Slight surface erosion (erosion rills on yard), thin cover on lawn, direct flow to lake.	Tax Map 53, Lot 1 0360442 4878524	9' x 75'	Define & stabilize foot path, reseed bare & thinning grass.	Low	Low
6 R	2	Residential	Slight surface erosion, roof runoff erosion, direct flow to lake.	Tax Map 53, Lot 2 0360428 4878533		Widen infiltration trench, reseed bare soil & thinning grass.	Low	Low
5 PR	2	Private Road	Severe surface erosion, direct flow to lake.	Wildwood Rd where it takes sharp bend & goes downhill toward lake 0360436 4878541	12' x 700'	Install sediment basin(s), reshape ditch, install turnouts, monoslope road to north so that it drains to woods, install several water bars.	Medium	High
6 PR	2	Private Road	Moderate ditch erosion, bare soil, direct flow to lake.	Wildwood Rd @ CMP pole #48 0360403 4878590	6' x 45'	Armor culvert inlet & outlet, install sed. pool, remove/block culvert across driveway & install new culvert under road to buffer.	Medium	Medium

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
1 CS	2	Construction Site	Severe surface erosion, undersized culvert, bare soil, direct flow to (intermittent?) stream.	Wildwood Acres (first driveway beyond 350 Wildwood Rd) 0360710 4878193	30' x 200'	Enlarge culvert, install sediment basin, install turnouts, clean collapsed silt fence & reinstall, apply thicker layer of hay mulch on bare areas.	Low	Medium
5 C	2	Commercial	Moderate surface erosion, bare soil, direct flow to lake.	Camp Wildwood, dock in front of cabin #21 0360842 4877765	80' x 30'	Add mulch or erosion control mix to bare areas, reseed bare soil and thinning grass.	Medium	Low
6 C	2	Commercial	Moderate surface erosion, bare soil, unstable access, direct flow to lake.	Camp Wildwood beach 0360852 4877767	40' x 100'	Reduce steepness of beach.	Medium	High
7 C	2	Commercial	Moderate surface erosion, direct flow to stream.	Sucker Brook crossing on Camp Wildwood (bridge) downstream from 2 TR 0360875 4877900	12' x 100'	Clean the existing turnout, put curb over bridge to direct storm water runoff into a new sediment basin to the right of the bridge (facing downstream).	Medium	Medium
1 D	3	Driveway	Slight surface erosion, unstable culvert inlet/outlet, moderate ditch erosion, direct flow to stream.	End of Moose Run by CMP pole #5 0359663 4880369	3' x 30'	Armor culvert inlet/outlet, enlarge culvert.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
1 P	4	Path	Slight surface erosion, direct flow to stream.	Tax Map 8, Lot 39A. End Casey Lane @ brook crossing 0359702 4878219	8' x 100'	Install turnouts & runoff diverters on both approaches to brook.	Medium	Low
7 PR	4	Private Road	Road goes through wetland, direct flow to stream.	Tax Map 8, Lot 39A. Low spot towards end of Casey Lane 0359600 4878358	10' x 50'	Install culvert so high flows don't overtop road, build up road by adding new surface material and gravel.	Low	Medium
8 PR	4	Private Road	Similar to previous entry, road goes through wetland, bare soil, direct flow to stream.	Tax Map 8, Lot 39A. Low spot towards end of Casey Lane 0359511 4878436	10' x 15'	Install culvert so high flows don't overtop road, build up road by adding new surface material and gravel.	Low	Medium
9 PR	4	Private Road	Severe surface erosion, bare soil.	"No Name Rd" short distance off Carissa Drive 0358573 4878636	6' x 30'	Install culvert, build up road & add new surface material.	Medium	Medium
10 PR	4	Private Road	Bare soil.	"No Name Rd" off Carissa Drive uphill from 9 PR 0358574 4878624	4' x 20'	Install culvert, add new surface material.	Low	Low
11 PR	4	Private Road	Moderate surface erosion, bare soil.	"No Name Rd" off Carissa Drive uphill from 10 PR 0358565 4878613	3' x 30'	Install culvert, add new surface material.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
12 PR	4	Private Road	Moderate ditch and shoulder erosion, (contributes sediment to stream @ 17 PR).	Beginning of "No Name Rd" off Carissa Drive (this site drains in a different direction than 9 PR, 10 PR & 11 PR) 0358614 4878662	2' x 40'	Install turnout & sediment basin, build up road & add new surface material.	Medium	Medium
13 PR	4	Private Road	Severe surface erosion, bare soil, possibly direct flow to intermittent stream.	"No Name Rd" off Carissa Drive where a twitch trail diverts from main road 0358576 4878510	3' x 150'	Reshape ditch, remove debris/sediment from ditch, install sediment pools, build up road & add new surface material.	Medium	Medium
14 PR	4	Private Road	Severe surface erosion, moderate ditch erosion, ditch flow has popped out on road causing major erosion, bare soil.	"No Name Rd" off Carissa Drive 0358549 4878342	15' x 200'	Reshape ditch, install culvert, build up road, reshape and crown road, install turnouts, install runoff diverters.	Low	Medium
15 PR	4	Private Road	Moderate surface erosion.	Carissa Drive, culvert just past Ample Rock Farm 0358682 4878492	3' x 15'	Build up road & add new surface material, reshape (crown) road.	Low	Low
16 PR	4	Private Road	Moderate surface erosion, bare soil, direct flow to stream.	Carissa Drive, second culvert up from farm 0358831 4878318	3' x 40'	Build up road & add new surface material, reshape (crown) road.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
17 PR	4	Private Road	Slight surface erosion, unstable inlet and outlets of culverts, severe road shoulder erosion, buildup of grader berm, direct flow to stream. (Site 12 PR contributes to erosion problems at this site.)	Carissa Drive @ stream crossing (bridge) at sign for "private drive" & close to pole #20 0358686 4878817	42' x 10'	Armor culvert inlets and outlets, reshape (crown) road, remove grader berm, stabilize eroding road shoulders, pack down loose material on shoulders and vegetate.	High	High
18 PR	4	Private Road	Severe ditch backslope erosion, streams appear to have been straightened, direct flow to stream.	Cable-gated drive off Carissa Drive where there's a downed power line 0358839 4879440	½ mile x ½ mile	Armor culvert inlet/outlet, install plunge pools or sediment basins, stabilize ditch backslopes, reshape (crown) road.	Medium	High
19 PR	4	Private Road	Slight surface erosion, unstable culvert inlet/outlet, direct flow to stream.	Big stream crossing where there's 3 culverts by 229 Howard Trail 0359946 4878215	12' x 15'	Armor inlet/outlet with stone, lengthen culverts, install turnouts.	Medium	High
20 PR	4	Private Road	Moderate surface erosion, bare soil, direct flow to stream (now a beaver pond).	Un-named spur road off lower Frost Farm Road 0359792 4879229	30' x 150'	Reshape (crown) road, install runoff diverters.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
2 P	4	Path	Moderate surface erosion, delta in stream, direct flow to stream.	“Old Limington Road” @ bridge crossing brook which is now a snowmobile trail 0360054 4878839	8' x 120'	Install at least 2 runoff diverters.	Medium	Low
21 PR	4	Private Road	Severe surface erosion, bare soil, uncovered piles.	End of Carissa Drive where a spur road comes downhill 0358946 4878074	10' x 300'	Install ditch & armor w/ stone, turnouts & runoff diverters, reshape & crown spur road, cover piles.	Low	High
22 PR	5	Private Road	Moderate surface erosion, unstable culvert inlet & outlet, moderate ditch erosion.	Steep Hill Trail 0360359 4877186	3' x 15'	Armor culvert inlet, outlet & ditch with stone, reshape ditch, remove debris/sediment.	Low	Low
7 R	5	Residential	Slight surface erosion, roof runoff erosion, inadequate shoreline vegetation, direct flow to lake.	Waterview Trail South, Tax Map 51, Lot 2-B 0360502 4877026	3' x 30'	Install infiltration trench at roof dripline, add to buffer.	Low	Low
8 R	5	Residential	Bare soil (thin duff layer), direct flow to lake.	Tax Map 51, Lot 3 0360557 4877066	50' x 50'	Define foot path, no raking.	Low	Low
9 R	5	Residential	Slight surface erosion, bare soil, inadequate shoreline vegetation, shoreline erosion.	Shady Acres, Tax Map 51, Lot 6 0360478 4877249	10' x 10'	Don't cut/enhance buffer (as of 7/12, path better defined & mulch installed under the dripline.)	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
10 R	5	Residential	Slight surface erosion, bare soil, roof runoff erosion, undercut shoreline, shoreline erosion, direct flow to lake.	5 Shady Acres 0360418 4877294	20' x 50'	Define foot path, install infiltration trench @ roof dripline, reinforce shoreline with rocks at beach.	Low	Medium
11 R	5	Residential	Moderate surface erosion, bare soil, roof runoff erosion, exposed roots, direct flow to lake.	9 Shady Acres 0360412 4877339	20' x 60'	Define foot path, install infiltration trench @ roof dripline, apply mulch/erosion control mix.	Medium	Medium
12 R	5	Residential	Moderate surface erosion, bare soil, roof runoff erosion, direct flow to lake.	11 Shady Acres 0360403 4877346	30' x 40'	Define foot path, install infiltration trench @ roof dripline, add to buffer, install buffer at top of beach.	Low	Medium
23 PR	5	Private Road	Moderate surface erosion, direct flow to stream.	Lower Steep Hill Trail 0360430 4877191	10' x 120'	Armor ditch with stone, install ditch around corner, install sediment pool by stream, keep turnouts cleaned out.	High	Medium
13 R	5	Residential	Slight surface erosion, bare soil, roof runoff erosion, direct flow to lake.	Tax Map 52, Lot 14, natural log house with green trim 0360174 4877987	3' x 50'	Define foot path, install infiltration trench @ roof dripline, apply mulch/erosion control mix.	Low	Low
14 R	5	Residential	Water from foundation drain causes erosion, direct flow to lake.	75 Waterview Trail 0360166 4878009	10' x 30'	Redirect flow to vegetation.	Low	Low

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
24 PR	5	Private Road	Moderate road shoulder erosion, direct flow to stream.	Howard Trail about 40' south of CMP pole with sign "speed limit 15 mph" on it 0359926 4877290	3' x 75'	Install turnouts into the woods, install sediment basins.	Medium	Medium
15 R	5	Residential	Moderate surface erosion, caving channel near lakeshore through ice berm, direct flow to lake.	4 Waterview Trail 0360265 4877659	1' x 10'	Armor ditch with stone, use existing big, rock basin in back of the house by the road as a settling pond by moving second culvert & setting it at a higher elevation.	Medium	Medium
16 R	5	Residential	Undercut shoreline, shoreline erosion, direct flow to lake.	Red house 0360311 4877553	4' x 5'	Cut leaning tree but leave root mass, install boulders.	Low	Low
17 R	5	Residential	Moderate surface erosion on driveway, undercut shoreline, shoreline erosion, exposed roots, direct flow to lake	Homeowner sign grown into tree, natural log home with green trim 0360338 4877471	10' x 40'	Install runoff diverters on driveway, define foot path, apply mulch/erosion control mix.	Medium	Medium
25 PR	5	Private Road	Unstable culvert inlet & outlet, road slumping over culvert outlet, delta in stream, direct flow to stream.	Waterview Trail near house at #14 0360277 4877480	5' x 12'	Armor culvert inlet & outlet, reshape (crown) road, vegetate or armor ditch with stone, reshape ditch, build-up road to reduce slumping.	High	Medium

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
26 PR	5	Private Road	Slight surface erosion, moderate ditch erosion, accumulated sediment in ditch, direct flow to stream.	Waterview Trail across from sign for "Buck Fever Drive" 0360126 4877947	5' x 130'	Armor culvert inlet & outlet, remove grader berm, reshape ditch & install turnouts, install sediment basins at culvert inlet & outlet.	Medium	Medium
2 D	5	Driveway	Severe surface erosion (affects 27 PR & 18 R).	28 Waterview Trail South 0360418 4877126	10' x 45'	Add new surface material (gravel or recycled asphalt), reshape (crown), re-orient upper open top culvert.	High	High
27 PR	5	Private Road	Severe ditch erosion, buildup of sediment that erodes from 2 D, direct flow to lake.	Waterview Trail South @ pole #11 0360433 4877151	12' x 50'	Clean out & reshape ditch, armor ditch with stone, clean out sediment basin, reshape (crown), add new surface material.	Medium	High
18 R	5	Residential	Moderate surface erosion, delta in lake, inadequate shoreline vegetation, result of 2 D & 27 PR, direct flow to lake.	Waterview Trail South @ stone steps at low spot, across road from gray house 0360484 4877143	50' x 100'	Extend existing diverters by lake, add to buffer, install runoff diverter, apply mulch/erosion control mix.	Medium	Medium
28 PR	5	Private Road	Unstable culvert inlet & outlet, ditch undercut at outlet, direct flow to lake.	Waterview Trail 0360218 4877602	5' x 12'	Armor culvert inlet & outlet, armor ditch with stone, install sediment basins at culvert inlet & outlet.	Medium	High

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
29 PR	5	Private Road	Moderate ditch erosion, delta in stream, existing turnout sends storm water runoff directly into stream.	Howard Trail – next stream crossing south of site 24 PR 0360001 4877064	3' x 150' (on both sides of road)	Lengthen culvert, install plunge pool, reshape ditch & armor it with stone, install turnouts, remove grader berms.	High	High
19 R	6	Residential	Slight surface erosion, bare soil, direct flow to lake.	21 Woods Pond Drive 0361240 4875583	10' x 20'	Define foot path, apply mulch/erosion control mix, reseed bare & thinning grass.	Low	Low
20 R	6	Residential	Slight surface erosion, bare soil, slight shoreline erosion, direct flow to lake.	33 Woods Pond Drive 0361176 4875625	10' x 15'	Apply mulch/erosion control mix, establish buffer on sides of steps, reseed bare & thinning grass.	Low	Low
21 R	6	Residential	Slight surface erosion, bare soil, direct flow to lake.	43 Woods Pond Drive (@ jct. Woods Pond Drive & Libby Lane 0361120 4875670	5' x 10'	Apply mulch/erosion control mix, establish buffer & extend to right (facing the lake), apply crushed stone under deck, install runoff diverter at top of beach.	Low	Medium
22 R	6	Residential	Slight surface erosion, bare soil, uncovered sand pile, direct flow to lake. (Sites 31 PR & 6 D contribute to erosion problems at this site).	1 Libby Lane, two-story yellow house 0361093 4875705	25' x 50'	Remove sand pile, apply mulch/erosion control mix to bare areas.	Medium	Medium

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
23 R	6	Residential	Moderate surface erosion, bare soil, shoreline erosion, unstable access, direct flow to lake.	Tax map 50, Lot 12 0361108 4875736	50' x 50'	Minimize bare areas, install runoff diverters, apply mulch/erosion control mix, establish buffer.	Medium	Medium
24 R	6	Residential	Undercut shoreline, shoreline erosion, unstable access – collapsed retaining walls, direct flow to lake.	17 Libby Lane 0361062 4875727	20' x 30'	Stabilize retaining walls – discuss with Code Enforcement Officer & possibly an engineer.	High	High
3 D	6	Driveway	Moderate surface erosion, bare soil, roof runoff erosion, direct flow to lake.	81 Woods Pond Drive 0361031 4875816	50' x 50' (front of house – lakeside)	Install infiltration trench @ roof dripline, apply mulch/erosion control mix, add to buffer on right side of dock (facing the lake).	Low	Medium
25 R	6	Residential	Slight surface erosion, roof runoff erosion, direct flow to lake.	113 Woods Pond Drive 0360896 4875991	5' x 40'	Install runoff diverters, install infiltration trench @ roof dripline and/or dry well at gutter downspout, apply mulch/erosion control mix, & infiltration trench at base of driveway.	Low	Low
4 D	6	Driveway	Severe surface erosion, inadequate shoreline vegetation, sediment pool too small, direct flow to lake.	Westwood Shores Cottages, driveway to cottages 8 & 9 0360652 4876636	12' x 175'	Enlarge sediment basin, add new surface material, add to buffer, install runoff diverters (see survey sheet for more information).	High	Medium

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
30 PR	6	Private Road	Moderate surface erosion, storm water runoff flows downhill, direct flow to lake.	Westwood Shores Cottages, end of road between cottages 2 & 3 0360594 4876775	10' x 100'	Install ditch to send runoff from woods into buffer, establish buffer.	Low	Medium
5 D	6	Driveway	Moderate surface erosion.	79 Woods Pond Drive 0361031 4875765	40' x 100'	Reshape (crown) driveway, install runoff diverters (broad-based dips), establish buffer at base of driveway.	Low	Medium
26 R	6	Residential	Slight surface erosion, exposed roots, direct flow to lake.	79 Woods Pond Drive (same lot as 5 D) 0361040 4875805	4' x 15'	Install runoff diverter at top of path to lake, define foot path from house across yard, apply mulch/erosion control mix, plantings to minimize open area between house & lake.	Low	Medium
31 PR	6	Private Road	Severe surface erosion, unstable ditch backslope (this site contributes to erosion problem at 22 R and is partially caused by 6 D).	Woods Pond Drive @ sign for 10 mph (pole #VZ-7) 0361062 4875700	12' x 200'	Install turnout or sediment basin at lower end on uphill side of road, reshape (crown) road.	Medium	Medium
6 D	6	Driveway	Moderate surface erosion (contributes to erosion problems at 22 R & 31 PR).	76 Woods Pond Drive 0361032 4875714	12' x 80'	Reshape & clean out ditch, install check dams, add new surface material, reshape (crown) driveway, install runoff diverters .	Medium	Medium

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Map Site	Sector	Land Use	Type of Problem	Location & GPS coordinates	Area	Recommendations	Impact	Cost
7 D	6	Driveway	Severe surface erosion (storm water flow is through vegetation, 8 D, and possibly to lake).	90 Woods Pond Drive 0360964 4875839	15' x 85'	Reshape (grade it to slope toward the side of driveway with a lamppost, install 2 rubber razor bars (one at the top & one in the middle), install sediment basins.	High	High
8 D	6	Driveway	Moderate surface erosion (this is the result of erosion at 7 D).	89 Woods Pond Drive 0360971 4875831	3' x 150'	Control erosion from site 7 D.	Low	Low

Woods Pond Watershed Survey Pollutant Loading Estimates

Gully Erosion Formula:

Site	Top width (ft.)	Bottom width (ft.)	Eroded depth (ft.)	Length (ft.)	# of years present	Soil type (see below)	Soil weight (tons/ft. ³)	Avg. width x depth x length x soil weight/# of years (tons/year)
2 R	2.0	1.0	0.21	94	3	S	.055	0.54
3 PR	2.5	1.0	0.5	500	15	SL	0.0525	1.53
1 BA	1.0 0.83	1.0 0.83	0.42 0.25	15 5	1 1	S S	.055 .055	0.35 + 0.06 = 0.41
1 SR	1.5	0.5	0.25	30	2	S	.055	2.06
3 R	0.75	0.33	0.17	78	10	SL	0.0525	0.04

Appendix B

Site	Top width (ft.)	Bottom width (ft.)	Eroded depth (ft.)	Length (ft.)	# of years present	Soil type (see below)	Soil weight (tons/ft. ³)	Avg. width x depth x length x soil weight/# of years (tons/year)
2 TR	2.0	1.5	0.25	412	2	S	.055	7.08
5 PR	1.33	0.5	0.25	600	1	S	.055	7.55 reduced by 50% = 3.77
5 C	1.5	0.66	0.25	80	1	S	.055	1.19
7 C	1.0	0.66	0.17	100	1	S	.055	0.78
1 P	2.0	1.0	0.25	37	6	SL	.0525	0.01
9 PR	7.0	3.0	1.5	30	10	S	.055	1.24
2 P	2.0	1.0	1.0	120	7	S	.055	1.41

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Site	Top width (ft.)	Bottom width (ft.)	Eroded depth (ft.)	Length (ft.)	# of years present	Soil type (see below)	Soil weight (tons/ft. ³)	Avg. width x depth x length x soil weight/# of years (tons/year)
11 R	1.17	1.17	0.12	91	3	S	.055	0.23
17 R	1.5	0.75	0.04	97	3	S	.055	0.08
26 PR	1.5	0.75	0.583	130	4	S	.055	1.17
2 D*	1.5	0.67	0.17	22	1	S	.055	0.22*
18 R	1.5	0.75	0.5	20	3	S	.055	0.21
29 PR	1.25 0.83	0.66 0.5	0.33 0.25	150 150	1 1	S S	.055 .055	2.60 + 1.37 = 3.97
22 R	1.08	0.58	0.12	54	1	S	.055	0.30

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Site	Top width (ft.)	Bottom width (ft.)	Eroded depth (ft.)	Length (ft.)	# of years present	Soil type (see below)	Soil weight (tons/ft. ³)	Avg. width x depth x length x soil weight/# of years (tons/year)
23 R	1.5	1.0	0.10	66	1	S	.055	0.45
4 D	1.33	0.66	0.25	175	1	S	.055	2.39
6 D	2.5 2.5	1.08 0.05	0.28 0.21	72 78	3 3	S S	.055 .055	0.66 + 0.45 = 1.11
7 D	1.5	1.5	0.35	85	1	S	.055	2.45

Appendix B

WEPP:

Site	Underlying Soil	Road Design	Road Surface	Road Gradient (%)	Road length (ft.)	Road Width (ft.)	Fill Gradient (%)	Fill Length (ft.)	Buffer Gradient (%)	Buffer Length (ft.)	Erosion (tons/year)
6 PR	S	OSR	Gravel	2	150	12	15	6	0	0	0.03
19 PR	S	IBD	Gravel	13	127	9	11	17	11	33	0.04
23 PR	S	IBD	Gravel	13	120	13	30	8	0	0	0.14
24 PR	S	IBD	Gravel	14	135	11	15	7	0	0	0.14
27 PR	S	IBD	Gravel	18	385	12	24	87	0	0	1.16
31 PR	S	IBD	Gravel	5	364	17	40	9	11	41	0.30

Appendix B

Bank Erosion formula:

Site	Bank height (ft.)	Lateral Recession Rate (from table)	Length (ft.)	Soil Type	Soil Weight (tons/ft³)	L x H x LRR x soil weight = Erosion (tons/year)
12 PR	1.5	0.20	175	SL	.0525	2.76
13 PR	2.5	0.25	108	SL	.0525	3.54
17 PR	3.0	0.10	42	S	.055	0.69
18 PR	2.0	.055	550	SL	.0525	3.18 x 70% reduction = 0.95
15 R	1.667	0.08	24	S	.055	0.18
25 PR	1.25	0.08	77	S	.055	0.42
28 PR	1.75	0.30	16	S	.055	0.46
24 R	3.5	0.40	20	SL	.0525	1.47

Soil types: **S** Sands and Loamy Sands (.055); **SL** Sandy Loam (.0525); **L** Loams, Sandy Clay Loams and Sandy Clays (.045).

* This driveway washed out in summer 2012. It has since been repaired. This soil loss measurement was conducted in fall 2012. Had soil loss been done at the time of the washout, it would have had a much higher tons/year of soil loss.

44.92 total tons/year soil loss in Woods Pond Watershed